Jaricus Whitlock

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Sent:	Monday, November 13, 2023 11:43 PM
To:	Jaricus Whitlock
Cc:	Kenny Pilgrim; Plummer, Rick; Hansen, Paul
Subject:	ABE Air Modeling Protocol
Attachments:	ABE_Modeling Protocol_Nov 2023.pdf

This Message Is From an External Sender

This message came from outside your organization.

Good Evening Jaricus ,

Please find attached the air modeling protocol for Amite BioEnergy. Would you also like a paper copy, and should I send this to anyone else at MDEQ?

Thanks,

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AIR TOXICS
MODELING PROTOCOL

AMITE BIOENERGY, LLC
1763 GEORGIA PACIFIC ROAD NO. 2
GLOSTER, MISSISSIPPI

PPM PROJECT NO. 30065126

November 2023

PPM
CONSULTANTS

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APPENDIX

1.0 INTRODUCTION

Amite BioEnergy LLC (ABE) is a wood pellets production facility located in Gloster, Mississippi. The facility is classified as a major source of Hazardous Air Pollutants (HAP). Due to the facility's classification as a HAP major source, the facility is subject to 40 CFR Part 63, Subpart B. ABE was required to perform a Maximum Achievable Control Technology (MACT) case-by-case analysis (Analysis) in accordance with the clean air act (CAA) Section 112(g).

The Mississippi Department of Environmental Quality (MDEQ) is requiring ABE to conduct an impact analysis on air toxics emitted from over all operations in order to demonstrate the facility's emissions of air toxics are at such rates to not adversely affect human health in accordance with Mississippi Administrative Code, Title 11, Part 2, Chapter 2, Rule 2.5.A.(3)(a)-(b). A table showing facility emissions is included in **Table 1 – Facility Potential to Emit** of **Appendix B.**

The methodology described in the protocol will be further utilized in the final modeling report to demonstrate compliance with applicable standards. The purpose of this modeling protocol is to provide the MDEQ with an opportunity to review and approve the proposed modeling methodology. Currently, MDEQ does not have an air toxics program and has indicated that ABE should rely on other states frameworks. This protocol is prepared in accordance with the current U.S. Environmental Protection Agency (U.S. EPA)[1] and the Alabama Department of Environmental Management's (ADEM)[2] modeling guidelines. **Section 2.0, Air Quality Dispersion Modeling Methodology**, describes the proposed modeling methodology, which includes a discussion of the Air Toxics Screening Analysis.

Section 3.0, Model Selection and Inputs, describes the model selection and inputs, which includes a discussion of the dispersion model selection, meteorological data, land use, topography, Good Engineering Practice (GEP) Stack Height analysis, building wake effects, receptor grid, emission rates, and source parameters.

Section 4.0, Modeling Report Contents, describes the content of the modeling report that will be submitted to MDEQ.

[1] EPA's *Guideline on Air Quality Models (Revised)*, Federal Register Vol. 70, No. 216, pp. 68,218 - 68,261, November 9, 2005. Codified at 40 CFR Part 51, Appendix W and EPA's *New Source Review Workshop Manual (DRAFT)* (1990).
[2] *PSD Air Quality Analysis Modeling Guidelines*, Air Division, Planning Branch ADEM, September 2020.

2.0 AIR QUALITY DISPERSION MODELING METHODOLOGY

The purpose of the proposed air quality analysis is to demonstrate that emissions of HAPs (Methanol, Formaldehyde, Phenol, and Acetaldehyde) from the facility will not adversely affect human health As discussed in detail in the following sections, the air dispersion modeling analysis will be conducted in accordance with the U.S. EPA's Guideline on Air Quality Models (the "Guideline")[3], ADEM's Air Quality Modeling Procedures[4], and other appropriate guidance such as the Draft New Source Review Workshop Manual[5] and recent U.S. EPA Modeling Clearinghouse "Clarification Memos."

