OGLETHORPE POWER CORPORATION

Warrenton, Georgia

Warren County Biomass Electric Generation Facility Construction Permit Application

Volume II - Modeling

October 2009

Project 081101.0100

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CONSTRUCTION PERMIT APPLICATION
VOLUME II - MODELING

OGLETHORPE POWER CORPORATION ▪ WARRENTON, GEORGIA

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1. EXECUTIVE SUMMARY

Oglethorpe Power Corporation (Oglethorpe) plans to construct a nominal 100 megawatt (MW) biomass-fueled electric generating facility in Warren County, Georgia (Warren facility). The plant will consist of a biomass-fueled boiler and ancillary equipment to produce steam for the generation of electricity.

The scope of the project will require an air quality permit issued under the Prevention of Significant Deterioration (PSD) permitting rules as facility emissions exceed PSD applicability thresholds, as shown in the following table.

TABLE 1-1. PROPOSED FACILITY-WIDE POTENTIAL TO EMIT

Pollutant	Potential Emissions (tpy)	PSD/112(g) Thresholds (tpy)	Permitting Triggered?
CO	625.7	100	Yes
NO_X	648.7	40	Yes
PM[1]	143.8	25	Yes
PM_{10}[1]	144.4	15	Yes
$PM_{2.5}$[2]	144.4	10	Yes
SO_2	56.2	40	Yes
VOC	39.1	40	No
H_2SO_4	6.9	7	No
Fluorides	-	3	No
Pb	8.13E-04	0.6	No
Total HAP	19.9	25	No
Maximum Single HAP	9.9	10	No

1. PM emissions are filterable particulate only. PM_{10} emissions are estimated as total particulate emissions (filterable + condensable). PM_{10} filterable emissions are based on the speciation of the PM. Due to the differences in the material handling particulate speciations, filterable PM emissions are very similar to total PM_{10} emissions.

2. $PM_{2.5}$ emissions assumed to be equal to PM_{10} emissions for PSD applicability purposes.

Volume I of the construction permit application contains the project description, emission calculation methodologies, regulatory applicability analysis, Best Available Control Technology (BACT) review, and permit application forms. This report (Volume II) provides details of the air quality dispersion modeling conducted in support of the application.

The following sections detail the methods and models used to demonstrate that the proposed facility will not cause or contribute to a violation of either the National Ambient Air Quality Standards (NAAQS) or PSD Class I and Class II Increment. The modeling methods used are consistent with the U.S. EPA's *Guideline on Air Quality Models*, 40 CFR Part 51, Appendix W (Revised, November 9, 2005), and the U.S. EPA's *AERMOD Implementation Guide.*[1] Additionally, the ambient impact assessment of toxic air pollutant (TAP) emissions is conducted in accordance to the Georgia's *Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions* (June 21, 1998).

Consistent with Georgia Environmental Protection Division's (EPD) direction on the Ambient Ratio Method (ARM), Oglethorpe has shown compliance with the annual NO_2 standards by modeling NO_2 emissions as 75% of NO_X emissions.

Oglethorpe has presented the evaluations completed for PM_{10} to satisfy all PSD air quality analysis requirements for $PM_{2.5}$, consistent with the final $PM_{2.5}$ NSR Implementation Rule. Use of the PM_{10} surrogate approach was proposed in the modeling protocol submitted to Georgia EPD,[2] and subsequently approved[3]; refer to Appendix G for a copy of the letters. Oglethorpe recognizes that U.S. EPA recently suggested that the appropriateness of using PM_{10} as a surrogate for $PM_{2.5}$ must be judged on a case-by-case basis. Oglethorpe is confident that PM_{10} is an appropriate surrogate for $PM_{2.5}$ for this project and would be happy to discuss with Georgia EPD what, if any, additional information might be needed to support this approach. Although no annual NAAQS exists for PM_{10}, the modeling analysis includes an evaluation of the annual PM_{10} impacts, as the old PM_{10} annual standard is being used as a surrogate for the $PM_{2.5}$ annual standard.

The results of the air quality dispersion modeling analyses presented in this report can be summarized as follows:

- ▲ The proposed project does not cause any ambient impacts of CO, NO_2, and SO_2 above their respective Class II Significant Impact Levels (SILs) for all applicable averaging periods.
- ▲ The proposed project does not cause any ambient impacts of PM_{10}, NO_2, and SO_2 above their respective Class I SILs for all applicable averaging periods.
- ▲ Maximum ambient impacts of PM_{10} above the 24-hr and annual Class II SILs are predicted at a distance of 3.72 kilometers (km) and 1.40 km, respectively, from the proposed facility.
- ▲ The proposed facility does not cause or contribute to any exceedance of the PSD Class II Increment or NAAQS for PM_{10}.
- ▲ The ambient impacts of TAP emissions are far less than the acceptable ambient concentrations (AACs) as defined by Georgia EPD.

The PSD air quality analyses described in this report demonstrate that the proposed facility will neither cause nor contribute to a violation of any NAAQS, PSD Increment, or any Georgia EPD toxic air pollutant standards.

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[1] http://www.epa.gov/scram001/7thconf/aermod/aermod_implmtn_guide_19March2009.pdf.

[2] Letter from Mr. Doug Fulle (Oglethorpe) to Mr. Peter Courtney (Georgia EPD), dated April 28, 2009.

[3] Letter from Mr. Peter Courtney (Georgia EPD) to Mr. Doug Fulle (Oglethorpe), dated July 2, 2009.

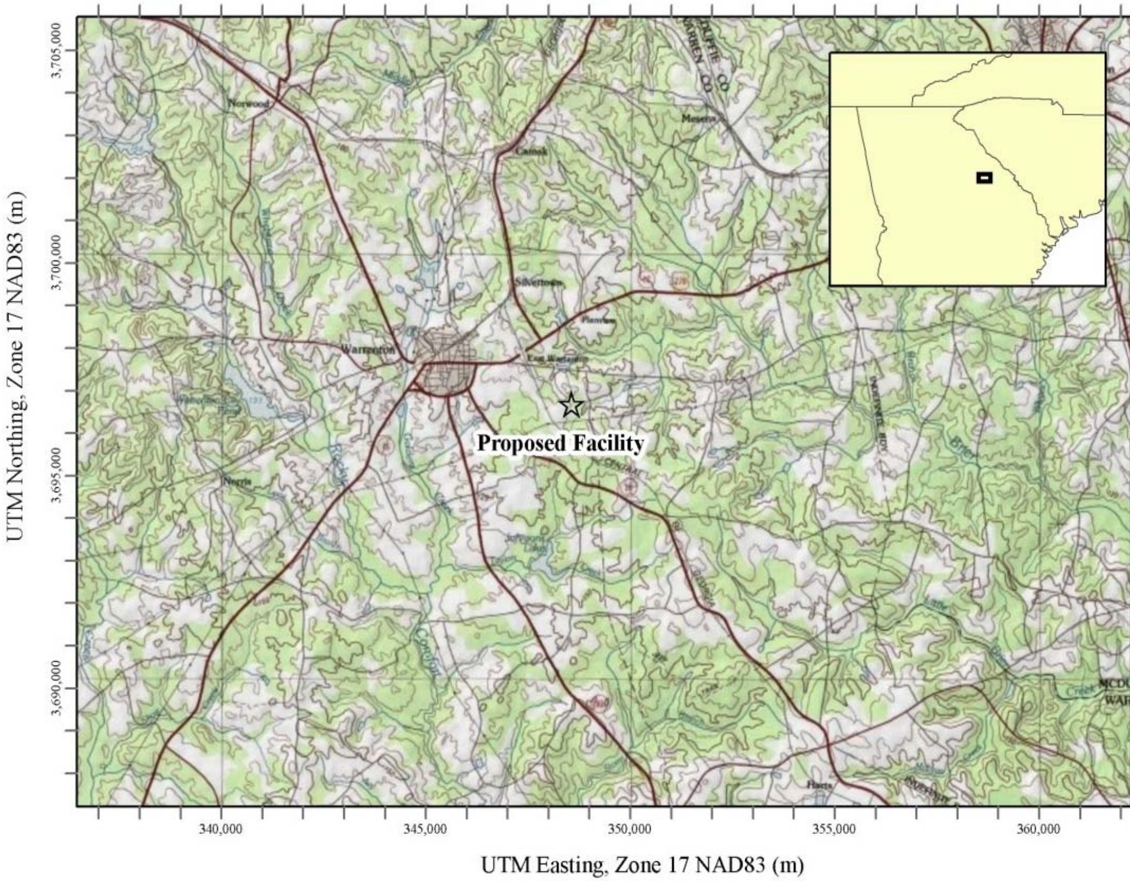
The remainder of this modeling protocol is organized as follows.

- Section 2 – description of the proposed project;
- Section 3 – required dispersion modeling analyses;
- Section 4 – technical approach employed in the modeling analyses;
- Section 5 – results of the PSD dispersion analyses;
- Section 6 – ambient impact assessment of TAP emissions;

- Appendix A – area map, site layout map, and other supporting figures;
- Appendix B – flowchart of PSD modeling requirements;
- Appendix C – land use representativeness analysis;
- Appendix D – documentation of the PM_{10} regional source inventory;
- Appendix E – electronic modeling files from all analyses;
- Appendix F – documentation of the Georgia EPD TAP analysis;
- Appendix G – dispersion modeling protocol and Georgia EPD response; and
- Appendix H – Class I notification letters.

Oglethorpe plans to construct a nominal 100 MW biomass fueled electric generating facility in Warren County, Georgia. The Warren facility will be located just east of the town of Warrenton, Georgia. Figure 2-1 provides a map of the area surrounding the Warren facility property.

FIGURE 2-1. FACILITY LOCATION



The proposed facility's air emissions units will be:

- Bubbling Fluidized Bed Boiler
- Emergency Fire Water Pumps
- Raw Material Handling and Storage
- Sorbent Silo
- Sand Silo and Day Hopper
- Fly Ash Silo and Bottom Ash Storage Area
- Storage Tanks
- Cooling Tower
- Paved Roads

A detailed discussion of emission estimates, including control technology limitations, is presented in Volume I of this application. Figures A-1 and A-2 in Volume II present the layout of buildings and modeled emission sources on the property. The emissions rates included in this modeling analysis are discussed in Section 4, "Modeling Methodologies."

Per Georgia EPD guidance, Oglethorpe excluded emissions from the emergency fire pumps as these units will operate less than 500 hours per year. [4]

[4] Letter from Mr. Peter Courtney (Georgia EPD) to Mr. Doug Fulle (Oglethorpe), July 2, 2009.

The Warren facility is located in Warren County, which has been designated by the U.S. EPA as "attainment" or "unclassifiable" for all criteria pollutants. As such, PSD regulations apply to any new major stationary source or major modifications to an existing major stationary source. As discussed in Volume I, the project triggers PSD requirements for CO, NO_X, PM, PM_{10}, $PM_{2.5}$, and SO_2 due to the emissions of the proposed project as shown in Table 3-1.

TABLE 3-1. PROPOSED FACILITY-WIDE POTENTIAL TO EMIT

Pollutant	Potential Emissions (tpy)	PSD/112(g) Thresholds (tpy)	Permitting Triggered?
CO	625.7	100	Yes
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1. PM emissions are filterable particulate only. PM_{10} emissions are estimated as total particulate emissions (filterable + condensable). PM_{10} filterable emissions are based on the speciation of the PM. Due to the differences in the material handling particulate speciations, filterable PM emissions are very similar to total PM_{10} emissions.

2. $PM_{2.5}$ emissions assumed to be equal to PM_{10} emissions for PSD applicability purposes.

Oglethorpe has determined that evaluations completed for PM_{10} are sufficient in satisfying all PSD air quality analysis requirements for $PM_{2.5}$. The use of a PM_{10} as a surrogate for $PM_{2.5}$ was first suggested by U.S. EPA in 1997, following the initial promulgation of the NAAQS for $PM_{2.5}$. This policy has subsequently been reaffirmed by U.S. EPA through interpretive memos and the final $PM_{2.5}$ NSR Implementation Rule, which underwent notice and comment rulemaking.[5,6,7] Oglethorpe

[5] *Interim Implementation of New Source Review Requirements for $PM_{2.5}$*, John Seitz (EPA OAQPS), October 23, 1997.

[6] *Implementation of New Source Review Requirements in $PM_{2.5}$ Nonattainment Areas*, Stephen Page (EPA OAQPS), April 5, 2005. This document reaffirms the 1997 Seitz memo.

recognizes that U.S. EPA recently suggested that the appropriateness of using PM_{10} as a surrogate for $PM_{2.5}$ must be judged on a case-by-case basis. Oglethorpe is confident that PM_{10} is an appropriate surrogate for $PM_{2.5}$ for this project and would be happy to discuss with Georgia EPD what, if any, additional information might be needed to support this approach.

Section 3 of this report addresses requirements for evaluating NAAQS, PSD Increment, and additional impacts. These PSD air dispersion modeling analyses were conducted in accordance with the following guidance documents:

- ▲ U.S. EPA's *Guideline on Air Quality Models* 40 CFR Part 51, Appendix W (Revised, November 9, 2005)
- ▲ U.S. EPA's *AERMOD Implementation Guide* (http://www.epa.gov/scram001/7thconf/aermod/aermod_implmtn_guide_19March2009.pdf)
- ▲ Georgia EPD's *Georgia Air Dispersion Modeling Guidance* (http://www.georgiaair.org/airpermit/downloads/infodocs/AirDispModelingGuid_v2.pdf)

A summary of the tasks that are performed in a standard PSD air quality modeling analysis is presented in the flow chart provided as Appendix B to this report.

3.1 LOAD MODELING ANALYSIS

The *Guideline on Air Quality Models* states that modeling should contain sufficient detail to determine the maximum ambient concentration of the pollutant under consideration, and that this will likely involve modeling several operating loads or production rates. For some types of sources, operating at a reduced load translates into reduced stack gas exit velocities and/or temperatures, leading to different and potentially higher modeled impact characteristics.

Oglethorpe conducted a screening analysis to determine which operating load results in the highest modeled ambient impacts. Table 3-2 presents the stack characteristics modeled in this analysis.

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[7] "Implementation of the New Source Review (NSR) Program for Particulate Matter Less Than 2.5 Micrometers ($PM_{2.5}$)," May 16, 2008, 73 FR 28321. In this final rule, EPA formally established the prior 1997 PM_{10} surrogate policy as the approach to address $PM_{2.5}$ NSR in SIP-approved states until the earlier of May 16, 2011 or when a state develops its own $PM_{2.5}$ NSR regulations.

TABLE 3-2. WARREN FACILITY OPERATING LOAD ANALYSIS STACK CHARACTERISTICS

Scenario	Fuel Blend	Operating Load	Stack Height (ft)	(m)	Exhaust Temperature (°F)	(K)	Exhaust Velocity (ft/s)	(m/s)	Stack Diameter (ft)	(m)
1	Design Blend	VWO	220	67	335	441	79	24	12	4
2	Design Blend	100% Load	220	67	330	439	74	23	12	4
3	Off-Design Blend	VWO	220	67	335	441	81	25	12	4
4	Off-Design Blend	100% Load	220	67	330	439	77	23	12	4
5	Off-Design Blend	80% Load	220	67	330	439	66	20	12	4
6	Off-Design Blend	60% Load	220	67	330	439	51	16	12	4
7	Off-Design Blend	40% Load	220	67	325	436	37	11	12	4
8	Worst HHV Blend	VWO	220	67	335	441	87	26	12	4

Values shown above in metric units have been rounded to improve readability. Please refer to appendices for precise values.

The SCREEN3 model was used to model a unit emission rate under each of the scenarios. Since the boiler building adjacent to the boiler stack is a significant downwash structure, building downwash was enabled in the modeling analysis. Table 3-3 shows the dimensions of the boiler building.

TABLE 3-3. WARREN BUILDING DIMENSIONS FOR MODELING

Building	Height (m)	Minimum Horizontal Dimension (m)	Maximum Horizontal Dimension (m)
Boiler Building	57.9	48.2	54.9

The results for the scenarios are presented in Table 3-4.

TABLE 3-4. WARREN OPERATING LOAD ANALYSIS RESULTS

Scenario	Fuel Blend	Load	Modeled Emission Rate (g/s)	Maximum Impact ($\mu g/m^3$)	Distance to Maximum (m)
1	Design Blend	VWO	1	12.09	174
2	Design Blend	100% Load	1	12.73	174
3	Off-Design Blend	VWO	1	11.70	174
4	Off-Design Blend	100% Load	1	12.36	174
5	Off-Design Blend	80% Load	1	13.98	174
6	Off-Design Blend	60% Load	1	17.07	174
7	Off-Design Blend	40% Load	1	21.79	174
8	Worst HHV Blend	VWO	1	10.98	178

For the purposes of modeling the impacts of the facility for the remainder of the modeling in Volume II, Oglethorpe has conservatively modeled the main boiler stack using the set of stack parameters that yielded the highest unit impacts, represented in Table 3-4 by Scenario 7, or 40% load, for all scenarios (the specific emission rates modeled are presented in Section 4).[8] The modeled stack parameters for the boiler stack under this worst-case load impact are summarized in Table 3-5.

TABLE 3-5. MODELED BIOMASS BOILER STACK PARAMETERS

Stack Height (m)	Exhaust Temperature (K)	Exhaust Velocity (m/s)	Stack Diameter (m)
67.06	435.93	11.27	3.66

3.2 SIGNIFICANCE ANALYSIS (CLASS II)

The Class II Significance Analysis is conducted to determine whether the emissions increases associated with the project would cause a significant impact upon the area surrounding the facility. The Significance Analysis is limited to CO, NO_2, PM_{10}, and SO_2, as these are the only pollutants for which PSD modeling requirements are triggered (see discussions in Section 3 regarding $PM_{2.5}$ and Section 3.3 regarding ozone). "Significant" impacts are defined by ambient concentration thresholds commonly referred to as the Significance Impact Levels (SILs), shown in Table 3-6.

[8] To be more accurate, one could define the specific emission rate associated with 40% load, and model that with the 40% load parameters, and so on for the other loads. For this project, Oglethorpe has used a highly conservative approach that will overestimate boiler impacts by using the stack parameters associated with the lowest dispersion together with the maximum emission rates proposed from the boiler (these rates may not actually occur at the 40% load). As can be inferred from the maximum impacts in Table 3-4, this conservative approach likely overestimates boiler impacts by a factor of approximately two.

TABLE 3-6. SIGNIFICANT IMPACT LEVELS, NAAQS, PSD CLASS II INCREMENTS, AND MONITORING *DE MINIMIS* LEVELS FOR CRITERIA AIR POLLUTANTS

Pollutant	Averaging Period	PSD SIL ($\mu g/m^3$)	Primary and Secondary NAAQS ($\mu g/m^3$)	Class II PSD Increment ($\mu g/m^3$)	Monitoring *de minimis* Level ($\mu g/m^3$)
CO	1-hour	2,000	40,000	--[1]	--
	8-hour	500	10,000	--[1]	575
NO_2	Annual	1	100	25	14
Ozone	8-hour	--[3]	147	--[3]	VOC or NO_X emissions increase >100 tpy
PM_{10}	24-hour	5	150	30	10
	Annual	1	50[2]	17	--
SO_2	3-hour	25	1,300	512	--
	24-hour	5	365	91	13
	Annual	1	80	20	--

1. No PSD Increments have been established for CO.
2. Although the annual NAAQS for PM_{10} was revoked, effective December 17, 2006, its value is shown as the annual-average impacts of PM_{10} are being used as a surrogate for compliance with the annual
3. No SIL or PSD Increments have been established for Ozone.

If the highest off-property concentration for a given pollutant is less than the SIL for all averaging periods, then further analyses for that pollutant are not required. This is because the emissions increases resulting in impacts less than the SIL, by definition, are unable to either cause or contribute to any exceedance of the NAAQS or PSD Increment. If concentrations exceed the SIL, NAAQS and PSD Increment analyses are required to demonstrate that the project neither causes nor contributes to any exceedances.

The geographic extent to which significant impacts occur is used to define the significant impact area (SIA) within which compliance with the NAAQS and PSD Increments must be demonstrated. The SIA encompasses a circle centered on the Warren facility with a radius extending out to either (1) the farthest location where the predicted ambient impact of a pollutant from the project exceeds the Class II SIL, or (2) a distance of 50 km, whichever is less. All sources within a distance of 50 km of the edge of a SIA are assumed to potentially contribute to ground-level concentrations within the SIA and are considered for possible inclusion in the NAAQS and PSD Increment analyses.

3.3 AMBIENT MONITORING REQUIREMENTS

Under current U.S. EPA policies, the maximum impacts due to the emissions increases from a project are also assessed against monitoring *de minimis* levels to determine whether pre-construction monitoring should be considered. The monitoring *de minimis* concentrations for CO, PM_{10}, NO_2, and

SO_2 are listed in Table 3-6. If either the predicted modeled impact from the project or the existing ambient concentration is less than the monitoring *de minimis* concentration, the permitting agency has the discretionary authority to exempt an applicant from pre-construction ambient monitoring.

For the pollutants that exceed the monitoring *de minimis* levels, Oglethorpe requests that Georgia EPD waive the pre-construction monitoring requirements of 40 CFR 52.21(m) for this project since background concentration data developed from a statewide study are already available from Georgia EPD and provide suitable estimates of background concentrations. For PM_{10}, which is the only pollutant to exceed the monitoring *de minimis* concentrations, the ambient background concentrations are 20 $\mu g/m^3$ and 38 $\mu g/m^3$ for annual and 24-hour average concentrations, respectively.[9] These data provide reasonable (or in some cases conservative) estimates of the background pollutant concentrations considered in this analysis, and the values are added to PM_{10} impacts predicted in the modeling analysis conducted to demonstrate compliance with the NAAQS. CO, NO_2 and SO_2 are below the monitoring *de minimis* concentrations, and thus no pre-construction monitoring is required.

While the Significance Analysis modeling does not predict NO_2 concentrations greater the monitoring *de minimis* levels, the NO_X project emission increases are greater than 100 tpy, which is the SIL trigger for ozone. As NO_X and VOC are precursors to ozone formation, the project's potential impact on ozone formation is considered. A minimal impact on ozone formation due to NO_X is typically demonstrated through compliance with the NO_2 standard, and due to the infeasibility of completing a photochemical modeling analysis for a single stationary source. The southeastern U.S. is considered a NO_X-limited atmosphere with respect to ozone formation, and while it is possible that increasing NO_X emissions in a NO_X-limited atmosphere could cause an increase in ozone production, this effect is miniscule on an individual source-level and for practical purposes cannot be quantified, but rather is qualitatively addressed as insignificant for all but the very largest sources.[10] Furthermore, ozone monitor data are readily available from the state-run ozone monitors in Athens and Augusta, Georgia, located approximately 55 and 35 miles from the Warren facility, respectively. Further, Oglethorpe asserts that ozone monitoring is not necessary in light of the relatively small magnitude of the NO_X emissions increases (and the VOC increase below even the PSD Significant Emission Rate [SER]) as well as the presence of the existing monitors that are nearby.

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[9] Letter from Mr. Peter Courtney (Georgia EPD) to Mr. Doug Fulle (Oglethorpe), July 2, 2009.

[10] To appreciate the essentially immeasurable impact on area ozone due to a source such as proposed, consider EPA's detailed findings in the final CAIR rulemaking (generally 70 FR 25162, May 12, 2005). Table VI-12 (p. 25254) shows a base case impact for Atlanta a 1.4 ppb decrease via 2010 CAIR controls. Those 2010 CAIR controls are based on a reduction of 1.2 million tpy of NO_X in the states. Focusing on Georgia reductions alone, which have the largest impact on ozone, a state reduction of 76,819 tpy (combined with reductions in surrounding states) was necessary to impact ozone by 1.4 ppb. Using the relationship of Georgia reductions in NO_X to ozone level reductions, a 648 tpy emissions rate could be expected to impact ozone by 0.012 ppb, which is 0.016% of the 75 ppb NAAQS. Contrast 0.016% with the relative ratios of SIL versus NAAQS in Table 3-6. The next lowest ratio for a short-term standard is SO_2 24-hr with a factor of 1.36%, or nearly two orders of magnitude different.

3.4 REGIONAL SOURCE INVENTORIES

For off-site pollutant impacts calculated in the Significance Analysis that exceeded the applicable Class II SIL, a Significant Impact Area (SIA) was determined for each pollutant for which an exceedance is predicted. The SIA encompasses a circle centered on the Warren facility with a radius extending out to the (1) furthest locations where emissions increases cause a significant ambient impact, or (2) a distance of 50 km, whichever is less. Based on the PM_{10} Significance Analysis results, the SIA was determined to be 3.72 km for the 24-hour averaging period and 1.40 km for the annual averaging period. Therefore, the 3.72 km distance was used to establish the SIA used for all of the PM_{10} NAAQS and Increment modeling. All other pollutants were shown to have impacts below their respective SILs. To develop the PM_{10} inventory, all PM_{10} sources within a distance of 50 km of the edge of a SIA are assumed to potentially contribute to ground-level concentrations within the SIA and were evaluated for possible inclusion in the NAAQS and PSD Increment analyses.

The PM_{10} regional source inventory was compiled using the procedures provided by Georgia EPD.[11] The first step was to develop an initial list of facilities within 50 km of the SIA, a distance of 53.72 km (also known as the Significant Impact Distance [SID]). Oglethorpe used a Geographic Information System (GIS) program to select all counties that fall within 53.72 km of the Warren facility. Oglethorpe then identified all sources in these counties using a list of Title V sources provided by Georgia EPD[12], and the Georgia EPD online database of issued air permits.[13] Oglethorpe reviewed the list of sources and calculated the distance from each facility in the inventory to the Warren facility. Any sources beyond 50 km of the SIA were excluded.

For sources within 50 km of the SIA, Oglethorpe reviewed the Georgia EPD online Title V database, facility permits available online, and Georgia EPD paper files to determine the potential PM_{10} emissions for each facility. For these facilities within 50 km of the SIA, the “20D” screening process was applied to exclude insignificant sources.[14] In this process, regional sources whose potential PM_{10} emissions (tpy) were less than 20 times the distance to the edge of the SIA (in km) were eliminated since they can be presumed to have negligible contributions to receptors in the SIA. Regional sources located within close proximity to each other (2 km, per Georgia EPD guidance) were evaluated cumulatively in the 20D analysis to determine whether the combined “source” was still appropriate to exclude. Tables 1 and 2 in Appendix D list the sources considered in the 20D screening evaluation.

Following application of the 20D rule, four facilities (three major sources and one minor source) remained for inclusion in the PM_{10} regional source inventory. For the three major sources, individual stack parameters were obtained from the 2005 National Emission Inventory (NEI) dataset. Emissions from these facilities were used to prepare inventories for the NAAQS and Increment modeling. If necessary, a facility-specific scalar was applied to the individual emission sources to ensure the total facility-wide potential emissions were being modeled for NAAQS compliance. For example, for the

[11] Letter from Mr. Peter Courtney (Georgia EPD) to Mr. Doug Fulle (Oglethorpe), July 2, 2009.

[12] Title V Source list provided by Mr. Peter Courtney (Georgia EPD) on May 4, 2009.

[13] http://www.georgiaair.org

[14] Federal Register, Volume 57, No. 45, March 6, 1992, p. 8079.

Temple-Inland facility in Thomson, Georgia, the facility potential emissions of PM_{10} are listed as 275.1 tpy. However, the potential emissions from the individual sources are only 248.7 tpy. Therefore, the emissions from each individual source were multiplied by a factor of 1.11 (representing the ratio of 275.1 ÷ 248.7), so that the total modeled emissions for the facility match its listed facility-wide potential emissions.

For the Increment inventory, all major emission sources constructed after the PM_{10} major source baseline date were included as increment consumers. Emission sources constructed before the major source baseline date are considered baseline sources, and are not included in the increment inventory. Emission rates for the Increment inventory are based on actual facility emissions, as presented in the 2005 NEI dataset, and construction dates are based on the installation and modification dates listed in facility Title V permit applications.

The lone minor source identified for inclusion in the modeling inventory is Martin Marietta Aggregates Warrenton Rock Quarry, located approximately 1.5 km southwest of the proposed Warren facility. Emission rates for sources at this facility were determined from a review of the facility files at Georgia EPD. The current potential emissions for the facility are based on the December 17, 2008, emission inventory contained in the facility permit files. These potential emissions were modeled as both the NAAQS emission inventory, and as the increment-consuming sources at the facility. The facility's increment-expanding emissions, those existing prior to the PM_{10} minor source baseline date of November 19, 1997, for Warren County and since shutdown, are represented by the emission sources not present in the 2008 inventory, but listed in the December 7, 1996, emission inventory of the facility. Stack parameters and coordinates for the emission sources were determined from electronic modeling files of the facility, provided by Georgia EPD.[15]

Emission rates and stack parameters for the NAAQS and Increment emission inventory sources are shown in Tables D-3 and D-4 of Appendix D.

3.5 NAAQS ANALYSIS

The primary NAAQS are the maximum concentration ceilings, measured in terms of total concentration of a pollutant in the atmosphere, which define the "levels of air quality which the U.S. EPA judges are necessary, with an adequate margin of safety, to protect the public health."[16] Secondary NAAQS define the levels that "protect the public welfare from any known or anticipated adverse effects of a pollutant." The objective of the NAAQS analysis is to demonstrate through air quality modeling that emissions from a proposed project do not contribute to or cause an exceedance of the NAAQS at any ambient location. Table 3-6 lists the NAAQS for the criteria pollutants modeled for this project.

[15] Modeling files provided as email attachments from Mr. Peter Courtney (Georgia EPD) to Mr. Stephen Simonsen (Trinity Consultants) on July 22, 2009.

[16] 40 CFR §50.2(b)

For PM_{10}, a NAAQS analysis is required since the Significance Analysis impacts were above the SILs. The NAAQS analysis included the potential emissions from all proposed emission units at the Warren facility. Impacts attributable to facility-wide emissions were then combined with the impacts attributable to the regional source inventory. The resulting impacts, added to appropriate background concentrations, were assessed against the applicable NAAQS to demonstrate compliance. The highest 6th high 24-hour PM_{10} concentration predicted over the five-year period of meteorological data was compared to the NAAQS 24-hour standard for PM_{10}. The maximum of the annual average concentrations predicted over each of the five years was compared to the NAAQS annual standard for PM_{10}. These concentrations are calculated and compared in Section 5 of this volume.

3.6 CLASS II PSD INCREMENT ANALYSIS

The PSD Increments were established to "prevent deterioration" of air quality in certain areas of the country where air quality was better than the NAAQS. To achieve this goal, U.S. EPA established PSD Increments for certain pollutants. The sum of the PSD Increment concentration and a baseline concentration defines a "reduced" ambient standard, either lower than or equal to the NAAQS that must be met in an attainment area. U.S. EPA has established PSD Increments for PM_{10}, and thus Increment was addressed. The Class II PSD Increments are listed in Table 3-6.

To demonstrate compliance with the Class II PSD Increments, PM_{10} emissions from the Warren facility and those from sources in the regional inventory were modeled. For short-term averaging periods, the highest-second-high impact is compared to the applicable PSD Increment to assess compliance. For annual average standards the highest incremental impact is assessed.

The determination of whether an emissions change at a given source consumes or expands Increment is based on the source definition and the time the change occurs in relation to baseline dates. The major source baseline date for PM_{10} is January 6, 1975. Emission changes at major sources that occur after the major source baseline date affect Increment. In contrast, emission changes at minor sources only affect Increment after the minor source baseline date, which is set at the time when the first complete PSD application is submitted in a given area, usually classified on a county-by-county basis in Georgia. The Minor Source Baseline date for PM_{10} emissions in Warren County was established on November 19, 1997.

3.7 CLASS I REQUIREMENTS

Class I areas are federally protected areas for which more stringent air quality standards apply to protect unique natural, cultural, recreational, and/or historic values. Two principal air quality impacts are considered for Class I areas: PSD Increments for NO_2, SO_2, and PM_{10}, and air quality related values (AQRV).

In general, all PSD permit applications are required to demonstrate through air quality modeling that the emissions increases from the proposed project will not cause or contribute to any violations of allowable increments within potentially affected Class I areas, which are protected to a greater degree (i.e., the allowable increments are lower) than Class II areas. A significant contribution to Class I Increment consumption is defined as a modeled concentration in excess of the significant impact levels summarized in Table 3-7. These significant impact levels, which were originally developed as part of the 1996 New Source Review (NSR) reform rulemaking, have been accepted by states and Federal Land Managers (FLM) as an indication of whether a project is likely to cause or contribute to a Class I increment violation.

TABLE 3-7. CLASS I PSD INCREMENTS AND MODELING SIGNIFICANCE LEVELS

Pollutant	Averaging Period	Class I Increment ($\mu g/m^3$)	Proposed Significance Level ($\mu g/m^3$)
PM_{10}	24-hour	8.0	0.3
	Annual	4.0	0.2
SO_2	3-hour	25.0	1.0
	24-hour	5.0	0.2
	Annual	2.0	0.1
NO_2	Annual	2.5	0.1

In addition to the Class I Increment, the proposed project may be evaluated for its potential impact on AQRV at potentially-affected Class I areas. The FLM for Class I areas have the responsibility to protect AQRV and to consider, in consultation with the permitting authority, whether a proposed major emitting facility will have an adverse impact on such values. AQRV typically considered include visibility and deposition of sulfur and nitrogen.

Oglethorpe has qualitatively evaluated its impacts on federally-protected Class I areas by performing a Q/D screening analysis consistent with the recently adopted 2005 Best Available Control Technology (BART) guidelines for the Regional Haze Rule, which compares the ratio of visibility affecting pollutant emissions to the distance from the Class I area.[17] The analysis suggests that the proposed project will have no presumptive adverse impacts to any AQRVs at near-by Class I areas; therefore, Oglethorpe plans no AQRV analyses for the proposed project.

Oglethorpe has submitted a request for concurrence to the appropriate FLMs on the findings for the nearby Class I areas.[18,19,20] Copies of the letters to the FLMs presenting the Q/D screening analysis are included in Appendix H.

In order to assure that the proposed project does not contribute to exceedances of the Class I Increment standards at any of the above Class I areas, Oglethorpe performed a screening analysis for

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[17] U.S. EPA*, Regional Haze Regulations and Guidelines for Best Available Retrofit Technology (BART) Determinations; Final Rule, Federal Register Volume 70, No. 128, July 6, 2005*.

[18] Letter from Mr. Doug Fulle (Oglethorpe) to Mr. Bill Jackson (USDA Forest Service), October 2, 2009.

[19] Letter from Mr. Doug Fulle (Oglethorpe) to Ms. Catherine Collins (United States Fish and Wildlife Service), October 2, 2009.

[20] Letter from Mr. Doug Fulle (Oglethorpe) to Mr. John Notar (National Park Service), October 2, 2009.

Class I Increment. Following the procedure outlined by Georgia EPD, Oglethorpe appended 10 receptors for each Class I area to the receptor grid used for the Class II Significance Analysis. These receptors are located 50 km from the facility (the maximum recommended range of AERMOD), spaced 1 km apart, arrayed outward from a line connecting the Warren facility and Class I areas, and are shown on a plot in Appendix A. The results from these receptors are compared against the proposed Class I Modeling Significance Levels in Table 3-7 to demonstrate whether the project emissions would contribute to an exceedance of the Class I Increment.

3.8 ADDITIONAL IMPACTS ANALYSIS

PSD regulations require that three additional impacts be considered as part of a PSD permit action. These are a growth analysis, a soil and vegetation analysis, and a visibility analysis. The effect of the proposed project's PM_{10}, NO_2, SO_2, and CO emissions on local soils and vegetation is addressed through comparison of modeled impacts to secondary NAAQS and other relevant screening criteria that have been developed by U.S. EPA to provide protection for public welfare, including protection against decreased visibility, damage to animals, crops, vegetation and buildings.[21] PSD regulations require that three additional impacts be considered as part of a PSD permit action. These are a growth analysis, a soil and vegetation analysis, and a visibility analysis. The effect of the proposed project's PM_{10}, NO_2, SO_2, and CO emissions on local soils and vegetation is addressed through comparison of modeled impacts to secondary NAAQS and other relevant screening criteria that have been developed by U.S. EPA to provide protection for public welfare, including protection against decreased visibility, damage to animals, crops, vegetation and buildings.[22] Oglethorpe has determined that there is no potential for federally-listed threatened or endangered species at the proposed site. While there is the potential for five Georgia listed species (endangered, threatened, or unusual) to occur in Warren County, there is no habitat onsite for the three animals and no evidence of typical habitat for the two plants. Based on this review, no flora or fauna requiring protection at levels below the secondary NAAQS have been identified, and the secondary NAAQS are a suitable threshold for soils and vegetation impacts.

There will be some growth associated with the project. Long-term, there are estimated to be 40 full-time jobs directly associated with the facility. In addition, there will be indirect jobs in the area surrounding the facility, with the largest portion being related to supplying biomass for fuel. There is a surplus of wood in the area (approximately a 75 mile radius) surrounding the facility – average annual net growth is approximately 550 million cubic feet ($MMft^3/yr$) of pine and 720 $MMft^3/yr$ of all species, while annual removals are only 390 $MMft^3/yr$ of pine (71%) and 490 $MMft^3/yr$ off all species (68%). Thus, there is ample biomass in the area to support the proposed facility.

The general area has experienced a modest decrease in population since 1990. Warren County has declined from 6,078 to 5,908 (-3%), while Warrenton has declined from 2,056 to 1,926 (-6%). For comparison, over that same time period, the Augusta metropolitan statistical area (MSA) grew by

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[21] U.S. EPA, *A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils and Animals* (EPA 450/2-81-078). 1980.

[22] U.S. EPA, *A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils and Animals* (EPA 450/2-81-078). 1980.

22% and the Atlanta MSA grew by 72%. Thus, there is significant existing capacity in the city and county to absorb project related growth without requiring an infrastructure or housing expansion, and any general population growth impacts would be considered *de minimis*.

It is unclear what job growth or other impacts may be related to the facility biomass purchases. There is a surplus of unused biomass material in the area, but it is not possible to predict what portion may come from slash (leftover from timber or pulp harvesting) versus whole trees nor specifically what sources could supply the biomass. It is likely there could be some increase in chipping in the area, as the most efficient way to transport much of the biomass will be as chips. However, where and by whom cannot be reasonably estimated.

Per Georgia EPD, visibility analyses for Class II areas are not necessary for this project, as no airstrips, state parks, or State Historic Sites are located within the project's Significant Impact Area (SIA).[23]

[23] Letter from Mr. Peter Courtney (Georgia EPD) to Mr. Doug Fulle (Oglethorpe), July 2, 2009.

4. MODEL SELECTION AND METHODOLOGY

This section includes a summary of the modeling methodology originally presented in dispersion modeling protocol previously submitted,[24] and subsequently approved by Georgia EPD.[25] Copies of these letters are included in Appendix G.

4.1 MODELED EMISSION SOURCES

As discussed in Section 3 of this report, the Significance, Increment, and NAAQS modeling analyses have different objectives and therefore, include distinct sets of emission sources and/or emission rates in the analyses. In short, the Significance Analysis evaluates the emission increases associated with the project; the Increment Analysis evaluates the changes in emissions relative to a baseline date, while the NAAQS Analysis evaluates all emission sources currently in operation. This section discusses the emission sources and rates included in each of these analyses.

4.1.1 WARREN FACILITY MODELED SOURCES

Table 4-1 presents a summary of the Warren facility modeled source. Note that since the Warren facility is an entirely new facility, all emissions will be used for the Significance, Increment, and NAAQS analyses. Emissions from all sources other than the biomass boiler are modeled using a single rate for short- and long-term averaging periods, shown in Table 4-1.

[24] Letter from Mr. Doug Fulle (Oglethorpe) to Mr. Peter Courtney (Georgia EPD), April 28, 2009.

[25] Letter from Mr. Peter Courtney (Georgia EPD) to Mr. Doug Fulle (Oglethorpe), dated July 2, 2009.

TABLE 4-1. MODELED SOURCES LIST

Model ID	Source Description	PM_{10} Modeled Emission Rates[1] (lb/hr)	(g/s)
	Process Units - Point Sources		
CT01	Cooling Tower (Cell 1)	5.97E-02	7.52E-03
CT02	Cooling Tower (Cell 2)	5.97E-02	7.52E-03
CT03	Cooling Tower (Cell 3)	5.97E-02	7.52E-03
CT04	Cooling Tower (Cell 4)	5.97E-02	7.52E-03
BMG01	Biomass Unloading Area (BM01)	1.94E+00	2.45E-01
BMG02	Fuel Processing Building (BM02)	1.98E+00	2.49E-01
BMG03	Transfer Tower (BM03)	1.08E+00	1.37E-01
BMG04	Boiler Fuel Feed System (BM04)	8.52E-01	1.07E-01
BMG05	Sorbent Silo (BM05)	4.23E-02	5.33E-03
BMG06	Boiler Bed Sand Silo (BM06)	4.23E-02	5.33E-03
BMG07	Sand Day Silo (BM07)	4.23E-02	5.33E-03
BMG08	Bottom Ash Covered Storage Area (BM08)	6.35E-02	8.00E-03
BMG09	Fly Ash Silo (BM09)	6.35E-02	8.00E-03
BMG10	Mobile Grinder (BM10)	2.67E-01	3.36E-02
	Fuel Handling - Volume Sources		
TX01	Material Unloading/Truck Dump (DMP1 - DMP6)	4.42E-03	5.57E-04
TX02	Transer from Dump (DMP1 - DMP6) to Hopper (HPR1 - HPR6)	1.47E-03	1.86E-04
TX03	Transfer Belt Conv. (CV05, CV06) to Radial Stacking Belt Conv. (CV07, CV08)	5.34E-04	6.73E-05
TX04	Radial Stacking Belt Conveyor (CV07) to Radial Stock Pile (SP01)	7.86E-04	9.90E-05
TX05	Radial Stacking Belt Conveyor (CV08) to Radial Stock Pile (SP02)	7.86E-04	9.90E-05
TX06	Radial Stock Pile (SP01) to Reclaim Chain Conveyor (CV09)	3.93E-04	4.95E-05
TX07	Radial Stock Pile (SP02) to Reclaim Chain Conveyor (CV10)	3.93E-04	4.95E-05
TX08	Reclaim Chain Conveyor (CV09) to Reclaim Belt Conveyor (CV11)	1.34E-04	1.68E-05
TX09	Reclaim Chain Conveyor (CV10) to Reclaim Belt Conveyor (CV12)	1.34E-04	1.68E-05
TX10	Reclaim Belt Conveyor (CV11) to Stockout Belt Conveyor (CV13)	1.34E-04	1.68E-05
TX11	Reclaim Belt Conveyor (CV12) to Stockout Belt Conveyor (CV13)	1.34E-04	1.68E-05
TX12	Longwood Material Unloading	2.46E-03	3.09E-04
GRN3	Longwood Grinder	9.00E-02	1.13E-02
	Biomass Storage Piles - Volume Sources		
SP01	Radial Stock Pile 1 (SP01)	1.18E-01	1.48E-02
SP02	Radial Stock Pile 2 (SP02)	1.18E-01	1.48E-02
SP03	Longwood Storage (SP03)	1.04E-01	1.31E-02
	Paved Roads - Volume Sources		
RMH01-71	Single Road Segment[2]	4.58E-02	5.77E-03

1. Emission rates have been rounded to ease readability. Please refer to appendices for precise values.
2. Paved roads are represented as 71 volume sources, all with the same emission rate.

4.1.2 BIOMASS BOILER EMISSION RATES

For the biomass boiler the proposed emission limits for BACT reflect values appropriate for long-term (30-day) averaging periods for CO, NO_X and SO_2. However, over short time frames emissions from a boiler can demonstrate notable variability, while over a longer-term period the average emission rate will meet the BACT limit. In order to accommodate the inherent variability of emissions, while demonstrating compliance with the modeling analyses, Oglethorpe has modeled short term emission rates that are higher than the BACT limits. The modeled emission rates are shown in Table 4-2. The listed rates are multiples of the maximum short term heat input of 1,399 MMBtu/hr for all averaging periods, and the control technology-based emission limits documented in Volume I.[26] Oglethorpe is not proposing the values in Table 4-2 as emissions limits, but rather as a demonstration that no emission limits are needed to protect the ambient air. Even with the conservatism of the 40% stack parameters and the multipliers shown in Table 4-2, neither CO, NO_2 or SO_2 exceed even the SIL.

TABLE 4-2. MODELING EMISSION RATES FOR THE BOILER

Pollutant	BACT Limit (lb/MMBtu)	BACT-equivalent Emissions (lb/hr)[1]	Short-term Emissions (lb/hr)[2]	Avg. Period	Modeled Emission Rate (lb/hr)	Multiplier of Short-Term Rate
CO	0.080	102.56	111.92			
				1-Hour	2,238.40	20
				8-Hour	1,119.20	10
NO_2[3]	0.110	141.02	153.89			
				Annual	115.42	1
PM_{10}	0.018	23.08	25.18			
				24-Hour	25.18	1
				Annual	25.18	1
SO_2	0.010	12.82	13.99			
				3-Hour	104.93	8
				24-Hour	69.95	5
				Annual	13.99	1

1. BACT-equivalent rate based on BACT limits and annual sustainable heat input rate of 1,282 MMBtu/hr.
2. Short-term rate based on BACT limits and short-term heat input rate of 1,399 MMBtu/hr.
3. NO_2 emissions were molded as 75% of NO_X short-term emissions, per the Ambient Ratio Method.

- For CO, Oglethorpe modeled a one-hour average emission rate based on multiplier of 20, and an eight-hour average emission rate multiplier of 10. These values still result in predicted concentrations below the 1-hour and 8-hour SILs for CO. Thus, for CO, Oglethorpe proposes that no additional short-term limit is necessary to protect the NAAQS and requests that no short-term limit be included.
- For NO_2, there are no Class II ambient air quality standards with a short-term limit. Consistent with Georgia EPD's direction on ARM,[27] Oglethorpe has shown compliance with the annual NO_2 standards by modeling NO_2 emissions as 75% of

[26] Note that for the NO_X and SO_2 annual values, the modeled values when converted to tons per year are slightly higher than Oglethorpe is requesting for the boiler, which results in a conservative analysis.

[27] Letter from Mr. Peter Courtney (Georgia EPD) to Mr. Doug Fulle (Oglethorpe), dated July 2, 2009.

NO_X emissions for both the significance level (SIL) and inventory modeling (NAAQS/Increment).

- For PM_{10}, the compliance method is via 3-hour stack test, and thus the BACT limit averaging period is shorter than the shortest PM_{10} averaging period. No multiplier was considered.
- For SO_2, Oglethorpe modeled a three-hour average multiplier of 8 and a 24-hour multiplier of 5. As with CO, these emissions still result in predicted concentrations below the all SILs for SO_2. As such Oglethorpe proposes that no additional 3-hour limit is necessary to protect the NAAQS or Increment and requests that no 3-hour or 24-hour limits be included.

4.2 SELECTION OF MODEL

The latest version (07026) of the AERMOD modeling system was used to estimate maximum ground-level concentrations in all air pollutant analyses conducted for this application. AERMOD is a refined, steady-state, multiple source, Gaussian dispersion model and was promulgated in December 2005 as the preferred model for use by industrial sources for this type of air quality analysis.[28] The AERMOD model has the Plume Rise Modeling Enhancements (PRIME) incorporated in the regulatory version, so the direction-specific building downwash dimensions used as inputs are determined by the Building Profile Input Program, PRIME (BPIP PRIME), version 04274.[29] BPIP PRIME is designed to incorporate the concepts and procedures expressed in the GEP Technical Support document, the Building Downwash Guidance document, and other related documents, while incorporating the PRIME enhancements to improve prediction of ambient impacts in building cavities and wake regions.[30]

The AERMOD modeling system is composed of three modular components: AERMAP, the terrain preprocessor; AERMET, the meteorological preprocessor; and AERMOD, the control module and modeling processor. AERMAP is the terrain pre-processor that is used to import terrain elevations for selected model objects and to generate the receptor hill height scale data that are used by AERMOD to drive advanced terrain processing algorithms. Digital elevation model (DEM) data available from the USGS are utilized to interpolate surveyed elevations onto user-specified receptor grids and buildings and sources in the absence of more accurate site-specific elevation data.

AERMET generates a separate surface file and vertical profile file to pass meteorological observations and turbulence parameters to AERMOD. AERMET meteorological data are refined for a particular analysis based on the choice of micrometeorological parameters that are linked to the land

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[28] 40 CFR Part 51, Appendix W−*Guideline on Air Quality Models*, Appendix A.1− AMS/EPA Regulatory Model (AERMOD).

[29] Earth Tech, Inc., *Addendum to the ISC3 User's Guide, The PRIME Plume Rise and Building Downwash Model,* Concord, MA.

[30] U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, *Guidelines for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations) (Revised),* Research Triangle Park, North Carolina, EPA 450/4-80-023R, June 1985.

use and land cover (LULC) around the particular facility and/or meteorological site. By feeding raw surface and upper air station NWS observation data to AERMET, a complete set of model-ready meteorological data specific to this project was created. The details of the AERMET processing are provided in Section 4.3 below.

The *BREEZE*®-AERMOD GIS Pro v7.0 software, developed by Trinity Consultants, was used to assist in developing the model input files for AERMOD and AERMET, respectively.[31] These software programs incorporate the most recent versions of AERMOD (dated 07026), AERMET (dated 06341), and AERMAP (dated 09040) to estimate ambient impacts from the modeled sources. Following procedures outlined in the *Guideline*, the AERMOD modeling was performed using all regulatory default options.

4.3 METEOROLOGICAL DATA AND LAND USE REPRESENTATIVENESS

The U.S. EPA's federal *Guideline on Air Quality Models*, codified at 40 CFR Part 51, Appendix W, states in Section 9.3.1.2, "Meteorological Input Data – Recommendations" that:

> *… five years of representative meteorological data should be used when estimating concentrations with an air quality model. Consecutive years from the most recent, readily available 5-year period are preferred. The meteorological data may be collected either onsite or at the nearest National Weather Service (NWS) station.*

The meteorological data that are "representative" for a particular facility are typically determined subjectively, and the *Guideline* offers the following guidance in Section 9.3(a).

> *The meteorological data … should be selected on the basis of spatial and climatological (temporal) representativeness as well as the ability of the individual parameters selected to characterize the transport and dispersion conditions in the area of concern. The representativeness of the data is dependent on: (1) the proximity of the meteorological monitoring site to the area under consideration; (2) the complexity of the terrain; (3) the exposure of the meteorological monitoring site; and (4) the period of time during which data are collected. The spatial representativeness of the data can be adversely affected by large distances between the source and receptors of interest and the complex topographic characteristics of the area.*

Georgia EPD provided Oglethorpe with AERMOD meteorological data files for both Macon and Athens, Georgia. These files had already been processed using the latest version of AERMET (06341). As such, no AERMET processing was required to be performed by Oglethorpe. Instead, Oglethorpe conducted a land use representativeness analysis to identify the meteorological data set most appropriate for use with the Warren facility. Based on analysis included in Appendix C, the

[31] Documentation of the equivalency demonstrations for *BREEZE*®-AERMOD available at http://remote.aermod.com/AERMODequivalency.aspx

Athens (AHN) NWS station is most representative of the conditions at Warren facility.[32] Thus, meteorological data based on surface observations and upper air measurements from Athens (station 13873) for the 1989-1993 time period were used for all AERMOD modeling analyses.[33] The height of the meteorological profile base (met station elevation above sea-level, used in computation of the potential temperature) is listed on the National Climatic Data Center (NCDC) website as 244.4 meters.

4.4 RECEPTOR GRID COORDINATE SYSTEM

For this air dispersion modeling analysis, ground level concentrations were calculated at receptors placed along the fenceline and on a Cartesian receptor grid. Fenceline receptors were spaced 50 meters apart, as specified in the Georgia Air Dispersion Modeling Guidance.[34] Beyond the fenceline, receptors are spaced 100 meters apart in a Cartesian grid extending to a radius of 20 km from the Warren facility for the significance analysis. For the full NAAQS and PSD Increment analyses, the analyses need only be conducted for receptors where the project is determined to cause a significant impact. Therefore, the NAAQS and PSD Increment analyses were conducted on a reduced grid sufficient to extend beyond the most distant significant impact by at least 100 meters.

The evaluation of Class I Increment was completed per Georgia EPD guidance using an additional set of 10 receptors, each located 1 km apart, at a distance of 50 km from the project site, for each of the applicable Class I areas

Receptor elevations required by AERMOD were determined using the AERMAP terrain preprocessor (version 09040). AERMAP also calculates hill height parameters required by AERMOD. Terrain elevations from the USGS 1 arc second National Elevation Dataset (NED) were used for AERMAP processing. Plots of the receptor location and elevations are included in Appendix A.

In all modeling analysis data files, the location of emission sources, structure, and receptors is represented in the Universal Transverse Mercator (UTM) coordinate system. The Warren facility is located at approximately 348.37 kilometers East and 3,696.92 kilometers North in UTM Zone 17 (NAD 83).

4.5 BUILDING DOWNWASH

The emission units at the Warren facility were evaluated in terms of their proximity to nearby structures. The purpose of this evaluation is to determine if stack discharges might become caught in

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[32] The land use representativeness analysis was originally submitted with the April 28, 2009, dispersion modeling protocol, contained in Appendix G. Based on feedback provided by Mr. Peter Courtney (Georgia EPD), the analysis was reevaluated. Appendix C contains the revised analysis, which serves as the basis for this modeling analysis. A key update was the correction of the Macon NWS station coordinates. When the land use analysis was performed with the revised coordinates, the results indicated that the proposed facility is most similar to the Athens NWS.

[33] This data set was provided via email by Mr. Peter Courtney to Ms. Deanna Duram (Trinity Consultants) on January 29, 2009.

[34] Georgia EPD's *Georgia Air Dispersion Modeling Guidance,* December 1, 2006.

the turbulent wakes of these structures leading to downwash of the plumes. Wind blowing around a building creates zones of turbulence that are greater than if the building were absent. The current version of the AERMOD dispersion model treats building wake effects following the algorithms developed by Schulman and Scire.[35] This approach requires the modeler to input wind direction-specific building dimensions for structures located within 5*L* of a stack, where *L* is the lesser of the height or projected width of a nearby structure. Stacks taller than the structure height plus 1.5*L* are not subject to the effects of downwash in the AERMOD model.

For these modeling analyses, the direction-specific building dimensions used as input to the AERMOD model were calculated using the *BREEZE®-AIR* software, developed by Trinity. This software incorporates the algorithms of the U.S. EPA sanctioned Building Profile Input Program, PRIME version (BPIP PRIME), version 04274. BPIP PRIME is designed to incorporate the concepts and procedures expressed in the GEP Technical Support document, the Building Downwash Guidance document, and other related documents.[36]

Output from the BPIP PRIME downwash analysis is provided in the electronic files included with this report. The output contains a summary of the dominant structure for each emissions unit and the actual building height and projected widths for all wind directions. Building downwash was not considered for any regional sources for the NAAQS or PSD Increment analyses. A plot of buildings used in the analysis, as well as their heights, is included in Appendix A.

4.6 REPRESENTATION OF EMISSION SOURCES

4.6.1 COORDINATE SYSTEM

In all modeling analysis input and output files, the location of emission sources, structure, and receptors will be represented in the Universal Transverse Mercator (UTM) coordinate system. The Warren facility is located at approximately 348.37 kilometers East and 3,696.92 kilometers North in UTM Zone 17 (NAD 83). The facility base elevation is 160 meters (525 feet) above mean sea level.

4.6.2 SOURCE TYPES

The AERMOD dispersion model allows for emissions units to be represented as point, area, or volume sources. For point sources with unobstructed vertical releases, it is appropriate to use actual stack parameters (i.e., height, diameter, exhaust gas temperature, and gas exit velocity) in the modeling analyses. The Warren boiler was modeled as a point source using actual stack parameters. The ancillary sources at the facility (storage piles, material handling sources, and cooling towers) were represented as a combination of point

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[35] Earth Tech, Inc., *Addendum to the ISC3 User's Guide, The PRIME Plume Rise and Building Downwash Model,* Concord, MA.

[36] U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards, *Guidelines for Determination of Good Engineering Practice Stack Height (Technical Support Document for the Stack Height Regulations) (Revised),* Research Triangle Park, North Carolina, EPA 450/4-80-023R, June 1985.

and volume source emissions. Tables 4-3 and 4-4 detail source parameters for point and volume sources, respectively.

TABLE 4-3. WARREN FACILITY POINT SOURCE LIST

Stack ID	Description	Stack Height (ft)	Stack Height (m)	Exhaust Temperature (°F)	Exhaust Temperature (K)	Flow Rate (acfm)	Exhaust Velocity (ft/s)	Exhaust Velocity (m/s)	Stack Diameter (ft)	Stack Diameter (m)
B001	Biomass Boiler Stack	220	67.1	325	436	250,993	37.0	11.3	12.00	3.66
CT01	Cooling Tower Cell 1	46	14.0	94	308	1,401,618	38.2	11.7	27.89	8.50
CT02	Cooling Tower Cell 2	46	14.0	94	308	1,401,618	38.2	11.7	27.89	8.50
CT03	Cooling Tower Cell 3	46	14.0	94	308	1,401,618	38.2	11.7	27.89	8.50
CT04	Cooling Tower Cell 4	46	14.0	94	308	1,401,618	38.2	11.7	27.89	8.50
BMG01	Biomass Unloading Area	50	15.2	Ambient		45,342	78.5	23.9	3.50	1.07
BMG02	Fuel Processing Building	85	25.9	Ambient		46,165	80.0	24.4	3.50	1.07
BMG03	Transfer Tower	40	12.2	Ambient		25,312	85.9	26.2	2.50	0.76
BMG04	Boiler Fuel Feed System	190	57.9	Ambient		19,885	89.9	27.4	2.17	0.66
BMG05	Sorbent Silo	75	22.9	Ambient		987	188.5	57.5	0.33	0.10
BMG06	Boiler Bed Sand Silo	55	16.8	Ambient		987	188.5	57.5	0.33	0.10
BMG07	Sand Day Silo	75	22.9	Ambient		987	188.5	57.5	0.33	0.10
BMG08	Bottom Ash Covered Storage	15	4.6	Ambient		1,481	282.9	86.2	0.33	0.10
BMG09	Fly Ash Silo	75	22.9	Ambient		1,481	282.9	86.2	0.33	0.10
BMG10	Longwood Mobile Chipping	25	7.6	Ambient		6,229	84.6	25.8	1.25	0.38

1. Boiler stack parameters are representative for 40% biomass load operating scenario.

2. Values shown above in metric units have been rounded to improve readability. Please refer to Appendix E for precise values.

TABLE 4-4. WARREN FACILITY VOLUME SOURCE LIST

Source ID	Description	Release Height (ft)	Release Height (m)	Length of side (ft)	Length of side (m)
TX01	Raw Material Unloading/Truck Dump (DMP1 - DMP6)	5.0	1.5	8.5	2.6
TX02	Dump (DMP1 - DMP6) to Hopper (HPR1 - HPR6)	5.0	1.5	5.0	1.5
TX03	Transfer Belt (CV05, CV06) to Radial Stacking Belt (CV07, CV08)	25.0	7.6	4.5	1.4
TX04	Radial Stacking Belt (CV07) to Radial Stock Pile (SP01)	50.0	15.2	4.5	1.4
TX05	Radial Stacking Belt (CV08) to Radial Stock Pile (SP02)	50.0	15.2	4.5	1.4
TX06	Radial Stock Pile (SP01) to Reclaim Chain (CV09)	50.0	15.2	5.0	1.5
TX07	Radial Stock Pile (SP02) to Reclaim Chain (CV10)	50.0	15.2	5.0	1.5
TX08	Reclaim Chain (CV09) to Reclaim Belt (CV11)	50.0	15.2	5.0	1.5
TX09	Reclaim Chain (CV10) to Reclaim Belt (CV12)	50.0	15.2	5.0	1.5
TX10	Reclaim Belt (CV11) to Stockout Belt (CV13)	10.0	3.0	5.0	1.5
TX11	Reclaim Belt (CV12) to Stockout Belt (CV13)	10.0	3.0	5.0	1.5
TX12	Longwood Material Unloading	5.0	1.5	48.7	14.9
GRN3	Longwood Mobile Chipping	20.0	6.1	1.0	0.3
SP01	Processed Wood Pile 1	25.0	7.6	420.0	128.0
SP02	Processed Wood Pile 2	25.0	7.6	420.0	128.0
SP03	Longwood Storage	25.0	7.6	520.0	158.5
RMH01-71	Road Segment	8.0	2.4	-	-

1. Values shown above in metric units have been rounded to improve readability. Please refer to Appendix E for precise values.

4.6.3 GEP STACK HEIGHT ANALYSIS

The U.S. EPA has promulgated stack height regulations that restrict the use of stack heights in excess of "Good Engineering Practice" (GEP) in air dispersion modeling analyses. The GEP height of a stack is the greater of (1) 65 meters (measured from the base elevation of the stack) and (2) the value returned from the following equation: [37]

$H_{GEP} = H + 1.5L$, where:

H_{GEP} = minimum GEP stack height,
H = structure height, and
L = lesser dimension of the structure (height or projected width).

Under the regulations, that portion of a stack that is in excess of the GEP stack height is generally not creditable when modeling to determine source impacts, preventing the use of excessively tall stacks to reduce ground-level pollutant concentrations. A GEP analysis was conducted for each stack included in these modeling analyses. Stacks that have a release height lower than their GEP value were modeled at their actual release height. The dominant downwash structure at the Warren facility is the boiler building which has a height of 190 feet and projected width of 166 feet (as noted in the output from the BPIP output file). Based on the GEP formula above, the boiler building dimensions yield a GEP height for the boiler stack of 439 feet. The actual stack height is 220 feet, which is below the GEP value. Therefore, the boiler stack will be modeled at the actual release height.

4.7 CLASS I AREAS MODELING METHODOLOGY

Per Georgia EPD direction[38], Oglethorpe assessed the Class I area significance by adding to the Class II receptor grid a line of 10 receptors 1 km apart, located approximately 50 km from the project site, for each of the applicable Class I areas.

[37] 40 CFR 51.100(ii).

[38] Letter from Mr. Peter Courtney (Georgia EPD) to Mr. Doug Fulle (Oglethorpe), July 2, 2009.

This section summarizes the results of the Class II dispersion modeling analyses and demonstrates that the Warren facility does not cause or contribute to an exceedance of the NAAQS or Class II Increment. Electronic copies of modeling files are included on a CD-ROM in Appendix E.

5.1 SIGNIFICANCE ANALYSIS

5.1.1 CLASS II SIGNIFICANCE ANALYSIS

As discussed in Section 3, a Significance Analysis was conducted to determine the need for further pollutant modeling. The results of the Significance Analysis for each pollutant are provided in Tables 5-1 through 5-4. A comparison of the significance modeling results and the monitoring *de minimis* levels is shown in Table 5-5.

TABLE 5-1. CO SIGNIFICANCE RESULTS

Averaging Period	Year	UTM East (km)	UTM North (km)	Max Conc. ($\mu g/m^3$)	SIL ($\mu g/m^3$)	Exceeds SIL?	SIA (km)
1-Hour	1989	348.30	3697.80	533.2	2,000	No	N/A
	1990	348.90	3697.70	568.3	2,000	No	
	1991	348.90	3697.70	547.8	2,000	No	
	1992	348.90	3696.10	513.6	2,000	No	
	1993	348.90	3697.80	538.2	2,000	No	
	MAX	348.90	3697.70	568.3	2,000	No	
8-Hour	1989	348.03	3696.43	111.0	500	No	N/A
	1990	348.43	3697.50	138.6	500	No	
	1991	347.91	3696.71	100.2	500	No	
	1992	348.30	3697.80	108.0	500	No	
	1993	347.89	3696.76	119.3	500	No	
	MAX	348.43	3697.50	138.6	500	No	

TABLE 5-2. NO_2 CLASS II SIGNIFICANCE RESULTS

Averaging Period	Year	UTM East (km)	UTM North (km)	Max Conc. (μg/m^3)	SIL (μg/m^3)	Exceeds SIL?	SIA (km)
Annual	1989	348.08	3696.35	0.71	1	No	N/A
	1990	348.04	3696.41	0.63	1	No	
	1991	347.95	3696.62	0.73	1	No	
	1992	349.40	3697.00	0.68	1	No	
	1993	349.40	3697.00	0.63	1	No	
	MAX	347.95	3696.62	0.73	1	No	

TABLE 5-3. PM_{10} CLASS II SIGNIFICANCE RESULTS

Averaging Period	Year	UTM East (km)	UTM North (km)	Max Conc. (μg/m^3)	SIL (μg/m^3)	Exceeds SIL?	SIA (km)
24-Hour	1989	348.03	3697.54	27.8	5	Yes	3.72
	1990	348.03	3697.54	29.8	5	Yes	
	1991	348.81	3696.96	24.1	5	Yes	
	1992	348.03	3697.54	33.2	5	Yes	
	1993	348.81	3696.96	18.6	5	Yes	
	MAX	348.03	3697.54	33.2	5	Yes	
Annual	1989	348.03	3696.43	3.4	1	Yes	1.40
	1990	348.01	3696.48	3.5	1	Yes	
	1991	348.01	3696.48	4.2	1	Yes	
	1992	348.01	3696.48	4.1	1	Yes	
	1993	348.01	3696.48	3.3	1	Yes	
	MAX	348.01	3696.48	4.2	1	Yes	

TABLE 5-4. SO_2 CLASS II SIGNIFICANCE RESULTS

Averaging Period	Year	UTM East (km)	UTM North (km)	Max Conc. (µg/m³)	SIL (µg/m³)	Exceeds SIL?	SIA (km)
3-Hour	1989	348.70	3697.90	14.48	25	No	N/A
	1990	348.48	3697.49	16.26	25	No	
	1991	349.20	3696.30	15.89	25	No	
	1992	348.20	3696.19	16.79	25	No	
	1993	349.00	3696.30	16.45	25	No	
	MAX	348.20	3696.19	16.79	25	No	
24-Hour	1989	348.13	3696.26	4.23	5	No	N/A
	1990	348.11	3696.30	3.60	5	No	
	1991	348.04	3696.41	3.52	5	No	
	1992	348.13	3696.26	3.24	5	No	
	1993	347.90	3696.20	3.23	5	No	
	MAX	348.13	3696.26	4.23	5	No	
Annual	1989	348.08	3696.35	0.09	1	No	N/A
	1990	348.04	3696.41	0.08	1	No	
	1991	347.95	3696.62	0.09	1	No	
	1992	349.40	3697.00	0.08	1	No	
	1993	349.40	3697.00	0.08	1	No	
	MAX	347.95	3696.62	0.09	1	No	

As shown in the tables above, only PM_{10} exceeds the Class II SIL, requiring further analysis to demonstrate compliance with NAAQS and Class II Increment for PM_{10}. CO, NO_2, and SO_2 are below the SILs, and no further modeling is required to demonstrate compliance with the air quality standards.

TABLE 5-5. COMPARISON AGAINST MONITORING *DE MINIMIS* LEVELS

Pollutant	Averaging Period	Year	UTM East (km)	UTM North (km)	Max Conc. (µg/m³)	Monitoring *De Minimis* (µg/m³)	Exceeds *De Minimis?*
CO	8-Hour	MAX	348.43	3697.50	138.62	575	No
NO_2	Annual	MAX	347.95	3696.62	0.73	14	No
PM_{10}	24-Hour	MAX	348.03	3697.54	33.2	10	Yes
SO_2	24-Hour	MAX	331.74	3743.76	0.13	13	No

The modeled impacts of PM_{10} exceed the monitoring *de minimis* levels. As discussed in Section 3.3, Oglethorpe requests that Georgia EPD waive the pre-construction monitoring requirements of 40 CFR 52.21(m) for this project since ambient monitoring data are already available from suitable monitoring stations.

5.1.2 CLASS I SIGNIFICANCE ANALYSIS

As shown in Tables 5-6 and 5-7, NO_2 and SO_2 are below the SILs, and no further modeling is required to demonstrate compliance with the air quality standards.

TABLE 5-6. NO_X CLASS I SIGNIFICANCE RESULTS AT 50 KM

Averaging Period	Year	UTM East (km)	UTM North (km)	Max Conc. (µg/m^3)	SIL (µg/m^3)	Exceeds SIL?
Annual	1989	397.47	3686.30	0.02	0.1	No
	1990	398.44	3693.22	0.02	0.1	No
	1991	398.44	3693.22	0.02	0.1	No
	1992	398.44	3693.22	0.02	0.1	No
	1993	398.44	3693.22	0.02	0.1	No
	MAX	398.44	3693.22	0.02	0.1	No

TABLE 5-7. SO_2 CLASS I SIGNIFICANCE RESULTS AT 50 KM

Averaging Period	Year	UTM East (km)	UTM North (km)	Max Conc. (µg/m^3)	SIL (µg/m^3)	Exceeds SIL?
3-Hour	1989	398.14	3690.24	0.97	1	No
	1990	398.44	3693.22	0.86	1	No
	1991	358.49	3745.68	0.87	1	No
	1992	397.67	3687.28	0.91	1	No
	1993	365.23	3743.82	0.76	1	No
	MAX	398.14	3690.24	0.97	1	No
24-Hour	1989	331.74	3743.76	0.13	0.2	No
	1990	356.53	3746.04	0.11	0.2	No
	1991	358.49	3745.68	0.12	0.2	No
	1992	398.26	3691.23	0.11	0.2	No
	1993	321.03	3738.42	0.13	0.2	No
	MAX	331.74	3743.76	0.13	0.2	No
Annual	1989	397.47	3686.30	0.002	0.1	No
	1990	398.44	3693.22	0.002	0.1	No
	1991	398.44	3693.22	0.002	0.1	No
	1992	398.44	3693.22	0.003	0.1	No
	1993	398.44	3693.22	0.002	0.1	No
	MAX	398.44	3693.22	0.003	0.1	No

TABLE 5-8. PM_{10} CLASS I SIGNIFICANCE RESULTS AT 50 KM

Averaging Period	Year	UTM East (km)	UTM North (km)	Max Conc. (μg/m^3)	SIL (μg/m^3)	Exceeds SIL?
24-Hour	1989	341.42	3746.17	0.325	0.3	Yes
	1990	333.63	3744.40	0.171	0.3	No
	1991	340.44	3746.02	0.225	0.3	No
	1992	359.47	3745.48	0.237	0.3	No
	1993	327.12	3741.85	0.143	0.3	No
	MAX	341.42	3746.17	0.325	0.3	Yes
Annual	1989	398.4	3693.2	0.0077	0.2	No
	1990	398.4	3693.2	0.0083	0.2	No
	1991	398.4	3692.2	0.0092	0.2	No
	1992	398.4	3693.2	0.0093	0.2	No
	1993	398.4	3693.2	0.0086	0.2	No
	MAX	398.4	3693.2	0.0093	0.2	No

As shown in Table 5-8, the predicted concentrations of PM_{10} slightly exceed the 24-hour average Class I SIL for one receptor, which represents the Shining Rock Wilderness Area (Shining Rock). Per Georgia EPD guidance, the receptor is located 50 km from the Warren facility, which is the maximum recommended distance for use with AERMOD. However, the actual distance between the Warren facility and Shining Rock is over 210 km. While the facility impacts can reasonably be assumed to fall below the Class I SIL when transported to this distance, Oglethorpe performed one additional modeling analysis to quantitatively estimate the facility impacts. An AERMOD run was completed using the modeling receptors at the actual coordinates of Shining Rock, and the results are shown in Table 5-9.

TABLE 5-9. PM_{10} CLASS I SIGNIFICANCE RESULTS

Distance to Facility (km)	Averaging Period	Year	UTM East (km)	UTM North (km)	Max Conc. (μg/m^3)	SIL (μg/m^3)	Exceeds SIL?
50	24-Hour	1989	341.42	3746.17	0.325	0.3	Yes
218	24-Hour	1989	336.38	3914.72	0.005	0.3	No

As shown in Table 5-9, the predicted 24-hour average concentration at Shining Rock was 0.005 μg/m^3. These results are significantly below the 24-hour average PM_{10} Class I SIL, despite the use of AERMOD, which can be expected to over-predict concentrations at long distances (thus leading to the 50 km limitation for usage as a guideline model). AERMOD is a steady-state dispersion model designed for short-range analysis, and assumes a uniform wind field distribution. The model assumes a plume travels directly from source to receptor, when in reality a plume may change directions over the time it takes to travel to a distant receptor, resulting in a more circuitous path from source to receptor. This underestimation of travel time in turn underestimates the degree to which a plume will disperse when transported long distances. Coupling the inherent conservative nature of the AERMOD analysis with the predicted impacts at the actual distances indicates that the expected impacts from Warren facility emissions at the Shining Rock Wilderness Area will be considerably less than the 24-hour average PM_{10} Class I SIL.

5.2 CLASS II INCREMENT

In order to receive a PSD permit, a proposed PSD project must be determined to not "cause or contribute" to a PSD Increment or NAAQS violation. According to U.S. EPA's *Draft New Source Review Workshop Manual*, the impacts from the project's "net emissions increase" are not considered to be causing or contributing to an exceedance when emissions levels are insignificant.[39] Because an Increment analysis includes additional emission sources from the regional inventory, Oglethorpe employed a refined procedure to evaluate the whether the Warren facility contributes to any PSD Increment violations. Rather than complete modeling runs with all sources for all receptors, and then evaluate whether the Warren facility's contribution exceeded significance levels, Oglethorpe used the EVENTFILE option inherent to AERMOD to identify those receptors and averaging periods (i.e., receptor-events) for which the Oglethorpe contribution is above significance levels. This option generates a new input file that contains receptors and times in which the predicted concentration exceeds a given threshold (e.g., the 24-hour PM_{10} Significance standard). Using the receptor-events where Oglethorpe is significant, Oglethorpe emissions and inventory emissions, AERMOD is then run to estimate ambient concentrations for comparison against the Class II Increment. Because this refined analysis does not include all averaging periods within the 5 years of meteorological data considered for the significance analysis, all results were compared against the relevant Increment standard.[40]

The analysis showed 18 receptor-events above the 24-hour Class II PM_{10} Increment standard. These events were mapped, as shown in Figure A-7. As the figure shows, these events occur at receptors located within the property boundary of the adjacent Martin-Marietta Aggregates Quarry, which was determined using the modeling receptors included in the facility's own modeling analysis.[41] Therefore, it is appropriate to exclude the contribution of the quarry's own sources from these results. As Table 5-10 shows, the 18 events do not represent exceedances of the 24-hour Class II PM_{10} Increment standard.

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[39] U.S. EPA, Office of Air Quality Planning and Standards, *Draft New Source Review Workshop Manual*, (Research Triangle Park, NC: U.S. EPA, October 1990).

[40] Using this refined approach, it cannot be determined whether the highest impact at a receptor is a first-high, second-high, or something else. Thus, every impact calculated in this refined approach was assessed against the Class II increment.

[41] Quarry modeling files provided by email from Mr. Peter Courtney (Georgia EPD) to Mr. Stephen Simonsen (Trinity Consultants) on July 22, 2009.

A full list of all receptor-events considered is included in Appendix E.

TABLE 5-10. 24-HOUR PM_{10} INCREMENT RESULTS

Event ID	Date	UTM East (km)	UTM North (km)	Modeled Conc. (μg/m³)	Warren Facility Contribution (μg/m³)	Quarry Contribution (μg/m³)	Adjusted Ambient Concentration[1] (μg/m³)	Increment (μg/m³)	Exceeds Increment? (Yes/No)
CH249375	1992-12-28	347.40	3695.00	145.35	5.56	139.72	5.63	30	No
CH249371	1992-12-28	347.60	3695.00	119.03	5.78	113.17	5.86	30	No
CH249362	1992-12-28	347.60	3695.20	118.01	6.59	111.34	6.67	30	No
CH249369	1992-12-28	347.50	3695.10	112.85	6.04	106.74	6.11	30	No
CH249367	1992-12-28	347.60	3695.10	112.73	6.18	106.47	6.26	30	No
CH249373	1992-12-28	347.50	3695.00	87.63	5.83	81.72	5.91	30	No
CH249365	1992-12-28	347.50	3695.20	80.06	6.23	73.75	6.31	30	No
CH249377	1992-12-28	347.50	3694.90	69.70	5.27	64.35	5.35	30	No
CH249378	1992-12-28	347.40	3694.90	62.89	5.29	57.52	5.37	30	No
CH249376	1992-12-28	347.60	3694.90	55.69	5.49	50.12	5.57	30	No
CH249379	1992-12-28	347.40	3694.80	51.54	5.08	46.38	5.17	30	No
CH245573	1992-08-29	347.70	3695.10	42.39	5.26	36.97	5.42	30	No
CH245571	1992-08-29	347.80	3695.20	41.00	5.34	35.50	5.50	30	No
CH249368	1992-12-28	347.40	3695.20	38.19	5.35	32.77	5.42	30	No
CH245570	1992-08-29	347.70	3695.30	38.14	5.07	32.90	5.24	30	No
CH249372	1992-12-28	347.40	3695.10	37.18	5.52	31.59	5.59	30	No
CH245572	1992-08-29	347.70	3695.20	33.27	5.27	27.84	5.43	30	No
CH249364	1992-12-28	347.40	3695.30	33.15	5.06	28.02	5.13	30	No

1. Adjusted concentration equal to modeled value minus concentration from quarry emission sources.

For the PM_{10} annual Increment analysis all receptors above the annual SIL of 1 μg/m³ were selected (since there is only a single "event" with an annual standard). The regional inventory was then added to the Warren facility emission sources, and the model was run to estimate ambient concentrations for comparison against the Class II Increment for all 5 years. As shown in Table 5-11, none of the predicted concentrations exceed the annual Increment standard of 17 μg/m³.

TABLE 5-11. ANNUAL PM_{10} INCREMENT RESULTS

Avg. Period	Year	UTM East (km)	UTM North (km)	Conc. (μg/m³)	Increment (μg/m³)	Exceeds Increment? (Yes/No)
Annual	1989	348.03	3696.43	3.36	17	No
	1990	348.01	3696.48	3.30	17	No
	1991	348.01	3696.48	4.27	17	No
	1992	348.01	3696.48	4.08	17	No
	1993	348.01	3696.48	3.12	17	No
	MAX	348.01	3696.48	4.27	17	No

Therefore, the Warren facility has demonstrated that it will not cause or contribute to an exceedance of the Class II Increment. Appendix E contains electronic files with the results of this review for each event.

5.3 NAAQS

For demonstrating compliance with the PM_{10} NAAQS standards, Oglethorpe followed a similar procedure as for the Increment modeling analyses. First, all receptor-events for which the Warren facility impacts were above the appropriate PM_{10} SILs were used to generate a custom input file that included emissions from both the facility and the NAAQS inventory sources.

Due to a lack of evidence linking health problems to long-term exposure to coarse particle pollution, U.S. EPA revoked the annual PM_{10} standard in 2006 (effective December 17, 2006). However, the dispersion modeling results for the annual averaging period are included, as the comparison of modeled PM_{10} impacts provides a surrogate for the $PM_{2.5}$ annual NAAQS. For the PM_{10} annual NAAQS analysis all receptors above the annual SIL of 1 $\mu g/m^3$ were selected. The regional inventory was then added to the Warren facility emission sources, and the model was run to estimate ambient concentrations for comparison against the Class II NAAQS for all 5 years.

The analysis showed results for seven receptor-events above the 24-hour NAAQS standard. These events were mapped, as shown on Figure A-8. As the figure shows, these events occur at receptors located within the property boundary of the adjacent Martin-Marietta Aggregates Quarry. Therefore, it is appropriate to exclude the contribution of the quarry's own sources from these results. As Table 5-12 shows, the seven events do not represent exceedances of the 24-hour Class II PM_{10} NAAQS standard. A full list of all receptor-events considered is included in Appendix E.

TABLE 5-12. 24-HOUR PM_{10} NAAQS RESULTS

Event ID	Date	UTM East (km)	UTM North (km)	Modeled Conc. ($\mu g/m^3$)	Warren Facility Contrib. ($\mu g/m^3$)	Quarry Contrib. ($\mu g/m^3$)	Adjusted Ambient Conc.[1] ($\mu g/m^3$)	Bkg. Conc. ($\mu g/m^3$)	Total Ambient Conc.[2]	NAAQS ($\mu g/m^3$)	Exceeds Increment? (Yes/No)
CH249375	1992-12-28	347.40	3695.00	192.68	5.56	187.00	5.68	38	44	150	No
CH249371	1992-12-28	347.60	3695.00	173.59	5.78	167.68	5.91	38	44	150	No
CH249362	1992-12-28	347.60	3695.20	171.49	6.59	164.77	6.72	38	45	150	No
CH249367	1992-12-28	347.60	3695.10	163.96	6.18	157.64	6.31	38	44	150	No
CH249369	1992-12-28	347.50	3695.10	148.47	6.04	142.31	6.16	38	44	150	No
CH249373	1992-12-28	347.50	3695.00	124.79	5.83	118.83	5.96	38	44	150	No
CH249365	1992-12-28	347.50	3695.20	115.39	6.23	109.03	6.36	38	44	150	No

1. Adjusted concentration equal to modeled value minus concentration from quarry emission sources.
2. Total concentration equal to adjusted ambient concentration plus the background concentration.

As shown in Table 5-13, none of the predicted concentrations exceed the annual NAAQS standard of 50 µg/m^3.

TABLE 5-13. ANNUAL PM_{10} NAAQS RESULTS

Avg. Period	Year	UTM East (km)	UTM North (km)	Modeled Conc. (µg/m^3)	Bkg. Conc. (µg/m^3)	Total Conc. (µg/m^3)	NAAQS (µg/m^3)	Exceeds NAAQS? (Yes/No)
Annual	1989	348.03	3696.43	4.84	20	25	50	No
	1990	348.01	3696.48	5.05	20	25	50	No
	1991	348.01	3696.48	5.74	20	26	50	No
	1992	348.01	3696.48	5.47	20	25	50	No
	1993	348.01	3696.48	4.58	20	25	50	No
	MAX	348.01	3696.48	5.74	20	26	50	No

5.4 ADDITIONAL IMPACTS

The modeling results from the PSD NAAQS can be assessed against the secondary NAAQS standards, which have been developed by U.S. EPA to provide protection for public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings. Table 5-14 shows that no impacts exceed the secondary NAAQS standards. Thus, there are no adverse impacts expected on soils or vegetation.

TABLE 5-14. SOIL AND VEGETATION IMPACTS

Pollutant	Avg. Period	Total Conc.[1] (µg/m^3)	Secondary NAAQS (µg/m^3)	Exceeds NAAQS? (Yes/No)
CO	1-Hour	568.3	N/A	No
	8-Hour	138.6	N/A	No
NO_2	Annual	0.73	100	No
PM_{10}	24-Hour	67.3	150	No
SO_2	3-Hour	16.79	1,300	No
	24-Hour	4.23	N/A	No
	Annual	0.09	N/A	No

1. CO, NO_2 and SO_2 impacts include only facility sources since the impacts do not exceed the SILs.

6. Toxic Air Pollutants Impact Assessment

This section details the assumptions used for completing the toxic air pollutant (TAP) modeling analysis (i.e., model setup) and the results of modeling analysis.

Georgia EPD regulates the emissions of toxic air pollutant (TAP) emissions through a program approved under the provisions of *Georgia Rules for Air Quality Control*, 391-3-1-.02(2)(a)3(ii). A TAP is defined as any substance that may have an adverse effect on public health, excluding any specific substance that is covered by a State or Federal ambient air quality standard. Procedures governing the Georgia EPD's review of toxic air pollutant emissions as part of air permit reviews are contained in the agency's *Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions (Guideline)*.[42]

6.1 Derivation of Acceptable Ambient Concentration

According to the *Guideline*, dispersion modeling should be completed for each potentially toxic pollutant having quantifiable emission increases. The *Guideline* infers that a pollutant is identified as a toxic pollutant if any of the following toxicity-determined values have been established for that pollutant:

- ▲ U.S. EPA Integrated Risk Information System (IRIS) reference concentration (RfC) or unit risk;
- ▲ Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PEL);
- ▲ American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV);
- ▲ National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limits (REL); and,
- ▲ Lethal Dose – 50% (LD50) Standards.

The *Guideline* specifies that the resources should be referenced in the priority schedule listed above to determine long-term and short-term acceptable ambient concentrations (AACs) based on the exposure limits that are provided.

The AAC for each toxic pollutant is calculated from the toxicity data presented in the resources listed above. For any pollutant, both a long-term and short-term AAC might be calculated. If a pollutant has a RfC and/or unit risk, an annual average (long-term) AAC can be calculated as follows. The RfC is an estimate of daily inhalation exposure that is likely to be without an appreciable risk of deleterious effects during a lifetime. The unit risk is a quantitative assessment of cancer-causing potential per concentration of air inhaled. An annual average AAC is obtained by dividing the unit risk by a cancer risk factor based on the weight-of-evidence classification, i.e., 1:1,000,000 for known carcinogens (class A), 1:100,000 for probable carcinogens (class B), and 1:10,000 for suspected

[42] *Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions*. Georgia Department of Natural Resources, Environmental Protection Division, Air Protection Branch, Revised, June 21, 1998.

carcinogens (class C). The resultant is an annual average AAC in units of micrograms per cubic meter ($\mu g/m^3$). RfC values are given in units of milligrams per cubic meter (mg/m^3) and require no conversion.

If RfC and unit risk data are not available in the IRIS database, then an annual standard cannot be calculated and a 24-hour AAC must be derived. The bases for the 24-hour standards are the OSHA PEL given at 29 CFR Part 1910 Subpart Z, followed in priority by the ACGIH TLV, NIOSH REL, and LD50 databases. These resources provide exposure limits as time-weighted averages (TWA) in terms of occupational exposure duration (i.e., typically an 8-hour average). If a TWA value is provided for a given pollutant, the 24-hour average AAC is derived as follows. First, an adjustment factor (i.e., 40 divided by the total weekly emitting hours) is applied to the TWA to account for exposure in excess of occupational duration. This adjustment factor is assumed to be 168 hours per week for continuous operation. Second, the adjusted TWA is divided by a safety factor to account for human carcinogenicity: 100 for pollutants that are not known human carcinogens, 300 for pollutants that are known human carcinogens. The resultant value is adopted as a 24-hour AAC. Per the *Guideline*, if a toxic air pollutant has an annual AAC, then the derivation of and comparison to a 24-hour standard is not required.

An additional standard must be met if a given pollutant has listed a Short Term Exposure Limit (STEL) or Ceiling (C) in any one of the above-named resources. A STEL is a 15-minute weighted average concentration that should not be exceeded at any time during the workday. A C value is a concentration that should not be exceeded at any time during occupational exposure. These values have been established for pollutants that are acute sensory irritants and apply as a 15-minute standard, also adjusted by a safety factor of 10. No adjustment factor is applied to STEL or C values. A 15-minute average standard, if applicable, must be met in addition to an annual average and/or 24-hour average standard. The *Guideline* clearly states that each of annual, 24-hour, and 15-minute AAC should be derived if the appropriate toxicity information is provided in any of the listed resources.

Details on the development of the emissions for the proposed project are presented in Volume I of this Application. Oglethorpe has evaluated the available reference material to determine the applicable AAC standards for all TAP identified as being emitted from the bubbling fluidized bed boiler.

Tables F-1 through F-3 summarize the annual, 24-hour and 15-minute AACs for the pollutants potentially emitted by the proposed biomass boiler.

6.2 DETERMINATION OF TOXIC AIR POLLUTION IMPACT

The Georgia EPD Guideline recommends a tiered approach to model TAP impacts, beginning with screening analyses using SCREEN3, followed by refined modeling, if necessary. Note that, consistent with Georgia EPD’s Guidelines, downwash effects were not considered in the TAP assessment. The following sections present the modeling methodology and the model results.

6.2.1 SELECTION OF THE MODEL

Two levels of air quality dispersion model sophistication exist: screening and refined dispersion modeling. Normally, screening modeling is performed to determine the need for refined modeling. When results from a screening model indicate potentially adverse impacts, a refined modeling analysis is performed. A refined modeling analysis can provide a more accurate estimate of a source's impact and requires more detailed and precise input data than a screening model. Screening modeling was performed using the SCREEN3 model (version 96043) to estimate the maximum ground-level concentrations (MGLC).