2.1 AIR TOXICS ANALYSIS

An air toxics analysis requires calculation of an acceptable ambient concentration (AAC), air quality modeling of a predicted ambient impact, and a comparison of the modeled result with the AAC. This first series of steps is regarded as “screening” after which more in-depth analysis may be required. This initial step includes a screening level air dispersion modeling evaluation, using U.S. EPA’s SCREEN3 air dispersion model, to predict Maximum Ground Level Concentrations (MGLCs) from a given facility. The MGLCs are then compared to the calculated AACs established using toxicity data from the Integrated Risk Information System (IRIS) and Occupational Safety and Health Administration (OSHA) Time Weighted Average (TWA) and ceiling Permissible Exposures Limit (PEL) standards (PEL-TWA, PEL-C). If an MGLC exceeds a respective calculated AAC, additional analyses may be required including a site-specific risk assessment, the use of alternative toxicity data, safety factors, or alternative methods of impact assessment.

Due to the complexity of modeling numerous stacks across the facility, ABE is proposing to conduct the Air Toxics Analysis using The American Meteorological Society / Environmental Protection Agency Regulatory Model (AERMOD). This will allow for a greater degree of accuracy in the analysis.

Table 2-1, Acceptable Ambient Concentration, lists the applicable standards for the pollutants involved with the proposed project.

TABLE 2-1

[3] Federal Register Vol. 70, No. 216, pp. 68,218 - 68,261, November 9, 2005. Codified at 40 CFR Part 51, Appendix W.
[4] *PSD Air Quality Analysis Modeling Guidelines*, Air Division, Planning Branch ADEM, September 2020.
[5] EPA's *New Source Review Workshop Manual (DRAFT)* (1990).

ACCEPTABLE AMBIENT CONCENTRATIONS (OSHA)

Pollutant	Averaging Period	PEL-TWA (ppm)	PEL-C (ppm)
Methanol	8-hr	200	1000
Formaldehyde	8-hr	0.75	-
Phenol	8-hr	5	-
Acetaldehyde	8-hr	200	25

2.2 AIR TOXICS SCREENING

For each compound that requires review, the air dispersion model incorporates all sources at the facility emitting the compound under review. The modeled emissions rate will be each source's maximum potential as allowed by the permit. After discussion with MDEQ on October 26, 2023, it was determined the four above noted compounds account for approximately 80%-85% of all HAPs at the facility. MDEQ agreed to limit the HAP screening to these four HAPs.

The analysis compares the maximum concentration from the model to the appropriate **Table 2-1** significance level. If the maximum concentration for a pollutant is less than its respective significance level, the project's impact is not significant, and no further analysis is required. If the maximum concentration for a pollutant is greater than or equal to its respective significance level, the project's impact is potentially significant, and further analysis will be required.

3.0 MODEL SELECTION AND INPUTS

This modeling protocol proposes certain dispersion models and input parameters for approval by MDEQ. **Section 3.1, Dispersion Model Selection**, describes the potential computer models for the analysis. **Section 3.2, Meteorological Data**, describes the meteorological data. **Section 3.3, Land Use**, describes the land use of the area surrounding the facility. **Section 3.4, Topography**, describes the topography of the area surrounding the facility. **Section 3.5, Good Engineering Practice (GEP) Stack Height**, describes the stack height analysis. **Section 3.6, Building Wake (Downwash) Effects**, describes the building wake (downwash) analysis. **Section 3.7, Receptor Grid**, describes the receptor grids. **Section 3.8, Emission Rates**, describes the proposed emission rates and averaging periods for the modeling analysis. **Section 3.9, Source Parameters**, describes the default source parameters used in the analysis, if applicable.

3.1 DISPERSION MODEL SELECTION

The American Meteorological Society / Environmental Protection Agency Regulatory Model (AERMOD) is the Guideline-recommended model for evaluating near-field impacts (i.e., source receptor distances of less than 50 km). 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. Additionally, a fourth processor, the AERSURFACE tool, is used to estimate surface characteristics required for input to AERMET. The most recent versions of each processor will be used: for AERMOD, version 21112; for AERMET, version 21112; for AERMAP, version 18081; and for AERSURFACE, version 20060. All AERMOD dispersion modeling will be performed using the regulatory default options.