6.2.2 SCREENING METHODOLOGY

The SCREEN3 model was used to assess emissions from the biomass boiler. For point sources with unobstructed vertical releases, it is appropriate to use actual stack parameters (i.e., height, diameter, exhaust gas temperature, and gas exit velocity) in the modeling analyses. Consistent with the Georgia EPD *Guideline*, building downwash was not included in the toxic impact assessment. Table 6-1 presents the stack parameters used for the SCREEN analysis.

TABLE 6-1. STACK PARAMETERS USED IN THE TAP ANALYSIS

Stack Description	Stack Height (m)	Stack Temperature[1] (K)	Exit Velocity[1] (m/s)	Stack Diameter (m)	Modeled Emissions[2] (g/s)	Max. Impact (μg/m^3)
Biomass Boiler, B001	67.06	435.93	11.27	3.66	1.0	2.02

1. For conservatism, the parameters from the 40% load off-design fuel scenario were utilized as these yielded the highest unit impacts in the load analysis.
2. For simplicity, a unit emission rate was modeled from the boiler stack.

SCREEN3 requires that the land surrounding the facility be classified as either urban or rural, in order to select the proper dispersion coefficients. As the location for the proposed facility is largely undeveloped, a land classification of "rural" was selected for the analysis. A unit emission rate of 1 gram per second (g/s) was modeled from the boiler stack. The modeled impact was then multiplied by the emission rate of each TAP to obtain the maximum modeled impact of each TAP for comparison to the applicable AACs.

6.2.3 SCREENING METHODOLOGY

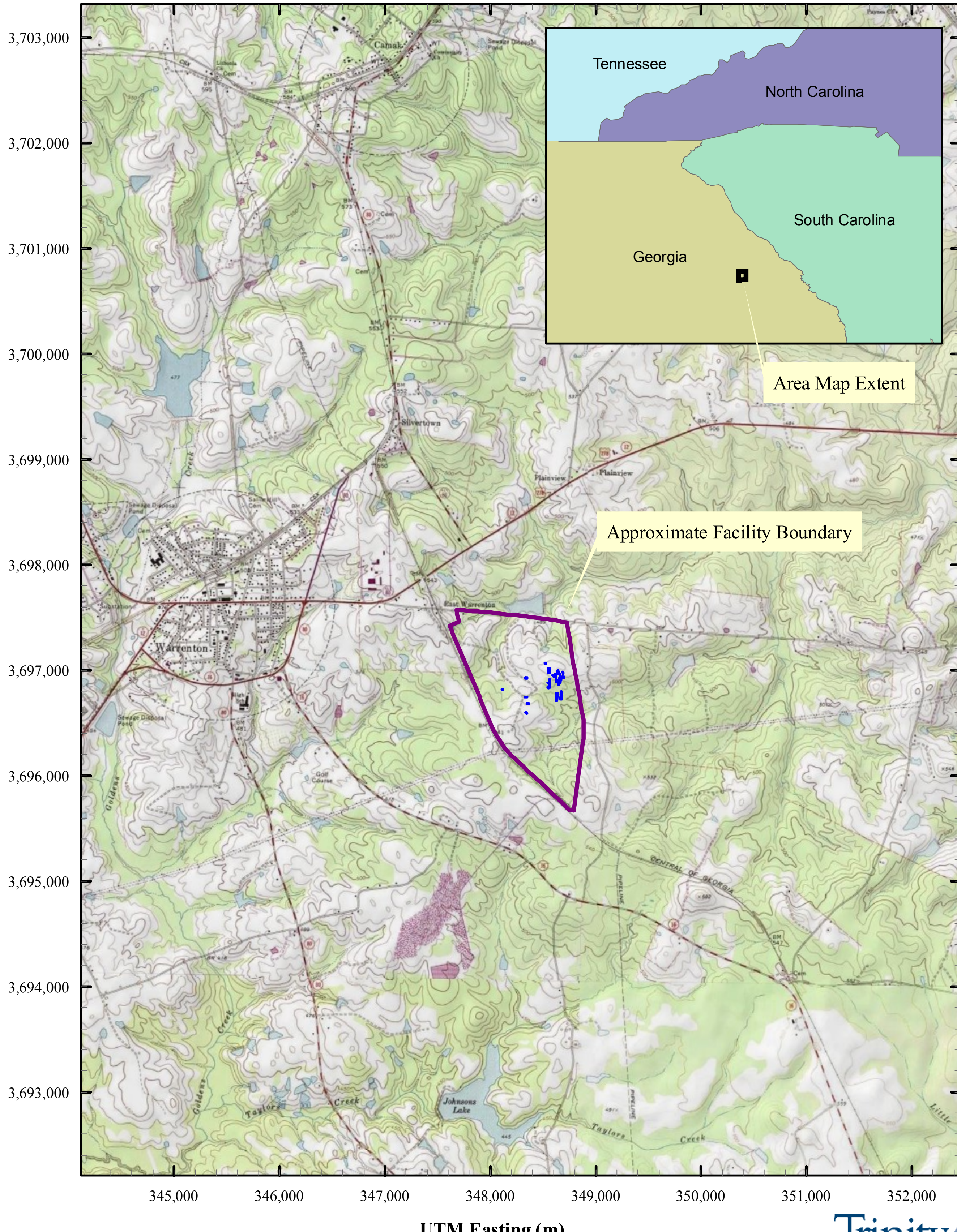
This section presents the results of the dispersion modeling analysis and a comparison of the predicted maximum ambient impacts to the applicable AAC. Copies of the SCREEN3 input and output files are attached. Table F-1 presents a summary of the results. Note that the SCREEN3 model provides a maximum predicted 1-hour impact result. Per the *Guidelines,* the 1-hour predicted impact is multiplied by 0.08 to establish the maximum predicted annual impact for screening purposes. For comparison to the 24-hour AAC, the 1-hour predicted impact is multiplied by 0.4. Likewise, for comparison to the 15-minute AAC, the 1-hour predicted impact is multiplied by 1.32. As seen in Table F-4, all predicted impacts are far below the AAC, and thus require no further analysis.

APPENDIX A

SUPPORTING FIGURES

Figure A-1. Facility Area Map

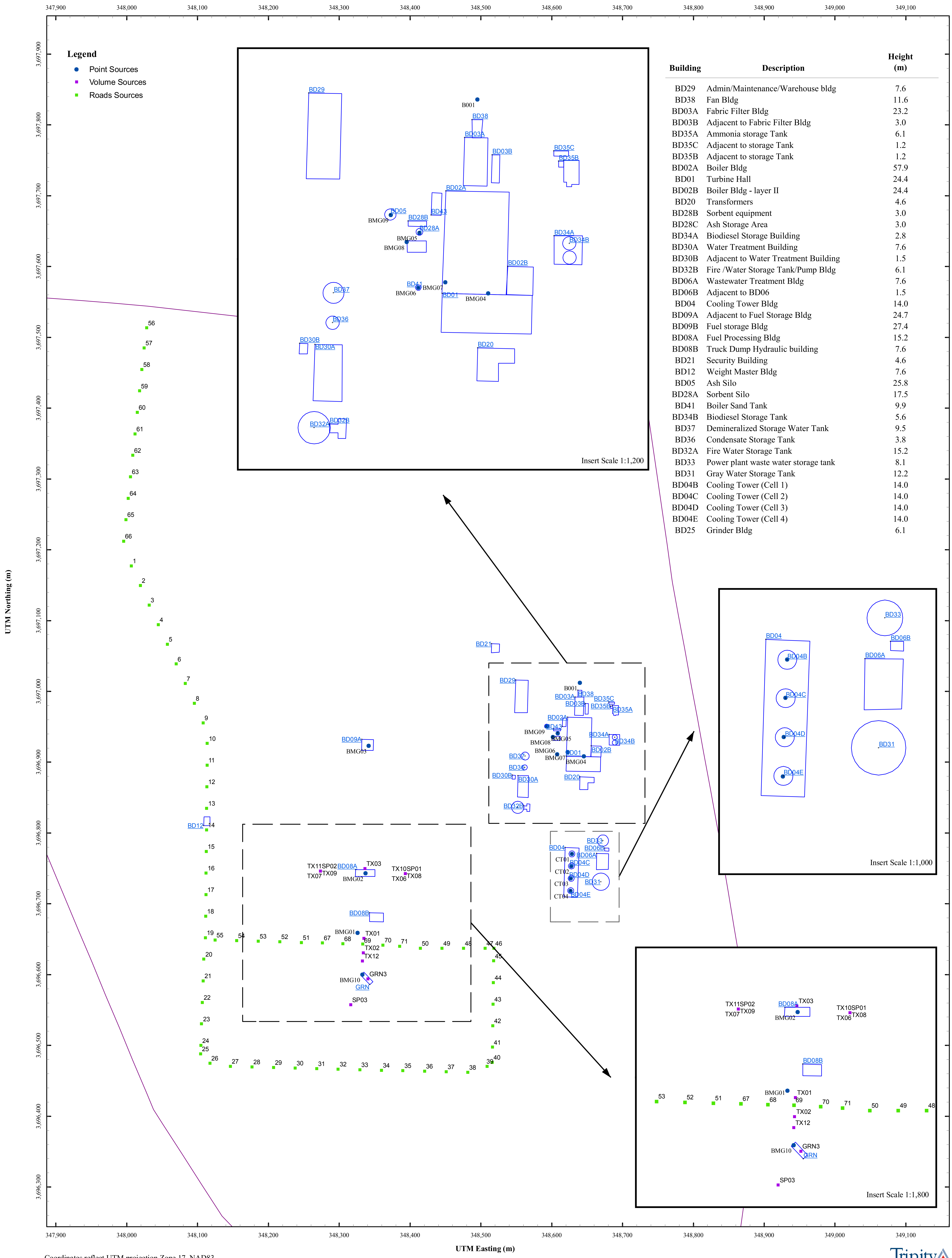
Oglethorpe Power Corporation Warren County Facility
Warrenton, Warren County, Georgia



Coordinates reflect UTM projection Zone 17, NAD83.

Figure A-2. Modeled Site Layout

Oglethorpe Power Corporation Warren County Facility
Warrenton, Warren County, Georgia

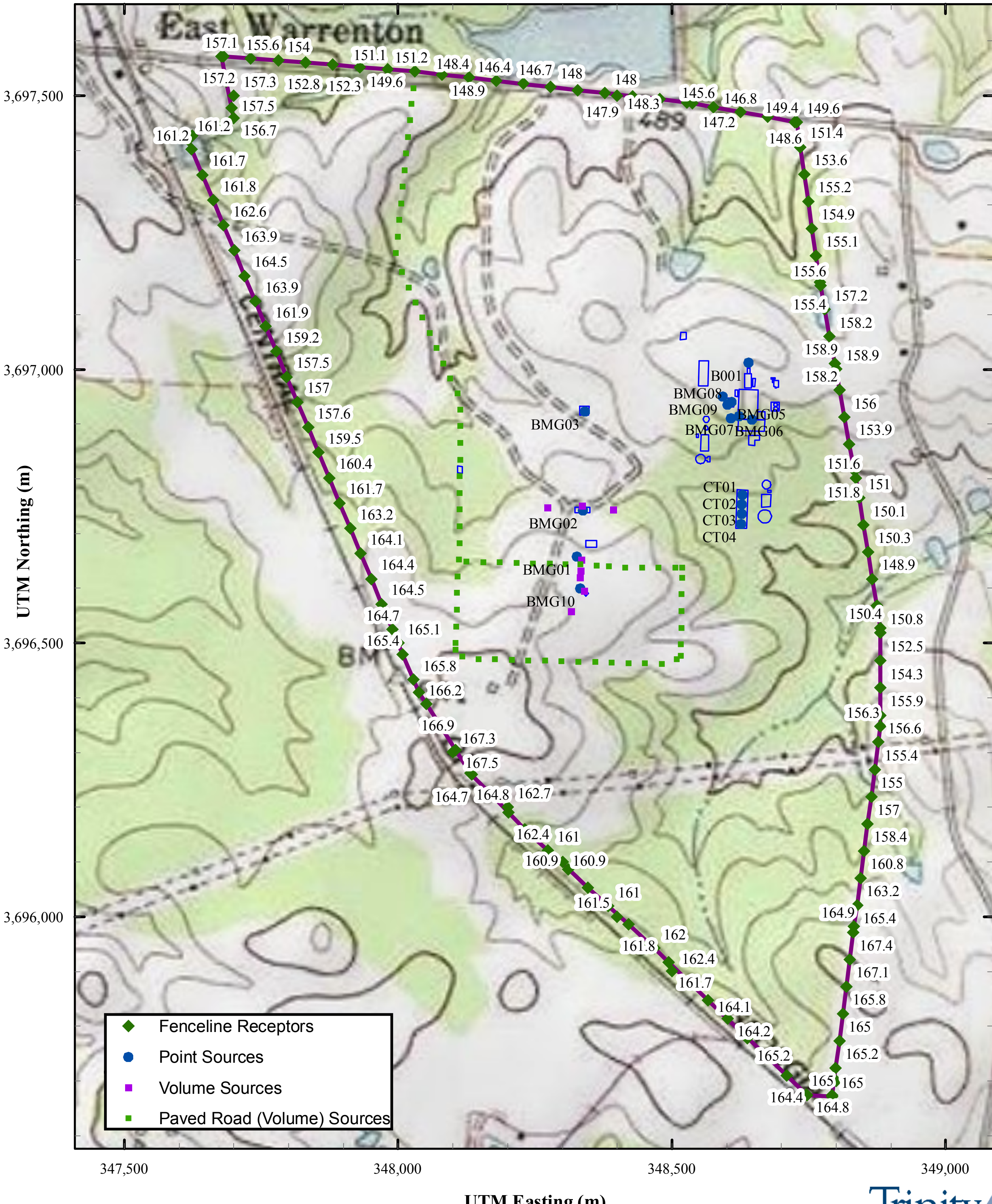


Building	Description	Height (m)
BD29	Admin/Maintenance/Warehouse bldg	7.6
BD38	Fan Bldg	11.6
BD03A	Fabric Filter Bldg	23.2
BD03B	Adjacent to Fabric Filter Bldg	3.0
BD35A	Ammonia storage Tank	6.1
BD35C	Adjacent to storage Tank	1.2
BD35B	Adjacent to storage Tank	1.2
BD02A	Boiler Bldg	57.9
BD01	Turbine Hall	24.4
BD02B	Boiler Bldg - layer II	24.4
BD20	Transformers	4.6
BD28B	Sorbent equipment	3.0
BD28C	Ash Storage Area	3.0
BD34A	Biodiesel Storage Building	2.8
BD30A	Water Treatment Building	7.6
BD30B	Adjacent to Water Treatment Building	1.5
BD32B	Fire /Water Storage Tank/Pump Bldg	6.1
BD06A	Wastewater Treatment Bldg	7.6
BD06B	Adjacent to BD06	1.5
BD04	Cooling Tower Bldg	14.0
BD09A	Adjacent to Fuel Storage Bldg	24.7
BD09B	Fuel storage Bldg	27.4
BD08A	Fuel Processing Bldg	15.2
BD08B	Truck Dump Hydraulic building	7.6
BD21	Security Building	4.6
BD12	Weight Master Bldg	7.6
BD05	Ash Silo	25.8
BD28A	Sorbent Silo	17.5
BD41	Boiler Sand Tank	9.9
BD34B	Biodiesel Storage Tank	5.6
BD37	Demineralized Storage Water Tank	9.5
BD36	Condensate Storage Tank	3.8
BD32A	Fire Water Storage Tank	15.2
BD33	Power plant waste water storage tank	8.1
BD31	Gray Water Storage Tank	12.2
BD04B	Cooling Tower (Cell 1)	14.0
BD04C	Cooling Tower (Cell 2)	14.0
BD04D	Cooling Tower (Cell 3)	14.0
BD04E	Cooling Tower (Cell 4)	14.0
BD25	Grinder Bldg	6.1

Coordinates reflect UTM projection Zone 17, NAD83.

Figure A-3. Modeled Fenceline Receptors and Elevations (m)

Oglethorpe Power Corporation Warren County Facility
Warrenton, Warren County, Georgia



Coordinates reflect UTM projection Zone 17, NAD83.

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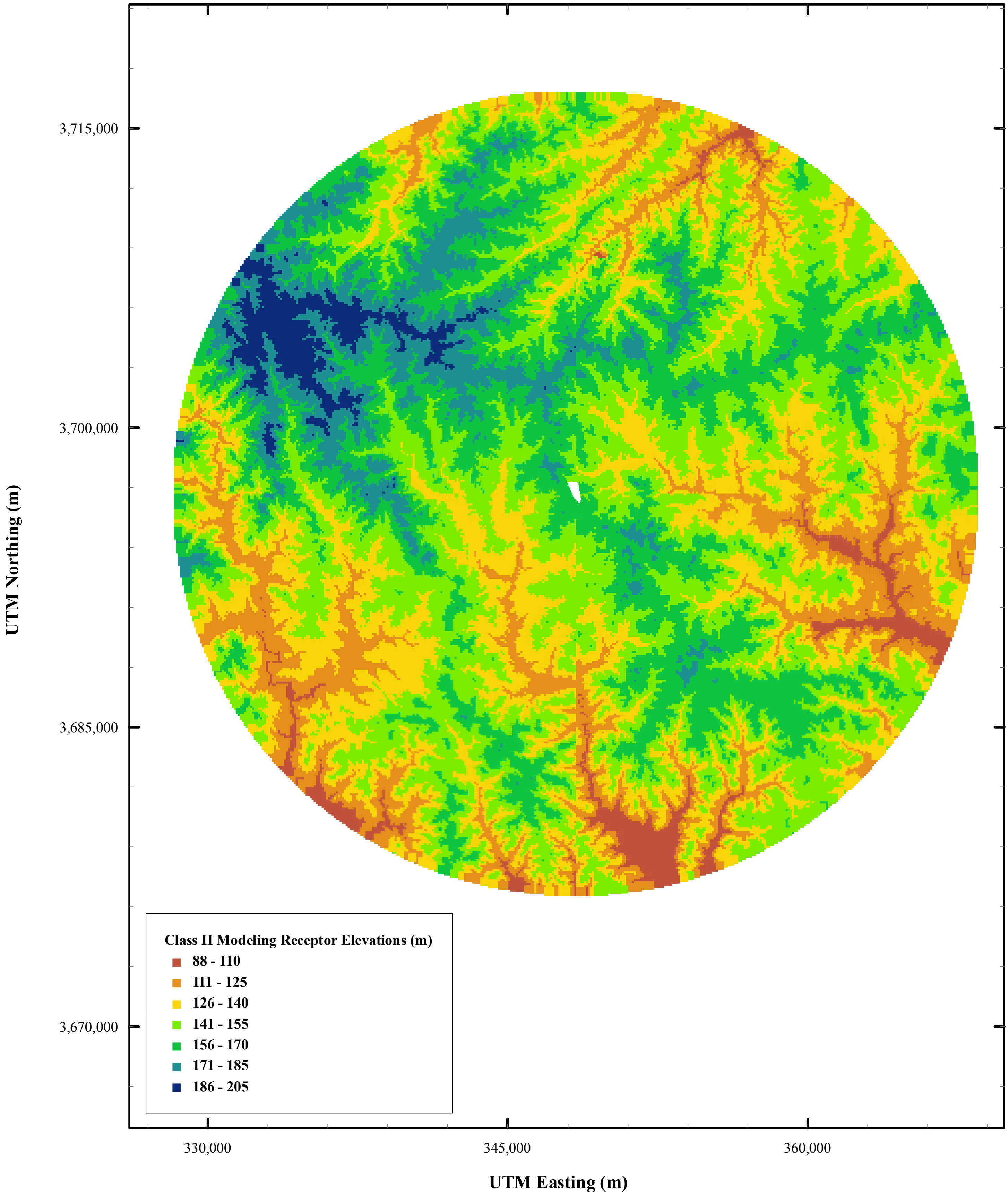
Figure A-4. Class II Significance Modeling Grid

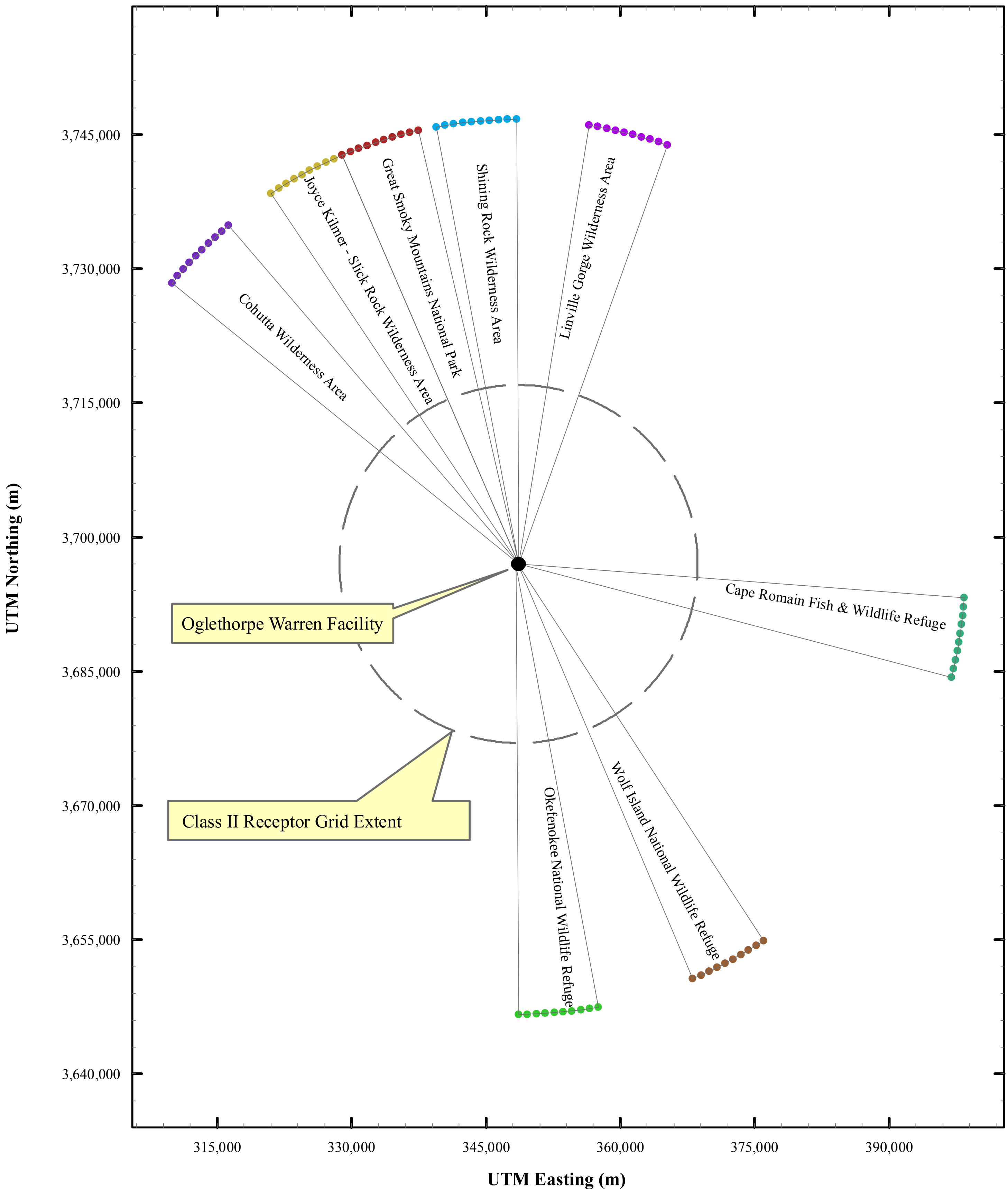
Oglethorpe Power Corporation Warren County Facility
Warrenton, Warren County, Georgia



Coordinates reflect UTM projection Zone 17, NAD83.

Figure A-5. Class I Significance Modeling Receptors

Oglethorpe Power Corporation Warren County Facility
Warrenton, Warren County, Georgia



Coordinates reflect UTM projection Zone 17, NAD83.

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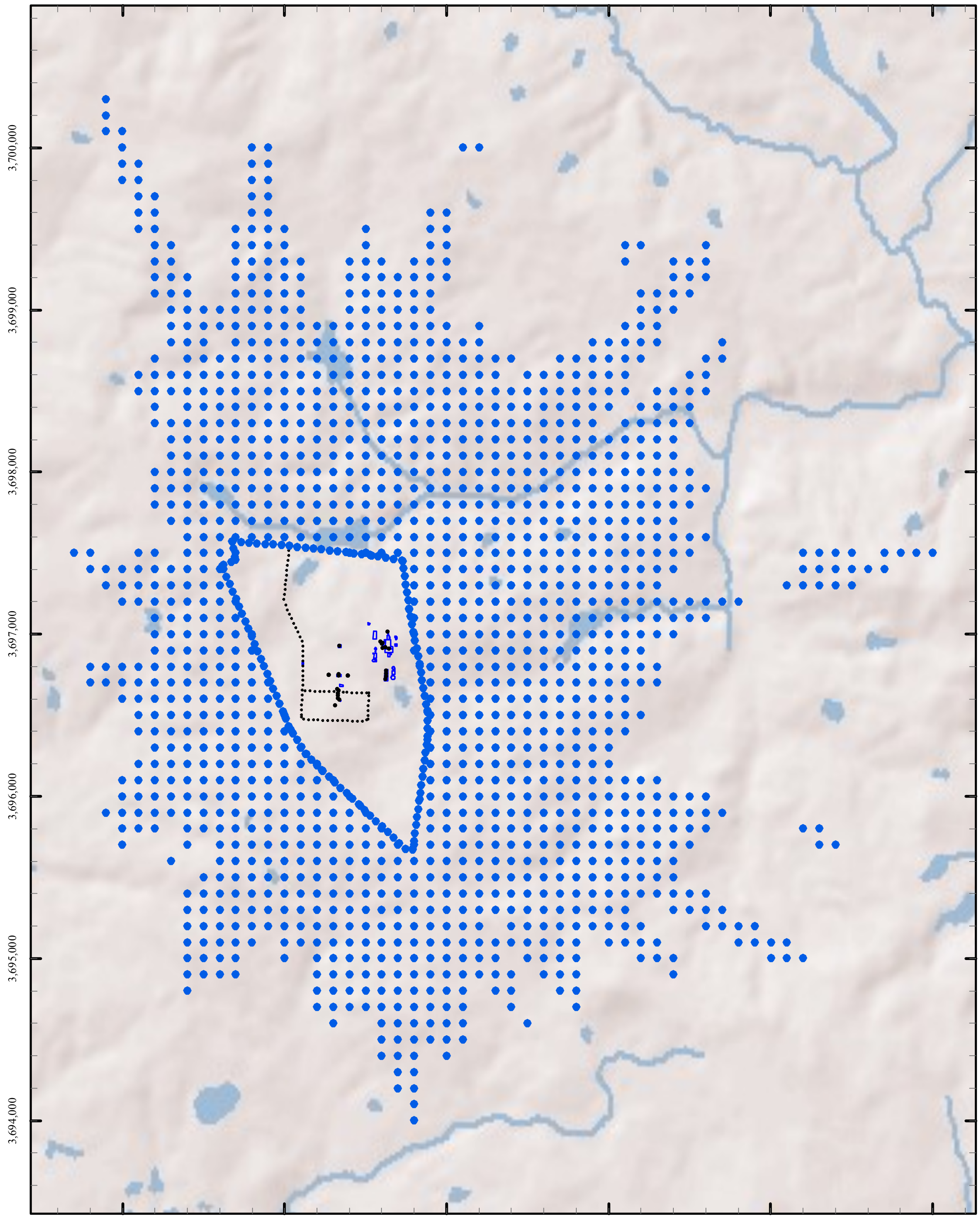
Figure A-6. PM10 NAAQS and Increment Receptors

Oglethorpe Power Corporation Warren County Facility
Warrenton, Warren County, Georgia



Coordinates reflect UTM projection Zone 17, NAD83.
The refined NAAQS and Increment modeling, with regional inventory sources, is limited to those receptors at which the project has demonstrated impacts above the SILs.
The shaded relief imagery was developed by ESRI using GTOPO30, SRTM, and NED elevation data from the USGS.

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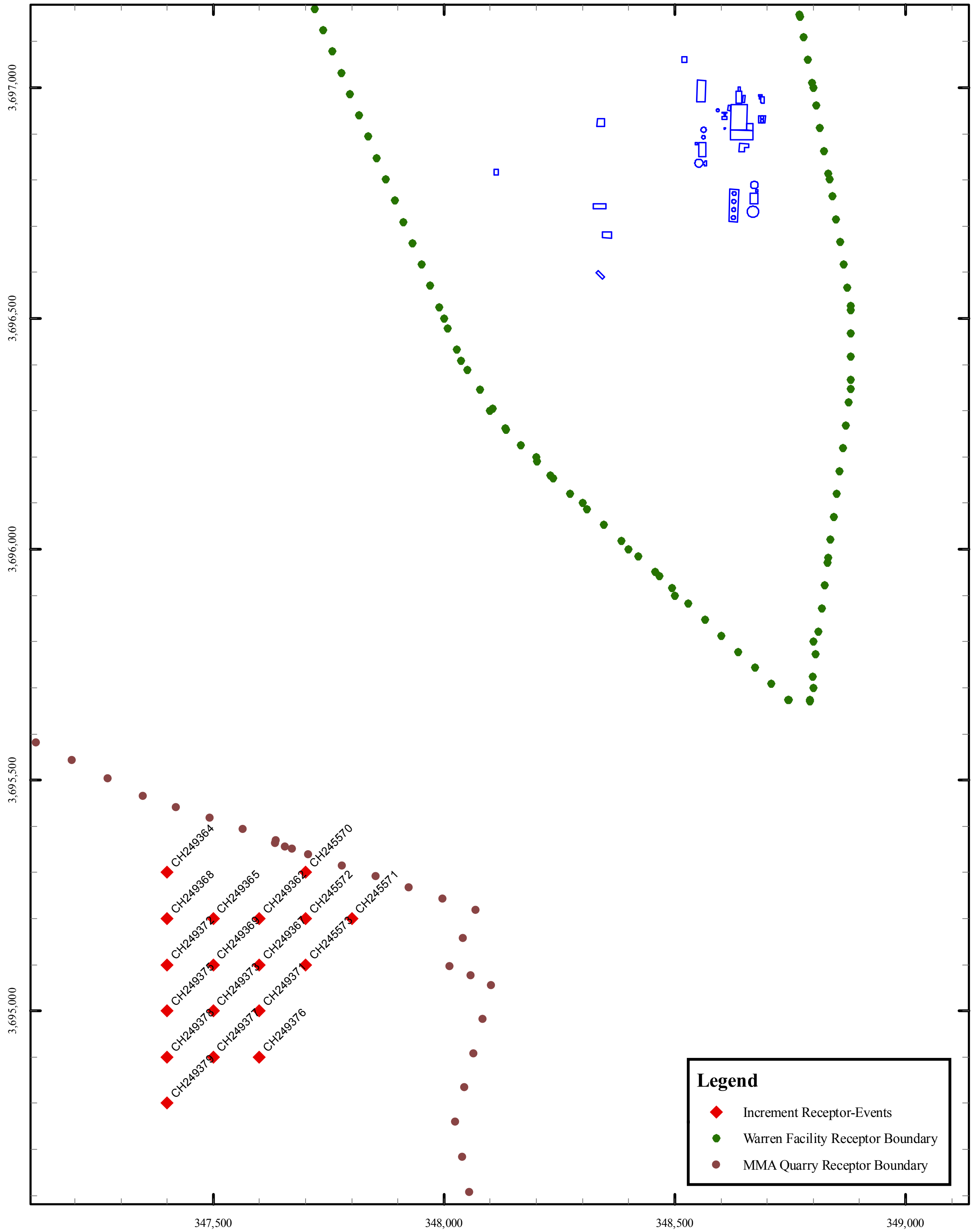
Figure A-7. 24-hr Average PM10 Increment Results

Oglethorpe Power Corporation Warren County Facility
Warrenton, Warren County, Georgia



Coordinates reflect UTM projection Zone 17, NAD83.
NAAQS receptor-events are those receptors with both a total 24-hr average concentrations above 150 ug/m3, and a contribution from Oglethorpe sources above 5 ug/m3. However, for those events within the property boundary of another industrial source, that source's concentrations may be excluded from the total. The labeled event IDs correspond to those shown in Table 5-12 of the Class II Dispersion Modeling Analysis Report.

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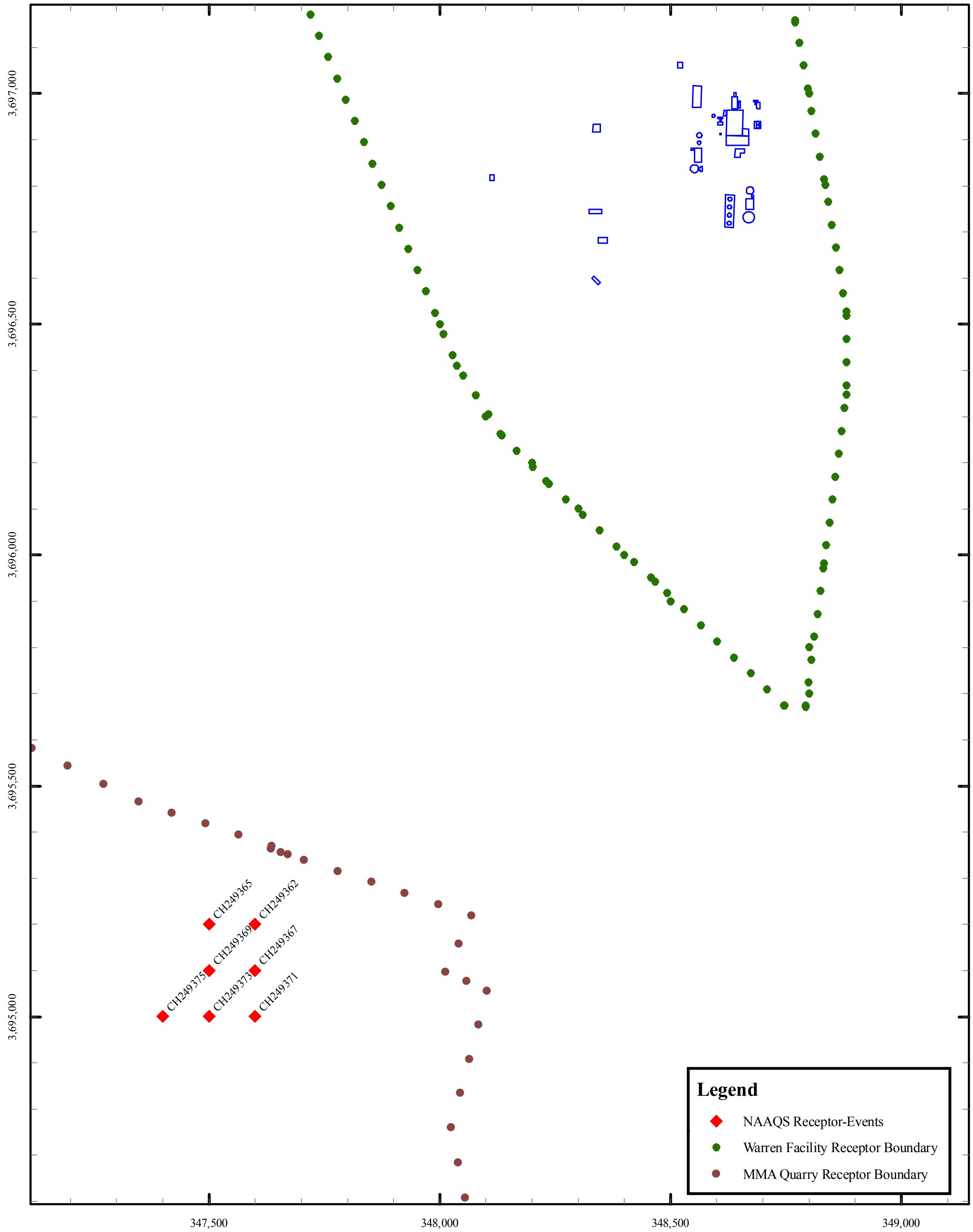
Figure A-8. 24-hr Average PM10 NAAQS Results

Oglethorpe Power Corporation Warren County Facility
Warrenton, Warren County, Georgia



Coordinates reflect UTM projection Zone 17, NAD83.
NAAQS receptor-events are those receptors with both a total 24-hr average concentrations above 150 ug/m3, and a contribution from Oglethorpe sources above 5 ug/m3. However, for those events within the property boundary of another industrial source, that source's concentrations may be excluded from the total. The labeled event IDs correspond to those shown in Table 5-12 of the Class II Dispersion Modeling Analysis Report.

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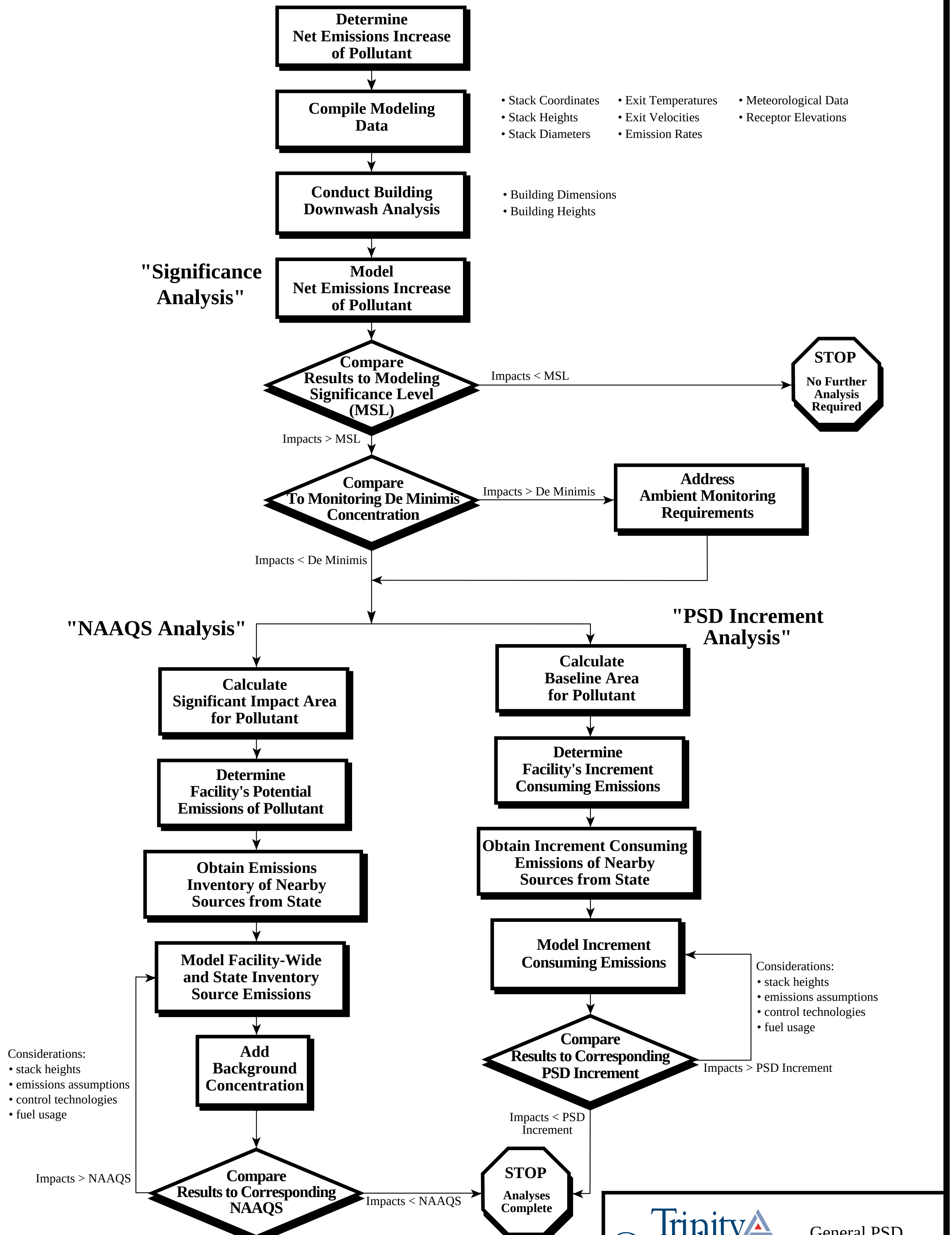
APPENDIX B

PSD FLOW CHART



Note: "Impacts" refers to off-property impacts.

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General PSD Modeling Flow Chart

APPENDIX C

LAND USE REPRESENTATIVENESS ANALYSIS

To define the land use characteristics and micrometeorological parameters in the areas of interest, Trinity utilized the U.S. EPA program AERSURFACE (version 08009) to analyze a digital mapping of land use and cover; specifically the 30-meter resolution USGS digital National Land Cover Data (NLCD) from 1992, as is recommended for usage with AERSURFACE.[1]

AERSURFACE resolves predominant land cover types into a grid comprising 30 meter-by-30 meter cells extending out to a specified distance from the center of the facility or NWS site; the recommended distance is 1 km for surface roughness and 10 km for albedo and Bowen ratio. The data, which contain the land use category code and coordinates for each cell, are used by AERSURFACE to calculate the wind sectors and determine the weighted percentage of each land use type contained within each of the twelve 30-degree sectors; note that albedo and Bowen ratio are constant for each of the sectors, varying only seasonally. The weighted percentages of each land use type are then utilized to calculate the weighted average surface parameters (Bowen ratio, albedo, and surface roughness) for each of the sectors.