3.2 METEOROLOGICAL DATA

The EPA AERMOD program requires meteorological data preprocessed with the AERMET program. Three additional variables are considered when preprocessing the surface and meteorological data for a site. These variables are:

- Surface roughness;
- Albedo; and
- Bowen Ratio.

MDEQ has readily available AERSURFACE data associated with meteorological data.

3.3 LAND USE

ABE is located in Gloster, Mississippi. An Auer Land Use analysis[6] for a 3-kilometer radius surrounding the facility is required to demonstrate the appropriate dispersion regime

[6] Auer, Jr., A.H., 1978. "Correlation of Land Use and Cover with Meteorological Anomalies." Journal of Applied Meteorology, 17:636-643.

(urban/rural) for the area. The land within a 3-kilometer radius of the facility is predominately rural; therefore, no urban options will be selected for the modeling. An area map demonstrating the 3-kilometer area surrounding ABE is presented in **Figure 2 – Land Use Map** of **Appendix A.**

3.4 TOPOGRAPHY

The terrain elevation for each modeled building, source, and receptor will be determined using USGS National Elevation Data set (NED). The terrain height for each modeled receptor will be calculated using AERMAP (version 19191), a terrain preprocessor developed specifically for the AERMOD model. AERMAP computes the terrain height and hill height scale from the digital terrain elevations surrounding the modeled receptors. AERMAP also computes the terrain height for modeled sources and buildings. AERMAP is used to search for the terrain height and location that has the greatest influence on dispersion for an individual receptor. ABE will use 1/3 arc second terrain data files for the dispersion modeling.

3.5 FENCELINE

ABE is proposing to use the property boundaries to designate the “fenceline” for the purpose of defining where the “ambient air” will begin with regard to the model.

The fenceline can be located on **Figure 1 – Site Map** of **Appendix A**.

3.6 GOOD ENGINEERING PRACTICE (GEP) STACK HEIGHT

A good engineering practice (GEP) stack height evaluation determines if avoidance of building wake effects allow a point source to be modeled at a height greater than 65 meters. The GEP formula stack height is expressed as the greater of 65 meters or GEP = Hb + 1.5L (where Hb is the building height, and L is the lesser of the building's height or maximum projected width). These procedures follow EPA Guidelines for Determination of Good Engineering Practice Stack Height.[7]

All stacks at the facility are less than 65 meters in height. ABE plans on modeling each emission source at its proposed stack height to demonstrate compliance. Therefore, a GEP stack height analysis is not expected to be required.

[7] EPA, Guideline for Determination of Good Stack height (Technical Support Document for the Stack Height Regulations) (Revised), 1985.

3.7 BUILDING WAKE (DOWNWASH) EFFECTS

The emissions sources at the proposed facility will be evaluated in terms of their proximity to nearby structures. The purpose of this evaluation is to determine if stack discharges may become caught in the turbulent wakes generated by these structures. AERMOD incorporates the Plume Rise Model Enhancements (PRIME) algorithms for estimating enhanced plume growth and restricted plume rise for plumes affected by building wakes.[8]

Direction-specific structure dimensions and the dominant downwash structure parameters used as input to AERMOD will be determined using the Building Profile Input Program - PRIME Model (BPIPPRM) software version 04274.

The output from the BPIPPRM downwash analysis lists the names and dimensions of the structures generating wake effects and the locations and heights of the affected emissions sources (i.e., stacks). In addition, the output contains a summary of the dominant structure for each emissions source (considering all wind directions) and the actual structure height and projected widths for all wind directions. This information will be incorporated into the AERMOD data input files.

For the purpose of this Air Toxics analysis, ABE is proposing to model only fully enclosed buildings.