Figure C-1 illustrates the land use and cover for the Warren site based on the grid cell assignments contained in the AERSURFACE roughness domain output file. The circle in the figure denotes a 1 km radius around the center of the facility; individual sectors are also shown in black. Two similar figures for the Athens and Macon NWS stations were created by Trinity using the AERSURFACE grid cell assignments (from AERSURFACE runs prepared using the NWS coordinates from the National Oceanic and Atmospheric Administration [NOAA] website) and are included as Figures C-2 and C-3.[2]

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[1] http://seamless.usgs.gov/website/seamless/viewer.htm

[2] http://mi3.ncdc.noaa.gov/mi3qry/login.cfm

FIGURE C-1. LAND USE CATEGORIES FOR THE 1-KM AREA SURROUNDING THE WARREN FACILITY

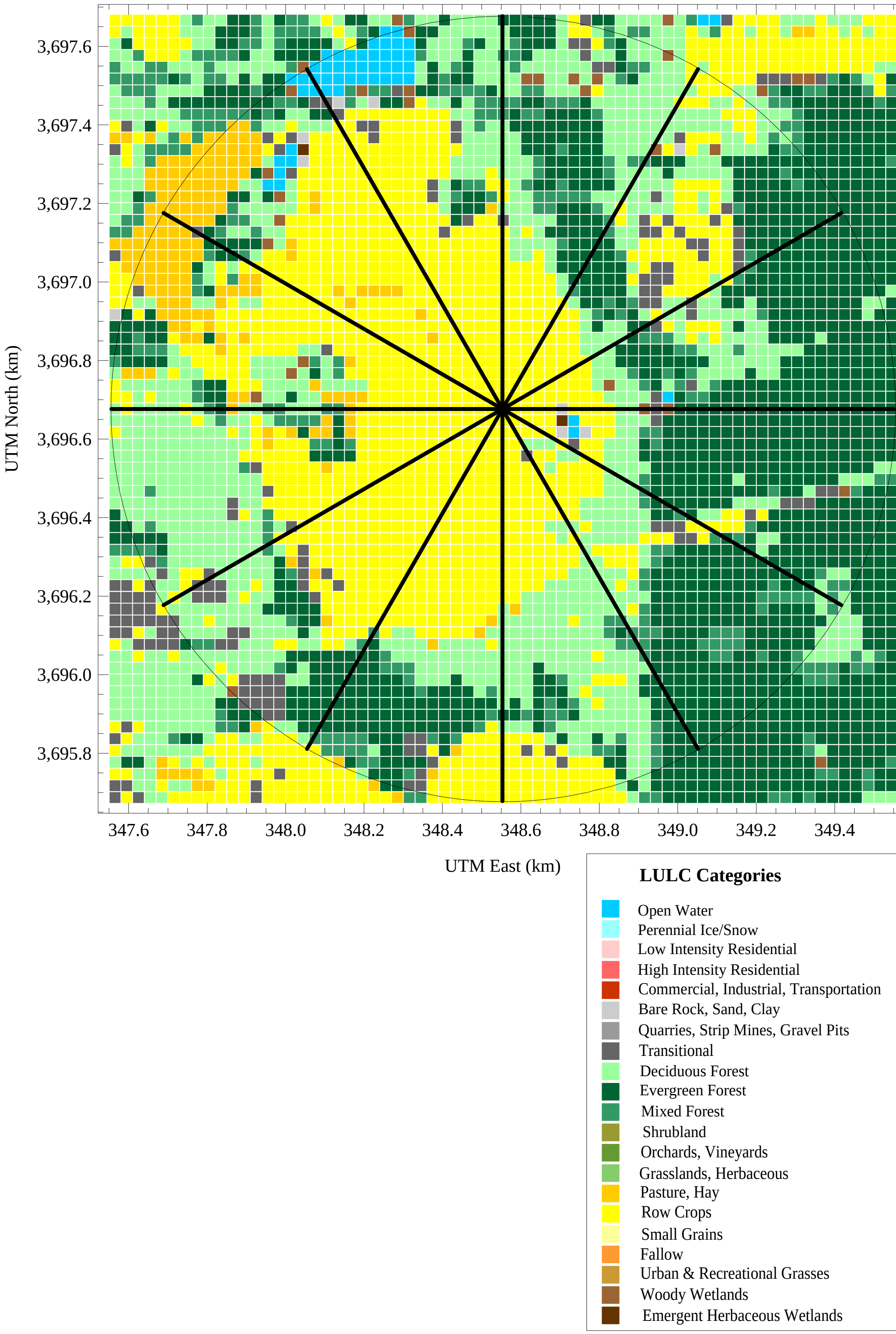


FIGURE C-2. LAND USE CATEGORIES FOR THE 1-KM AREA SURROUNDING THE ATHENS NWS

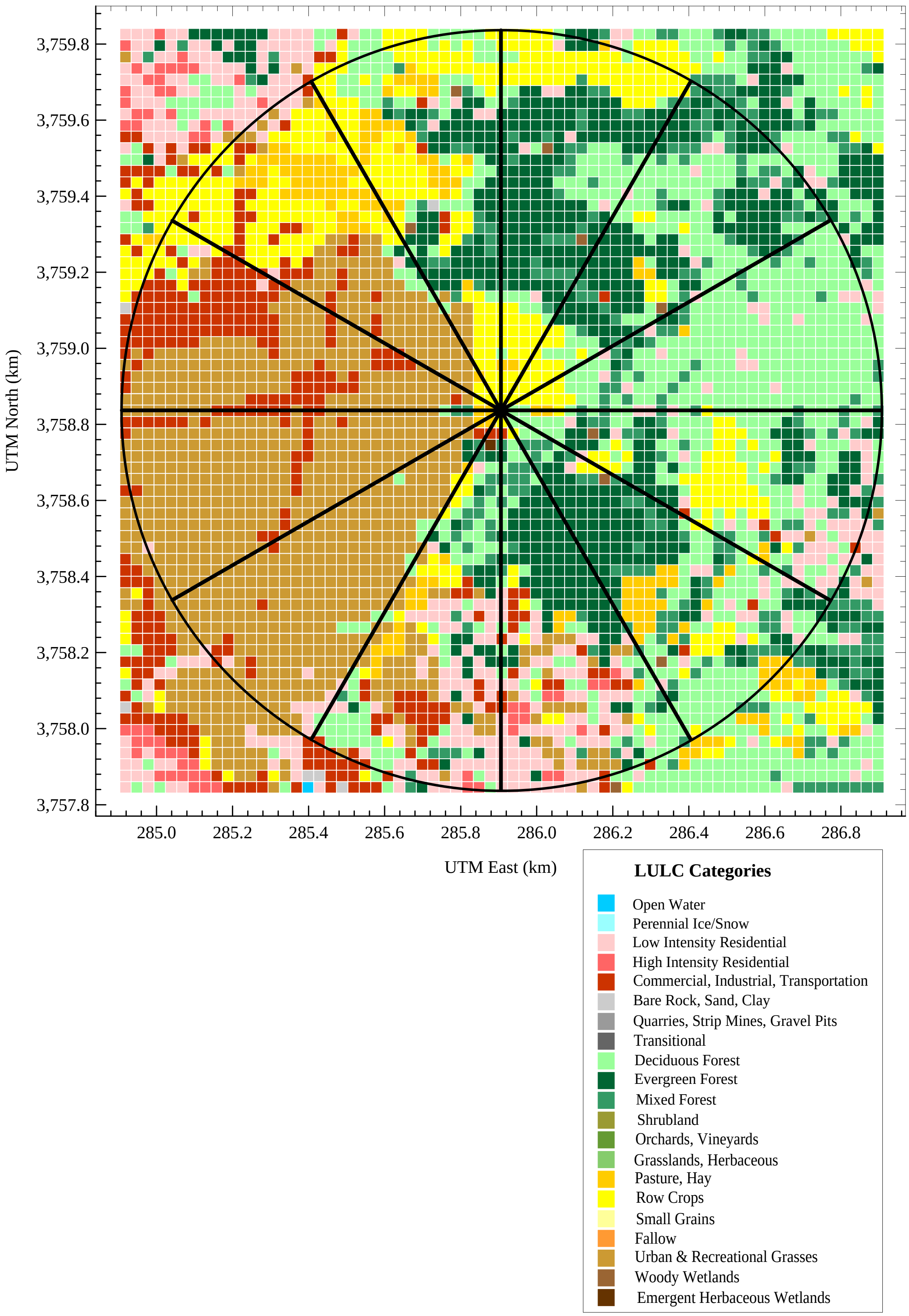
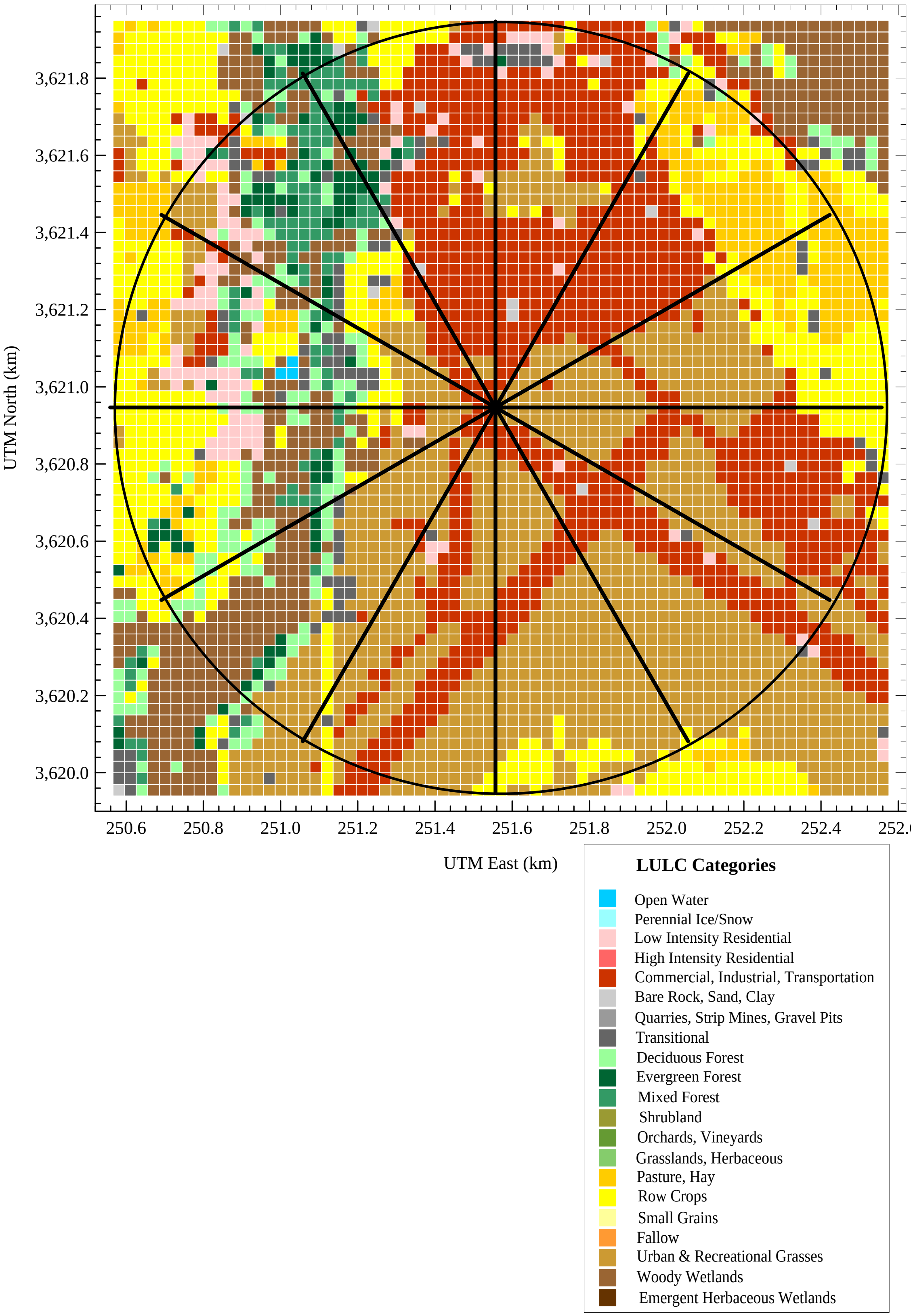


FIGURE C-3. LAND USE CATEGORIES FOR THE 1-KM AREA SURROUNDING THE MACON NWS



To facilitate a quantitative comparison of surface characteristics, Trinity utilized AERSURFACE to determine the weighted average parameters for the facility and the NWS sites based on the 1992 NLCD data. The geographic coordinates for the two NWS sites provided by Georgia EPD were used for the center of the study area for the NWS sites, while an approximate central location was used as the center of the facility study area. Because the facility and NWS sites are located in a temperate region that experiences weather conditions typical of varying seasons, seasonal average parameters were computed for each season; the seasonal assignment "Winter" values were assigned by AERSURFACE based on no "continuous snow cover for most of winter". The analysis was completed for dry, wet, and average moisture conditions (moisture conditions impact the Bowen ratio parameters assigned). Copies of the AERSURFACE output files are included as an electronic attachment.

Table C-1 presents a summary of the parameter values utilized to compute the weighted average parameters, while Table C-2 presents the surface characteristics determined by AERSURFACE for the Facility. All parameter values are based on the values recommended in U.S. EPA's *AERMET User's Guide*.[3]

Tables C-3 through C-5 present various comparisons of the parameter assignments, considering annual averages, seasonal averages, and overall differences. As neither U.S. EPA nor Georgia EPD have published guidance detailing a quantitative comparison of surface characteristics, Trinity used the comparisons recommended by the Alabama Department of Environmental Management to provide a quantitative review of the surface characteristics.[4]

Figure C-4 includes a quantitative review of the land use assignments. These comparisons illustrate that the albedo for both Athens and Macon NWS are very similar to each other, and that the Bowen ratio parameter assignments for the facility are most similar to the Athens NWS. The facility's surface roughness parameter assignments are generally similar to both the Macon NWS and Athens NWS, but the average parameter indicates that the facility is most similar to the Athens NWS. Figure C-4 also illustrates that the facility's land use assignments are more similar to the Athens NWS site.

Based on the results of this analysis, Oglethorpe selected the Athens NWS station for surface observational meteorological data, and used the AERMOD-ready surface and profile meteorological files provided by Georgia EPD for Athens for the modeling analyses.[5]

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[3] U.S. EPA, *User's Guide for the AERMOD Meteorological Preprocessor (AERME*T), EPA-454/B-03-002, November 2004.

[4] PSD Air Quality Analysis AERMOD Modeling Guidelines, Alabama Department of Environmental Management, May 2008, Appendix C.

[5] AERMET files were provided via email by Mr. Peter Courtney on January 29, 2009.

TABLE C-1. AERMET PARAMETER VALUES

Landuse	Albedo				Surface Roughness				Bowen Ratio (Average Moisture)				Bowen Ratio (Dry Conditions)				Bowen Ratio (Wet Conditions)			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Water	0.12	0.10	0.14	0.20	0.0001	0.0001	0.0001	0.0001	0.1	0.1	0.1	1.5	0.1	0.1	0.1	2.0	0.1	0.1	0.1	0.3
Deciduous Forest	0.12	0.12	0.12	0.50	1.00	1.30	0.80	0.50	0.7	0.3	1.0	1.5	1.5	0.6	2.0	2.0	0.3	0.2	0.4	0.5
Coniferous Forest	0.12	0.12	0.12	0.35	1.30	1.30	1.30	1.30	0.7	0.3	0.8	1.5	1.5	0.6	1.5	2.0	0.3	0.2	0.3	0.3
Swamp/Wetlands	0.12	0.14	0.16	0.30	0.20	0.20	0.20	0.05	0.1	0.1	0.1	1.5	0.2	0.2	0.2	2.0	0.1	0.1	0.1	0.5
Cultivated Land	0.14	0.20	0.18	0.60	0.03	0.20	0.05	0.01	0.3	0.5	0.7	1.5	1.0	1.5	2.0	2.0	0.2	0.3	0.4	0.5
Grassland	0.18	0.18	0.20	0.60	0.50	0.10	0.01	0.001	0.4	0.8	1.0	1.5	1.0	2.0	2.0	2.0	0.3	0.4	0.5	0.5
Urban	0.14	0.16	0.18	0.35	1.00	1.00	1.00	1.00	1.0	2.0	2.0	1.5	2.0	4.0	4.0	2.0	0.5	1.0	1.0	0.5
Desert Shrubland	0.30	0.28	0.28	0.45	0.30	0.30	0.30	0.15	3.0	4.0	6.0	6.0	5.0	6.0	10.0	10.0	1.0	1.5	2.0	2.0

TABLE C-2. AERSURFACE ASSIGNMENTS FOR THE WARREN FACILITY

Sector	Albedo				Surface Roughness				Bowen Ratio (Average Moisture)				Bowen Ratio (Dry Conditions)				Bowen Ratio (Wet Conditions)			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
1 (0-30 deg)	0.14	0.16	0.16	0.16	0.213	0.541	0.541	0.153	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38
2 (30-60 deg)	0.14	0.16	0.16	0.16	0.140	0.425	0.425	0.100	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38
3 (60-90 deg)	0.14	0.16	0.16	0.16	0.406	0.729	0.729	0.318	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38
4 (90-120 deg)	0.14	0.16	0.16	0.16	0.363	0.597	0.597	0.307	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38
5 (120-150 deg)	0.14	0.16	0.16	0.16	0.422	0.749	0.749	0.332	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38
6 (150-180 deg)	0.14	0.16	0.16	0.16	0.207	0.538	0.538	0.144	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38
7 (180-210 deg)	0.14	0.16	0.16	0.16	0.099	0.363	0.363	0.069	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38
8 (210-240 deg)	0.14	0.16	0.16	0.16	0.089	0.333	0.333	0.064	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38
9 (240-270 deg)	0.14	0.16	0.16	0.16	0.112	0.384	0.384	0.075	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38
10 (270-300 deg)	0.14	0.16	0.16	0.16	0.105	0.369	0.369	0.071	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38
11 (300-330 deg)	0.14	0.16	0.16	0.16	0.046	0.223	0.223	0.032	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38
12 (330-360 deg)	0.14	0.16	0.16	0.16	0.042	0.179	0.179	0.030	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38

TABLE C-3. COMPARISON OF AERSURFACE ASSIGNMENTS, ANNUAL AVERAGES

Albedo Assignments

Sector	**Athens NWS (AHN)** Average	**Macon NWS (MCN)** Average	**Facility** Average	**Facility** % of AHN[1]	**Facility** % of MCN[1]
All	0.158	0.160	0.155	**1.6%**	3.1%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Bowen Ratio Assignments - Average Moisture

Sector	**Athens NWS (AHN)** Average	**Macon NWS (MCN)** Average	**Facility** Average	**Facility** % of AHN[1]	**Facility** % of MCN[1]
All	0.70	0.48	0.63	**10%**	32%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Bowen Ratio Assignments - Dry Conditions

Sector	**Athens NWS (AHN)** Average	**Macon NWS (MCN)** Average	**Facility** Average	**Facility** % of AHN[1]	**Facility** % of MCN[1]
All	1.58	0.90	1.42	**10%**	59%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Bowen Ratio Assignments - Wet Conditions

Sector	**Athens NWS (AHN)** Average	**Macon NWS (MCN)** Average	**Facility** Average	**Facility** % of AHN[1]	**Facility** % of MCN[1]
All	0.37	0.25	0.32	**12.3%**	28.0%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Surface Roughness Assignments

Sector	**Athens NWS (AHN)** Average	**Macon NWS (MCN)** Average	**Facility** Average	**Facility** % of AHN[1]	**Facility** % of MCN[1]
1	0.433	0.070	0.362	**16%**	417%
2	0.579	0.076	0.273	**53%**	261%
3	0.640	0.036	0.546	**15%**	1,426%
4	0.689	0.037	0.466	**32%**	1,151%
5	0.530	0.035	0.563	**6%**	1,520%
6	0.573	0.025	0.357	**38%**	1,313%
7	0.379	0.030	0.224	**41%**	658%
8	0.041	0.051	0.205	399%	**303%**
9	0.019	0.163	0.239	1140%	**46%**
10	0.035	0.130	0.229	562%	**75%**
11	0.040	0.158	0.131	228%	**17%**
12	0.157	0.152	0.108	32%	**29%**
All	0.343	0.080	0.308	**10%**	285%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

TABLE C-4. COMPARISON OF AERSURFACE ASSIGNMENTS, SEASONAL AVERAGES

Albedo Assignments

	Athens NWS (AHN)				Macon NWS (MCN)				Facility (as % of AHN)[1]				Facility (as % of MCN)[1]			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Seasonal Average	0.15	0.16	0.16	0.16	0.14	0.17	0.17	0.16	0.14	0.16	0.16	0.16	0.14	0.16	0.16	0.16
% of NWS[1]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7%	**0%**	**0%**	**0%**	**0%**	6%	6%	0%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Bowen Ratio Assignments - Average Moisture

	Athens NWS (AHN)				Macon NWS (MCN)				Facility (as % of AHN)[1]				Facility (as % of MCN)[1]			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Seasonal Average	0.61	0.44	0.88	0.88	0.37	0.38	0.55	0.61	0.52	0.38	0.81	0.81	0.52	0.38	0.81	0.81
% of NWS[1]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	**15%**	14%	**8%**	**8%**	41%	**0%**	47%	33%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Bowen Ratio Assignments - Dry Conditions

	Athens NWS (AHN)				Macon NWS (MCN)				Facility (as % of AHN)[1]				Facility (as % of MCN)[1]			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Seasonal Average	1.46	0.99	1.93	1.93	0.76	0.74	1.04	1.04	1.28	0.87	1.77	1.77	1.28	0.87	1.77	1.77
% of NWS[1]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	**12%**	12%	**8%**	**8%**	68%	**18%**	70%	70%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Bowen Ratio Assignments - Wet Conditions

	Athens NWS (AHN)				Macon NWS (MCN)				Facility (as % of AHN)[1]				Facility (as % of MCN)[1]			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Seasonal Average	0.33	0.29	0.42	0.42	0.21	0.23	0.28	0.28	0.27	0.25	0.38	0.38	0.27	0.25	0.38	0.38
% of NWS[1]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	**18%**	14%	**10%**	**10%**	29%	**9%**	36%	36%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Surface Roughness Assignments

	Athens NWS (AHN)				Macon NWS (MCN)				Facility (as % of AHN)[1]				Facility (as % of MCN)[1]			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Seasonal Average	0.271	0.450	0.445	0.206	0.070	0.100	0.093	0.057	0.187	0.453	0.453	0.141	0.187	0.453	0.453	0.141
% of NWS[1]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	**31%**	**1%**	**2%**	**31%**	167%	352%	387%	147%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

TABLE C-5. COMPARISON OF AERSURFACE ASSIGNMENTS, DIFFERENCES

Albedo Assignments

Sector	Athens NWS (AHN)				Macon NWS (MCN)				Facility				Difference Between Athens & Facility				Difference Between Macon & Facility				Facility (as % of AHN)[1]				Facility (as % of MCN)[1]			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
All	0.15	0.16	0.16	0.16	0.14	0.17	0.17	0.16	0.14	0.16	0.16	0.16	0.01	-	-	-	-	0.01	0.01	-	7%	**0%**	**0%**	**0%**	**0%**	6%	6%	0%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Bowen Ratio Assignments - Average Moisture

Sector	Athens NWS (AHN)				Macon NWS (MCN)				Facility				Difference Between Athens & Facility				Difference Between Macon & Facility				Facility (as % of AHN)[1]				Facility (as % of MCN)[1]			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
All	0.61	0.44	0.88	0.88	0.37	0.38	0.55	0.61	0.52	0.38	0.81	0.81	0.09	0.06	0.07	0.07	(0.15)	-	(0.26)	(0.20)	**15%**	**14%**	**8%**	**8%**	41%	**0%**	47%	33%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Bowen Ratio Assignments - Dry Conditions

Sector	Athens NWS (AHN)				Macon NWS (MCN)				Facility				Difference Between Athens & Facility				Difference Between Macon & Facility				Facility (as % of AHN)[1]				Facility (as % of MCN)[1]			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
All	1.46	0.99	1.93	1.93	0.76	0.74	1.04	1.04	1.28	0.87	1.77	1.77	0.18	0.12	0.16	0.16	(0.52)	(0.13)	(0.73)	(0.73)	**12%**	**12%**	**8%**	**8%**	68%	18%	70%	70%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Bowen Ratio Assignments - Wet Conditions

Sector	Athens NWS (AHN)				Macon NWS (MCN)				Facility				Difference Between Athens & Facility				Difference Between Macon & Facility				Facility (as % of AHN)[1]				Facility (as % of MCN)[1]			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
All	0.33	0.29	0.42	0.42	0.21	0.23	0.28	0.28	0.27	0.25	0.38	0.38	0.06	0.04	0.04	0.04	(0.06)	(0.02)	(0.10)	(0.10)	**18%**	14%	**10%**	**10%**	29%	**9%**	36%	36%

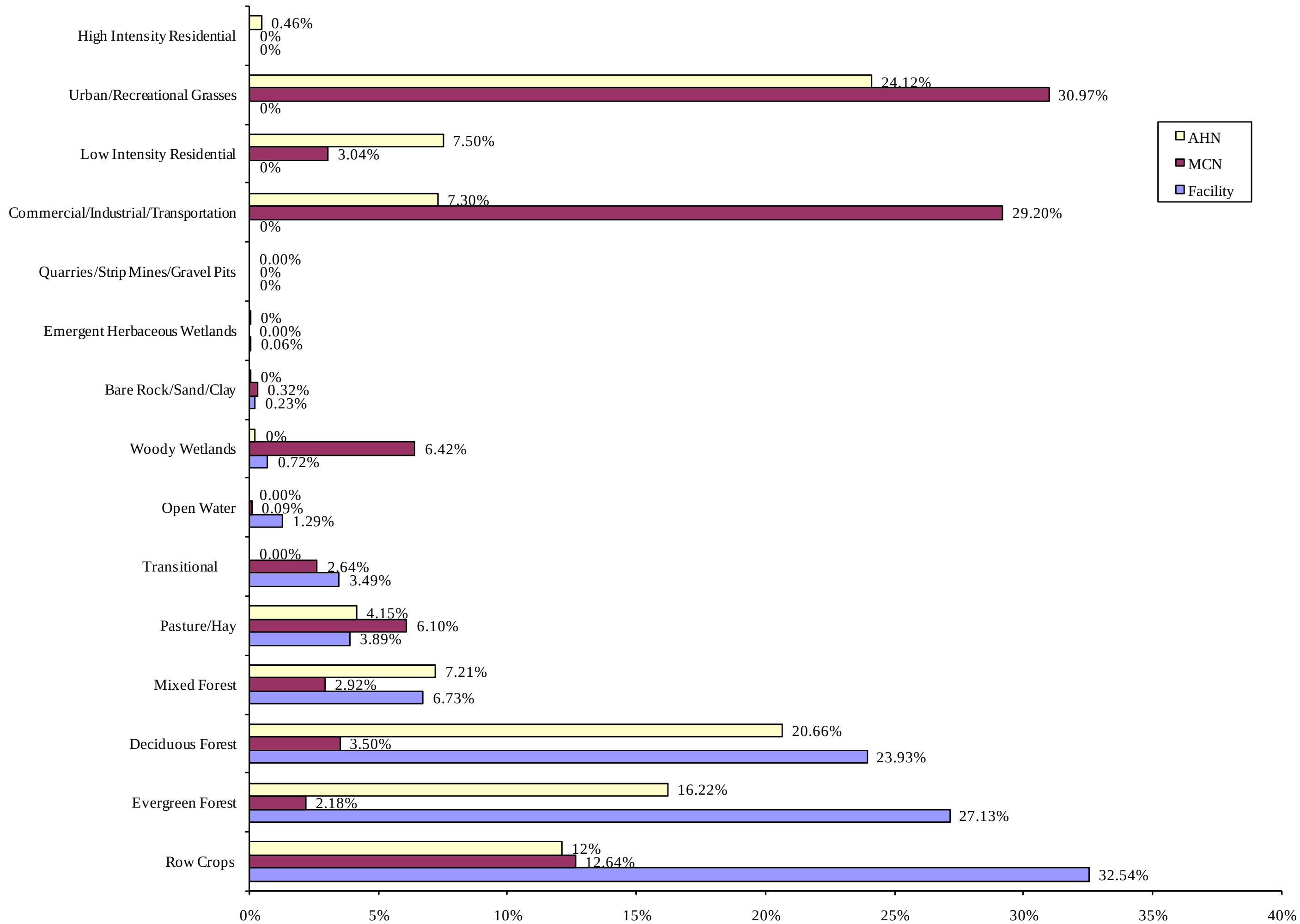
1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Surface Roughness Assignments

Sector	Athens NWS (AHN)				Macon NWS (MCN)				Facility				Difference Between Athens & Facility				Difference Between Macon & Facility				Facility (as % of AHN)[1]				Facility (as % of MCN)[1]			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
1	0.283	0.612	0.612	0.224	0.069	0.077	0.072	0.062	0.213	0.541	0.541	0.153	0.070	0.071	0.071	0.071	-0.144	-0.464	-0.469	-0.091	**25%**	**12%**	**12%**	**32%**	209%	603%	651%	147%
2	0.436	0.770	0.770	0.340	0.061	0.096	0.093	0.052	0.140	0.425	0.425	0.100	0.296	0.345	0.345	0.240	-0.079	-0.329	-0.332	-0.048	**68%**	**45%**	**45%**	**71%**	130%	343%	357%	92%
3	0.504	0.855	0.855	0.345	0.027	0.052	0.045	0.019	0.406	0.729	0.729	0.318	0.098	0.126	0.126	0.027	-0.379	-0.677	-0.684	-0.299	**19%**	**15%**	**15%**	**8%**	1,404%	1,302%	1,520%	1,574%
4	0.573	0.889	0.889	0.404	0.034	0.048	0.041	0.026	0.363	0.597	0.597	0.307	0.210	0.292	0.292	0.097	-0.329	-0.549	-0.556	-0.281	**37%**	**33%**	**33%**	**24%**	968%	1,144%	1,356%	1,081%
5	0.396	0.712	0.711	0.302	0.035	0.041	0.035	0.028	0.422	0.749	0.749	0.332	-0.026	-0.037	-0.038	-0.030	-0.387	-0.708	-0.714	-0.304	**7%**	**5%**	**5%**	**10%**	1,106%	1,727%	2,040%	1,086%
6	0.505	0.690	0.679	0.417	0.025	0.032	0.026	0.018	0.207	0.538	0.538	0.144	0.298	0.152	0.141	0.273	-0.182	-0.506	-0.512	-0.126	**59%**	**22%**	**21%**	**65%**	728%	1,581%	1,969%	700%
7	0.354	0.439	0.428	0.293	0.029	0.037	0.030	0.022	0.099	0.363	0.363	0.069	0.255	0.076	0.065	0.224	-0.070	-0.326	-0.333	-0.047	**72%**	**17%**	**15%**	**76%**	241%	881%	1,110%	214%
8	0.036	0.056	0.047	0.025	0.050	0.062	0.053	0.038	0.089	0.333	0.333	0.064	-0.053	-0.277	-0.286	-0.039	-0.039	-0.271	-0.280	-0.026	147%	495%	609%	156%	**78%**	**437%**	**528%**	**68%**
9	0.018	0.026	0.021	0.012	0.135	0.213	0.201	0.104	0.112	0.384	0.384	0.075	-0.094	-0.358	-0.363	-0.063	0.023	-0.171	-0.183	0.029	522%	1377%	1729%	525%	**17%**	**80%**	**91%**	**28%**
10	0.034	0.043	0.036	0.025	0.097	0.180	0.170	0.074	0.105	0.369	0.369	0.071	-0.071	-0.326	-0.333	-0.046	-0.008	-0.189	-0.199	0.003	209%	758%	925%	184%	**8%**	**105%**	**117%**	**4%**
11	0.028	0.060	0.052	0.020	0.136	0.197	0.187	0.110	0.046	0.223	0.223	0.032	-0.018	-0.163	-0.171	-0.012	0.090	-0.026	-0.036	0.078	**64%**	272%	329%	**60%**	66%	**13%**	**19%**	71%
12	0.087	0.245	0.235	0.062	0.144	0.166	0.163	0.133	0.042	0.179	0.179	0.030	0.045	0.066	0.056	0.032	0.102	-0.013	-0.016	0.103	**52%**	27%	24%	**52%**	71%	**8%**	**10%**	77%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

FIGURE C-4. COMPARISON OF LAND USE CATEGORIES



APPENDIX D

REGIONAL INVENTORY SOURCES

Table D-1. Regional Source Inventory - Major Source Review

SOURCE DESCRIPTION	City	County	Application Number	UTM East (NAD83 Zone 17) (m)	UTM North (NAD83 Zone 17) (m)	Potential Facility PM_{10} Emissions (tpy)	Distance from Facility (km)	W/in 2 km of another facility?	Exclude Per 20D Rule?[1]
Georgia-Pacific Corp Chip-n-Saw Div. Warrenton	Warrenton	Warren	15586	346,956.898	3,697,766.743	97.8	1.94	No	**No**
TRW Warrenton Foundry	Warrenton	Warren	18565	352,854.858	3,699,389.457	93.7	5.08	No	**No**
HP Pelzer - Thomson	Thomson	Mcduffie	18028	357,092.726	3,702,061.876	32	10.09	No	Yes
TIN Inc. Dba Temple-Inland	Thomson	Mcduffie	17729	361,502.960	3,705,313.391	275.1	15.56	No	**No**
Kamin - Wrens Calcine Plant	Wrens	Jefferson	18155	366,484.067	3,680,602.183	218.74	24.08	No	Yes
Kamin - Wrens Main	Wrens	Jefferson	18156	369,198.533	3,682,434.504	250	25.08	No	Yes
Southern Natural Gas	Wrens	Jefferson	17482	370,269.848	3,675,170.468	5.88	30.56	Yes	Yes
Thiele Kaolin Co. Reedy Creek Div.	Reedy Creek	Glascock	16796	370,269.848	3,675,170.468	230	30.56	Yes	
GA Tenn Mining Co	Wrens	Jefferson	17101	369,878.583	3,672,829.332	185	31.99	No	Yes
Georgia Iron Works	Grovetown	Columbia	17240	389,501.796	3,702,675.945	5	41.38	Yes	Yes
Metokote Corporation Plt 14	Grovetown	Columbia	15212	389,385.811	3,704,080.838	0	41.49	Yes	
Augusta-Richmond County Deans Bridge Road Landfill	Blythe	Richmond	17962	393,567.697	3,690,991.866	28.21	45.37	No	Yes
Washington County Power LLC	Sandersville	Washington	14963	314,748.365	3,663,977.524	79.5	47.04	No	Yes
Imerys Clays, Inc., Deepstep Road Plant Sandersville, GA	Sandersville	Washington	18051	324,392.868	3,655,700.000	152.55	47.58	No	Yes
Georgia Bathware	Union Point	Greene	16494	307,434.462	3,720,941.109	1.5	47.75	No	Yes
Burgess Pigment Company, Sandersville Plant	Sandersville	Washington	16797	330,772.566	3,650,664.643	150	49.33	Yes	Yes
Kamin - Sandersville	Sandersville	Washington	18154	330,772.566	3,650,664.643	127.16	49.33	Yes	
Quebecor World Kri Inc.	Evans	Columbia	17627	396,034.141	3,711,686.647	0	49.79	No	Yes
Thiele Kaolin Co. - Sandersville Plant	Sandersville	Washington	16792	330,686.071	3,649,164.561	415	50.77	Yes	Yes
Imerys Clays, Inc. Sandersville Calcine Plant	Sandersville	Washington	16693	330,657.126	3,649,161.399	94	50.78	Yes	
Crawfod Kitchens, Inc.	Martinez	Columbia	15577	398,963.452	3,708,219.657	0	51.71	No	Yes
Southern Natural Gas Co., Hall Gate	Milledgeville	Baldwin	15813	308,427.714	3,659,645.025	19.56	54.61	No	*Beyond SID*
Novelis, Inc.	Greensboro	Green	17636	295,863.013	3,714,898.770	17	55.76	No	*Beyond SID*
Solvay Advanced Polymers - Augusta	Augusta	Richmond	18040	405,656.191	3,692,765.697	21.8	57.23	No	*Beyond SID*
The Proctor & Gamble Manufacturing Company	Augusta	Richmond	16744	406,562.477	3,694,781.101	102	58.03	No	*Beyond SID*
Thermal Ceramics	Augusta	Richmond	18161	407,138.205	3,700,364.246	200	58.69	No	*Beyond SID*
Occidental Chemical Corp	Augusta	Richmond	16711	407,597.583	3,695,443.124	30	59.05	Yes	*Beyond SID*
Prayon Inc.	Augusta	Richmond	15484	407,741.621	3,695,468.473	281	59.19	Yes	*Beyond SID*
Kendall Co Augusta Plant	Augusta	Richmond	17997	408,696.153	3,695,710.019	2.49	60.14	Yes	*Beyond SID*

1. Emissions from facilities within 2 km of another site, as determined by a review of the coordinates when sorted by distance from the Warren facility, were grouped together when completing the 20D screening.

Table D-2. Regional Source Inventory - Minor Source Review

Facility Name	Most Recent Permit Number	City	County	UTM East (NAD83 Zone 17) (m)	UTM North (NAD83 Zone 17) (m)	Potential Facility PM_{10} Emissions (tpy)	Distance from Facility (km)	W/in 2 km of another facility?	Exclude Per 20D Rule?[1,2]
Martin Marietta Aggregates - Warrenton Rock Quarry	1423-301-0005-S-01-3	Warrenton	Warren	347,946	3,695,382	98.1	1.44	No	**No**
Jebco, Inc.	2522-301-0010-S-01-0	Warrenton	Warren	343,662	3,697,525	0	4.97	No	Yes
Shaw Industries Group, Inc. - Plant 22/89	2281-189-0024-S-01-2	Thomson	McDuffie	356,807	3,701,793	33.2	9.70	No	Yes
Pelzer Acoustic Products LLC	2399-189-0020-S-01-1	Thomson	McDuffie	361,527	3,703,986	12	14.88	Yes	Yes
Reeves Construction Co.	2951-301-0007-S-01-0	Thomson	Warren	361,037	3,705,920	45.96	15.53		
Hanson Aggregates Southeast LLC - Sparta Quarry	1423-141-0007-S-02-1	Sparta	Hancock	337,582	3,685,184	*N/A*	15.90	No	Yes
Milliken & Company Kingsley Plan	2221-189-0021-S-01-0	Thomson	McDuffie	360,222	3,710,799	*N/A*	18.31	No	Yes
Martin Marietta Aggregates - Camak Rock Quarry	1423-301-0002-S-01-1	Thomson	Warren	347,924	3,716,391	*N/A*	19.72	No	Yes
Erdene Materials Corporation - Dearing Plant	1455-189-0025-B-01-0	Dearing	McDuffie	371,754	3,697,857	*N/A*	23.22	No	Yes
Mestek, Inc. (dba Air Balance, Inc.)	3433-163-0015-B-01-0	Wrens	Jefferson	369,721	3,673,964	*N/A*	31.05	No	Yes
Continental Commercial Products, LLC - Glit Divisior	2295-163-0031-S-04-0	Wrens	Jefferson	371,459	3,675,353	*N/A*	31.29	No	Yes
Georgia Vitrified Brick & Clay Ltc	3259-036-11751	Harlem	Columbia	380,034	3,697,625	*N/A*	31.49	No	Yes
Corridor Materials LLC - Sparta Quarry	1423-141-0002-B-01-0	Sparta	Hancock	317,731	3,684,524	*N/A*	33.14	Yes	Yes
Corridor Mining LLC - Culverton Quarry	1423-141-0002-B-02-0	Sparta	Hancock	315,971	3,683,610	*N/A*	35.11		
Reeves Cc Inc. - Appling Hmaf	2951-073-0024-S-02-0	Appling	Columbia	381,234	3,710,694	*N/A*	35.55	No	Yes
Hexcel Reinforcements Corp.	2221-317-0019-S-03-0	Washington	Wilkes	338,045	3,731,573	*N/A*	36.44	Yes	Yes
Anthony Forest Products Company	2439-317-0027-S-01-2	Washington	Wilkes	337,424	3,731,418	*N/A*	36.48		
Sample & Son Const and Demolition LF	4953-073-0030-S-01-0	Grovetown	Columbia	382,931	3,710,318	*N/A*	36.98		
Reeves Construction Co.	2951-073-0026-S-02-0	Grovetown	Columbia	384,120	3,709,694	*N/A*	37.87	Yes	Yes
Augusta Ready Mix, Inc.	3273-073-0031-R-01-0	Grovetown	Columbia	384,589	3,709,140	*N/A*	38.12		
International Paper Company - Washington Lumber Mil	2421-317-0023-V-01-1	Washington	Wilkes	338,979	3,733,610	*N/A*	38.15	No	Yes
Martin Marietta Aggregates	1423-036-11280	Grovetown	Columbia	385,159	3,709,414	*N/A*	38.75	Yes	Yes
Augusta Asphalt, LLC	2951-073-0028-R-01-0	Grovetown	Columbia	385,194	3,709,406	*N/A*	38.78		
Paul Creek Energy Center	4911-303-0052-E-01-0	Warthen	Washington	325,635	3,664,932	*N/A*	39.16	No	Yes
AFG Insulations, Inc.	3296-317-0030-E-01-0	Washington	Wilkes	337,317	3,735,091	*N/A*	40.02	No	Yes
Aggregates, USA - Dogwood Quarry	1423-073-0002-S-02-0	Grovetown	Columbia	388,045	3,704,794	*N/A*	40.31	No	Yes
Ready Mix USA, LLC - Sparta Rock Quarry	1423-141-0008-S-01-0	East of Sparta	Hancock	310,493	3,681,646	*N/A*	40.93	No	Yes
Pollard Lumber Co	2421-073-0023-S-01-0	Appling	Columbia	382,225	3,720,504	*N/A*	41.24	No	Yes
MetoKote Corp Plant 14	3479-073-0020-S-02-0	Grovetown	Columbia	389,363	3,703,792	*N/A*	41.42	No	Yes
Pittman Construction Company	2951-133-0019-S-02-0	Greensboro	Greene	310,334	3,714,071	*N/A*	42.00	No	Yes
National Security Agency	9711-245-0176-S-01-0	Augusta	Richmond	390,998	3,699,652	*N/A*	42.54	No	Yes
Vulcan Materials	1423-133-0018-S-01-0	Greensboro	Greene	306,807	3,712,676	*N/A*	44.71	No	Yes
Georgia Department of Transportation - Davisboro Asphalt Pla	2951-303-0049-R-01-0	Davisboro	Washington	349,678	3,651,097	*N/A*	45.60	No	Yes
Leco Corporation	3297-036-11078	Grovetown	Columbia	394,372	3,705,331	*N/A*	46.62	No	Yes
Cobb EMC - Sandersville	4911-303-0045-S-01-0	Sandersville	Washington	331,802	3,652,098	*N/A*	47.63	No	Yes
Lafarge Building Materials, Inc. - Martinez Concrete Plan	3273-073-0015-R-01-0	Martinez	Columbia	395,868	3,705,928	*N/A*	48.20	No	Yes
Cobb EMC - Robin Springs	4911-303-0038-S-01-0	Sandersville	Washington	324,916	3,654,516	*N/A*	48.34	Yes	Yes
Kentucky-Tennessee Clay Company (Plt 53)	3295-303-0021-S-02-1	Sandersville	Washington	325,130	3,654,389	*N/A*	48.35		
Unimin Corporation - Hephzibah	1455-245-0007-S-02-2	Hephzibah	Richmond	396,297	3,686,147	*N/A*	48.89	No	Yes
Thermo King Corporation	3585-163-0007-B-01-0	Louisville	Jefferson	370,429	3,652,598	*N/A*	49.21	No	Yes
US Battery Manufacturing Company	3691-073-0017-B-03-0	Evans	Columbia	395,518	3,712,345	*N/A*	49.50	No	Yes
Sandersville Ethanol, LLC	2869-303-0050-S-01-0	Sandersville	Washington	328,546	3,651,211	*N/A*	49.68	No	Yes
Kennametal Inc.	3545-073-0012-S-02-0	Evans	Columbia	396,787	3,710,426	*N/A*	50.15	No	Yes
Martin Marietta Aggregates	1423-121-5292-SM	Augusta	Richmond	398,434	3,709,133	*N/A*	51.41	No	Yes
Kentucky-Tennessee Clay Company (Plts 51 & 52)	3295-303-0005-S-01-0	Sandersville	Washington	329,474	3,648,637	*N/A*	51.70	No	Yes
Georgia Industrial Minerals, Inc.	3295-303-0046-B-01-1	Sandersville	Washington	316,547	3,655,890	*N/A*	51.85	No	Yes

1. As noted in EPD guidance "Recommended Minor Source (<100 tpy) Criteria Pollutant Inventory Techniques for PSD Modeling Projects", minor sources inherently have emissions below 100 tons per year. Thus, any facility located more than 5 km from the proposed facility will be excluded per the 20D Rule.

2. Emissions from facilities within 2 km of another site, as determined by a review of the coordinates when sorted by distance from the Warren facility, were grouped together when completing the 20D screening.

Table D-3. Modeling Data for Georgia-Pacific Chip-n-Saw Warrenton

Source ID	Model ID	UTM East (NAD83 Zone 17) (m)	UTM North (NAD83 Zone 17) (m)	Elevation (m)	Potential PM Emissions (tons/yr)	Installation/ Modification Date	NAAQS Inventory Emission (lb/hr)	Increment Inventory Emission (lb/hr)	Height (m)	Diam. (m)	Vel. (m/s)	Temp. (F)	Notes
BESP	GPBESP	346,957	3,697,767	168	62.06	1/1/1973	14.17		23	1.30	18	500	1
103S	GP103S	346,957	3,697,767	168	0.84	1/1/1989	0.19	0.12	9	2.13	21	100	1,2
104S	GP104S	346,957	3,697,767	168	6.41	1/1/1989	1.46	0.89	7	2.13	21	100	1,2
S201	GPS201	346,957	3,697,767	168	0.70	1/1/1973	0.16		7	0.53	21	260	1
S202	GPS202	346,957	3,697,767	168	0.70	1/1/1973	0.16		7	0.53	21	260	1
S203	GPS203	346,957	3,697,767	168	0.70	1/1/1976	0.16		7	0.53	21	260	1
302P	GP302P	346,957	3,697,767	168	1.07	1/1/1995	0.25	0.15	20	3.23	18	100	1,2
105A	GP105A	346,957	3,697,767	168	7.46	1/1/1978	1.70		1	1.00	0	Ambient	1
105B	GP105B	346,957	3,697,767	168	6.02	1/1/1978	1.37		1	1.00	0	Ambient	1
Facility Total:					**85.96**		**19.63**	**1.15**					3

1. As total of individual max actual emission rates do not sum to facility-wide total potential emissions presented in Title V application, individual source emission rates were scaled by ratio of (total potential / total max actual) to ensure total facility-wide potential emissions were modeled.
2. Increment emission rates reflect max actual emissions as presented in facility Title V application.