3.8 RECEPTOR GRID

The receptor grids used in the preliminary modeling analysis will follow the written guidelines provided by ADEM in their Air Quality Modeling Procedures (AQMP). For the modeling analysis, ABE is proposing to use a Cartesian receptor grid to locate off-property, ground-level concentrations. The initial receptor grid extends from the property boundary outward to 10,000 meters (or 10 kilometers). ABE will ensure the appropriate terrain features are captured as well as ensuring concentrations are decreasing at the edge of the grid. If the AOI extends beyond the initial grid, the grid should be extended to encompass the entire AOI (please note that the AOI will not extend greater than 50 kilometers from the facility due to accuracy constraints of the dispersion models).

[8] L.L. Schulman, D.G. Strimaitis, and J.S. Scire, Development and Evaluation of the Prime Plume Rise and Building Downwash Model, *AWMA*, 50:378-390, 2000.

Receptor spacing varies according to distance from the facility. ABE will place receptors at 100-meter intervals along the property boundary. ABE will also place 100-meter spaced receptors along any public roads, railroads, or navigable waterways that bisect the property. From the property line to 4,000 meters (or 4 kilometer), ABE will place receptors every 100 meters. From 4 kilometer to 7 kilometers from the property boundary, ABE will place receptors every 250 meters. From 7 kilometers to 10 kilometers from the property boundary, ABE will place receptors every 500 meters. If receptors are required beyond 10 kilometers, the receptors will be placed with spacing of 500 meters. If the maximum concentration from the significance analysis is located in an area where the receptor spacing is greater than 100 meters, a refined receptor grid (100 meter spacing) will be placed around the location to ensure that the maximum concentration has been accurately located.

3.9 EMISSION RATES

The modeled emission rates for the Air Toxics Analysis are the Potential to Emit (PTE) emissions. For short-term averaging periods, the modeled emission rates are the hourly maximum PTE.

3.10 SOURCE PARAMETERS

ADEM requires a table to be submitted with the protocol identifying all sources used in the modeling, including all applicable stack, area, and volume source parameters.

Table 2 – Emission Source Inventory is included to provide MDEQ with the requested information to include stack identification (Permit and AERMOD Identifications), UTM locations, emission rates, stack height, exit velocity, exit temperature, and inner diameter. Please note that stacks that discharge in the downward direction will be modeled as a "Raincap" discharge with the height corresponding to the height of the release.

4.0 MODELING REPORT CONTENTS

A document that details the modeling methodology and summarizes the modeling results will be submitted to MDEQ. The air dispersion modeling report will include the following information:

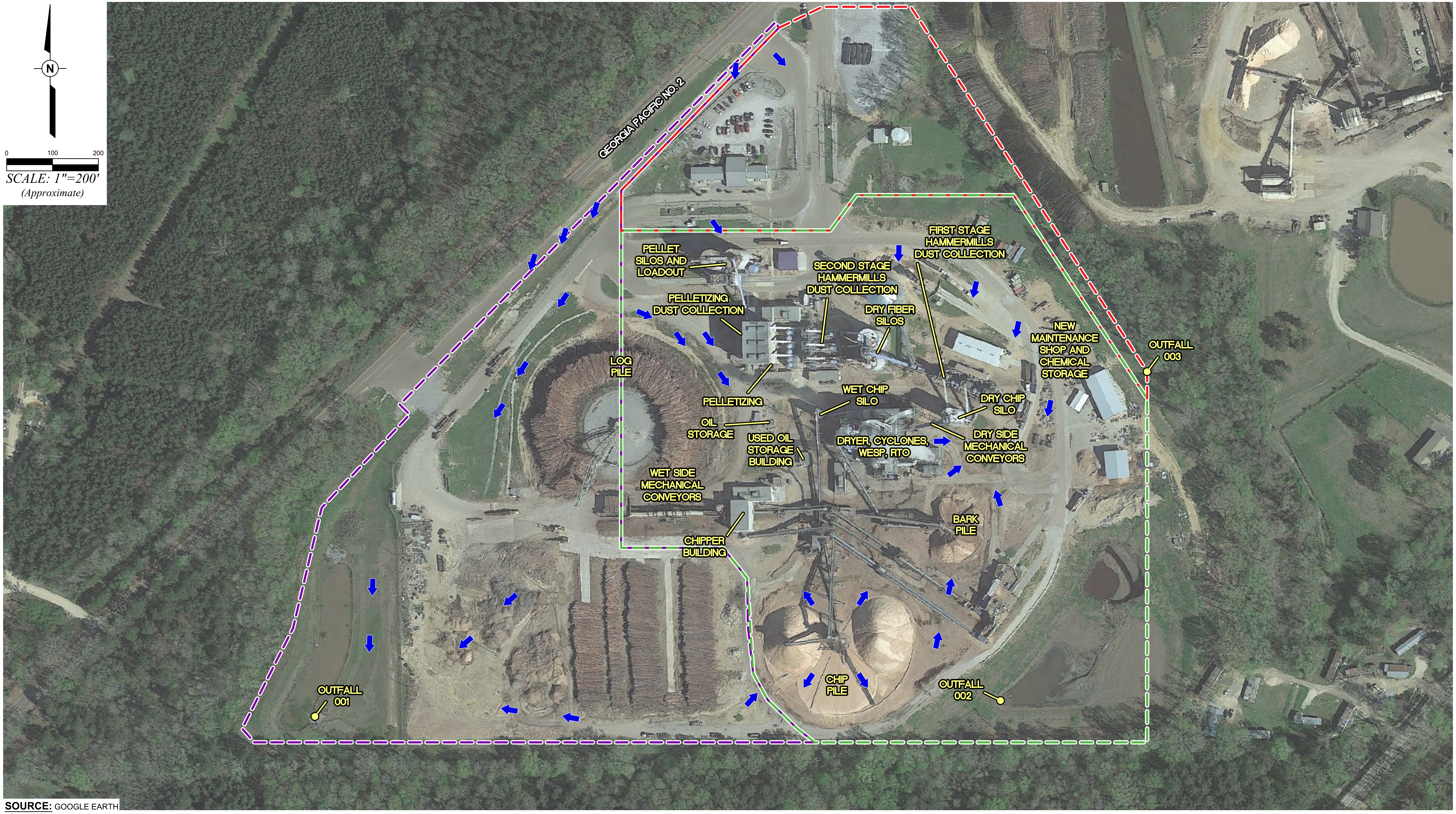
- Brief overview of the proposed project;
- Facility plot plan indicating sources, property line, clear scale, and true north;

- Emissions rate summary for all facility sources, with units consistent with modeling;
- Stack parameter summary for all facility sources, with units consistent with modeling;
- Any calculations for stack parameters unless previously approved by MDEQ;
- Approved modeling protocol;
- Technical basis for any nonstandard procedures, if applicable;
- Summary of all model inputs (e.g., model used, met data, rural or urban dispersion coefficients, etc.);
- Comparison of all modeling results to the applicable standards; and
- Upon request, ABE will provide electronic copies of all modeling files, including model input files, output files, met data with appropriate documentation if processing performed, building downwash files, and raw topographic (NED) data.