Table D-4. Modeling Data for Temple-Inland

Source ID	Model ID	UTM East (NAD83 Zone 17) (m)	UTM North (NAD83 Zone 17) (m)	Elevation (m)	Potential PM Emissions (tons/yr)	Installation/ Modification Date	NAAQS Inventory Emission (lb/hr)	Increment Inventory Emission (lb/hr)	Height (m)	Diam. (m)	Vel. (m/s)	Temp. (F)	Notes
SB01	TINSB01	362,550	3,703,879	170	25.94	1/1/1974	5.92		18	1.1	4.6	390	
SB02	TINSB02	362,550	3,703,879	170	1.47	1/1/1974	0.34		14	0.4	8.8	80	
SD06	TINSD06	362,550	3,703,879	170	47.14	1/1/1997	10.76	9.73	25	1.5	32.0	80	1
SD11	TINSD11	362,550	3,703,879	170	73.48	1/1/1997	16.78	15.17	12	2.5	12.2	150	1
SF01	TINSF01	362,550	3,703,879	170	8.81	1/1/1974	2.01		2	0.8	20.9	80	
SF02	TINSF02	362,550	3,703,879	170	4.88	1/1/1974	1.11		5	0.7	15.5	80	
SF03	TINSF03	362,550	3,703,879	170	12.50	1/1/1991	2.85	2.58	3	1.3	12.3	80	1
SF04	TINSF04	362,550	3,703,879	170	12.50	1/1/1991	2.85	2.58	3	1.3	12.3	80	1
SM01	TINSM01	362,550	3,703,879	170	10.36	1/1/1974	2.37		26	0.9	24.4	80	
SM02	TINSM02	362,550	3,703,879	170	10.21	1/1/1974	2.33		26	0.9	24.4	80	
SP01	TINSP01	362,550	3,703,879	170	3.33	1/1/1997	0.76	0.69	19	1.2	3.7	80	1
SP03	TINSP03	362,550	3,703,879	170	22.78	1/1/1997	5.20	4.70	16	1.8	11.3	80	1
SP56	TINSP56	362,550	3,703,879	170	12.83	1/1/1997	2.93	2.65	14	1.6	7.3	120	1
SP07	TINSP07	362,550	3,703,879	170	9.11	1/1/2001	2.08	1.88	5	0.9	16.9	80	1
SR01	TINSR01	362,550	3,703,879	170	1.84	1/1/1974	0.42		26	0.8	2.4	80	
SP4X	TINSP4X	362,550	3,703,879	170	17.92	1/1/1974	4.09		16	1.6	21.5	120	
Facility Total:					**275.10**		**62.81**	**39.98**					2

1. Increment emission rates reflect actual emissions as presented in 2005 NEI dataset.
2. As individual stack emission rates did not sum to facility-wide total presented in Title V application, individual source emission rates were scaled appropriately to ensure total facility-wide emissions were included.

Table D-5. Modeling Data for TRW Warrenton Foundry

Source ID	Model ID	UTM East (NAD83 Zone 17) (m)	UTM North (NAD83 Zone 17) (m)	Elevation (m)	Potential PM Emissions (tons/yr)	Installation/ Modification Date	NAAQS Inventory Emission (lb/hr)	Increment Inventory Emission (lb/hr)	Height (m)	Diam. (m)	Vel. (m/s)	Temp. (F)	Notes
910	TRW910	352,855	3,699,389	148	10.21	1/1/1995	2.33	2.33	27	1.5	15.5	200	1
920	TRW920	352,855	3,699,389	148	4.69	1/1/1995	1.07	1.07	18	2.1	16.5	150	1
930	TRW930	352,855	3,699,389	148	46.19	1/1/1995	10.55	10.55	18	2.0	24.0	150	1
980	TRW980	352,855	3,699,389	148	0.19	1/1/1995	0.04	0.04	9	0.2	15.2	Ambient	1
981	TRW981	352,855	3,699,389	148	0.19	1/1/1995	0.04	0.04	9	0.2	15.2	Ambient	1
982	TRW982	352,855	3,699,389	148	0.19	1/1/1995	0.04	0.04	9	0.2	15.2	Ambient	1
983	TRW983	352,855	3,699,389	148	0.19	1/1/1995	0.04	0.04	9	0.2	15.2	Ambient	1
941A	TRW941A	352,855	3,699,389	148	0.30	1/1/1995	0.07	0.07	20	0.5	15.2	Ambient	1
921A	TRW921A	352,855	3,699,389	148	0.30	1/1/1995	0.07	0.07	20	0.5	15.2	Ambient	1
940A	TRW940A	352,855	3,699,389	148	3.00E-01	1/1/1995	0.07	0.07	66	1.5	50.0	Ambient	
Facility Total:					**94.43**		**14.33**	**14.33**					2

1. NAAQS and Increment emission rates both reflect potential emissions as presented in Title V Application.
2. To provide a conservative estimate of facility impacts to regional modeling, no adjustment applied to individual stack emissions, although modeled total exceeds listed facility-wide total.

Table D-6. Modeling Data for Martin Marietta Aggregates - Warrenton Rock Quarry

Source	Schedule	Source ID	Model ID	UTM East (NAD83 Zone 17) (m)	UTM North (NAD83 Zone 17) (m)	Elevation (m)	Height (ft)	Horizontal Dimension (ft)	Veritcal Dimension (ft)	Installation Date per most recent permit	2006 PM10 Emissions (lb/hr)	2008 PM10 Emissions (lb/hr)	Difference b/t 1996 and 2008 PM Emissions (lb/hr)	NAAQS Inventory Emission (lb/hr)	Increment Inventory Emission (lb/hr)	Notes
Current Primary Plant Emission Sources																
54 × 26 Grizzly Feeder	20 hr day, 4AM-11PM	FD1	MMQ001	347,291	3,694,330	157.6	25	2.079	5.814	9/26/2006	0.0896	0.0243	-0.065	0.024	-0.065	
C-145B Jaw Crusher	20 hr day, 4AM-11PM	CR1	MMQ002	347,291	3,694,330	157.6	20	0.789	4.651	11/9/1999	0.9264	0.5276	-0.399	0.528	-0.399	
Conveyor #P1 54" × 75'	20 hr day, 4AM-11PM	CCP1	MMQ003	347,291	3,694,330	157.6	5	1.047	2.326	11/9/1999		0.0672	0.067	0.067	0.067	
Conveyor #P2 42" × 236'	20 hr day, 4AM-11PM	CCP2	MMQ004	347,291	3,694,330	157.6	5	0.814	2.326	11/9/1999		0.0672	0.067	0.067	0.067	
6 × 16 2d Screen #1	20 hr day, 4AM-11PM	SC1	MMQ005	347,369	3,694,360	157.1	30	0.698	6.977	11/9/1999		1.176	1.176	1.176	1.176	
5 1/2 STD Crusher	20 hr day, 4AM-11PM	CR2	MMQ006	347,369	3,694,360	157.1	15	1.133	6.977	11/9/1999	0.8352	0.5103	-0.325	0.510	-0.325	
Conveyor #P3 36" × 100'	20 hr day, 4AM-11PM	CCP3	MMQ007	347,369	3,694,360	157.1	5	0.698	2.326	11/9/1999		0.0672	0.067	0.067	0.067	
Conveyor #P4 36" × 404'	20 hr day, 4AM-11PM	CCP4	MMQ008	347,426	3,694,390	155.8	5	0.698	2.326	11/9/1999		0.0672	0.067	0.067	0.067	
Conveyor #P5 36" × 404'	20 hr day, 4AM-11PM	CCP5	MMQ009	347,493	3,694,460	155.2	5	0.698	2.326	11/9/1999		0.0672	0.067	0.067	0.067	
Conveyor #P6 36" × 404'	20 hr day, 4AM-11PM	CCP6	MMQ010	347,533	3,694,580	154.1	5	0.698	2.326	11/9/1999		0.0672	0.067	0.067	0.067	
Conveyor #P7 36" × 319'	20 hr day, 4AM-11PM	CCP7	MMQ011	347,576	3,694,700	152.6	5	0.698	2.326	11/9/1999		0.0672	0.067	0.067	0.067	
Conveyor #P7A 36" × 330'	20 hr day, 4AM-11PM	CCP7A	MMQ012	347,576	3,694,700	152.6	5	0.698	2.326	3/31/2006		0.0672	0.067	0.067	0.067	
Primary Plant Sources, 1996, Since Removed																
Conveyor #1 30" × 100'	20 hr day, 4AM-11PM	CC1	MMQ013	347,304	3,694,307	156.9	5	1.047	2.326	1970s	0.0896		-0.090	0.000	-0.090	1
Conveyor #2 36" × 100'	20 hr day, 4AM-11PM	CC2	MMQ014	347,331	3,694,287	155.9	5	0.581	2.326	1970s	0.4872		-0.487	0.000	-0.487	1
Rip Rap Conveyor 60" × 50	20 hr day, 4AM-11PM	CC2A	MMQ015	347,328	3,694,284	155.9	5	0.581	2.326	1970s	0.5404		-0.540	0.000	-0.540	1
Rip Rap Stacker 36" × 75	20 hr day, 4AM-11PM	CC2B	MMQ016	347,330	3,694,284	155.8	5	0.698	2.326	1970s	0.0532		-0.053	0.000	-0.053	1
Conveyor #3 36" × 30'	20 hr day, 4AM-11PM	CC3	MMQ017	347,328	3,694,284	155.9	5	0.698	2.326	1970s	0.5768		-0.577	0.000	-0.577	1
Conveyor #4 36" × 30'	20 hr day, 4AM-11PM	CC4	MMQ018	347,335	3,694,297	156.1	5	1.134	2.326	1970s	0.5768		-0.577	0.000	-0.577	1
Conveyor #5 36" × 30'	20 hr day, 4AM-11PM	CC5	MMQ019	347,359	3,694,336	156.8	5	0.698	2.326	1970s	0.5768		-0.577	0.000	-0.577	1
Conveyor #6 30" × 150'	20 hr day, 4AM-11PM	CC6	MMQ020	347,359	3,694,336	156.8	5	0.581	2.326	1970s	0.6496		-0.650	0.000	-0.650	1
Current Secondary Plant Emission Sources																
36: Conveyor #8	20 hr day, 4AM-11PM	CC8	MMQ021	347,519	3,694,940	156.7	5	0.698	2.326	9/26/2006		0.048	0.048	0.048	0.048	
8×24 3d Screen #2	20 hr day, 4AM-12AM	SC2	MMQ022	347,436	3,695,060	159.1	30	0.581	6.977	9/26/2006		0.84	0.840	0.840	0.840	
36: Conveyor #9	20 hr day, 4AM-12AM	CC9	MMQ023	347,436	3,695,060	159.1	5	0.581	2.326	9/26/2006		0.0253	0.025	0.025	0.025	
24" Conveyor #12	20 hr day, 4AM-12AM	CC12	MMQ024	347,436	3,695,060	159.1	5	0.581	2.326	9/26/2006		0.0126	0.013	0.013	0.013	
75 Ton Surge Bin #1	20 hr day, 4AM-12AM	BN1	MMQ025	347,382	3,695,030	160.0	25	0.698	5.814	9/26/2006		0.0126	0.013	0.013	0.013	
75 Ton Surge Bin #2	20 hr day, 4AM-12AM	BN2	MMQ026	347,390	3,695,040	160.3	25	0.581	5.814	9/26/2006		0.0126	0.013	0.013	0.013	
48" × 19' Belt Feeder #1	20 hr day, 4AM-12AM	BF1	MMQ027	347,382	3,695,030	160.0	15	0.581	6.977	9/26/2006		0.0126	0.013	0.013	0.013	
48" × 19' Belt Feeder #2	20 hr day, 4AM-12AM	BF2	MMQ028	347,390	3,695,040	160.3	15	2.279	6.977	9/26/2006		0.0126	0.013	0.013	0.013	
1560 Omnicone Crusher	20 hr day, 4AM-12AM	CR3	MMQ029	347,382	3,695,030	160.0	15	1.133	6.977	9/26/2006		0.1553	0.155	0.155	0.155	
Secondary Plant Source	20 hr day, 4AM-12AM	CR4	MMQ030	347,390	3,695,040	160.3	15	1.133	6.977	9/26/2006		0.1553	0.155	0.155	0.155	
Secondary Plant Source	20 hr day, 4AM-12AM	CC10	MMQ031	347,390	3,695,040	160.3	5	0.698	2.326	9/26/2006		0.0253	0.025	0.025	0.025	
Secondary Plant Source	20 hr day, 4AM-12AM	CC11	MMQ032	347,390	3,695,040	160.3	5	0.698	2.326	9/26/2006		0.0253	0.025	0.025	0.025	
Secondary Plant Source	20 hr day, 4AM-12AM	SC3	MMQ033	347,386	3,695,130	162.0	30	2.279	6.977	9/26/2006		0.4424	0.442	0.442	0.442	
Secondary Plant Source	20 hr day, 4AM-12AM	CC15	MMQ034	347,386	3,695,130	162.0	5	0.581	2.326	9/26/2006		0.0204	0.020	0.020	0.020	
Secondary Plant Source	20 hr day, 4AM-12AM	SC4	MMQ035	347,386	3,695,130	162.0	30	2.279	6.977	9/26/2006		0.3565	0.357	0.357	0.357	
Secondary Plant Source	20 hr day, 4AM-12AM	BNA	MMQ036	347,386	3,695,130	162.0	15	0.698	6.977	9/26/2006		0.0001	0.000	0.000	0.000	
Secondary Plant Source	20 hr day, 4AM-12AM	BNB	MMQ037	347,386	3,695,130	162.0	15	0.698	6.977	9/26/2006		0.0001	0.000	0.000	0.000	
Secondary Plant Source	20 hr day, 4AM-12AM	BNC	MMQ038	347,386	3,695,130	162.0	15	0.698	6.977	9/26/2006		0.0051	0.005	0.005	0.005	
Secondary Plant Source	20 hr day, 4AM-12AM	BND	MMQ039	347,386	3,695,130	162.0	15	0.698	6.977	9/26/2006		0.0051	0.005	0.005	0.005	
Secondary Plant Source	20 hr day, 4AM-12AM	BNE	MMQ040	347,386	3,695,130	162.0	15	0.698	6.977	9/26/2006		0.0052	0.005	0.005	0.005	
Secondary Plant Source	20 hr day, 4AM-12AM	CC17	MMQ041	347,386	3,695,130	162.0	5	0.581	2.326	9/26/2006		0.0047	0.005	0.005	0.005	
Secondary Plant Source	20 hr day, 4AM-12AM	FD3	MMQ042	347,386	3,695,130	162.0	15	0.698	6.977	9/26/2006		0.0052	0.005	0.005	0.005	
36" Conveyor #19	20 hr day, 4AM-12AM	CC19	MMQ043	347,386	3,695,130	162.0	5	0.698	2.326	9/26/2006		0.0156	0.016	0.016	0.016	
36" Conveyor #13	20 hr day, 4AM-12AM	CC13	MMQ044	347,436	3,695,060	159.1	5	0.698	2.326	9/26/2006		0.0269	0.027	0.027	0.027	
36" Conveyor #14b	20 hr day, 4AM-12AM	CC14b	MMQ045	347,510	3,695,110	162.2	5	0.698	2.326	3/11/2008		0.0269	0.027	0.027	0.027	2
36" Telescoping Conveyor #14	20 hr day, 4AM-12AM	CC14	MMQ046	347,510	3,695,110	162.2	5	0.698	2.326	9/26/2006		0.0269	0.027	0.027	0.027	
24" Conveyor #18	20 hr day, 4AM-12AM	CC18	MMQ047	347,470	3,695,080	160.3	5	0.465	2.326	9/26/2006		0.0005	0.001	0.001	0.001	
Conveyor #20 24" × 50'	20 hr day, 4AM-12AM	CC20	MMQ048	347,407	3,695,093	160.8	5	0.465	2.326	9/26/2006		0	0.000	0.000	0.000	3
Conveyor #21 30" × 75'	20 hr day, 4AM-12AM	CC21	MMQ049	347,407	3,695,093	160.8	5	0.581	2.326	9/26/2006		0	0.000	0.000	0.000	3
30" Conveyor #16	20 hr day, 4AM-12AM	CC16	MMQ050	347,374	3,695,150	162.0	5	0.581	2.326	9/26/2006		0.0054	0.005	0.005	0.005	
	20 hr day, 4AM-12AM	CC26	MMQ051	347,343	3,695,220	160.9	5	0.581	2.326	9/26/2006		0.0056	0.006	0.006	0.006	
	20 hr day, 4AM-12AM	CC27	MMQ052	347,407	3,695,230	161.7	5	0.581	2.326	9/26/2006		0.0056	0.006	0.006	0.006	
Secondary Plant Sources, 1996, Since Removed																
6 x 16 3 Deck Screen #1	20 hr day, 4AM-12AM	SC1	MMQ053	347,338	3,694,296	156.0	**30**	2.279	6.977	1970s	6.9600		-6.960	0.000	-6.960	4
4' STD Crusher	20 hr day, 4AM-12AM	CR3	MMQ054	347,356	3,694,348	157.2	15	1.133	6.977	1970s	0.5568		-0.557	0.000	-0.557	5
Conveyor #7 30" × 30'	20 hr day, 4AM-12AM	CC7	MMQ055	347,372	3,694,376	157.2	5	0.581	2.326	1970s	0.1988		-0.199	0.000	-0.199	6
Conveyor #8 30" × 60'	20 hr day, 4AM-12AM	CC8	MMQ056	347,384	3,694,391	157.0	5	0.581	2.326	1970s	0.1988		-0.199	0.000	-0.199	6
Conveyor #9 30" × 100'	20 hr day, 4AM-12AM	CC9	MMQ057	347,405	3,694,411	156.6	5	0.581	2.326	1970s	0.1988		-0.199	0.000	-0.199	6
Conveyor #10 36" × 30'	20 hr day, 4AM-12AM	CC10	MMQ058	347,361	3,694,382	157.5	5	0.698	2.326	1970s	0.3248		-0.325	0.000	-0.325	6
Conveyor #11 30" × 60'	20 hr day, 4AM-12AM	CC11	MMQ059	347,366	3,694,351	157.0	5	0.581	2.326	1970s	0.1260		-0.126	0.000	-0.126	6
Conveyor #12 30" × 120'	20 hr day, 4AM-12AM	CC12	MMQ060	347,361	3,694,382	157.5	5	0.581	2.326	1970s	0.3164		-0.316	0.000	-0.316	6
6 x 16 3 Deck Screen #2	20 hr day, 4AM-12AM	SC2	MMQ061	347,372	3,694,377	157.2	**30**	2.279	6.977	1970s	5.4000		-5.400	0.000	-5.400	4
1560 Omnicone Crusher	20 hr day, 4AM-12AM	CR4	MMQ062	347,332	3,694,288	155.9	15	1.133	6.977	1970s	0.3096		-0.310	0.000	-0.310	5
Conveyor #16 36" × 30'	20 hr day, 4AM-12AM	CC16	MMQ063	347,348	3,694,353	157.5	5	0.698	2.326	1970s	0.1806		-0.181	0.000	-0.181	6
Conveyor #17 30" × 80'	20 hr day, 4AM-12AM	CC17	MMQ064	347,362	3,694,368	157.4	5	0.581	2.326	1970s	0.1806		-0.181	0.000	-0.181	6
Conveyor #18 30" × 80'	20 hr day, 4AM-12AM	CC18	MMQ065	347,359	3,694,348	157.1	5	0.581	2.326	1970s	0.2520		-0.252	0.000	-0.252	6
Conveyor #20 24" × 50'	20 hr day, 4AM-12AM	CC20	MMQ066	347,359	3,694,336	156.8	5	0.465	2.326	1970s	0.0728		-0.073	0.000	-0.073	6
Conveyor #21 30" × 75'	20 hr day, 4AM-12AM	CC21	MMQ067	347,391	3,694,363	156.5	5	0.581	2.326	1970s	0.3780		-0.378	0.000	-0.378	6

Table D-6. Modeling Data for Martin Marietta Aggregates - Warrenton Rock Quarry

Source	Schedule	Source ID	Model ID	UTM East (NAD83 Zone 17) (m)	UTM North (NAD83 Zone 17) (m)	Elevation (m)	Height (ft)	Horizontal Dimension (ft)	Veritcal Dimension (ft)	Installation Date per most recent permit	2006 PM10 Emissions (lb/hr)	2008 PM10 Emissions (lb/hr)	Difference b/t 1996 and 2008 PM Emissions (lb/hr)	NAAQS Inventory Emission (lb/hr)	Increment Inventory Emission (lb/hr)	Notes
Quarry Roads																
Paved Road	15 hr day, 4AM-7PM	RD2006	MMQ073	347,677	3,695,370	162.2	0	14.7	5.81		0.0281	0.087453624	0.059	0.087	0.059	7
Paved Road	15 hr day, 4AM-7PM	RD2007	MMQ074	347,668	3,695,340	161.3	0	14.7	5.81		0.0281	0.087453624	0.059	0.087	0.059	7
Paved Road	15 hr day, 4AM-7PM	RD2008	MMQ075	347,659	3,695,310	160.6	0	14.7	5.81		0.0141	0.043726812	0.030	0.044	0.030	7
Paved Road	15 hr day, 4AM-7PM	RD2009	MMQ076	347,645	3,695,280	159.9	0	14.7	5.81		0.0141	0.043726812	0.030	0.044	0.030	7
Unpaved Road	15 hr day, 4AM-7PM	RD2010	MMQ077	347,622	3,695,260	160.1	0	14.7	5.81		0.1467	0.456273019	0.310	0.456	0.310	7
Unpaved Road	15 hr day, 4AM-7PM	RD2011	MMQ078	347,594	3,695,250	161.0	0	14.7	5.81		0.1467	0.456273019	0.310	0.456	0.310	7
Paved Road	15 hr day, 4AM-7PM	RD2012	MMQ079	347,681	3,695,310	160.7	0	14.7	5.81		0.0141	0.043726812	0.030	0.044	0.030	7
Paved Road	15 hr day, 4AM-7PM	RD2013	MMQ080	347,683	3,695,270	159.0	0	14.7	5.81		0.0141	0.043726812	0.030	0.044	0.030	7
Paved Road	15 hr day, 4AM-7PM	RD2014	MMQ081	347,678	3,695,240	158.2	0	14.7	5.81		0.0141	0.043726812	0.030	0.044	0.030	7
Paved Road	15 hr day, 4AM-7PM	RD2015	MMQ082	347,672	3,695,210	158.6	0	14.7	5.81		0.0141	0.043726812	0.030	0.044	0.030	7
Paved Road	15 hr day, 4AM-7PM	RD2016	MMQ083	347,666	3,695,180	159.0	0	14.7	5.81		0.0141	0.043726812	0.030	0.044	0.030	7
Paved Road	15 hr day, 4AM-7PM	RD2017	MMQ084	347,660	3,695,150	159.4	0	14.7	5.81		0.0141	0.043726812	0.030	0.044	0.030	7
Unpaved Road	15 hr day, 4AM-7PM	RD2018	MMQ085	347,654	3,695,120	159.8	0	14.7	5.81		0.0733	0.228136509	0.155	0.228	0.155	7
Unpaved Road	15 hr day, 4AM-7PM	RD2019	MMQ086	347,640	3,695,090	160.3	0	14.7	5.81		0.0733	0.228136509	0.155	0.228	0.155	7
Unpaved Road	15 hr day, 4AM-7PM	RD2020	MMQ087	347,613	3,695,070	161.1	0	14.7	5.81		0.0733	0.228136509	0.155	0.228	0.155	7
Unpaved Road	15 hr day, 4AM-7PM	RD2021	MMQ088	347,539	3,695,240	162.3	0	14.7	5.81		0.0730	0.226995827	0.154	0.227	0.154	7
Unpaved Road	15 hr day, 4AM-7PM	RD2022	MMQ089	347,527	3,695,210	163.4	0	14.7	5.81		0.0730	0.226995827	0.154	0.227	0.154	7
Unpaved Road	15 hr day, 4AM-7PM	RD2023	MMQ090	347,554	3,695,190	163.0	0	14.7	5.81		0.0730	0.226995827	0.154	0.227	0.154	7
Unpaved Road	15 hr day, 4AM-7PM	RD2024	MMQ091	347,580	3,695,170	162.0	0	14.7	5.81		0.0730	0.226995827	0.154	0.227	0.154	7
Unpaved Road	15 hr day, 4AM-7PM	RD2025	MMQ092	347,591	3,695,140	161.4	0	14.7	5.81		0.0730	0.226995827	0.154	0.227	0.154	7
Unpaved Road	15 hr day, 4AM-7PM	RD2026	MMQ093	347,595	3,695,110	161.3	0	14.7	5.81		0.0730	0.226995827	0.154	0.227	0.154	7
Unpaved Road	15 hr day, 4AM-7PM	RD2027	MMQ094	347,598	3,695,080	161.4	0	14.7	5.81		0.0730	0.226995827	0.154	0.227	0.154	7
Unpaved Road	15 hr day, 4AM-7PM	RD2028	MMQ095	347,563	3,695,250	161.6	0	14.7	5.81		0.1467	0.456273019	0.310	0.456	0.310	7
Unpaved Road	15 hr day, 4AM-7PM	RD2029	MMQ096	347,533	3,695,260	161.9	0	14.7	5.81		0.0737	0.229277192	0.156	0.229	0.156	7
Unpaved Road	15 hr day, 4AM-7PM	RD2030	MMQ097	347,505	3,695,270	162.0	0	14.7	5.81		0.0737	0.229277192	0.156	0.229	0.156	7
Unpaved Road	15 hr day, 4AM-7PM	RD2031	MMQ098	347,478	3,695,280	161.8	0	14.7	5.81		0.0737	0.229277192	0.156	0.229	0.156	7
Unpaved Road	15 hr day, 4AM-7PM	RD2032	MMQ099	347,450	3,695,300	161.3	0	14.7	5.81		0.0737	0.229277192	0.156	0.229	0.156	7
Unpaved Road	15 hr day, 4AM-7PM	RD2033	MMQ100	347,422	3,695,310	160.3	0	14.7	5.81		0.0737	0.229277192	0.156	0.229	0.156	7
Unpaved Road	15 hr day, 4AM-7PM	RD2034	MMQ101	347,391	3,695,310	158.4	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2035	MMQ102	347,361	3,695,310	157.9	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2036	MMQ103	347,330	3,695,310	157.8	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2037	MMQ104	347,300	3,695,310	157.6	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2038	MMQ105	347,269	3,695,310	158.1	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2039	MMQ106	347,238	3,695,310	158.7	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2040	MMQ107	347,209	3,695,310	159.2	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2041	MMQ108	347,185	3,695,280	160.0	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2042	MMQ109	347,171	3,695,260	160.5	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2043	MMQ110	347,166	3,695,230	160.8	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2044	MMQ111	347,171	3,695,190	160.3	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2045	MMQ112	347,176	3,695,160	159.9	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2046	MMQ113	347,181	3,695,130	159.4	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2047	MMQ114	347,186	3,695,100	158.6	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2048	MMQ115	347,193	3,695,070	157.9	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2049	MMQ116	347,208	3,695,050	158.0	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2050	MMQ117	347,233	3,695,030	158.2	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2051	MMQ118	347,262	3,695,020	158.6	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2052	MMQ119	347,292	3,695,010	158.3	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2053	MMQ120	347,323	3,695,010	158.8	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2054	MMQ121	347,353	3,695,010	159.3	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2055	MMQ122	347,385	3,695,000	159.1	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2056	MMQ123	347,411	3,695,020	159.1	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2057	MMQ124	347,437	3,695,040	158.2	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2058	MMQ125	347,464	3,695,050	158.5	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2059	MMQ126	347,495	3,695,050	160.2	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2060	MMQ127	347,525	3,695,040	161.2	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2061	MMQ128	347,556	3,695,050	161.8	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD2062	MMQ129	347,584	3,695,060	161.7	0	14.7	5.81		0.0409	0.127117663	0.086	0.127	0.086	7
Unpaved Road	15 hr day, 4AM-7PM	RD3001	MMQ130	347,271	3,694,320	157.2	0	14.7	5.81		0.1157	0.35989044	0.244	0.360	0.244	7
Unpaved Road	15 hr day, 4AM-7PM	RD3002	MMQ131	347,241	3,694,310	156.7	0	14.7	5.81		0.1157	0.35989044	0.244	0.360	0.244	7
Unpaved Road	15 hr day, 4AM-7PM	RD3003	MMQ132	347,211	3,694,310	156.3	0	14.7	5.81		0.1157	0.35989044	0.244	0.360	0.244	7
Unpaved Road	15 hr day, 4AM-7PM	RD3004	MMQ133	347,180	3,694,310	155.9	0	14.7	5.81		0.1157	0.35989044	0.244	0.360	0.244	7
Unpaved Road	15 hr day, 4AM-7PM	RD3005	MMQ134	347,150	3,694,300	155.3	0	14.7	5.81		0.1157	0.35989044	0.244	0.360	0.244	7
Unpaved Road	15 hr day, 4AM-7PM	RD3006	MMQ135	347,119	3,694,300	155.2	0	14.7	5.81		0.1157	0.35989044	0.244	0.360	0.244	7
Unpaved Road	15 hr day, 4AM-7PM	RD3007	MMQ136	347,090	3,694,310	157.0	0	14.7	5.81		0.1157	0.35989044	0.244	0.360	0.244	7
Unpaved Road	15 hr day, 4AM-7PM	RD3008	MMQ137	347,060	3,694,320	158.2	0	14.7	5.81		0.1157	0.35989044	0.244	0.360	0.244	7
Unpaved Road	15 hr day, 4AM-7PM	RD3009	MMQ138	347,031	3,694,330	158.2	0	14.7	5.81		0.1157	0.35989044	0.244	0.360	0.244	7
Unpaved Road	15 hr day, 4AM-7PM	RD3010	MMQ139	347,007	3,694,360	157.1	0	14.7	5.81		0.1157	0.35989044	0.244	0.360	0.244	7
Unpaved Road	15 hr day, 4AM-7PM	RD3011	MMQ140	346,995	3,694,380	156.3	0	14.7	5.81		0.1157	0.35989044	0.244	0.360	0.244	7
Unpaved Road	15 hr day, 4AM-7PM	RD3012	MMQ141	346,981	3,694,410	155.2	0	14.7	5.81		0.1157	0.35989044	0.244	0.360	0.244	7
Unpaved Road	15 hr day, 4AM-7PM	RD3013	MMQ142	346,951	3,694,420	154.2	0	14.7	5.81		0.1157	0.35989044	0.244	0.360	0.244	7
Unpaved Road	15 hr day, 4AM-7PM	RD3014	MMQ143	346,922	3,694,430	152.9	0	14.7	5.81		0.1157	0.35989044	0.244	0.360	0.244	7
Unpaved Road	15 hr day, 4AM-7PM	RD3015	MMQ144	346,893	3,694,440	150.6	0	14.7	5.81		0.1157	0.35989044	0.244	0.360	0.244	7

1. Coordinates estimated from 1999 ISC modeling input file, provided by Mr. Pete Courtney (EDP) on July 22, 2009.
2. Dimensions assumed identical to CC14.
3. Coordinates reflect average of placement among other Secondary Plant sources.
4. Dimensions assumed identical to similar secondary plant screen
5. Dimensions assumed identical to similar secondary plant crusher
6. Dimensions assumed identical to secondary plant conveyor of equal width
7. Per guidance from EPD, pre-baseline emissions from roadways scaled using previous plant capacity of 450 tons/hr to current primary plant capacity of 1400 tons/hr.
8. Elevations estimated using USGS National Elevation Dataset.

APPENDIX E

ELECTRONIC MODEL FILES

The CD included with this application contains all of the input and output data files used to generate the results from the air quality analyses presented in Sections 3, 5 and 6. The following section provides a description of the contents of each folder included in the attached CD.

01 MET

- For the meteorological data files, the nomenclature is as follows:
  ATHATHYY(YY).xxx where:
  ATHATH = meteorological station (Athens)
  YY = met year (1989-1993)
  YYYY = combined met period (1989-1993) used for the NAAQS analyses
  xxx = profile or surface file (.pfl = profile, .sfc = output)

02 DOWNWASH

- Contains the input (.inp), output (.out) and summary (.sum) files from the building downwash analysis. This analysis includes all modeled sources and buildings at Warren Facility.

03 LOAD ANALYSIS

- Contains the input (.dat) and output (.out) files from the load analysis

For all of the load analysis files, the nomenclature is as follows:
ScenarioN.xxx where:
N = scenario number
xxx = input or output file (.dat = input, .out=output)

04 SIGNIFICANCE

- CO – contains the input (.ami), output (.lst) and plot (.plt) files from the 1-hr and 8-hr significance analysis
- NO2 – contains the input (.ami), output (.lst) and plot (.plt) files from the Annual significance analysis
- PM10 – contains the input (.ami), output (.lst) and plot (.plt) files from the 24-hr and Annual significance analysis
- SO2 – contains the input (.ami), output (.lst) and plot (.plt) files from the 3-hr, 24-hr, and Annual significance analysis

For all of the Class II significance files, the nomenclature is as follows:

ABCYY.xxx where:

A = pollutant ID (N = NO_2, P= PM_{10}, S = SO_2, C = CO)

B = type of analysis (S = significance)

C= averaging period examined (1 = 1-hr, 3 = 3-hr, 8 = 8-hr, 24 = 24-hr, A = Annual)

YY = modeled year (1989-1993)

xxx = input, output or plot file (.ami = input, .lst = output, .plt=plot)

05 CLASS I PM_{10} SIGNIFICANCE

- ▲ Contains the input (.ami) and output (.lst) files from the 24-hr Class I significance analysis for year 1989

06 INCREMENT

- ▲ Contains the significant event input (inp) files that include all receptors and times in which the predicted concentration from the facility exceeds the 24-hour PM_{10} Significance standard (5 µg/m^3)
- ▲ Contains the event input (.inp) and output (.out) files for the 24-hr Class II increment analyses for PM_{10}. These files include the facility emission sources and the regional inventory.
- ▲ Contains the Comma Delimited and Excel files used to process event output files for the 24-hr Class II increment analyses for PM_{10}
- ▲ Contains the input (.ami), output (.lst) and plot (.plt) files from the Annual Class II increment analysis for PM_{10}

07 NAAQS

- ▲ Contains the significant event input (inp) files that include all receptors and times in which the predicted concentration from the facility exceeds the 24-hour PM_{10} Significance standard (5 µg/m^3)
- ▲ Contains the event input (.inp) and output (.out) files for the 24-hr Class II NAAQS analyses for PM_{10}. These files include the facility emission sources and the regional inventory.
- ▲ Contains the Comma Delimited and Excel files used to process event output files for the 24-hr Class II NAAQS analyses for PM_{10}
- ▲ Contains the input (.ami), output (.lst) and plot (.plt) files from the Annual Class II NAAQS analysis for PM_{10}

08 TAP ASSESEMENT

- ▲ inputs_outputs.txt – contains the summary of input and output parameters used for TAP screening analyses

Oglethorpe Power Corporation
Warrenton, Georgia
Electronic Modeling Files
081101.0100
October 2009

Trinity Consultants

Tel: (678) 441-9977
Fax: (678) 441-9978
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APPENDIX F

GEORGIA TAP ANALYSIS DOCUMENTATION

Table F-1. Biomass Boiler TAP Screening Analysis

Stack Description	Stack Height (m)	Stack Temperature[1] (K)	Exit Velocity[1] (m/s)	Stack Diameter (m)	Modeled Emissions[2] (g/s)	Max. Impact (μg/m³)
Biomass Boiler, B001	67.06	435.93	11.27	3.66	1.0	2.02

1. For conservatism, the parameters from the 40% load off-design fuel scenario were utilized as these yielded the highest unit impacts in the load analysis.
2. For simplicity, a unit emission rate was modeled from the boiler stack.

Pollutant	HAP? (Yes/No)	Boiler Emissions (g/s)	Boiler 1-hr Impact (μg/m³)	Maximum 15-minute Average Impact (μg/m³)	15-minute Average AAC (μg/m³)	Maximum 15-minute Average Impact (% of AAC)	Maximum 24-hour Average Impact (μg/m³)	24-hour Average AAC (μg/m³)	Maximum 24-hour Average Impact (% of AAC)	Maximum Annual Impact (μg/m³)	Annual Average AAC (μg/m³)	Maximum Annual Impact (% of AAC)	Requires Refined Analysis?
1,1,1-Trichloroethane	Yes	1.18E-03	2.38E-03	3.14E-03	2.46E+05	<0.01%	9.52E-04	Not Needed	-	1.90E-04	1,000	<0.01%	No
1,2-Dibromoethene	Yes	1.42E-03	2.87E-03	3.79E-03	None	-	1.15E-03	None	-	2.30E-04	None	-	No
2-Butanone (MEK)	No	9.50E-04	1.92E-03	2.53E-03	8.85E+04	<0.01%	7.66E-04	Not Needed	-	1.53E-04	5,000	<0.01%	No
2-Chloronaphthalene	Yes	4.23E-07	8.53E-07	1.13E-06	None	-	3.41E-07	None	-	6.82E-08	None	-	No
2-Chlorophenol	No	4.23E-06	8.53E-06	1.13E-05	None	-	3.41E-06	1.54E+01	<0.01%	6.82E-07	None	-	No
Acenaphthene	Yes	2.07E-05	4.18E-05	5.51E-05	None	-	1.67E-05	None	-	3.34E-06	None	-	No
Acenaphthylene	Yes	4.60E-05	9.27E-05	1.22E-04	None	-	3.71E-05	None	-	7.41E-06	None	-	No
Acetaldehyde	Yes	7.66E-03	1.54E-02	2.04E-02	4.50E+03	<0.01%	6.17E-03	Not Needed	-	1.23E-03	4.55E+00	0.03%	No
Acetone	No	3.79E-02	7.64E-02	1.01E-01	1.78E+05	<0.01%	3.06E-02	1.90E+03	<0.01%	6.11E-03	None	-	No
Acetophenone	Yes	5.64E-07	1.14E-06	1.50E-06	None	-	4.55E-07	3.89E+01	<0.01%	9.10E-08	None	-	No
Acrolein	Yes	1.72E-03	3.48E-03	4.59E-03	2.50E+01	0.02%	1.39E-03	Not Needed	-	2.78E-04	2.00E-02	1.39%	No
Ammonia	No	4.34E+00	8.75E+00	1.16E+01	2.70E+03	0.43%	3.50E+00	Not Needed	-	7.00E-01	1.00E+02	0.70%	No
Anthracene	Yes	1.88E-05	3.80E-05	5.01E-05	None	-	1.52E-05	1.59E-01	<0.01%	3.04E-06	None	-	No
Antimony	Yes	1.39E-07	2.81E-07	3.71E-07	None	-	1.12E-07	3.97E-01	<0.01%	2.25E-08	None	-	No
Arsenic	Yes	2.20E-04	4.43E-04	5.85E-04	2.00E-01	0.29%	1.77E-04	Not Needed	-	3.55E-05	2.33E-04	15.25%	No
Barium	No	3.00E-06	6.04E-06	7.97E-06	None	-	2.42E-06	3.97E-01	<0.01%	4.83E-07	None	-	No
Benzaldehyde	No	1.50E-04	3.02E-04	3.99E-04	None	-	1.21E-04	1.15E+01	<0.01%	2.42E-05	None	-	No
Benzene	Yes	2.45E-03	4.94E-03	6.53E-03	1.60E+03	<0.01%	1.98E-03	Not Needed	-	3.96E-04	1.28E-01	0.31%	No
Benzo(a)anthracene	Yes	1.33E-05	2.68E-05	3.53E-05	None	-	1.07E-05	Not Needed	-	2.14E-06	9.09E-02	<0.01%	No
Benzo(a)pyrene	Yes	7.74E-05	1.56E-04	2.06E-04	None	-	6.24E-05	Not Needed	-	1.25E-05	9.09E-03	0.14%	No
Benzo(b)fluoranthene	Yes	1.33E-05	2.68E-05	3.53E-05	None	-	1.07E-05	Not Needed	-	2.14E-06	9.09E-02	<0.01%	No
Benzo(e)pyrene	Yes	3.71E-07	7.48E-07	9.87E-07	None	-	2.99E-07	None	-	5.98E-08	None	-	No
Benzo(g,h,i)perylene	Yes	1.32E-05	2.65E-05	3.50E-05	None	-	1.06E-05	None	-	2.12E-06	None	-	No
Benzo(b,k)fluoranthene	Yes	5.81E-07	1.17E-06	1.55E-06	None	-	4.69E-07	Not Needed	-	9.37E-08	9.09E-02	<0.01%	No
Benzo(j,k)fluoranthene	Yes	2.82E-05	5.69E-05	7.51E-05	None	-	2.27E-05	Not Needed	-	4.55E-06	9.09E-02	<0.01%	No
Benzo(k)fluoranthene	Yes	1.31E-05	2.64E-05	3.49E-05	None	-	1.06E-05	Not Needed	-	2.12E-06	9.09E-02	<0.01%	No
Benzoic acid	No	8.28E-06	1.67E-05	2.20E-05	None	-	6.68E-06	1.15E+01	<0.01%	1.34E-06	None	-	No
Beryllium	Yes	1.65E-04	3.33E-04	4.39E-04	5.00E-01	0.09%	1.33E-04	Not Needed	-	2.66E-05	2.00E-02	0.13%	No
Bis(2-ethylhexyl)phthalate	Yes	8.28E-06	1.67E-05	2.20E-05	1.00E+03	<0.01%	6.68E-06	Not Needed	-	1.34E-06	4.17E+00	<0.01%	No
Bromomethane	Yes	4.20E-04	8.46E-04	1.12E-03	8.00E+03	<0.01%	3.38E-04	Not Needed	-	6.77E-05	5.00E+00	<0.01%	No
Cadmium	Yes	1.65E-04	3.33E-04	4.39E-04	3.00E+01	<0.01%	1.33E-04	Not Needed	-	2.66E-05	5.56E-03	0.48%	No
Carbazole	Yes	3.17E-04	6.40E-04	8.44E-04	None	-	2.56E-04	Not Needed	-	5.12E-05	1.75E+00	<0.01%	No
Carbon tetrachloride	Yes	8.72E-04	1.76E-03	2.32E-03	1.57E+04	<0.01%	7.03E-04	Not Needed	-	1.41E-04	6.67E-01	0.02%	No
Chlorine	Yes	1.39E-01	2.81E-01	3.71E-01	3.00E+02	0.12%	1.12E-01	Not Needed	-	2.25E-02	2.00E-01	11.23%	No
Chlorobenzene	Yes	5.82E-03	1.17E-02	1.55E-02	None	-	4.69E-03	Not Needed	-	9.38E-04	1.00E+03	<0.01%	No
Chloroform	Yes	1.06E-03	2.13E-03	2.82E-03	2.40E+04	<0.01%	8.54E-04	Not Needed	-	1.71E-04	9.80E+01	<0.01%	No
Chromium	Yes	1.65E-04	3.33E-04	4.39E-04	None	-	1.33E-04	Not Needed	-	2.66E-05	8.00E-03	0.33%	No
Chromium VI	Yes	1.65E-04	3.33E-04	4.39E-04	None	-	1.33E-04	Not Needed	-	2.66E-05	8.00E-03	0.33%	No
Chrysene	Yes	1.34E-05	2.71E-05	3.57E-05	None	-	1.08E-05	Not Needed	-	2.16E-06	9.09E-01	<0.01%	No
Cobalt	Yes	1.15E-07	2.31E-07	3.05E-07	None	-	9.24E-08	Not Needed	-	1.85E-08	1.00E-01	<0.01%	No
Copper	No	1.65E-04	3.33E-04	4.39E-04	None	-	1.33E-04	7.94E-02	0.17%	2.66E-05	None	-	No
o-Cresol	Yes	5.64E-04	1.14E-03	1.50E-03	None	-	4.55E-04	Not Needed	-	9.10E-05	6.00E+02	<0.01%	No
m-Cresol, p-Cresol	Yes	2.91E-04	5.86E-04	7.74E-04	None	-	2.35E-04	Not Needed	-	4.69E-05	6.00E+02	<0.01%	No
Crotonaldehyde	No	1.75E-03	3.52E-03	4.64E-03	8.60E+01	<0.01%	1.41E-03	4.76E+00	0.03%	2.81E-04	None	-	No
Decachlorobiphenyl	Yes	7.66E-07	1.54E-06	2.04E-06	1.00E+02	<0.01%	6.18E-07	3.97E-01	<0.01%	1.24E-07	None	-	No
Dibenzo(a,h)anthracene	Yes	1.53E-05	3.08E-05	4.06E-05	None	-	1.23E-05	Not Needed	-	2.46E-06	8.33E-03	0.03%	No

Table F-1. Biomass Boiler TAP Screening Analysis

Stack Description	Stack Height (m)	Stack Temperature[1] (K)	Exit Velocity[1] (m/s)	Stack Diameter (m)	Modeled Emissions[2] (g/s)	Max. Impact (μg/m³)
Biomass Boiler, B001	67.06	435.93	11.27	3.66	1.0	2.02

1. For conservatism, the parameters from the 40% load off-design fuel scenario were utilized as these yielded the highest unit impacts in the load analysis.
2. For simplicity, a unit emission rate was modeled from the boiler stack.

Pollutant	HAP? (Yes/No)	Boiler Emissions (g/s)	Boiler 1-hr Impact (μg/m³)	Maximum 15-minute Average Impact (μg/m³)	15-minute Average AAC (μg/m³)	Maximum 15-minute Average Impact (% of AAC)	Maximum 24-hour Average Impact (μg/m³)	24-hour Average AAC (μg/m³)	Maximum 24-hour Average Impact (% of AAC)	Maximum Annual Impact (μg/m³)	Annual Average AAC (μg/m³)	Maximum Annual Impact (% of AAC)	Requires Refined Analysis?
Dichlorobenzene	Yes	8.09E-05	1.63E-04	2.15E-04	3.00E+04	<0.01%	6.52E-05	1.19E+02	<0.01%	1.30E-05	None	-	No
Dichlorobiphenyl	Yes	2.76E-06	5.56E-06	7.34E-06	1.00E+02	<0.01%	2.22E-06	Not Needed	-	4.45E-07	1.00E-01	<0.01%	No
1,2-Dichloroethane	Yes	2.06E-02	4.14E-02	5.47E-02	4.05E+04	<0.01%	1.66E-02	Not Needed	-	3.32E-03	3.85E-01	0.86%	No
Dichlorophenol	No	3.80E-05	7.67E-05	1.01E-04	None	-	3.07E-05	1.15E+01	<0.01%	6.13E-06	None	-	No
1,2-Dichloropropane	Yes	5.82E-03	1.17E-02	1.55E-02	None	-	4.69E-03	Not Needed	-	9.38E-04	4.00E+00	0.02%	No
2,4-Dinitrophenol	Yes	3.17E-05	6.40E-05	8.44E-05	None	-	2.56E-05	1.15E+00	<0.01%	5.12E-06	None	-	No
Ethanol	No	1.10E-03	2.21E-03	2.92E-03	1.88E+05	<0.01%	8.86E-04	1.51E+03	<0.01%	1.77E-04	None	-	No
Ethylbenzene	Yes	1.01E-04	2.04E-04	2.69E-04	5.45E+04	<0.01%	8.15E-05	Not Needed	-	1.63E-05	1.00E+03	<0.01%	No
Fluoranthene	Yes	3.00E-05	6.05E-05	7.99E-05	None	-	2.42E-05	None	-	4.84E-06	None	-	No
Fluorene	Yes	2.28E-05	4.60E-05	6.07E-05	None	-	1.84E-05	None	-	3.68E-06	None	-	No
Formaldehyde	Yes	3.14E-02	6.33E-02	8.36E-02	2.45E+02	0.03%	2.53E-02	Not Needed	-	5.06E-03	9.80E+00	0.05%	No
HCl	Yes	3.11E-01	6.27E-01	8.27E-01	7.00E+02	0.12%	2.51E-01	Not Needed	-	5.01E-02	2.00E+01	0.25%	No
HF	Yes	7.05E-02	1.42E-01	1.88E-01	1.64E+02	0.11%	5.69E-02	Not Needed	-	1.14E-02	1.40E+01	0.08%	No
Heptachlorobiphenyl	Yes	4.58E-07	9.23E-07	1.22E-06	1.00E+02	<0.01%	3.69E-07	Not Needed	-	7.39E-08	1.00E-01	<0.01%	No
Hexachlorobenzene	Yes	4.14E-05	8.35E-05	1.10E-04	None	-	3.34E-05	Not Needed	-	6.68E-06	2.17E-02	0.03%	No
Hexachlorobiphenyl	Yes	5.13E-07	1.03E-06	1.36E-06	1.00E+02	<0.01%	4.13E-07	3.97E-01	<0.01%	8.27E-08	None	-	No
Hexanal (hexaldehyde)	No	7.97E-03	1.61E-02	2.12E-02	None	-	6.43E-03	1.13E+02	<0.01%	1.29E-03	None	-	No
Heptachlorodibenzo-p-dioxins	Yes	2.27E-06	4.58E-06	6.05E-06	None	-	1.83E-06	None	-	3.66E-07	None	-	No
Heptachlorodibenzo-p-furans	Yes	2.82E-07	5.68E-07	7.50E-07	None	-	2.27E-07	None	-	4.55E-08	None	-	No
Hexachlorodibenzo-p-dioxins	Yes	6.12E-07	1.23E-06	1.63E-06	None	-	4.93E-07	Not Needed	-	9.86E-08	7.69E-06	1.28%	No
Hexachlorodibenzo-p-furans	Yes	5.60E-07	1.13E-06	1.49E-06	None	-	4.52E-07	None	-	9.03E-08	None	-	No
Indeno(1,2,3,c,d)pyrene	Yes	1.31E-05	2.64E-05	3.49E-05	None	-	1.06E-05	Not Needed	-	2.11E-06	9.09E-02	<0.01%	No
Iron	No	1.75E-05	3.52E-05	4.64E-05	None	-	1.41E-05	None	-	2.81E-06	None	-	No
Isobutyraldehyde	No	2.12E-03	4.26E-03	5.63E-03	None	-	1.71E-03	1.15E-02	14.82%	3.41E-04	None	-	No
Isobutyl alcohol	No	1.76E-03	3.55E-03	4.69E-03	None	-	1.42E-03	2.38E+02	<0.01%	2.84E-04	None	-	No
Lead	Yes	4.95E-04	9.98E-04	1.32E-03	None	-	3.99E-04	Not Needed	-	7.98E-05	1.50E+00	<0.01%	No
Manganese	Yes	3.30E-04	6.65E-04	8.78E-04	5.00E+02	<0.01%	2.66E-04	Not Needed	-	5.32E-05	5.00E-02	0.11%	No
Mercury	Yes	1.76E-04	3.55E-04	4.69E-04	4.00E+00	0.01%	1.42E-04	Not Needed	-	2.84E-05	3.00E-01	<0.01%	No
Methane	No	3.70E+00	7.46E+00	9.85E+00	None	-	2.99E+00	5.21E+02	0.57%	5.97E-01	None	-	No
Methyl chloride (chloromethane)	Yes	4.07E-03	8.21E-03	1.08E-02	4.13E+04	<0.01%	3.28E-03	Not Needed	-	6.57E-04	9.00E+01	<0.01%	No
2-Methylnaphthalene	Yes	7.13E-06	1.44E-05	1.90E-05	None	-	5.75E-06	2.31E+00	<0.01%	1.15E-06	None	-	No
Methylene chloride (dichloromethane)	Yes	2.96E-04	5.97E-04	7.88E-04	4.34E+04	<0.01%	2.39E-04	Not Needed	-	4.78E-05	2.13E+01	<0.01%	No
Molybdenum	No	3.70E-08	7.46E-08	9.85E-08	None	-	2.99E-08	1.19E+01	<0.01%	5.97E-09	None	-	No
Monochlorobiphenyl	Yes	1.06E-06	2.14E-06	2.82E-06	1.00E+02	<0.01%	8.55E-07	Not Needed	-	1.71E-07	1.00E-01	<0.01%	No
Monochlorophenol	No	4.14E-05	8.35E-05	1.10E-04	None	-	3.34E-05	1.54E+01	<0.01%	6.68E-06	None	-	No
Naphthalene	Yes	7.54E-04	1.52E-03	2.01E-03	7.50E+03	<0.01%	6.08E-04	Not Needed	-	1.22E-04	3.00E+00	<0.01%	No
Nickel	Yes	1.65E-04	3.33E-04	4.39E-04	None	-	1.33E-04	Not Needed	-	2.66E-05	9.00E-02	0.03%	No
2-Nitrophenol	No	4.23E-05	8.53E-05	1.13E-04	None	-	3.41E-05	2.99E+01	<0.01%	6.82E-06	None	-	No
4-Nitrophenol	Yes	1.94E-05	3.91E-05	5.16E-05	None	-	1.56E-05	1.15E+00	<0.01%	3.13E-06	None	-	No
Nonachlorobiphenyl	Yes	5.08E-07	1.02E-06	1.35E-06	1.00E+02	<0.01%	4.09E-07	3.97E-01	<0.01%	8.19E-08	None	-	No
Octachlorobiphenyl	Yes	3.60E-07	7.25E-07	9.57E-07	1.00E+02	<0.01%	2.90E-07	3.97E-01	<0.01%	5.80E-08	None	-	No
Octachlorodibenzo-p-dioxins	Yes	9.61E-07	1.94E-06	2.56E-06	None	-	7.75E-07	None	-	1.55E-07	None	-	No
Octachlorodibenzo-p-furans	Yes	6.79E-08	1.37E-07	1.81E-07	None	-	5.48E-08	None	-	1.10E-08	None	-	No
Pentachlorodibenzo-p-dioxins	Yes	1.25E-07	2.52E-07	3.32E-07	None	-	1.01E-07	None	-	2.01E-08	None	-	No
Pentachlorodibenzo-p-furans	Yes	4.10E-07	8.26E-07	1.09E-06	None	-	3.30E-07	None	-	6.61E-08	None	-	No
Pentachlorobenzene	No	4.14E-05	8.35E-05	1.10E-04	None	-	3.34E-05	None	-	6.68E-06	None	-	No

Table F-1. Biomass Boiler TAP Screening Analysis

Stack Description	Stack Height (m)	Stack Temperature[1] (K)	Exit Velocity[1] (m/s)	Stack Diameter (m)	Modeled Emissions[2] (g/s)	Max. Impact (μg/m³)
Biomass Boiler, B001	67.06	435.93	11.27	3.66	1.0	2.02

1. For conservatism, the parameters from the 40% load off-design fuel scenario were utilized as these yielded the highest unit impacts in the load analysis.
2. For simplicity, a unit emission rate was modeled from the boiler stack.

Pollutant	HAP? (Yes/No)	Boiler Emissions (g/s)	Boiler 1-hr Impact (μg/m³)	Maximum 15-minute Average Impact (μg/m³)	15-minute Average AAC (μg/m³)	Maximum 15-minute Average Impact (% of AAC)	Maximum 24-hour Average Impact (μg/m³)	24-hour Average AAC (μg/m³)	Maximum 24-hour Average Impact (% of AAC)	Maximum Annual Impact (μg/m³)	Annual Average AAC (μg/m³)	Maximum Annual Impact (% of AAC)	Requires Refined Analysis?
Pentachlorobiphenyl	Yes	5.84E-07	1.18E-06	1.55E-06	1.00E+02	<0.01%	4.71E-07	3.97E-01	<0.01%	9.42E-08	None	-	No
Pentachlorophenol	Yes	4.14E-05	8.35E-05	1.10E-04	None	-	3.34E-05	Not Needed	-	6.68E-06	1.96E+00	<0.01%	No
2-Pentanone	No	2.04E-03	4.12E-03	5.44E-03	None	-	1.65E-03	5.56E+02	<0.01%	3.30E-04	None	-	No
Perylene	Yes	3.99E-08	8.05E-08	1.06E-07	None	-	3.22E-08	None	-	6.44E-09	None	-	No
Phenanthrene	Yes	5.98E-05	1.21E-04	1.59E-04	None	-	4.82E-05	1.59E-01	0.03%	9.65E-06	None	-	No
Phenol	Yes	5.82E-04	1.17E-03	1.55E-03	6.00E+03	<0.01%	4.69E-04	Not Needed	-	9.38E-05	2.00E+02	<0.01%	No
Propanol	No	1.43E-03	2.88E-03	3.80E-03	9.50E+04	<0.01%	1.15E-03	3.97E+02	<0.01%	2.30E-04	None	-	No
Phosphorus	Yes	4.76E-07	9.59E-07	1.27E-06	None	-	3.84E-07	Not Needed	-	7.68E-08	7.00E-02	<0.01%	No
Potassium	No	6.87E-04	1.39E-03	1.83E-03	None	-	5.54E-04	None	-	1.11E-04	None	-	No
Propionaldehyde	Yes	1.08E-02	2.17E-02	2.87E-02	None	-	8.69E-03	Not Needed	-	1.74E-03	8.00E+00	0.02%	No
Pyrene	Yes	2.57E-05	5.19E-05	6.85E-05	None	-	2.08E-05	1.59E-01	0.01%	4.15E-06	None	-	No
Pyridine	No	5.64E-04	1.14E-03	1.50E-03	None	-	4.55E-04	1.19E+01	<0.01%	9.10E-05	None	-	No
Selenium	Yes	8.25E-04	1.66E-03	2.19E-03	None	-	6.65E-04	Not Needed	-	1.33E-04	2.00E+01	<0.01%	No
Silver	No	3.00E-05	6.04E-05	7.97E-05	None	-	2.42E-05	7.94E-03	0.30%	4.83E-06	None	-	No
Sodium	No	6.35E-06	1.28E-05	1.69E-05	None	-	5.12E-06	None	-	1.02E-06	None	-	No
Strontium	No	1.76E-07	3.55E-07	4.69E-07	None	-	1.42E-07	None	-	2.84E-08	None	-	No
Styrene	Yes	9.87E-05	1.99E-04	2.63E-04	8.52E+04	<0.01%	7.96E-05	Not Needed	-	1.59E-05	1.00E+03	<0.01%	No
2,3,7,8-Tetrachlorodibenzo-p-dioxins	Yes	9.48E-10	1.91E-09	2.52E-09	None	-	7.64E-10	Not Needed	-	1.53E-10	3.03E-07	0.05%	No
Tetrachlorodibenzo-p-dioxins	Yes	1.93E-08	3.90E-08	5.14E-08	None	-	1.56E-08	Not Needed	-	3.12E-09	3.03E-07	1.03%	No
2,3,7,8-Tetrachlorodibenzo-p-furans	Yes	1.21E-08	2.43E-08	3.21E-08	None	-	9.72E-09	None	-	1.94E-09	None	-	No
Tetrachlorodibenzo-p-furans	Yes	1.18E-07	2.38E-07	3.14E-07	None	-	9.50E-08	None	-	1.90E-08	None	-	No
Tetrachlorobenzene	No	4.14E-05	8.35E-05	1.10E-04	None	-	3.34E-05	None	-	6.68E-06	None	-	No
Tetrachlorobiphenyl	Yes	1.04E-06	2.10E-06	2.77E-06	1.00E+02	<0.01%	8.39E-07	Not Needed	-	1.68E-07	1.00E-01	<0.01%	No
Tetrachloroethene	Yes	1.12E-03	2.25E-03	2.97E-03	1.36E+05	<0.01%	9.00E-04	Not Needed	-	1.80E-04	1.69E+00	0.01%	No
Tetrachlorophenol	No	4.14E-05	8.35E-05	1.10E-04	None	-	3.34E-05	None	-	6.68E-06	None	-	No
Thallium	No	2.21E-06	4.46E-06	5.89E-06	None	-	1.78E-06	7.94E-02	<0.01%	3.57E-07	None	-	No
Tin	No	4.05E-07	8.17E-07	1.08E-06	None	-	3.27E-07	1.59E+00	<0.01%	6.54E-08	None	-	No
Titanium	No	3.53E-07	7.11E-07	9.38E-07	None	-	2.84E-07	1.19E+01	<0.01%	5.69E-08	None	-	No
o-Tolualdehyde	No	1.27E-03	2.56E-03	3.38E-03	None	-	1.02E-03	None	-	2.05E-04	None	-	No
p-Tolualdehyde	No	1.94E-03	3.91E-03	5.16E-03	None	-	1.56E-03	None	-	3.13E-04	None	-	No
Toluene	Yes	2.44E-03	4.91E-03	6.48E-03	1.13E+05	<0.01%	1.96E-03	Not Needed	-	3.93E-04	5.00E+03	<0.01%	No
Trichlorobiphenyl	Yes	6.07E-06	1.22E-05	1.62E-05	1.00E+02	<0.01%	4.90E-06	Not Needed	-	9.79E-07	1.00E-01	<0.01%	No
Trichlorobenzene	Yes	4.14E-05	8.36E-05	1.10E-04	4.00E+03	<0.01%	3.34E-05	Not Needed	-	6.68E-06	2.00E+02	<0.01%	No
Trichloroethylene (trichloroethene)	Yes	1.17E-03	2.35E-03	3.10E-03	1.07E+05	<0.01%	9.40E-04	Not Needed	-	1.88E-04	5.00E+00	<0.01%	No
Trichlorofluoromethane	No	9.52E-04	1.92E-03	2.53E-03	5.60E+05	<0.01%	7.67E-04	4.44E+03	<0.01%	1.53E-04	None	-	No
2,4,6-Trichlorophenol	Yes	3.88E-06	7.82E-06	1.03E-05	None	-	3.13E-06	Not Needed	-	6.25E-07	3.23E+00	<0.01%	No
Vanadium	No	1.73E-08	3.48E-08	4.60E-08	1.00E+01	<0.01%	1.39E-08	None	-	2.79E-09	None	-	No
Vinyl chloride	Yes	6.19E-04	1.25E-03	1.65E-03	1.28E+03	<0.01%	4.99E-04	Not Needed	-	9.98E-05	1.00E+02	<0.01%	No
o-Xylene	Yes	6.11E-04	1.23E-03	1.63E-03	6.55E+04	<0.01%	4.93E-04	Not Needed	-	9.85E-05	1.00E+02	<0.01%	No
m/p-Xylenes	Yes	7.79E-04	1.57E-03	2.07E-03	6.55E+04	<0.01%	6.28E-04	Not Needed	-	1.26E-04	1.00E+02	<0.01%	No
Yttrium	No	5.29E-09	1.07E-08	1.41E-08	None	-	4.26E-09	7.94E-01	<0.01%	8.53E-10	None	-	No
Zinc	No	2.20E-04	4.43E-04	5.85E-04	None	-	1.77E-04	None	-	3.55E-05	None	-	No

APPENDIX G

DISPERSION MODELING PROTOCOL AND RESPONSE

OglethorpePower

Oglethorpe Power Corporation
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An Electric Membership Cooperative

April 28, 2009

Mr. Peter Courtney
Georgia Environmental Protection Division
Air Protection Branch
4244 International Parkway, Suite 120
Atlanta, GA 30354
Peter.Courtney@dnr.state.ga.us

Hand delivered by Doug Fulle

~~Sent via Email and Return Receipt/Certified Mail# 70081830000162483223~~

Peter

Dear ~~Mr. Courtney~~:

Subject: *Oglethorpe Power Corporation – Warren County Operations Air Dispersion Modeling Protocol*

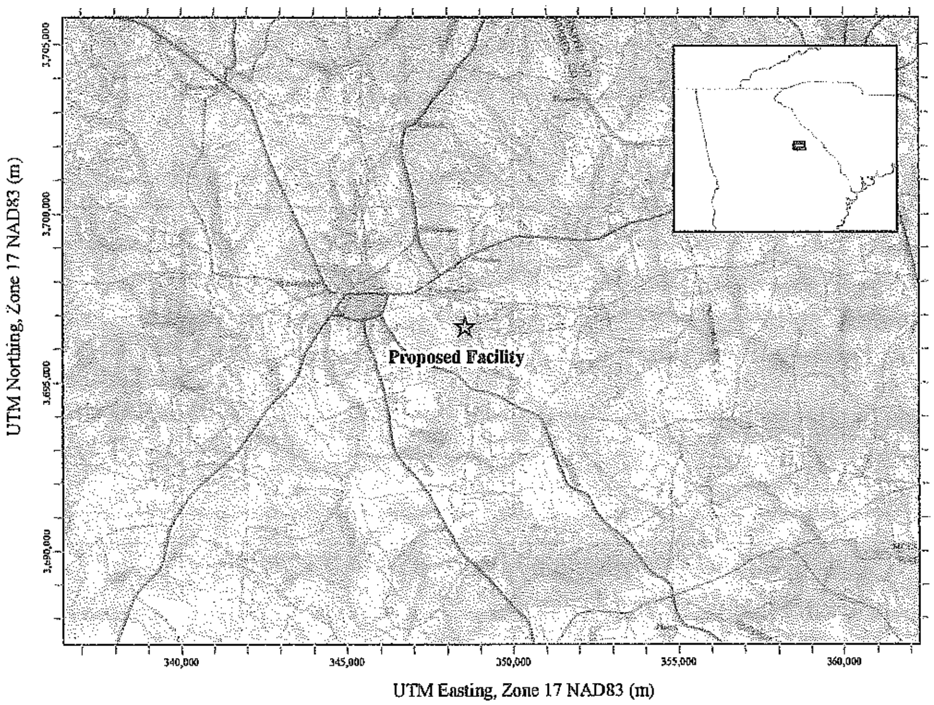
Oglethorpe Power Corporation (OPC) plans to construct a nominal 100 megawatt (MW) biomass-fueled electric generating facility in Warren County, Georgia (Warren facility). The plant will consist of a biomass-fueled boiler and ancillary equipment to produce steam for the generation of electricity. The project is anticipated to require an air quality permit issued under the Prevention of Significant Deterioration (PSD) permitting rules, as facility emissions will likely exceed PSD thresholds for carbon monoxide (CO), oxides of nitrogen (NO_X), particulate matter with an aerodynamic diameter less than 10 micrometers (PM_{10}), sulfur dioxide (SO_2), and volatile organic compounds (VOC). OPC is planning to submit a PSD construction permit application to the Georgia Environmental Protection Division (EPD) later this year.

Following EPD policy, OPC has prepared a dispersion modeling protocol describing proposed modeling methodologies. This protocol includes a brief description of the facility, an overview of the required PSD and state modeling analyses, and a description of the methodology proposed to be used in the modeling analyses. The analyses include evaluations of National Ambient Air Quality Standards (NAAQS), PSD Increment, and additional impacts analyses for visibility and non-air quality impacts, as well as the ambient impact assessment of toxic air pollutant (TAP) emissions.

Project Description

Figure 1 provides a map of the area surrounding the Warren facility property. The approximate UTM coordinates of the facility are 348.56 kilometers east and 3,696.68 kilometers north in Zone 17 (NAD 83).

FIGURE 1. FACILITY LOCATION



OPC proposes to construct one biomass-fueled boiler at the Warren facility. The boiler will nominally provide 100 MW of power (net) and is presently anticipated to have a heat input capacity of approximately 1,250 MMBtu/hr. The boiler will have the ability to burn biodiesel as a backup fuel, but OPC expects this fuel will only be used for plant startup (occasional use for load stabilization is possible but not expected). Steam produced by the boiler will feed a steam turbine generator, and net power produced by the steam generator will be sold to the grid. The proposed project will also include ancillary equipment, which may include an emergency generator, an emergency fire pump, a cooling tower, and a flyash storage silo. Additional emission sources include material handling sources (from both purchased chips and on-site wood chipping operations) and roadway emission sources.

The Warren facility will be located in Warren County, which has been designated by the U.S. EPA as "attainment" or "unclassifiable" for all criteria pollutants. As such, PSD regulations apply to any new major stationary source or major modifications to an existing major stationary source. A stationary source is considered "major" if it has the potential to emit either (1) 100 tons per year or more of a regulated pollutant if the source is classified as one of 28 designated industrial source categories, or (2) 250 tons per year or more of any regulated pollutant for unlisted sources. The electric generating unit proposed is not a fossil fuel-fired unit, and thus the Warren facility is not one of the 28 named source categories. As such, it is considered a major source if it has the potential to emit greater than 250 tons per year of any regulated pollutant. Table 1 shows the preliminary emissions due to the proposed boiler only for each pollutant compared to the corresponding PSD significant emission rates. As shown in Table 1, preliminary estimates of the potential emissions of CO and NO_X will be greater than 250 tons per year. Therefore, the Warren facility will be a new PSD major stationary source, and PSD review, including dispersion modeling, will be required for the proposed project. In addition to CO and NO_X, PM_{10}, SO_2 and VOC will exceed the PSD significant emission rates and will also be subject to PSD review.

Modeling of VOC emissions using reactive plume models to estimate ozone impacts is rarely conducted on a source-by-source basis in the Southeast, as the region is generally NO_2 limited with regard to ozone formation. Further, Georgia EPD has historically not required any assessment of VOC ambient impacts in PSD air quality analyses. Thus, no modeling will be conducted to evaluate potential impacts on ambient ozone. In addition, OPC presumes that evaluations completed for PM_{10} will be sufficient in satisfying all PSD air quality analysis requirements for $PM_{2.5}$.consistent with EPA policy and the final $PM_{2.5}$ NSR Implementation Rule.[1,2] Although no annual NAAQS exists for PM_{10}, the modeling analysis will include an evaluation of the annual PM_{10} impacts, as this pollutant is being used as a surrogate for $PM_{2.5}$, a pollutant for which an annual standard does exist.

TABLE 1. PRELIMINARY EMISSIONS – BOILER

Pollutant	Projected Biomass Boiler Emissions[1] (tpy)	PSD Significant Emission Rate[2] (tpy)
CO	438	100
H_2SO_4	0.3	7
Lead	0.01	0.6
NO_X	548	40
PM_{10}[3]	98	15
SO_2	55	40
VOC	93	40

1. The preliminary emissions are presented only for the biomass boiler. Total project emission increases will be outlined in the PSD permit application.
2. PSD major modification threshold
3. PM_{10} emission estimate includes filterable and condensable particulate matter.

PSD MODELING ANALYSES

PSD regulations require an evaluation of impacts against NAAQS and Increment at Class I and Class II areas, as well as an evaluation of additional impacts (e.g., visibility degradation, impact on soil and vegetation). The dispersion modeling analyses will be conducted in accordance with the U.S. EPA's *Guideline on Air Quality Models* 40 CFR 51, Appendix W (Revised, November 9, 2005), and in accordance with the U.S. EPA's *AERMOD Implementation Guide*.[3] A summary of the tasks to be performed is discussed in this section.

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1 Memorandum from Mr. Stephen D. Page (U.S. EPA, Office of Air Quality Planning and Standards), "Implementation of New Source Review Requirements in $PM_{2.5}$ Nonattainment Areas", April 6, 2005. (http://www.epa.gov/nsr/documents/nsrmemo.pdf)

2 "Implementation of the New Source Review (NSR) Program for Particulate Matter Less Than 2.5 Micrometers ($PM_{2.5}$)," May 16, 2008, 73 FR 28336.

3 http://www.epa.gov/scram001/7thconf/aermod/aermod_implmtn_guide_19March2009.pdf.

SIGNIFICANCE ANALYSIS

Initially, a significance analysis will be performed to determine if the emissions increases associated with the project will significantly impact the area surrounding the facility. The Significance Analysis will be conducted for CO, NO_X, PM_{10} and SO_2. Maximum ground-level concentrations will be compared to the U.S. EPA established significant impact levels (SIL) shown in Table 2.

TABLE 2. PSD MODELING SIGNIFICANCE LEVELS

Pollutant	Averaging Period	Significant Impact Level ($\mu g/m^3$)
CO	8-hour 1-hour	500 2,000
NO_2	Annual	1
PM_{10}	Annual 24-hour	1 5
SO_2	Annual 24-hour 3-hour	1 5 25

If the highest ambient concentration resulting from the modeled project emissions for a pollutant is less than the SIL, then further analyses are not required for that pollutant because the emissions will neither cause nor contribute to any exceedance of the NAAQS or PSD Increment. If concentrations exceed the SIL, NAAQS and PSD Increment analyses are required for that pollutant in a "Full Impacts Analysis." The geographic extent to which significant impacts occur is used to define the significant impact area (SIA) within which compliance with the NAAQS and PSD Increments must be demonstrated.

The SIA encompasses a circle centered on the Warren facility with a radius extending out to either (1) the farthest location where the predicted ambient impact of a pollutant from the project exceeds the Class II SIL, or (2) a distance of 50 km, whichever is less. The "Screening Area" encompasses all sources within a distance of 50 km of the radius of the SIA, which are assumed to potentially contribute to ground-level concentrations within the SIA and will be evaluated for possible inclusion in the NAAQS and PSD Increment analyses. A regional source inventory will be compiled for any pollutant that exceeds the SIL for both the NAAQS and PSD Increment analyses.

OFFSITE SOURCE INVENTORY

Preliminary analysis shows that only the proposed project emissions of PM_{10} result in modeled impacts that are above the SILs, while CO, NO_X, and SO_2 are below. Therefore, for PM_{10}, air dispersion modeling analyses are expected to be required to demonstrate compliance with the NAAQS as well as Class I and Class II PSD Increments, where applicable. OPC has presumptively assumed a SIA of 10 km for PM_{10}, based on this preliminary analyses and requests that Georgia EPD provide regional inventory source data reflective of this distance for PM_{10}.

Ambient Monitoring Requirements

Under current U.S. EPA policies, the maximum impacts due to the projected emissions from a project are also assessed against monitoring *de minimis* concentrations to determine whether pre-construction monitoring should be considered. The monitoring *de minimis* concentrations for CO, PM_{10}, NO_2 (primarily emitted as NO_X) and SO_2 are listed in Table 3. If either the predicted modeled impact from a net emission increase or the existing ambient concentration is less than the monitoring *de minimis* concentration, the permitting agency has the discretionary authority to exempt an applicant from pre-construction ambient monitoring.

Given the extensive ambient monitoring already in Georgia, OPC is requesting to utilize data from the monitors currently operated by Georgia EPD and requests approval as well as confirmation of the preferred monitors for this proposed project. Despite expecting to only require full modeling for PM_{10}, OPC requests the preferred monitors for all criteria pollutants.

Table 3. PSD *de Minimis* Monitoring Concentration

Pollutant	Averaging Period	Monitoring *De Minimis* Concentration ($\mu g/m^3$)
CO	8-hour 1-hour	575 -
NO_2	Annual	14
PM_{10}	Annual 24-hour	- 10
SO_2	Annual 24-hour 3-hour	- 13 -

NAAQS Analysis

Primary NAAQS are the maximum concentration ceilings, measured in terms of total concentration of a pollutant in the atmosphere, which define the "levels of air quality which the U.S. EPA judges are necessary, with an adequate margin of safety, to protect the public health."[4] Secondary NAAQS define the levels that "protect the public welfare from any known or anticipated adverse effects of a pollutant." The objective of the NAAQS analysis is to demonstrate through air quality modeling that emissions from the proposed project do not contribute to or cause an exceedance of the NAAQS at any ambient location.

[4] 40 CFR §50.2(b).

The primary and secondary NAAQS for CO, NO_X, PM_{10}, and $SO_2$are detailed in Table 4.

TABLE 4. PSD NAAQS

Pollutant	Averaging Period	Primary NAAQS (μg/m³)	Secondary NAAQS (μg/m³)
CO	8-hour 1-hour	10,000 40,000	- -
NO_2	Annual	100	100
PM_{10}	Annual 24-hour	50 150	50 150
SO_2.	Annual 24-hour 3-hour	80 365 -	- - 1,300

If a SIL is exceeded, the NAAQS analysis is completed for that pollutant. In the NAAQS analysis the potential emissions from all emission units at the Warren facility (identical to the significance analysis for a greenfield facility), combined with the emissions of regional sources included in a source inventory for the screening area, will be modeled together to compute the cumulative impact.

The regional source inventory will be comprised of all sources (major and minor) within the SIA and major Title V sources that are in the screening area, and are not excluded based on the "20D" procedure.[5] Using this procedure, sources outside the area of significant impact are excluded from the inventory if the entire facility's emissions (tpy) are less than 20 times the distance (km) from the facility to the nearest edge of the SIA. To be conservative, emissions from sources within close proximity to each other (2 km) will be combined prior to applying the "20D" procedure.

The resulting modeled concentration (project plus offsite inventory), added to the representative background level for each pollutant, will be assessed against the applicable NAAQS to demonstrate that the proposed project neither causes nor contributes to any modeled excess of an applicable air quality standard. For pollutants having an annual average NAAQS based on a simple annual arithmetic mean, the highest modeled concentration for each of five years of meteorological data will be assessed against the NAAQS to demonstrate compliance. For pollutants having a short-term average NAAQS, the highest, second-high concentration for each of five years of meteorological data will be assessed against the NAAQS to demonstrate compliance. For PM_{10}, the highest 6th-high concentration predicted over the five-year period of meteorological data will be compared, with ambient background, against the 24-hour average NAAQS standard.

[5] *Federal Register* 8079, March 6, 1992.

PSD INCREMENT ANALYSIS

The PSD regulations were enacted to "prevent deterioration" of air quality in areas of the country where the air quality was better than the NAAQS. To achieve this goal, the U.S EPA established PSD Increments for PM_{10}, SO_2, and NO_2. Increments have not been established for CO (or $PM_{2.5}$). The sum of the PSD Increment concentration and a baseline concentration defines a "reduced" ambient standard, either lower than or equal to the NAAQS that must be met in a designated attainment area. Significant deterioration is said to have occurred if the *change* in emissions occurring since a baseline date results in an off-property impact greater than the PSD Increment (i.e., the increased emissions "consume" more than the available PSD Increment).

The PSD Increments are further broken into Class I, II, and III Increments; although no Class III areas are located within Georgia. Class I areas are federally protected areas for which more stringent air quality standards apply to protect unique natural, cultural, recreational, and/or historic values. Class II areas are those areas external to the proposed project site at which ambient air quality standards and PSD Class II Increments apply. The Class II PSD Increments are listed in Table 5.

TABLE 5. PSD INCREMENT VALUES

Pollutant	Averaging Period	Class II PSD Increment ($\mu g/m^3$)
NO_2	Annual	25
SO_2	Annual	20
	24-hour	91
	3-hour	512
PM_{10}	24-hour	30
	Annual	17

To demonstrate compliance with the PSD Increment standards if the SILs are exceeded, "Increment affecting emissions" from the proposed project and other nearby sources will be modeled and assessed cumulatively against the PSD Class II Increment. The highest incremental impact for each of five meteorological data years modeled is used to demonstrate compliance with annual average PSD Increments and the highest, second-high concentration for each of five years of meteorological data will be assessed in comparison to short-term PSD Increments. The determination of whether an emissions change at a given source consumes or expands Increment is based on the source definition and the time the change occurs in relation to baseline dates. The major source baseline dates are February 8, 1988, for NO_X, and
January 6, 1975, for SO_2 and PM_{10}.[6] Emission changes at major sources that occur after the major source baseline dates affect Increment. In contrast, emission changes at minor sources only affect Increment after the minor source baseline date, which is set at the time when the first PSD application is completed in a given area, usually arranged on a county-by-county basis. If the minor source baseline date for

[6] The PM major source baseline date is utilized for PM_{10} as a specific baseline date.

Warren County for NO_X, SO_2, or PM_{10} has been set, emission changes at minor sources after these dates affect Increment for the respective pollutant.

OPC requests Georgia EPD's assistance with the compilation of the regional source inventory identified as consuming Increment as well as determining if the minor source baseline date has been triggered.

Class I Area Analysis

Class I areas are federally protected areas for which more stringent air quality standards apply to protect unique natural, cultural, recreational, and/or historic values. Two principal air quality impacts are considered for Class I areas: PSD Increments for NO_X, SO_2, and PM_{10}, shown in Table 6, and air quality related values (AQRV).

In general, all PSD permit applications are required to demonstrate through air quality modeling that the emissions increases from the proposed project will not cause or contribute to any violations of allowable increments within potentially affected Class I areas, which are protected to a greater degree (i.e., the allowable increments are lower) than Class II areas. A significant contribution to Class I Increment consumption is defined as a modeled concentration in excess of the significant impact levels summarized in Table 6. These significant impact levels, which were originally developed as part of the 1996 New Source Review (NSR) reform rulemaking, have been accepted by decision makers as an indication of whether a project is likely to cause or contribute to a Class I increment violation.

Table 6. Class I PSD Increments and Modeling Significance Levels

Pollutant	Averaging Period	Class I Increment ($\mu g/m^3$)	Significance Level ($\mu g/m^3$)
PM_{10}	24-hour	8.0	0.3
	Annual	4.0	0.2
SO_2	3-hour	25.0	1.0
	24-hour	5.0	0.2
	Annual	2.0	0.1
NO_2	Annual	2.5	0.1

The Federal Land Managers (FLM) for Class I areas have the responsibility to protect air quality related values (AQRV) and to consider in consultation with the permitting authority whether a proposed major emitting facility will have an adverse impact on such values. AQRV for which PSD modeling is typically conducted include visibility and deposition of sulfur and nitrogen.

Additional Impacts Analysis

PSD regulations require that three additional impact analyses be performed as part of a PSD permit action. These evaluations include a growth analysis, a soil and vegetation analysis, and a visibility analysis. No adverse impacts on growth are anticipated from the proposed project since all construction activities will occur for a finite time period.

Warren County for NO_X, SO_2, or PM_{10} has been set, emission changes at minor sources after these dates affect Increment for the respective pollutant.

OPC requests Georgia EPD's assistance with the compilation of the regional source inventory identified as consuming Increment as well as determining if the minor source baseline date has been triggered.

CLASS I AREA ANALYSIS

Class I areas are federally protected areas for which more stringent air quality standards apply to protect unique natural, cultural, recreational, and/or historic values. Two principal air quality impacts are considered for Class I areas: PSD Increments for NO_X, SO_2, and PM_{10}, shown in Table 6, and air quality related values (AQRV).

In general, all PSD permit applications are required to demonstrate through air quality modeling that the emissions increases from the proposed project will not cause or contribute to any violations of allowable increments within potentially affected Class I areas, which are protected to a greater degree (i.e., the allowable increments are lower) than Class II areas. A significant contribution to Class I Increment consumption is defined as a modeled concentration in excess of the significant impact levels summarized in Table 6. These significant impact levels, which were originally developed as part of the 1996 New Source Review (NSR) reform rulemaking, have been accepted by decision makers as an indication of whether a project is likely to cause or contribute to a Class I increment violation.

TABLE 6. CLASS I PSD INCREMENTS AND MODELING SIGNIFICANCE LEVELS

Pollutant	Averaging Period	Class I Increment ($\mu g/m^3$)	Significance Level ($\mu g/m^3$)
PM_{10}	24-hour	8.0	0.3
	Annual	4.0	0.2
SO_2	3-hour	25.0	1.0
	24-hour	5.0	0.2
	Annual	2.0	0.1
NO_2	Annual	2.5	0.1

The Federal Land Managers (FLM) for Class I areas have the responsibility to protect air quality related values (AQRV) and to consider in consultation with the permitting authority whether a proposed major emitting facility will have an adverse impact on such values. AQRV for which PSD modeling is typically conducted include visibility and deposition of sulfur and nitrogen.

ADDITIONAL IMPACTS ANALYSIS

PSD regulations require that three additional impact analyses be performed as part of a PSD permit action. These evaluations include a growth analysis, a soil and vegetation analysis, and a visibility analysis. No adverse impacts from growth are anticipated from the proposed project since all construction activities will occur for a finite time period.

To address potential soil and vegetation impacts, two comparisons are used. First, the NAAQS results (or significance results if SILs are not reached) are assessed against the secondary NAAQS standards, which provide protection for public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings. The NAAQS analysis includes emissions from all existing sources and significant regional sources, not only those associated with the proposed project. Additionally, NAAQS impacts will also be compared against conservative screening levels provided by EPA specifically to address potential soil and vegetation impacts.[7]

The remainder of the additional impacts analysis addresses impacts on visibility resulting from coherent plumes emanating from the proposed facility on nearby receptors that are potentially sensitive to plume visibility impacts. The primary variables that affect whether a plume is visible or not at a certain location are (1) quantity of emissions, (2) types of emissions, (3) relative location of source and observer, and (4) the background visibility range.

Class II Modeling Methodology

This section of the modeling protocol describes the specific modeling procedures and data resources utilized in the Class II Area PSD air quality modeling analyses. The techniques proposed for the air quality analysis are consistent with the current *Georgia EPD Guidelines.*

Selection of Model

The Class II PSD air quality modeling analyses will be conducted using the AMS/EPA Regulatory Model (AERMOD version 07026). In November 2005, U.S. EPA promulgated revisions to the *Guideline on Air Quality Models.*[8] AERMOD is a refined, steady-state, multiple source, Gaussian dispersion model.

Receptor Grid and Coordinate System

For this air dispersion modeling analysis, ground level concentrations will be calculated at receptors placed along the fenceline and on a Cartesian receptor grid. Fenceline receptors will be spaced 100 meters apart as specified in the Georgia Air Dispersion Modeling Guidance.[9] Beyond the fenceline, receptors will be spaced 100 meters apart in a Cartesian grid extending to a distance sufficient to resolve the SIA.

Receptor elevations required by AERMOD will be determined using the AERMAP terrain preprocessor (version 09040). AERMAP also calculates hill height parameters required by AERMOD. Terrain elevations from the USGS 1 arc second National Elevation Dataset (NED) will be used for AERMAP processing.

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[7] U.S. EPA, *A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals* (EPA 450/2-81-078), 1981.

[8] U.S. EPA, Office of Air Quality Planning and Standards, *Federal Register* Vol. 70 / No. 216, pp. 68,218-68,261, 40 CFR 51, Appendix W, *Revision to Guideline on Air Quality Models*, November 9, 2005.

[9] http://www.georgiaair.org/airpermit/downloads/infodocs/AirDispModelingGuid_v2.pdf.

In all modeling analysis data files, the location of emission sources, structure, and receptors will be represented in the Universal Transverse Mercator (UTM) coordinate system. The Warren facility is located at approximately 348.56 kilometers East and 3,696.68 kilometers North in UTM Zone 17 (NAD 83).

METEOROLOGICAL DATA

Site-specific dispersion models require a sequential hourly record of dispersion meteorology representative of the region within which the source is located. In the absence of site-specific measurements, the U.S. EPA guidelines recommend the use of readily available data from the closest and most representative National Weather Service (NWS) stations. Regulatory air quality modeling using AERMOD requires five years of quality-assured meteorological data that includes hourly records of the following parameters:

- Wind speed
- Wind direction
- Air temperature
- Micrometeorological Parameters (e.g., friction velocity, Monin-Obukhov length)
- Mechanical mixing height
- Convective mixing height

The first three of these parameters are directly measured by monitoring equipment located at typical surface observation stations. The friction velocity, Monin-Obukhov length, and mixing heights are derived from characteristic micrometeorological parameters and from observed and correlated values of cloud cover, solar insolation, time of day and year, and latitude of the surface observation station. Surface observation stations form a relatively dense network, are almost always found at airports, and are typically operated by the NWS. Upper air stations are fewer in number than surface observing points since the upper atmosphere is less vulnerable to local effects caused by terrain or other land influences and is therefore less variable. The NWS operates virtually all available upper air measurement stations in the United States.

The Warren Site is located approximately 89 km southeast of the Athens (AHN) NWS station, and 124 km northeast of the next nearest NWS station in Macon, Georgia, and each of these stations was considered in the land use analysis discussed in the following section. For the Athens (AHN) NWS, Georgia EPD provided preprocessed meteorological data based on surface observations and upper air measurements from Athens (station 13873), for the 1989-1993 time period.[10] For the Macon (MCN) NWS, Georgia EPD provided preprocessed meteorological data based on surface observations from

[10] This data set was provided via email by Mr. Peter Courtney on January 29, 2009.

Macon (station 03813) and upper air measurements from Centreville (station 3881) for the 1987-1991 time period.[11]

Land Use Representativeness Analysis

AERMOD utilizes planetary boundary layer (PBL) turbulence calculations to characterize the stability of the atmosphere, which is affected by the prevailing meteorological conditions and the land use and cover of the surrounding area. Because site-specific parameters are utilized in the meteorological data files, U.S. EPA made the following recommendation in the March 19, 2009 *AERMOD Implementation Guide*:[12]

> *When applying the AERMET meteorological processor (EPA, 2004a) to prepare the meteorological data for the AERMOD model (EPA, 2004b), the user must determine appropriate values for three surface characteristics: surface roughness length {zo}, albedo {r}, and Bowen ratio {Bo}*
>
> ...
>
> *When using National Weather Service (NWS) data for AERMOD, data representativeness can be thought of in terms of constructing realistic planetary boundary layer (PBL) similarity profiles and adequately characterizing the dispersive capacity of the atmosphere. As such, the determination of representativeness should include a comparison of the surface characteristics (i.e., zo, Bo and r) between the NWS measurement site and the source location, coupled with a determination of the importance of those differences relative to predicted concentrations.*
>
> ...
>
> *If the proposed meteorological measurement site's surface characteristics are determined to NOT be representative of the application site, it may be possible that another nearby meteorological measurement site may be representative of both meteorological parameters and surface characteristics. Failing that, it is likely that site-specific meteorological data will be required.*

The surface characteristics of interest for AERMET – surface roughness, albedo, and Bowen ratio – are based on the land use cover (e.g., urban, agriculture, wetlands, forest, water) in the area upwind of the facility (1 km for surface roughness, 10 km for albedo and Bowen ratio). If two locations have similar land use and cover, then the locations are expected to have similar surface characteristics. Thus, a land use analysis must be performed for the area immediately surrounding the source (the facility) and for the area immediately surrounding the NWS site. In its March 19, 2009 *AERMOD Implementation Guide*, the U.S. EPA states:[13]

> *Based on model formulations and model sensitivities, the relationship between the surface roughness upwind of the measurement site and the measured wind speeds is generally the most important consideration.*
>
> ...

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[11] Ibid.

[12] http://www.epa.gov/scram001/7thconf/aermod/aermod_implmtn_guide_19March2009.pdf, Sections 3.1 and 3.1.1, pages 3-4.

[13] http://www.epa.gov/scram001/7thconf/aermod/aermod_implmtn_guide_19March2009.pdf, Section 3.1.2, pages 4-5.

> *The dependence of meteorological measurements and plume dispersion on Bowen ratio and albedo is very different than the dependence on surface roughness. Effective values for Bowen ratio and albedo are used to estimate the strength of convective turbulence during unstable conditions by determining how much of the incoming radiation is converted to sensible heat flux. These estimates of convective turbulence are not linked as directly with tower measurements as the linkage between the measured wind speed and the estimation of mechanical turbulence intensities driven by surface roughness elements.*

An analysis of the surface characteristics for the facility and two nearby NWS stations, Athens and Macon, Georgia was performed to assess which of the two meteorological datasets better characterize land use conditions at the facility. The tables and figures associated with several comparisons are included in Attachment A. These tables demonstrate that the facility's surface characteristics for albedo and Bowen ratio are similar to the Athens NWS. The facility's surface roughness parameter assignments are equally similar to the Athens and Macon NWS. The surface roughness is evaluated on a sector by sector (30°) basis and over a much smaller area (1 km vs. 10 km). Therefore, there is greater variability between the calculated surface roughness values at the three sites. Given the differing locations (airport vs. site location for a utility), it is unlikely than any other NWS site within Georgia would have significantly better surface characteristics correlation; further, a more distant NWS site would likely have meteorological conditions that are more dissimilar to the facility than either of the Macon or Athens NWS sites. While the surface roughness characteristics of the facility equally resemble the surface roughness characteristics of both Macon and Athens NWS sites, the land use assignment surrounding the facility is more similar to the Macon NWS station. Therefore, the Macon NWS meteorological dataset provides a better representation of the land use conditions at the facility.

Based on those results, OPC proposes to use the Macon NWS station for surface observational meteorological data. OPC will use AERMOD-ready surface and profile meteorological files provided by Georgia EPD for Macon for the modeling analyses.[14] OPC intends to use the Macon airport site characteristics used by Georgia EPD in all modeling performed with AERMOD.

Building Downwash Analysis

AERMOD incorporates the Plume Rise Model Enhancements (PRIME) downwash algorithms. Direction specific building parameters required by AERMOD are calculated using the BPIP-PRIME preprocessor (version 04274).

Representation of Emission Sources

Source Types and Parameters

The AERMOD dispersion model allows for emission units to be represented as point, area, or volume sources. For point sources with unobstructed vertical releases, it is appropriate to use actual stack parameters (i.e., height, diameter, exhaust gas temperature, and gas exit velocity) in the modeling analyses. Based on preliminary source characteristics, OPC anticipates that the biomass boiler, the

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[14] AERMET files were provided via email by Mr. Peter Courtney on January 29, 2009.

emergency generator, the cooling tower and the flyash storage silo will be represented as point sources in the model. Additionally, fugitive emissions from the roads and material handling sources will be quantified and modeled in accordance with the with the U.S. EPA's *Guideline on Air Quality Model,* 40 CFR Part 51, Appendix W (Revised, November 9, 2005), the U.S. EPA's *AERMOD Implementation Guide*[15], and GA EPD's *Guideline for Assuring Acceptable Ambient Concentrations of PM_{10} in areas impacted by Quarry Operations Producing Crushed Stone.* Note that OPC may use wind-speed emission rates for those fugitive sources where the source emission rate is a function of wind speed (e.g., storage piles).

GEP Stack Height Analysis

U.S. EPA has promulgated stack height regulations that restrict the use of stack heights in excess of "Good Engineering Practice" (GEP) in air dispersion modeling analyses. Under these regulations, that portion of a stack in excess of the GEP height is generally not creditable when modeling to determine source impacts. This essentially prevents the use of excessively tall stacks to reduce ground-level pollutant concentrations. The minimum stack height not subject to the effects of downwash, called the GEP stack height, is defined by the following formula:

$H_{GEP} = H + 1.5L$, where:

H_{GEP} = minimum GEP stack height,
H = structure height, and
L = lesser dimension of the structure (height or projected width).

This equation is limited to stacks located within 5L of a structure. Stacks located at a distance greater than 5L are not subject to the wake effects of the structure. The wind direction-specific downwash dimensions and the dominant downwash structures used in this analysis are determined using BPIP. In general, the lowest GEP stack height for any source is 65 meters by default.[16] Based on preliminary estimates, OPC anticipates a release height for the boiler above the default value of 65 meters. An analysis of the boiler stack using BPIP-PRIME will be conducted to ensure that the release height used is within GEP.

Load Modeling Analysis

The *Guideline on Air Quality Models* states that modeling should contain sufficient detail to determine the maximum ambient concentration of the pollutant under consideration, and that this will likely involve modeling several operating loads or production rates. For some types of sources, operating at a reduced load translates into reduced stack gas exit velocities and lower temperatures leading to different and potentially higher impact characteristics.

PSD modeling for the boiler at Warren facility will initially be conducted at different load scenarios to establish the worst-case scenario to carry forward in the significant impact analyses. Five load scenarios

[15] http://www.epa.gov/scram001/7thconf/aermod/aermod_implmtn_guide_19March2009.pdf.

[16] 40 CFR §51.100(ii)

will model the boiler burning biomass at 40%, 60%, 80%, 100% and short-term maximum (valves wide open and overpressure situation) loads. The sixth scenario represents burning biodiesel at startup. Other than emission rate, OPC expects that exhaust flow rate and temperature may change across the scenarios, and these factors will be included in the analysis.

The SCREEN3 model will be used to model a unit emission rate (1 g/s) for each of the scenarios. The resulting impacts will then be scaled using the ratio of the maximum emission rate occuring at that load to the maximum emission rate for each pollutant. The OPC facility is not surrounded by any significant geographical features, therefore terrain elevations will not be input to SCREEN3. Since there may be significant downwash structures present in the vicinity of the boiler, building downwash will be enabled in the modeling analysis. The boiler building is anticipated to be the dominant structure, and thus will be used for downwash in the model.

Ambient Ratio Method (ARM)

The Ambient Ratio Method (ARM) has evolved from previous representations of the oxidation of nitric oxide (NO) by ambient ozone and other photochemical oxidants to form nitrogen dioxide (NO_2 – the regulated ambient pollutant). The ARM is an approach contained in Section 6.2.3, *Models for Nitrogen Dioxide (Annual Average)*, of U.S. EPA's *Guideline on Air Quality Models (Guideline)*, in 40 CFR Part 51, Appendix W. The *Guideline* provides that:

a. *A tiered screening approach is recommended to obtain annual average estimates of NO_2 from point sources for New Source Review analysis, including PSD… For Tier 1 … use an appropriate Gaussian model to estimate the maximum annual average concentration and assume a total conversion of NO to NO_2. If the concentration exceeds the NAAQS and/or PSD Increments for NO_2, proceed to the 2nd level screen.*

b. *For Tier 2 (2nd level) screening analysis, multiply the Tier 1 estimate(s) by an empirically derived NO_2/NO_X value of 0.75 (annual national default).*

The thresholds presented in Tables 2 through 6 are as NO_2. OPC will conservatively model NO_x emissions as NO_2. OPC will only apply the ARM Tier-2 default ratio in the event that compliance cannot be shown by using NO_X emissions to represent NO_2.

Class I Area Modeling Methodology

The Warren facility is located more than 200 km from the closest Class I area, the Shining Rock Wilderness area. Based on current FLM recommendations, impacts on Class I areas more than 300 km distant from the proposed project should not be considered. Table 7 shows the preliminary potential emissions of visibility- affecting and acidic pollutants from the proposed boiler, the primary emission source at the Warren facility. Table 8 details the Class I areas located at a distance of less than 300 km from the proposed facility.

Preliminary modeling results indicate that ambient concentrations within the Class II receptor grid (at a distance of 20 km from the proposed facility in the direction of the closest Class I area, the Shining Rock

Wilderness area) fall below the Class I Significance Levels. Therefore, OPC proposes to present the results from the Class II analysis as sufficient demonstration of compliance with Class I PSD Increment, and requests Georgia EPD confirmation that no further Class I PSD Increment modeling is necessary for the proposed project.

TABLE 7. SUMMARY OF VISIBILITY-AFFECTING POLLUTANT EMISSIONS

Pollutant	Projected Emissions (tpy)
NO_X	548
PM_{10}	98
SO_2	55
H_2SO_4	0.3
Total	**658**

TABLE 8. SUMMARY OF CLASS I AREAS WITHIN 300 KM OF THE WARREN FACILITY

Site	D (km)	Q/D
Shining Rock Wilderness Area	216	3.25
Great Smoky Mountain National Park	240	2.91
Cohutta Wilderness Area	242	2.90
Joyce Kilmer Slickrock Wilderness Area	248	2.83
Wolf Island Nat'l Wildlife Refuge	256	2.74
Okefenokee Nat'l Wildlife Refuge	261	2.69
Linville Gorge Wilderness Area	276	2.54
Cape Romain Nat'l Wildlife Refuge	283	2.48

In addition to the Class I Increment analysis, OPC must consider the impact of the proposed project on the AQRV at potentially-affected Class I areas. When considering the ratio of emissions increases to Class I distance (e.g., Q/D) for this project, it is unlikely that any FLM will require a full AQRV analysis. Table 8 shows the preliminary Q/D for all Class I areas within 300 km from the proposed facility. The preliminary Q/D values range from 3.05 to 2.32. The U.S. EPA's Best Available Retrofit Technology (BART) guidelines for the Regional Haze Rule[17] states that a Q/D value of ten or less indicates that AQRV analyses should not be required; assuming that the BACT analysis performed as part of the emission calculations is approved (similar screening thresholds were proposed in the current draft revisions to the Federal Land Manager AQRV guidelines [FLAG]) . Pending Georgia EPD concurrence, OPC will request confirmation from the FLMs that no AQRV modeling is necessary for the proposed project.

17 EPA, *Regional Haze Regulations and Guidelines for Best Available Retrofit Technology (BART) Determinations; Final Rule, Federal Register Volume 70, No. 128, July 6, 2005.*

ADDITIONAL IMPACTS MODELING METHODOLOGY

The required additional impacts evaluations include a growth analysis, a soil and vegetation analysis, and a plume visibility analysis. To assess soil and vegetation impacts, the modeling results from the PSD NAAQS are assessed against the secondary NAAQS standards and EPA's soils/vegetation screening guidelines. This analysis includes emissions from all existing sources and significant regional sources, not only those associated with the proposed project.

The plume visibility analysis addresses impacts resulting from coherent plumes emanating from the proposed facility. The primary variables that affect whether a plume is visible or not at a certain location are (1) quantity of emissions, (2) types of emissions, (3) relative location of source and observer, and (4) the background visibility range. To ensure that no adverse impacts would result, a VISCREEN analysis will be conducted to assess the impact on plume visibility at a sensitive receptor in the area. The Thomson McDuffie-Regional Airport is located approximately 14 km from the Warren site and OPC proposes to assess potential impacts on visibility this airport. Screening techniques are applied per the *Workbook for Plume Visual Impact Screening and Analysis,* which specifies a background visual range of 20 km for the area under consideration.

In the visibility analysis, the PM_{10}, NO_X and primary sulfate (H_2SO_4) emissions from the project are used as inputs to the model. For views at the area selected, calculations are performed by the model for two assumed plume-viewing backgrounds: the horizon sky and a dark terrain object. VISCREEN assumes that the terrain object is black and located adjacent to the plume on the side of the centerline opposite the observer. The VISCREEN model output shows separate tables for inside and outside of the sensitive area. Each table contains several variables: theta, azi, distance, alpha, critical and actual plume ΔE, and critical and actual plume contrast. These variables are defined as:

1. *Theta* – Scattering angle (the angle between direction solar radiation and the line of sight). If the observer is looking directly at the sun, theta equals zero degrees. If the observer is looking away from the sun, theta equals 180 degrees.
2. *Azi* – The azimuthal angle between the line connecting the observer and the line of sight.
3. *Alpha* – The vertical angle between the line of sight and the plume centerline.
4. ΔE – Used to characterize the perceptibility of a plume on the basis of the color difference between the plume and a viewing background. A ΔE less than 2.0 signifies that the plume is not perceptible.
5. *Contrast* – The contrast at a given wavelength of two colored objects such as plume/sky or plume/terrain.

The analysis is considered satisfactory if ΔE and *Contrast* are less than critical screening values of 2.0 and 0.05, respectively.

If necessary, a Level-2 VISCREEN analysis will be conducted to assess the impact on plume visibility. For a Level 2 analysis, several refinements to can be made, including using more appropriate meteorological parameters through an examination of the five years of meteorological data used in the dispersion modeling analysis. When using Level 2 meteorological data, the frequency of occurrence of each wind speed and stability class pair is determined, and the wind speed/stability class pairs are ranked according to the *Workbook for Plume Visual Impact Screening and Analysis*. If a Level 2 analysis is necessary, meteorological data from the Macon NWS for years 1987-1991 will be used to determine the frequency of occurrence of each wind speed and stability class pair. OPC requests the necessary data from Georgia EPD to prepare the input for Level 2 VISCREEN.[18]

Toxic Air Pollutant Modeling

The evaluation of ambient impacts of toxic pollutant emissions will be submitted in accordance to the Georgia's *Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions* (June 21, 1998), which was issued by the Georgia EPD Air Protection Branch pursuant to the provisions of GRAQC 391-3-1-.02(2)(a)3.(ii).
According to the *Guideline*, dispersion modeling should be completed for potentially toxic pollutants having quantifiable emission increases. The *Guideline* infers that a pollutant is identified as a toxic pollutant if any of the following toxicity-determined values have been established for that pollutant. The *Guideline* specifies that the resources used to develop the long-term and short-term acceptable ambient concentrations (AAC) of toxic air pollutants should be referenced in the priority schedule shown following.

- U.S. EPA Integrated Risk Information System (IRIS) reference concentration (RfC) or unit risk;
- Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PEL);
- American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLV);
- National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limits (REL); and
- Lethal Dose – 50% (LD50) Standards.

OPC will detail the methodology for identifying TAP in the analysis included as part of the application submittal.

A preliminary assessment of the air toxic impact will be conducted using the SCREEN3 model. If preliminary screening results show that refined modeling is required, either the AREMOD or ISCST3 (02035) models will be used to complete the air dispersion analysis.

If AERMOD will be used, all applicable elements of the modeling methodology outlined for the PSD air dispersion modeling analysis will be utilized as developed for that analysis. If ISCST3 will be used, the refined modeling procedures outlined in the *Guideline* will be utilized.

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[18] VISCREEN Level 2 requires frequency of wind speed and stability class, which is provided in the obsolete ISCST3 meteorological data sets. Since Georgia EPD processes the raw data to arrive at the AERMOD data sets, OPC seeks these raw data from Georgia EPD for the VISCREEN Level 2. Alternatively, OPC can process the raw data following EPA's procedures for creating ISCST3 meteorological data.

SUMMARY AND APPROVAL OF MODELING PROTOCOL

Trinity is supplying this written preliminary protocol so that EPD can formally comment on and approve the methodologies to be used for this analysis. Please provide a response to this protocol with comments for our project record at your earliest convenience. If you have any questions about the material presented in this letter, require additional information, or would like to talk about any of the proposed methods, please do not hesitate to call me at 770-270-7166.

Sincerely,

OGLETHORPE POWER CORPORATION

Doug J. Fulle
Vice President, Environmental Affairs

Attachment

cc: Ms. Wende Martin (OPC)
Mr. Mike Bilello (OPC)
Mr. Russell Bailey (Trinity)

Attachment A

Land Use Representativeness Comparison Information

To define the land use characteristics and micrometeorological parameters in the areas of interest, Trinity Consultants (Trinity) utilized the U.S. EPA program AERSURFACE (version 08009) to analyze a digital mapping of land use and cover; specifically the 30-meter resolution USGS digital National Land Cover Data (NLCD) from 1992, as is recommended for usage with AERSURFACE.[1]

AERSURFACE resolves predominant land cover types into a grid comprising 30 meter-by-30 meter cells extending out to a specified distance from the center of the facility or NWS site; the recommended distance is 1 km for surface roughness and 10 km for albedo and Bowen ratio. The data, which contain the land use category code and coordinates for each cell, are used by AERSURFACE to calculate the wind sectors and determine the weighted percentage of each land use type contained within each of the twelve 30-degree sectors; note that albedo and Bowen ratio are constant for each of the sectors, varying only seasonally. The weighted percentages of each land use type are then utilized to calculate the weighted average surface parameters (Bowen ratio, albedo, and surface roughness) for each of the sectors.

Figure A-1 illustrates the land use and cover for the Warren site based on the grid cell assignments contained in the AERSURFACE roughness domain output file. The circle in the figure denotes a 1 km radius around the center of the facility; individual sectors are also shown in black. Two similar figures for the Athens and Macon NWS stations were created by Trinity using the AERSURFACE grid cell assignments (from AERSURFACE runs prepared using the NWS coordinates from the National Oceanic and Atmospheric Administration [NOAA] website) and are included as Figures A-2 and A-3.[2]

[1] http://seamless.usgs.gov/website/seamless/viewer.htm

[2] http://mi3.ncdc.noaa.gov/mi3qry/login.cfm

FIGURE A-1. LAND USE CATEGORIES FOR THE 1-KM AREA SURROUNDING THE WARREN FACILITY

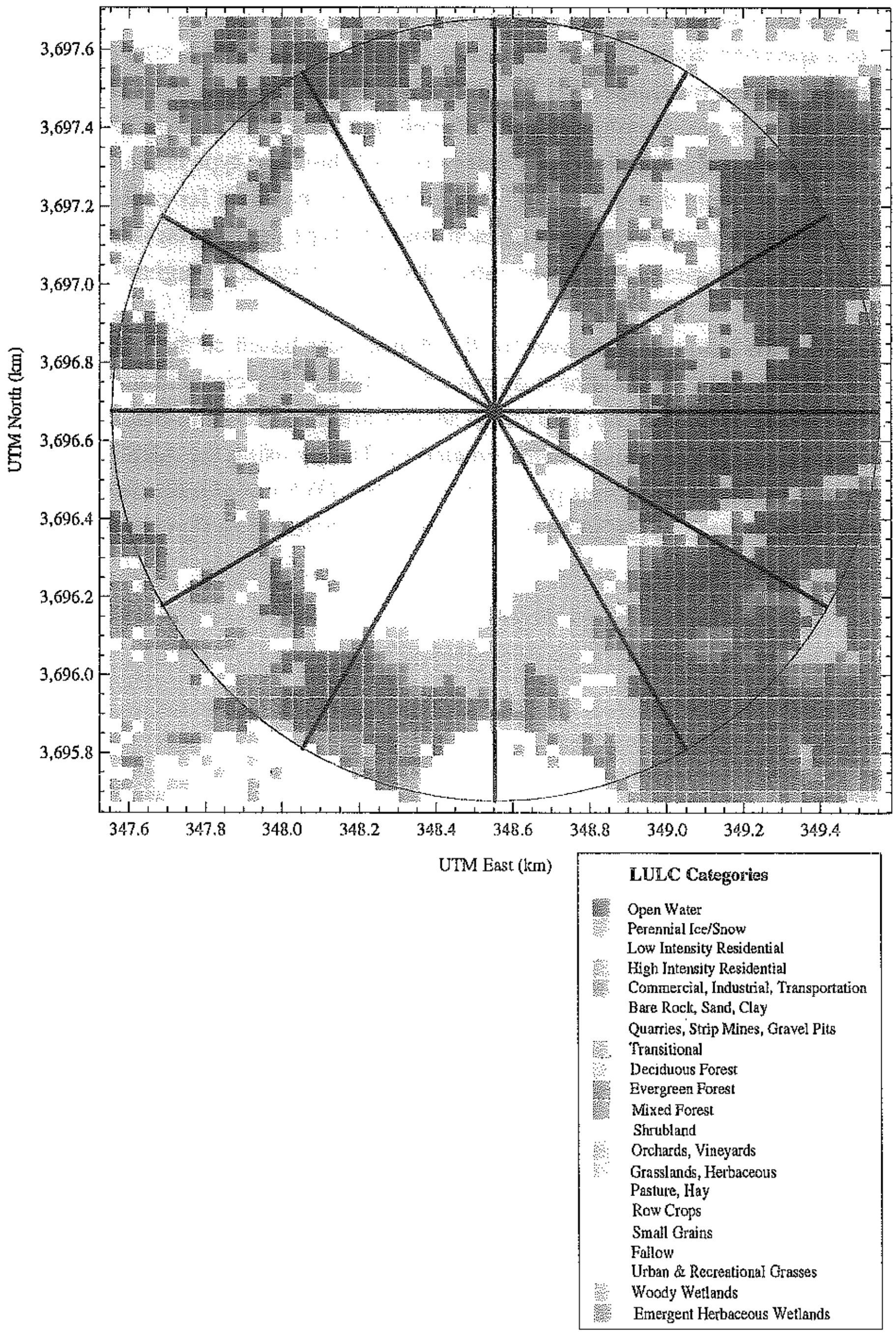


FIGURE A-2. LAND USE CATEGORIES FOR THE 1-KM AREA SURROUNDING THE ATHENS NWS

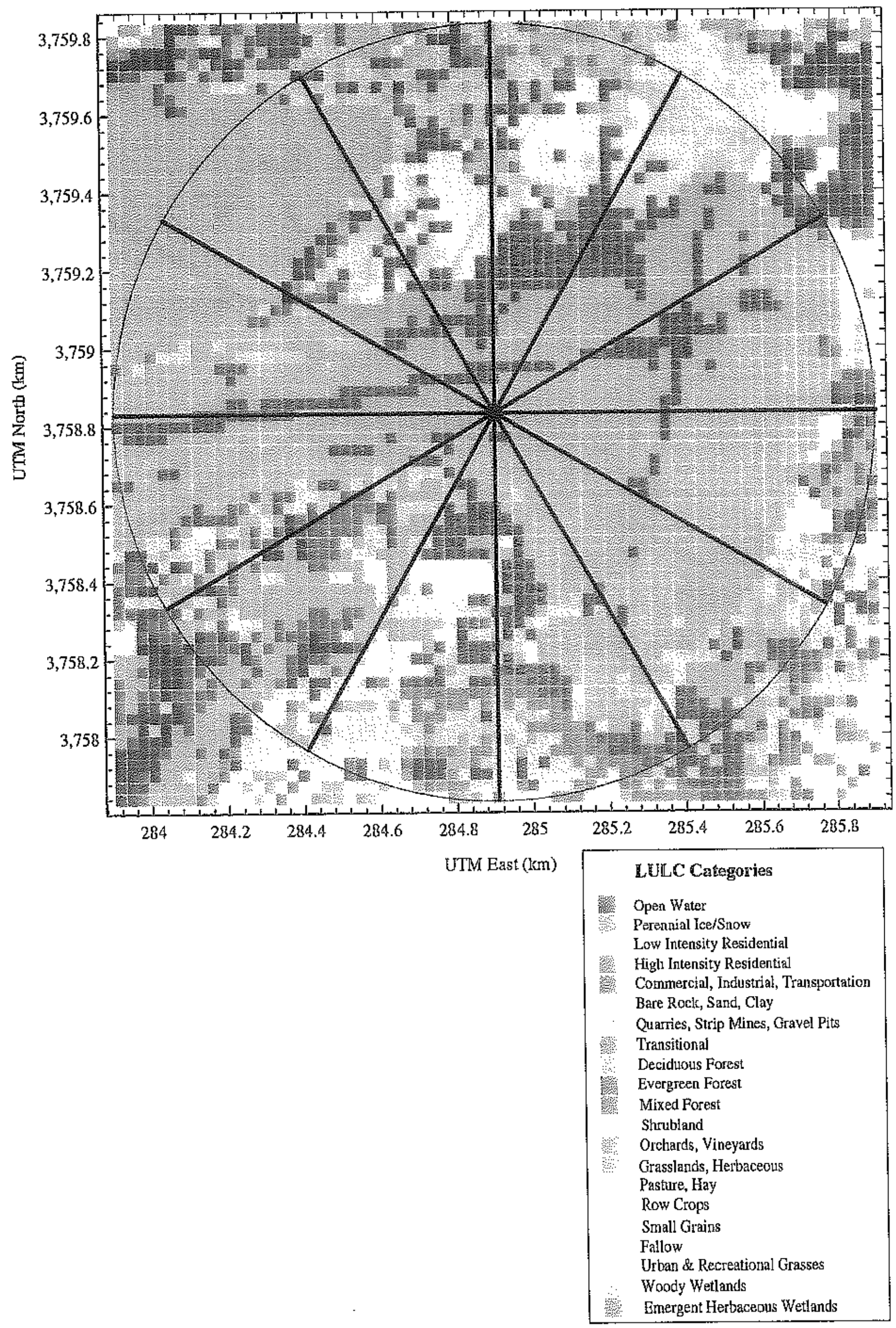
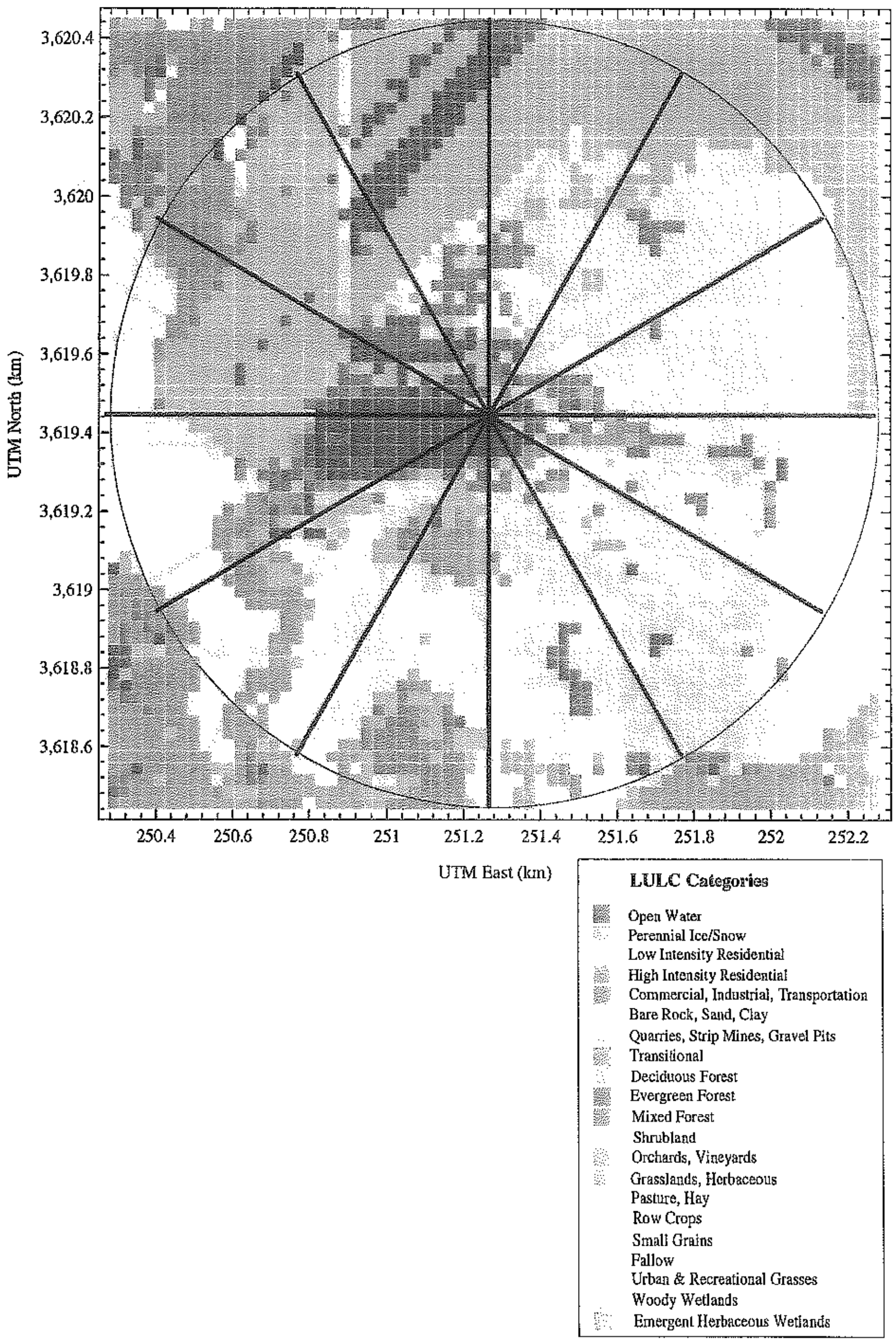


FIGURE A-3. LAND USE CATEGORIES FOR THE 1-KM AREA SURROUNDING THE MACON NWS



Inspection of the land use figures shows that the land use surrounding the proposed facility location appears to be most similar to the Macon NWS station with both areas predominately having agricultural (row crops) and forested areas. The Athens NWS station has large areas of urban and recreational grasses, low and high intensity residential, and commercial/industrial/transportation assignments.

To facilitate a quantitative comparison of surface characteristics, Trinity utilized AERSURFACE to determine the weighted average parameters for the facility and the NWS sites based on the 1992 NLCD data. The geographic coordinates for the two NWS sites extracted from the NOAA website were used for the center of the study area for the NWS sites while an approximate central location was used as the center of the facility study area. Because the facility and NWS sites are located in a temperate region that experiences weather conditions typical of varying seasons, seasonal average parameters were computed for each season; the seasonal assignment "Winter" values were assigned by AERSURFACE based on no "continuous snow cover for most of winter". The analysis was completed for dry, wet, and average moisture conditions (moisture conditions impact the Bowen ratio parameters assigned). Copies of the AERSURFACE output files are included as an electronic attachment.

Table A-1 presents a summary of the parameter values utilized to compute the weighted average parameters, while Table A-2 presents the surface characteristics determined by AERSFURACE for the Facility. All parameter values are based on the values recommended in U.S. EPA's *AERMET User's Guide.*[3]

Tables A-3 through A-5 present various comparisons of the parameter assignments, considering annual averages, seasonal averages, and overall differences.[4] Figure A-4 includes a quantitative review of the land use assignments. These comparisons illustrate that the albedo for both Athens and Macon NWS are very similar to each other. While Bowen ratio parameter assignments for the facility are most similar to the Athens NWS, there is no significant difference between the two NWS sites on Bowen ratio. The facility's surface roughness parameter assignments are equally similar to the Macon NWS and Athens NWS. Figure A-4 illustrates that the facility's actual land use assignments are more similar to the Macon NWS site.

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[3] U.S. EPA, *User's Guide for the AERMOD Meteorological Preprocessor (AERMET)*, EPA-454/B-03-002, November 2004.

[4] Analyses presented based on methodology recommended by the Alabama Department of Environmental Management (ADEM).

TABLE A-1. AERMET PARAMETER VALUES

Landuse	Albedo				Surface Roughness				Bowen Ratio (Average Moisture)				Bowen Ratio (Dry Conditions)				Bowen Ratio (Wet Conditions)			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Water	0.12	0.10	0.14	0.20	0.0001	0.0001	0.0001	0.0001	0.1	0.1	0.1	1.5	0.1	0.1	0.1	2.0	0.1	0.1	0.1	0.3
Deciduous Forest	0.12	0.12	0.12	0.50	1.00	1.30	0.80	0.50	0.7	0.3	1.0	1.5	1.5	0.6	2.0	2.0	0.3	0.2	0.4	0.5
Coniferous Forest	0.12	0.12	0.12	0.35	1.30	1.30	1.30	1.30	0.7	0.3	0.8	1.5	1.5	0.6	1.5	2.0	0.3	0.2	0.3	0.3
Swamp/Wetlands	0.12	0.14	0.16	0.30	0.20	0.20	0.20	0.05	0.1	0.1	0.1	1.5	0.2	0.2	0.2	2.0	0.1	0.1	0.1	0.5
Cultivated Land	0.14	0.20	0.18	0.60	0.03	0.20	0.05	0.01	0.3	0.5	0.7	1.5	1.0	1.5	2.0	2.0	0.2	0.3	0.4	0.5
Grassland	0.18	0.18	0.20	0.60	0.50	0.10	0.01	0.001	0.4	0.8	1.0	1.5	1.0	2.0	2.0	2.0	0.3	0.4	0.5	0.5
Urban	0.14	0.16	0.18	0.35	1.00	1.00	1.00	1.00	1.0	2.0	2.0	1.5	2.0	4.0	4.0	2.0	0.5	1.0	1.0	0.5
Desert Shrubland	0.30	0.28	0.28	0.45	0.30	0.30	0.30	0.15	3.0	4.0	6.0	6.0	5.0	6.0	10.0	10.0	1.0	1.5	2.0	2.0

TABLE A-2. AERSURFACE ASSIGNMENTS FOR THE WARREN FACILITY

Sector	Albedo				Surface Roughness				Bowen Ratio (Average Moisture)				Bowen Ratio (Dry Conditions)				Bowen Ratio (Wet Conditions)			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
1 (0-30 deg)	0.14	0.16	0.16	0.16	0.213	0.541	0.541	0.153	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38
2 (30-60 deg)	0.14	0.16	0.16	0.16	0.140	0.425	0.425	0.100	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38
3 (60-90 deg)	0.14	0.16	0.16	0.16	0.406	0.729	0.729	0.318	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38
4 (90-120 deg)	0.14	0.16	0.16	0.16	0.363	0.597	0.597	0.307	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38
5 (120-150 deg)	0.14	0.16	0.16	0.16	0.422	0.749	0.749	0.332	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38
6 (150-180 deg)	0.14	0.16	0.16	0.16	0.207	0.538	0.538	0.144	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38
7 (180-210 deg)	0.14	0.16	0.16	0.16	0.099	0.363	0.363	0.069	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38
8 (210-240 deg)	0.14	0.16	0.16	0.16	0.089	0.333	0.333	0.064	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38
9 (240-270 deg)	0.14	0.16	0.16	0.16	0.112	0.384	0.384	0.075	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38
10 (270-300 deg)	0.14	0.16	0.16	0.16	0.105	0.369	0.369	0.071	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38
11 (300-330 deg)	0.14	0.16	0.16	0.16	0.046	0.223	0.223	0.032	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38
12 (330-360 deg)	0.14	0.16	0.16	0.16	0.042	0.179	0.179	0.030	0.52	0.38	0.81	0.81	1.28	0.87	1.77	1.77	0.27	0.25	0.38	0.38

TABLE A-3. COMPARISON OF AERSURFACE ASSIGNMENTS, ANNUAL AVERAGES

Albedo Assignments

Sector	Athens NWS (AHN) Average	Macon NWS (MCN) Average	Facility Average	Facility % of AHN[1]	Facility % of MCN[1]
All	0.158	0.163	0.155	2%	5%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Bowen Ratio Assignments - Average Moisture

Sector	Athens NWS (AHN) Average	Macon NWS (MCN) Average	Facility Average	Facility % of AHN[1]	Facility % of MCN[1]
All	0.73	0.51	0.63	13%	24%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Bowen Ratio Assignments - Dry Conditions

Sector	Athens NWS (AHN) Average	Macon NWS (MCN) Average	Facility Average	Facility % of AHN[1]	Facility % of MCN[1]
All	1.62	1.00	1.42	12%	43%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Bowen Ratio Assignments - Wet Conditions

Sector	Athens NWS (AHN) Average	Macon NWS (MCN) Average	Facility Average	Facility % of AHN[1]	Facility % of MCN[1]
All	0.38	0.28	0.32	15.8%	16.4%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Surface Roughness Assignments

Sector	Athens NWS (AHN) Average	Macon NWS (MCN) Average	Facility Average	Facility % of AHN[1]	Facility % of MCN[1]
1	0.090	0.056	0.362	303%	552%
2	0.040	0.073	0.273	586%	276%
3	0.026	0.103	0.546	1978%	430%
4	0.028	0.134	0.466	1579%	248%
5	0.027	0.087	0.563	2005%	551%
6	0.040	0.067	0.357	786%	432%
7	0.109	0.112	0.224	106%	100%
8	0.298	0.114	0.205	31%	80%
9	0.097	0.027	0.239	147%	776%
10	0.035	0.016	0.229	553%	1,374%
11	0.072	0.066	0.131	81%	98%
12	0.057	0.044	0.108	90%	143%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Table A-4. Comparison of AERSURFACE Assignments, Seasonal Averages

Albedo Assignments

	Athens NWS (AHN)				Macon NWS (MCN)				Facility (as % of AHN)[1]				Facility (as % of MCN)[1]			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Seasonal Average	0.15	0.16	0.16	0.16	0.15	0.17	0.17	0.16	0.14	0.16	0.16	0.16	0.14	0.16	0.16	0.16
% of NWS[1]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	7%	0%	0%	0%	7%	6%	6%	0%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Bowen Ratio Assignments - Average Moisture

	Athens NWS (AHN)				Macon NWS (MCN)				Facility (as % of AHN)[1]				Facility (as % of MCN)[1]			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Seasonal Average	0.64	0.46	0.90	0.90	0.39	0.41	0.59	0.64	0.52	0.38	0.81	0.81	0.52	0.38	0.81	0.81
% of NWS[1]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	19%	17%	10%	10%	33%	7%	37%	27%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Bowen Ratio Assignments - Dry Conditions

	Athens NWS (AHN)				Macon NWS (MCN)				Facility (as % of AHN)[1]				Facility (as % of MCN)[1]			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Seasonal Average	1.52	1.03	1.96	1.96	0.83	0.83	1.16	1.16	1.28	0.87	1.77	1.77	1.28	0.87	1.77	1.77
% of NWS[1]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	16%	16%	10%	10%	54%	5%	53%	53%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Bowen Ratio Assignments - Wet Conditions

	Athens NWS (AHN)				Macon NWS (MCN)				Facility (as % of AHN)[1]				Facility (as % of MCN)[1]			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Seasonal Average	0.35	0.31	0.43	0.43	0.23	0.25	0.31	0.31	0.27	0.25	0.38	0.38	0.27	0.25	0.38	0.38
% of NWS[1]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	23%	19%	12%	12%	17%	0%	23%	23%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Surface Roughness Assignments

	Athens NWS (AHN)				Macon NWS (MCN)				Facility (as % of AHN)[1]				Facility (as % of MCN)[1]			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
Seasonal Average	0.069	0.097	0.087	0.053	0.043	0.114	0.111	0.032	0.187	0.453	0.453	0.141	0.187	0.453	0.453	0.141
% of NWS[1]	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	170%	369%	419%	168%	340%	298%	310%	340%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Table A-5. Comparison of AERSURFACE Assignments, Differences

Albedo Assignments

Sector	Athens NWS (AHN)				Macon NWS (MCN)				Facility				Difference Between Athens & Facility				Difference Between Macon & Facility				Facility (as % of AHN)[1]				Facility (as % of MCN)[1]			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
All	0.15	0.16	0.16	0.16	0.15	0.17	0.17	0.16	0.14	0.16	0.16	0.16	0.01	-	-	-	0.01	0.01	0.01	-	7%	0%	0%	0%	7%	6%	6%	0%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Bowen Ratio Assignments - Average Moisture

Sector	Athens NWS (AHN)				Macon NWS (MCN)				Facility				Difference Between Athens & Facility				Difference Between Macon & Facility				Facility (as % of AHN)[1]				Facility (as % of MCN)[1]			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
All	0.64	0.46	0.90	0.90	0.39	0.41	0.59	0.64	0.52	0.38	0.81	0.81	0.12	0.08	0.09	0.09	(0.13)	0.03	(0.22)	(0.17)	19%	17%	10%	10%	33%	7%	37%	27%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Bowen Ratio Assignments - Dry Conditions

Sector	Athens NWS (AHN)				Macon NWS (MCN)				Facility				Difference Between Athens & Facility				Difference Between Macon & Facility				Facility (as % of AHN)[1]				Facility (as % of MCN)[1]			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
All	1.52	1.03	1.96	1.96	0.83	0.83	1.16	1.16	1.28	0.87	1.77	1.77	0.24	0.16	0.19	0.19	(0.45)	(0.04)	(0.61)	(0.61)	16%	16%	10%	10%	54%	5%	53%	53%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Bowen Ratio Assignments - Wet Conditions

Sector	Athens NWS (AHN)				Macon NWS (MCN)				Facility				Difference Between Athens & Facility				Difference Between Macon & Facility				Facility (as % of AHN)[1]				Facility (as % of MCN)[1]			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
All	0.35	0.31	0.43	0.43	0.23	0.25	0.31	0.31	0.27	0.25	0.38	0.38	0.08	0.06	0.05	0.05	(0.04)	-	(0.07)	(0.07)	23%	19%	12%	12%	17%	0%	23%	23%

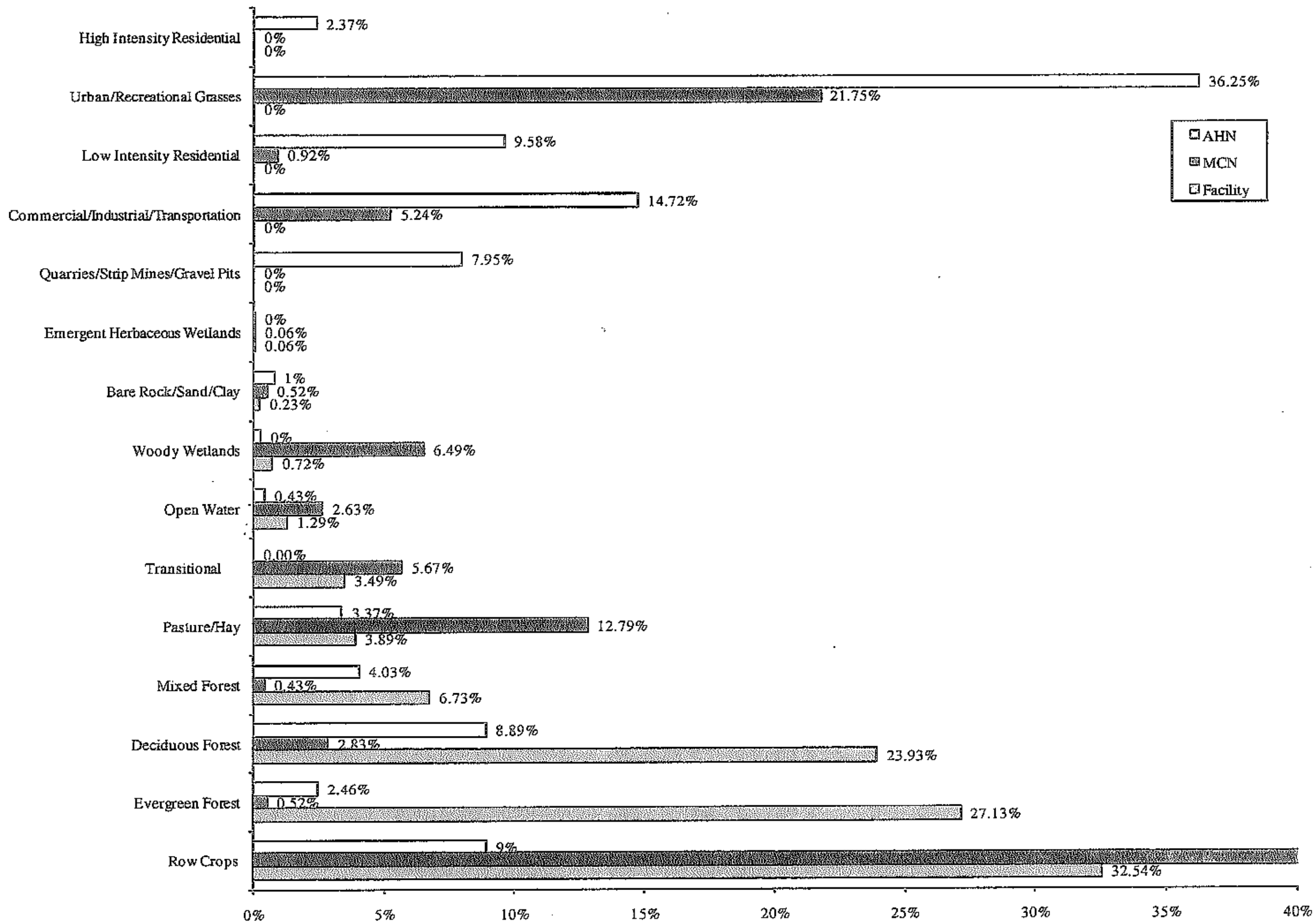
1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

Surface Roughness Assignments

Sector	Athens NWS (AHN)				Macon NWS (MCN)				Facility				Difference Between Athens & Facility				Difference Between Macon & Facility				Facility (as % of AHN)[1]				Facility (as % of MCN)[1]			
	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall	Winter
1	0.072	0.119	0.111	0.057	0.040	0.080	0.072	0.030	0.213	0.541	0.541	0.153	-0.141	-0.422	-0.430	-0.096	-0.173	-0.461	-0.469	-0.123	196%	355%	387%	168%	433%	576%	651%	410%
2	0.032	0.055	0.048	0.024	0.035	0.119	0.111	0.025	0.140	0.425	0.425	0.100	-0.108	-0.370	-0.377	-0.076	-0.105	-0.306	-0.314	-0.075	338%	673%	785%	317%	300%	257%	283%	300%
3	0.026	0.034	0.027	0.018	0.039	0.174	0.172	0.027	0.406	0.729	0.729	0.318	-0.380	-0.695	-0.702	-0.300	-0.367	-0.555	-0.557	-0.291	1,462%	2,044%	2,600%	1,667%	941%	319%	324%	1,078%
4	0.027	0.037	0.029	0.018	0.065	0.211	0.210	0.049	0.363	0.597	0.597	0.307	-0.336	-0.560	-0.568	-0.289	-0.298	-0.386	-0.387	-0.258	1,244%	1,514%	1,959%	1,606%	458%	183%	184%	527%
5	0.026	0.035	0.028	0.018	0.037	0.141	0.141	0.027	0.422	0.749	0.749	0.332	-0.396	-0.714	-0.721	-0.314	-0.385	-0.608	-0.608	-0.305	1,523%	2,040%	2,575%	1,744%	1,041%	431%	431%	1,130%
6	0.040	0.050	0.041	0.030	0.030	0.108	0.108	0.022	0.207	0.538	0.538	0.144	-0.167	-0.488	-0.497	-0.114	-0.177	-0.430	-0.430	-0.122	418%	976%	1,212%	380%	590%	398%	398%	555%
7	0.094	0.136	0.127	0.077	0.066	0.165	0.165	0.050	0.099	0.363	0.363	0.069	-0.005	-0.227	-0.236	0.008	-0.033	-0.198	-0.198	-0.019	5%	167%	186%	10%	50%	120%	120%	38%
8	0.269	0.371	0.353	0.200	0.067	0.168	0.168	0.051	0.089	0.333	0.333	0.064	0.180	0.038	0.020	0.136	-0.022	-0.165	-0.165	-0.013	67%	10%	6%	68%	33%	98%	98%	25%
9	0.095	0.117	0.103	0.072	0.021	0.036	0.035	0.017	0.112	0.384	0.384	0.075	-0.017	-0.267	-0.281	-0.003	-0.091	-0.348	-0.349	-0.058	18%	228%	273%	4%	433%	967%	997%	341%
10	0.035	0.043	0.036	0.026	0.013	0.020	0.018	0.011	0.105	0.369	0.369	0.071	-0.070	-0.326	-0.333	-0.045	-0.092	-0.349	-0.351	-0.060	200%	758%	925%	173%	708%	1,745%	1,950%	545%
11	0.068	0.087	0.078	0.056	0.058	0.085	0.076	0.045	0.046	0.223	0.223	0.032	0.022	-0.136	-0.145	0.024	0.012	-0.138	-0.147	0.013	32%	156%	186%	43%	21%	162%	193%	29%
12	0.048	0.075	0.066	0.037	0.039	0.057	0.050	0.031	0.042	0.179	0.179	0.030	0.006	-0.104	-0.113	0.007	-0.003	-0.122	-0.129	0.001	13%	139%	171%	19%	8%	214%	258%	3%

1. Calculated as the absolute value of (NWS average - facility average)/NWS average.

FIGURE A-4. COMPARISON OF LAND USE CATEGORIES



Georgia Department of Natural Resources

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4244 International Parkway • Suite 120 • Atlanta • Georgia 30354
404/363-7000 • Fax: 404/363-7100
Chris Clark, Commissioner
Dr. Carol A. Couch, Director
James A. Capp, Air Branch Chief

July 2, 2009

Forwarded to: Doug.Fulle@OPC.com
SSimonson@trinityconsultants.com

Mr. Doug J. Fulle
V.P. Environmental Affairs
Oglethorpe Power Corporation
2100 East Exchange Place
Tucker, GA 30084-5336

Subject: **Review of PSD Air Dispersion Modeling Protocol**
Oglethorpe Power Proposed Biomass-fired Power Plant, Warren County, GA

Dear Sirs:

Your air quality dispersion modeling protocol, cover letter dated April 28, 2009, which addresses the proposed greenfield development of a 100 MW biomass-fired power plant near Warrenton, Ga., generally conforms to the procedures and guidelines we use to assess Prevention of Significant Deterioration (PSD) modeling projects. However, we do have the following comments:

1. Based on the information provided in the protocol, the proposed facility may exceed the PSD-significant emission rates of NO_2, SO_2, CO, VOCs, and PM10/2.5. The facility will also be a source of air toxics emissions. This leads to the following:

   a. Project NOx emissions should be evaluated using the Ambient Ratio Method from Significance to refined modeling (see attached EPA memorandum). This should be clearly stipulated and consistently applied to expedite model review. The minor source baseline date for NO_2 in Warren County has not yet been triggered. You may wish to evaluate worst-case 1-hour NO_2 concentrations for potential excess of significance levels, in case the revised primary NO_2 NAAQS are promulgated (court-ordered to be signed by Jan 22, 2010) prior to final permit issuance. If the project net emissions model to exceed significance level(s), refined modeling for NAAQS and Increment comparison should be conducted using the highest 4^{th} highest 1-hour average concentration as a design concentration (as well as the maximum of the highest annual average concentrations). Please use a conservative ambient 1-hour average NO_2 concentration of 50 $\mu g/m^3$ to address NAAQS conformance with this standard (based on maximum hourly NO_2 concentrations measured at the Yorkville monitor), if necessary. The annual ambient background concentration of 7.2 $\mu g/m^3$ should be used to add to the maximum modeled annual average concentration for comparison to that NAAQS (same monitor, average of the last five years).

   b. Project SO_2 emissions may not cause impacts in excess of PSD significance levels. However, background ambient concentrations of 59, 24, and 5.2 $\mu g/m^3$ may be added to modeled refined NAAQS 3-hour, 24-hour, and annual concentrations for comparison to the NAAQS SO_2 standards, if necessary. These ambient concentrations are five-year averages of the design values from the Bibb County EPD monitor. The minor source baseline date in Warren County has not yet been triggered.

c. It is GA EPD's current understanding that CO may not require refined modeled impacts analysis. Acceptable background ambient concentrations of CO to be used to assess modeled compliance with the 1- and 8-hr average CO NAAQSs, are 1210 $\mu g/m^3$ and 939 $\mu g/m^3$, respectively (5-year average 2^{nd}-highs in Paulding County). Should the maximum-modeled CO concentration(s) be assessed to exceed the Significance levels, the NEI may be used to identify offsite sources of CO, but since the CO NAAQSs are short-term, the GA EPD permit files may need to be reviewed to provide the potential emissions necessary for inclusion in the modeled NAAQSs compliance assessment. Since the standards are both short-term, they will be assessed against the highest 2^{nd} high modeled concentrations. Emphasis should be placed on defining the worst-case, short-term CO emission rate (perhaps during start-up), for both Significance modeling and, if necessary, refined modeling. For many projects, this has involved proposing and modeling separate 1- and 8-hr start-up emissions scenario(s).

d. The Minor Source Baseline date for TSP/PM10/PM2.5 emissions in Warren Co. was established in 11/19/97. U.S. EPA has stipulated that, until PM2.5 Significance levels, monitoring *de minimis* concentrations, and Increments (and sufficient emission factors) are established, PM10 air quality standards are to act as surrogates for PM2.5. For this reason, it will be necessary to assess modeled annual (as well as 24-hr) average PM10 Class II Increment and NAAQSs compliance. Available sources of offsite PM10 emissions include the GA EPD spreadsheet of 'Potential' emissions of Increment-consuming sources for compilation of the offsite Increment and NAAQS source inventory, and the Title V air permit applications located on the Georgiaair.org website. The latter, and paper permit file review, are regarded as more current sources of potential emissions (See draft attachments on inventory preparation for more detail). The 2005 NEI database may be used to derive applicable stack exhaust characteristics for such sources.

   Review of the PM10/PM2.5 modeling analyses will be expedited by use of the short-term 'Potential' emission rates for both the 24-hr average and the annual average Increment and NAAQSs modeling, but is required for the 24-hr average modeling assessments. Use of different (ie., actual) emission rates for short-term and annual modeling will require additional supporting documentation to be submitted, as well as additional inventory review time. Ambient background concentrations of PM10 are 20 $\mu g/m^3$ and 38 $\mu g/m^3$ for annual and 24-hour average concentrations, respectively. These data result from a state-wide study of representative rural ambient monitor concentrations conducted in the late 1980's.

   The highest 6^{th} high 24-hour PM10 concentration predicted over the five-year period of meteorological data is to be compared, with ambient background, to the NAAQS 24-hour standard for PM10. The maximum of the annual average concentrations predicted over each of the five years is to be compared, with ambient background, to the NAAQS annual standard for PM10. PM10 Short-term Increment is to be assessed using the highest modeled 2^{nd} high PM10 24-hour concentration. The maximum-modeled annual concentration due to increment-consuming/expanding sources is to be compared to the annual PSD Increment limit. Based on the sources you list in the protocol, and the last two paragraphs on page A.10 of the DRAFT New Source Review Workshop Manual (EPA, 1990) fugitive emissions from roads, log yards, and biomass handling/processing sources should be quantified and modeled. As a non-listed source, these emissions are not included in your net project emissions. The emissions of such sources are not included in the assessment of PSD applicability of the project. The means of assessing fugitive emissions proposed in the protocol is acceptable. The firewater pump and emergency generator need not be included in the assessment of worst-case modeled significance, Increment or NAAQS impacts.

e. The proposed combined project emission rates of VOC and NOx exceed 100 tpy as indicated in your protocol. For this reason, an ozone ambient impacts analysis will be required of the project.

f. The permitting program has indicated that, for this project, air toxics with emission rates in excess of 20 pounds per year are to be modeled to demonstrate compliance with the Georgia '*Guideline for Ambient Impact Assessment of Toxic Air Pollutant Emissions*'. Building downwash should not be used to influence air toxics impacts. Application of site-specific, yet conservative, screening modeling techniques is encouraged. Simplicity will expedite review. The models SCREEN3 (96043) and ISCST3 (02035) should be used for air toxics impact assessments with the Athens/Athens (1989-1993) meteorological data available on the GA EPD (georgiaair.org) website. In calculating Acceptable Ambient Concentrations (AACs), please note that if listed on the IRIS database as having an RfC or an RBAC, or both, a worst-case 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 levels (STELs). Please include all spreadsheet calculations of toxic air contaminant emissions, criteria pollutant emissions, and AACs as electronic files in the application.

2. Please apply the 20D screening technique in accordance with the attached guidance you are being provided by GA EPD, particularly as regards short- and long-term D. Keep in mind that Region 4 EPA requires combining emissions from sources within 2 km of each other, prior to eliminating based on the 20D technique.

3. Please share your Class I area Q/d assessment, including revision of the Q, with each of the three FLM air quality assessment reviewers as indicated in your protocol. If they require an AQRV assessment, please copy GA EPD with their requirements, a copy of any Class I area modeling protocol required to be submitted, and all other communications you may have with the FLMs regarding this project. If no AQRV analysis is required due to the project's low Q/d ratio, GA EPD accepts your proposal to assess Class I area Significance with AERMOD under the following conditions:

   a. GA EPD would prefer the AERMOD-modeled assessment of Class I area significance be conducted using a line of 10 receptors 1 km apart, located approximately 50 km from the project site, oriented perpendicular to, and arranged bilaterally about a line drawn between the project site and the applicable Class I area.
   b. All project emissions should be included in the model, including applicable fugitives.
   c. The effects of building downwash should be incorporated in the model, using the BPIPrime utility (version 04274).
   d. Only screening level modeling of project emissions should be performed prior to having such modeling reviewed. If Cumulative modeling thresholds are exceeded, GA EPD will require a separate Class I area modeling protocol, in part because the FLM may be satisfied without such additional modeling.

4. We accept your proposed receptor grid spacing for Significance modeling, provided you understand that each design (maximum modeled, for significance and monitoring *de minimis*) concentration must be resolved to the nearest 100-meter receptor (ie., there must be more than 1 receptor located farther from the facility than the farthest receptor with a concentration greater than, or equal to, the respective significance concentration). For refined assessment of NAAQSs and PSD Increment, there is no need to place receptors outside the applicable Significant Impact Area, *per se*. Be certain to process terrain elevations using AERMAP (version 09040) for all receptors used in both the AERMOD and ISC3 models. It is our understanding that digital

elevation model (DEM) files processed by AERMAP are all based on the 1927 North American horizontal Datum (NAD 27), but that the National Elevation Dataset (NED) files you propose using are all NAD 83. Please ensure that all coordinates used to characterize sources, receptors, and building corners are in the same datum.

5. The SCREEN3 model, with receptor terrain elevations derived from topographic maps as may be necessary, may be used to resolve the worst-case operating condition for the main boiler stack (various anticipated operational capacities per EPA's Guideline on Air Quality Models), if necessary. This test could also be run using the AERMOD model. It is expected that a worst-case analysis will resolve the appropriate operating capacity to be modeled for NAAQSs and Increment assessments.

6. GA EPD has provided you with the AERMET (version 06341) pre-processed meteorological data files (Athens/Athens, 1989-1993) and the surface characteristics assessed by GA EPD around the Athens National Weather Service (NWS) instruments during the period of record (1992). Please use the AERMOD (version 07026) dispersion model for all PSD-modeled impacts analyses. The BPIP-PRIME model (version 04274) should be used to assess downwash dimensions of significant structures for AERMOD modeling, but for all sources (as practicable) within the Significant Impact Area, *per se*. We are not in a position at this time to allow the incorporation of AERMOD estimates of particle or gaseous plume depletion due to deposition.

7. NAAQS analysis:
   For short-term standards except PM10: compare to highest 2nd high concentrations.
   For PM10 24-hr standard, use the guidance provided in the addendum to the 06341 version of AERMOD to calculate the highest 6th high over the 5-year period of meteorological data.
   For annual standards, compare with the maximum annual average modeled concentration.
   Remember to add background to the modeled concentrations for NAAQSs assessments.

   Increment analysis:
   Same as above, except use the highest 2nd high concentration for 24-hour PM10.

   Other impact analyses:
   Conformance with all significance limits, regardless of the pollutant, should be assessed with the maximum-modeled long- or short-term concentration, as applicable. Comparison to the monitoring *de minimis* levels should be made with the maximum short- or long-term modeled concentration, as well.

8. Examination of the Warrenton 7.5 minute U.S.G.S. topographic map, and the 2004-2005 State of Georgia Highway and Transportation Map indicated no airstrips, or State Historic Sites, or State Parks are located within the proposed maximum extent of the project's largest Significant Impact Area (SIA) as indicated in the protocol. Based on these observations, GA EPD does not believe the project will require a Class II visibility analysis. Should the extent of the SIA increase, Oglethorpe Power is encouraged to communicate such information to GA EPD for an updated evaluation of its Class II visibility analysis requirements.

9. Please assess additional impacts to vegetation and soils using the guidance in the DRAFT 1990 New Source Review Workshop Manual, and A Screening Procedure for the Impacts of Air Pollution Sources on Plants, Soils, and Animals, EPA 450/2-81-078, 1980, or more recent or site-specific applicable references you may locate. The growth analysis should indicate the extent of the construction period, number of workers (both during construction and during normal operations) anticipated on site, and the impacts of the potential expansion of the logging and trucking industries.

10. GA EPD anticipates the review of the criteria by which ambient air is to be defined around the project site. We will also need to review a final meteorological representation analysis which demonstrates the Athens, GA NWS station adequately represents the project site. This analysis may involve the AERSURFACE utility (version 08009), particularly for Bowen Ratio and Albedo data. It may also involve aerial photo and/or topographic map analysis, particularly for surface roughness data. If start-up of emissions equipment will not be completed within the hour such is begun, it may be necessary to provide an hour-by-hour set of source emissions and stack characteristics portraying anticipated variations over the start-up period.

11. Other sources of guidance applicable to this project include:
    The Guideline on Air Quality Models (40 CFR 50, Appendix W), and
    The AERMOD Implementation Guide (EPA, March, 2009)

Both of which are available on the epa.gov/SCRAM001 website maintained by US EPA.

Please contact me at 404-363-7095 if you have any questions.

Sincerely,

Peter S. Courtney, P.E.
Environmental Specialist

Attachments: Draft MinorSourceInv.doc
Draft MajorSourceInv.doc
EPA memo regarding use of Ambient Ratio Method for significance modeling

APPENDIX H

CLASS I NOTIFICATION LETTERS

OglethorpePower

Oglethorpe Power Corporation
2100 East Exchange Place
Tucker, GA 30084-5336
phone 770-270-7600
fax 770-270-7872
An Electric Membership Cooperative

October 2, 2009

Ms. Catherine Collins
Environmental Engineer
United States Fish and Wildlife Service (FWS)
Branch of Air Quality
7333 West Jefferson Avenue, Suite 375
Lakewood, CO 80235-2017

Dear Ms. Collins:

Subject: Oglethorpe Power Corporation, Warren County Facility
Notification of PSD Project in Reference to FWS Class I Areas

Oglethorpe Power Corporation (Oglethorpe) is planning to construct a new nominal 100 megawatt (MW) biomass-fueled electric generating facility in Warren County, Georgia. The proposed facility consists of a biomass-fired boiler and ancillary equipment to produce steam for the generation of electricity. The proposed project is a major source with respect to the Prevention of Significant Deterioration (PSD) permitting program, as potential emissions of carbon monoxide (CO), oxides of nitrogen (NO_X), sulfur dioxide (SO_2), and particulate matter less than 10 microns in diameter (PM_{10}) are expected to exceed the major source thresholds and/or significant emission rates. Oglethorpe submitted a PSD construction permit application to the Georgia Environmental Protection Division (EPD) on August 7, 2009 with all portions except the dispersion modeling, which will be submitted in early October.

As part of the PSD application process, Oglethorpe has qualitatively evaluated its impacts on federally-protected Class I areas. The purpose of this letter is to provide the Federal Land Managers (FLM) with preliminary information on the proposed project and to request concurrence from the FLM on the finding presented below.

Q/D Screening Analysis

A Q/D screening analysis was performed in a manner consistent with the recently adopted 2005 Best Available Retrofit Technology (BART) guidelines for the Regional Haze Rule, which compares the ratio of visibility affecting pollutant emissions to the distance from the Class I area (i.e., referenced herein as the BART Approach).[1] For this so-called BART Approach, "Q" is the sum of the annual NO_X, PM_{10}, and SO_2 emissions, in tons per year (tpy) and "D" is the distance, in kilometers (km), from the proposed facility to the corresponding Class I area.

The U.S. EPA's BART guidelines for the Regional Haze Rule states that a Q/D ratio of ten or less indicates that a facility has no presumptive impact on the AQRVs. Similarly, a Q/D screening threshold of ten was proposed in the current draft revisions to the Federal Land Manager AQRV Workgroup

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[1] U.S. EPA, *Regional Haze Regulations and Guidelines for Best Available Retrofit Technology (BART) Determinations; Final Rule, Federal Register Volume 70, No. 128, July 6, 2005.*

Guidelines (i.e., referenced herein as the FLAG 2008 Approach); however, this document suggests that "Q" be calculated as the sum of the worst-case 24-hour emissions converted to an annual basis.[2]

A summary of the visibility-affecting pollutant (VAP) emissions resulting from the proposed facility are shown below in Table 1.[3] The annual emissions for the BART Approach are based on annual potential emissions that have been proposed through a PSD permit application. For the FLAG 2008 Approach, the Biomass Boiler's short term (daily) emission rates of VAP were calculated using BACT limits (lb/MMBtu) times the short-term (daily) maximum heat input of 1,399 MMBtu/hr (versus 1,282 MMBtu/hr for the annual average heat input). The proposed BACT limits were developed through a top-down BACT approach and are on averaging times of 3-hours for pollutants where compliance is measured via stack test and 30-days for pollutants where compliance is measured via continuous emissions monitoring system (CEMS). These daily emission rates were then extrapolated to annual emissions by multiplying by 8,760 hours per year. As shown in Table 1, the resulting sum of emissions, Q, differ by approximately 50 tons per year of VAP, with the FLAG 2008 Approach being slightly higher.

TABLE 1. SUMMARY OF VISIBILITY-AFFECTING POLLUTANT EMISSIONS

Pollutant	FLAG 2008 Approach Annualized Emissions from All Sources† (tpy)	BART Approach Annual Emissions from All Sources‡ (tpy)
NO_X	685.4	648.7
SO_2	61.3	56.2
Direct Particulate (minus H_2SO_4)*	143.8	137.5
H_2SO_4	7.5	6.9
Sum of Emissions (tpy)	**898**	**849**

* Direct Particulate includes all filterable and condensible PM_{10} such as EC, PMC, PMF, and SOA, except for H_2SO_4.

† FLAG 2008 Approach: Q = [SO_2 + NO_x + SO4 + EC + PMC + PMF + SOA + NO3 (maximum 24-hr basis)] * 8760/2000

‡ BART Approach: Q = SO_2 (tpy) + NO_x (tpy) + PM_{10} (tpy)

Although not shown in this table, the proposed 100 MW Bubbling Fluidized Bed (BFB) Boiler makes up over 98 percent of the total SO_2 and NO_X emitted, whereas the total direct particulate emissions have a 31 percent contribution from baghouse-controlled material handling sources and other miscellaneous emission units (e.g., cooling tower, fire water pump engines, paved roads, storage piles, uncontrolled material handling, and grinding).

As shown in Figure 1 and Table 2, eight (8) Class I areas are located within 300 km of the proposed Oglethorpe facility in Warren County, Georgia. The only Class I areas within 300 km of the proposed facility managed by the FWS are Wolf Island, Okefenokee, and Cape Romain, which are between 257 and 283 kilometers away.

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[2] U.S. Forest Service, National Park Service, and U.S. Fish and Wildlife Service. *Federal Land Managers' Air Quality Related Values Workgroup (FLAG).* June 27, 2008, *DRAFT.*

[3] Note that emissions shown in Table 1 include minor revisions to the emissions calculations from material handling equipment that differ slightly from the permit application submitted on August 7, 2009. Accordingly, the emissions shown in Table 1 will be reflected in a pending revision to be submitted to Georgia EPD in early October.

FIGURE 1. LOCATION OF PROPOSED WARREN FACILITY AND NEARBY CLASS I AREAS

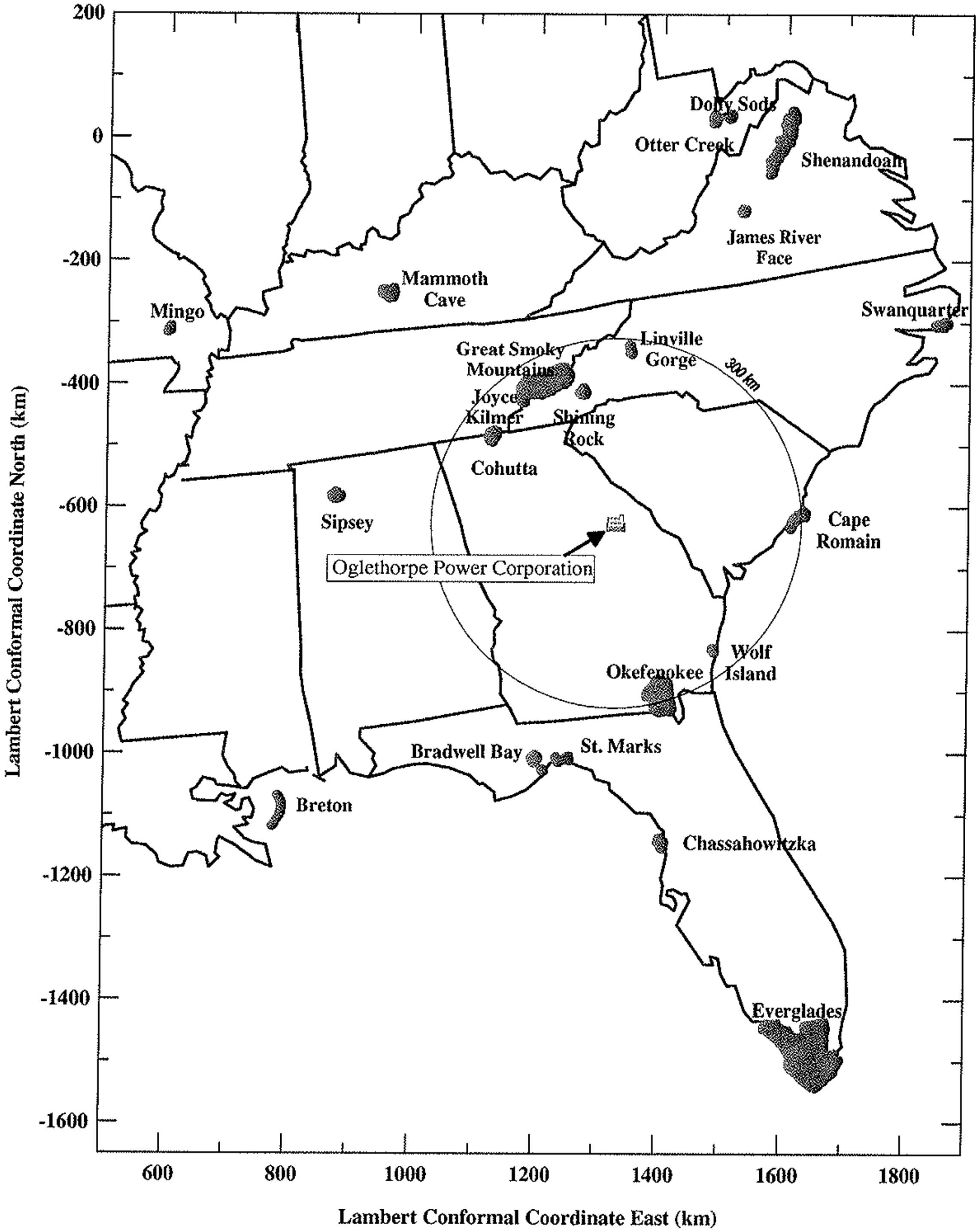

TABLE 2. SUMMARY OF CLASS I AREAS WITHIN 300 KM OF THE WARREN FACILITY

Class I Area Within 300km of Warren - Responsible FLM	Distance from Warren D (km)	Sum of Annual VAP Emissions Q (tpy)	BART Approach Q/D	Sum of Annualized VAP Emissions Q (tpy)	FLAG 2008 Approach Q/D
Shining Rock (NC) - FS	216	849	3.9	898	4.2
Great Smoky Mountains (NC/TN) - NPS	240		3.5		3.7
Cohutta (GA) - FS	241		3.5		3.7
Joyce Kilmer/Slickrock (NC/TN) - FS	247		3.4		3.6
Wolf Island (GA) - FWS	257		3.3		3.5
Okefenokee (GA) - FWS	262		3.2		3.4
Linville Gorge (NC) - FS	276		3.1		3.3
Cape Romain (SC) - FWS	283		3.0		3.2

Table 2 shows the results of the Q/D screening analysis for both the BART Approach and the FLAG 2008 Approach. As shown in Table 2, all of the eight Class I areas have a Q/D less than ten using either calculation methodology. This suggests that the proposed project will have no adverse impacts to any AQRVs at near-by Class I areas; therefore, Oglethorpe plans no AQRV analyses for the Warren County site for this proposed project. Based on Table 2, Oglethorpe requests that the FWS provide written concurrence of this finding of no impact.

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Oglethorpe greatly appreciates your feedback on this conclusion regarding no presumptive impacts to AQRVs at Class I areas under management of the FWS. Please feel free to contact me at 770-270-7166 or Mike Bilello at 770-270-7196 with any questions that you have.

Sincerely,

OGLETHORPE POWER CORPORATION

Douglas J. Fulle
Vice President, Environmental Affairs

DJF:dmc

c: Mr. Eric Cornwell (Georgia EPD)
Mr. Pete Courtney (Georgia EPD)
Mr. John Notar (National Park Service)
Mr. Bill Jackson (U.S. Forest Service)
Ms. Wende Martin (Oglethorpe)
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October 2, 2009

Mr. Bill Jackson
Air Program Staff
USDA Forest Service (FS)
National Forests in North Carolina
P.O. Box 2750
Ashville, NC 28802

Dear Mr. Jackson:

Subject: Oglethorpe Power Corporation, Warren County Facility
Notification of PSD Project in Reference to FS Class I Areas

Oglethorpe Power Corporation (Oglethorpe) is planning to construct a new nominal 100 megawatt (MW) biomass-fueled electric generating facility in Warren County, Georgia. The proposed facility consists of a biomass-fired boiler and ancillary equipment to produce steam for the generation of electricity. The proposed project is a major source with respect to the Prevention of Significant Deterioration (PSD) permitting program, as potential emissions of carbon monoxide (CO), oxides of nitrogen (NO_X), sulfur dioxide (SO_2), and particulate matter less than 10 microns in diameter (PM_{10}) are expected to exceed the major source thresholds and/or significant emission rates. Oglethorpe submitted a PSD construction permit application to the Georgia Environmental Protection Division (EPD) on August 7, 2009 with all portions except the dispersion modeling, which will be submitted in early October.

As part of the PSD application process, Oglethorpe has qualitatively evaluated its impacts on federally-protected Class I areas. The purpose of this letter is to provide the Federal Land Managers (FLM) with preliminary information on the proposed project and to request concurrence from the FLM on the finding presented below.

Q/D SCREENING ANALYSIS

A Q/D screening analysis was performed in a manner consistent with the recently adopted 2005 Best Available Retrofit Technology (BART) guidelines for the Regional Haze Rule, which compares the ratio of visibility affecting pollutant emissions to the distance from the Class I area (i.e., referenced herein as the BART Approach).[1] For this so-called BART Approach, "Q" is the sum of the annual NO_X, PM_{10}, and SO_2 emissions, in tons per year (tpy) and "D" is the distance, in kilometers (km), from the proposed facility to the corresponding Class I area.

The U.S. EPA's BART guidelines for the Regional Haze Rule states that a Q/D ratio of ten or less indicates that a facility has no presumptive impact on the AQRVs. Similarly, a Q/D screening threshold of ten was proposed in the current draft revisions to the Federal Land Manager AQRV Workgroup

[1] U.S. EPA, *Regional Haze Regulations and Guidelines for Best Available Retrofit Technology (BART) Determinations; Final Rule, Federal Register Volume 70, No. 128, July 6, 2005.*

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A summary of the visibility-affecting pollutant (VAP) emissions resulting from the proposed facility are shown below in Table 1.[3] The annual emissions for the BART Approach are based on annual potential emissions that have been proposed through a PSD permit application. For the FLAG 2008 Approach, the Biomass Boiler's short term (daily) emission rates of VAP were calculated using BACT limits (lb/MMBtu) times the short-term (daily) maximum heat input of 1,399 MMBtu/hr (versus 1,282 MMBtu/hr for the annual average heat input). The proposed BACT limits were developed through a top-down BACT approach and are on averaging times of 3-hours for pollutants where compliance is measured via stack test and 30-days for pollutants where compliance is measured via continuous emissions monitoring system (CEMS). These daily emission rates were then extrapolated to annual emissions by multiplying by 8,760 hours per year. As shown in Table 1, the resulting sum of emissions, Q, differ by approximately 50 tons per year of VAP, with the FLAG 2008 Approach being slightly higher.

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Pollutant	FLAG 2008 Approach Annualized Emissions from All Sources† (tpy)	BART Approach Annual Emissions from All Sources‡ (tpy)
NO_X	685.4	648.7
SO_2	61.3	56.2
Direct Particulate (minus H_2SO_4)*	143.8	137.5
H_2SO_4	7.5	6.9
Sum of Emissions (tpy)	**898**	**849**

* Direct Particulate includes all filterable and condensible PM_{10} such as EC, PMC, PMF, and SOA, except for H_2SO_4.

† FLAG 2008 Approach: $Q = [SO_2 + NO_x + SO4 + EC + PMC + PMF + SOA + NO3 \text{ (maximum 24-hr basis)}] * 8760/2000$

‡ BART Approach: $Q = SO_2\text{ (tpy)} + NO_x\text{ (tpy)} + PM_{10}\text{ (tpy)}$

Although not shown in this table, the proposed 100 MW Bubbling Fluidized Bed (BFB) Boiler makes up over 98 percent of the total SO_2 and NO_X emitted, whereas the total direct particulate emissions have a 31 percent contribution from baghouse-controlled material handling sources and other miscellaneous emission units (e.g., cooling tower, fire water pump engines, paved roads, storage piles, uncontrolled material handling, and grinding).

As shown in Figure 1 and Table 2, eight (8) Class I areas are located within 300 km of the proposed Oglethorpe facility in Warren County, Georgia. The only Class I areas within 300 km of the proposed facility managed by the FS are Shining Rock, Cohutta, Joyce Kilmer/Slickrock, and Linville Gorge, which are between 216 and 276 kilometers away.

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[2] U.S. Forest Service, National Park Service, and U.S. Fish and Wildlife Service. *Federal Land Managers' Air Quality Related Values Workgroup (FLAG).* June 27, 2008, *DRAFT.*

[3] Note that emissions shown in Table 1 include minor revisions to the emissions calculations from material handling equipment that differ slightly from the permit application submitted on August 7, 2009. Accordingly, the emissions shown in Table 1 will be reflected in a pending revision to be submitted to Georgia EPD in early October.

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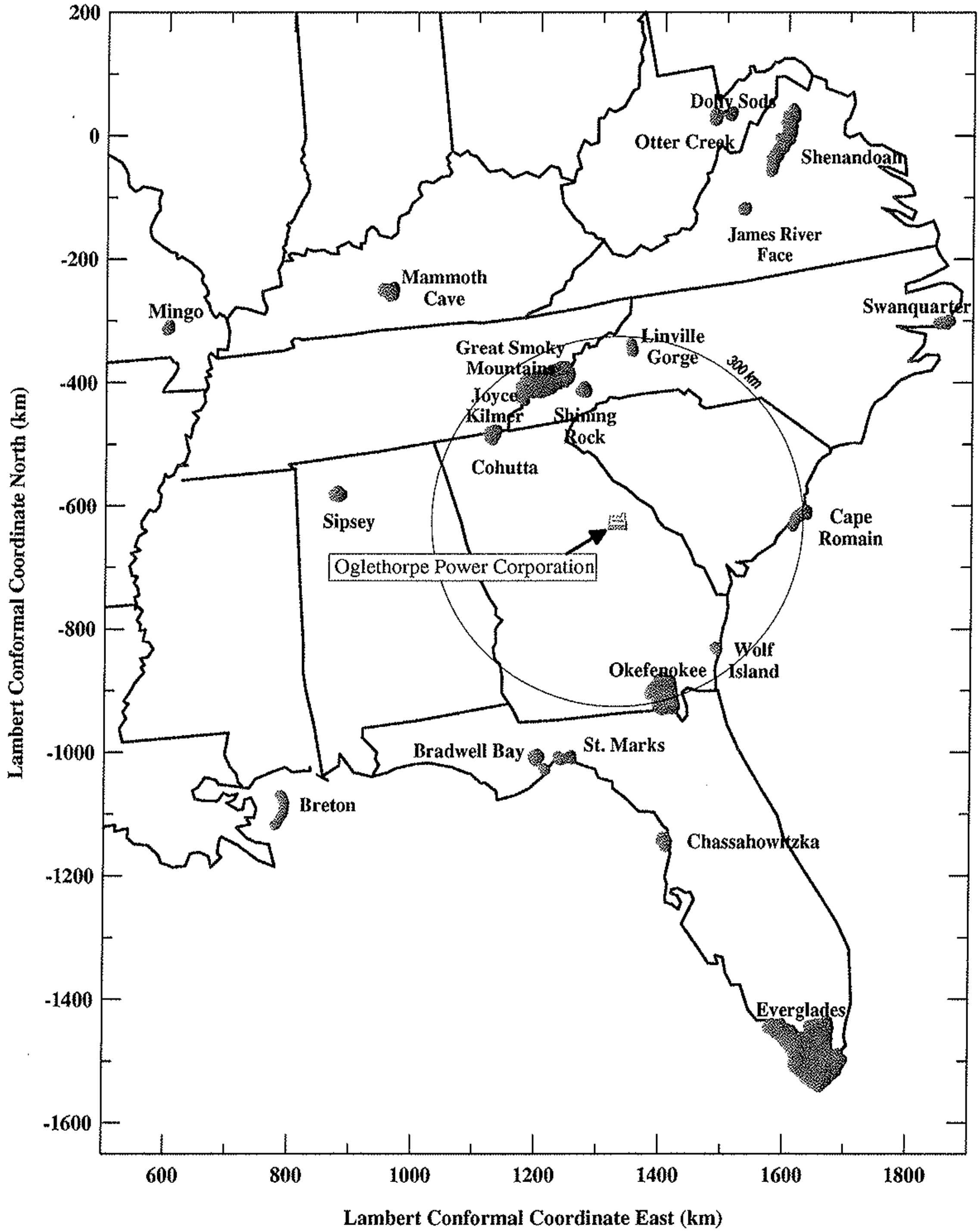

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Table 2 shows the results of the Q/D screening analysis for both the BART Approach and the FLAG 2008 Approach. As shown in Table 2, all of the eight Class I areas have a Q/D less than ten using either calculation methodology. This suggests that the proposed project will have no adverse impacts to any AQRVs at near-by Class I areas; therefore, Oglethorpe plans no AQRV analyses for the Warren County site for this proposed project. Based on Table 2, Oglethorpe requests that the FS provide written concurrence of this finding of no impact.

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An Electric Membership Cooperative

October 2, 2009

Mr. John Notar
National Park Service (NPS)
Air Resource Division
12795 W. Alameda Pkwy.
Lakewood, CO 80228

Dear Mr. Notar:

Subject: Oglethorpe Power Corporation, Warren County Facility
Notification of PSD Project in Reference to NPS Class I Areas

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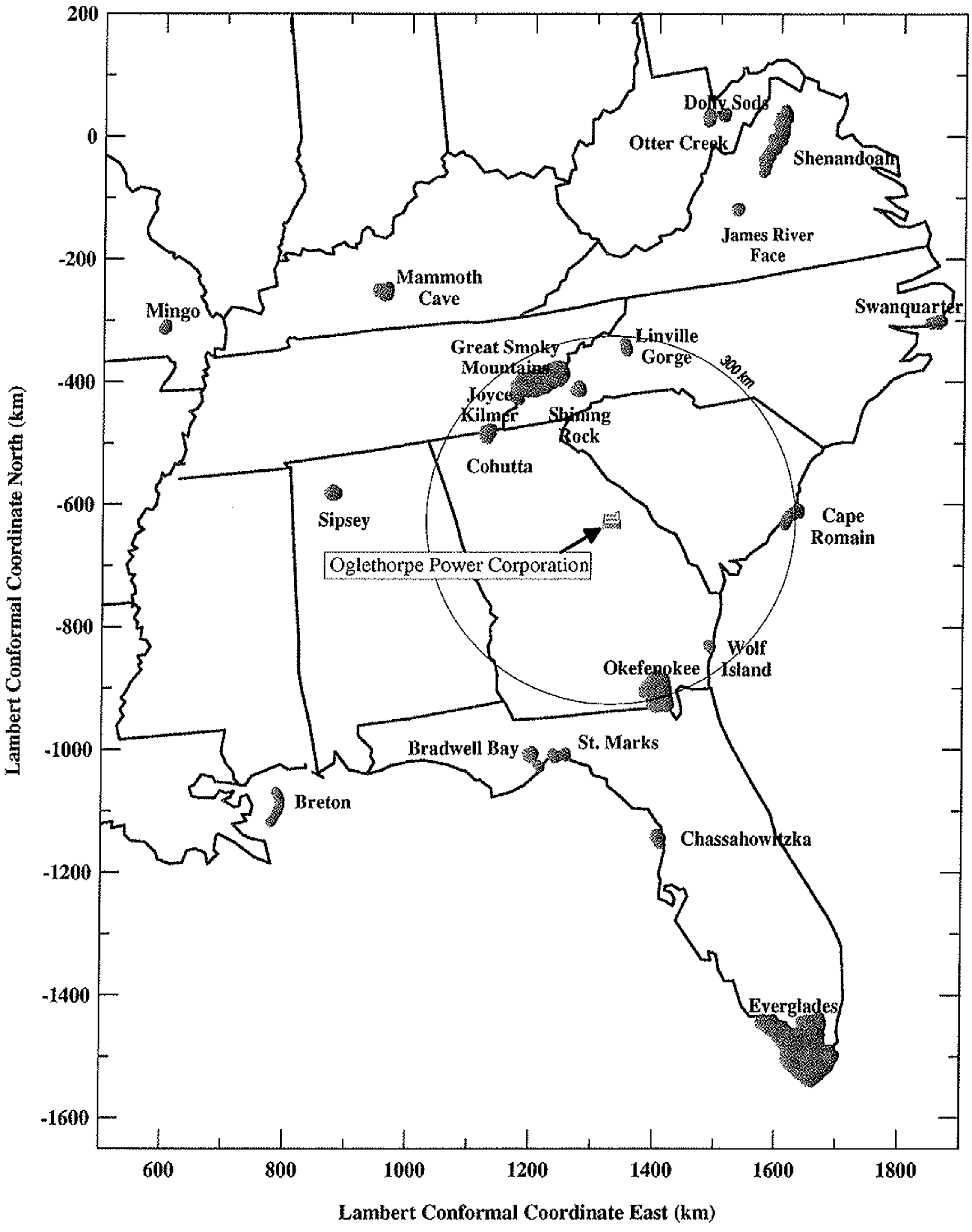

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Vice President, Environmental Affairs

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c: Mr. Jim Renfro (Great Smoky Mountains National Park)
Mr. Eric Cornwell (Georgia EPD)
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