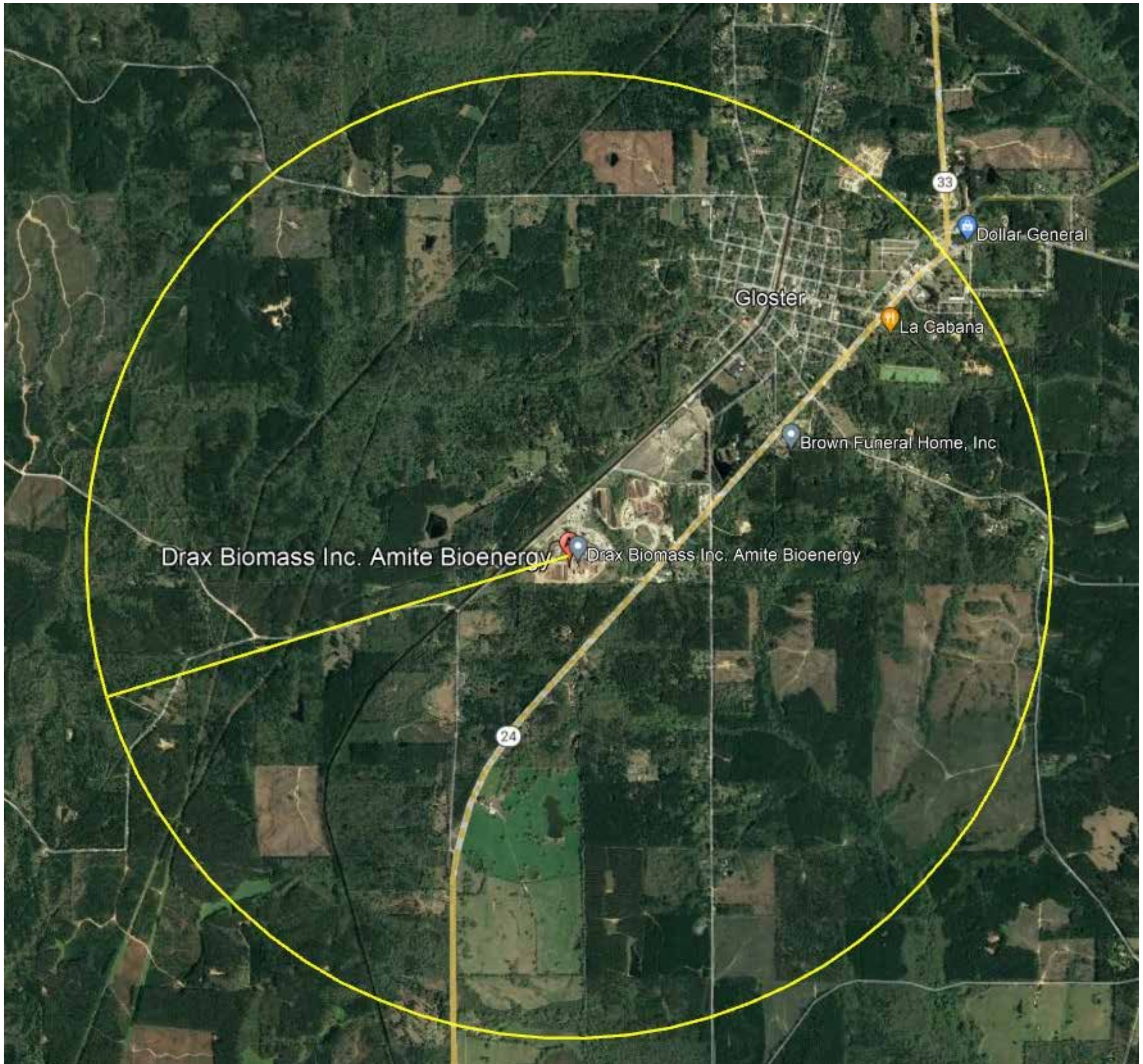
ABE will submit additional information to MDEQ upon request.

APPENDIX A

FIGURES



PPM CONSULTANTS, INC. www.ppmco.com DRAWN BY: BWH DRAWN DATE: 11/13/223 PROJECT NUMBER: 30065104 PHASE: -	DRAX BIOMASS, INC. **AMITE BIOENERGY, LLC** 1763 GEORGIA PACIFIC ROAD NO. 2 GLOSTER, MISSISSIPPI	SITE MAP (MAIN SITE)	FIGURE NUMBER 1



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DRAWN DATE: 11/13/23

PROJECT NUMBER: 30065126

Amite BioEnergy
Gloster Facility
1763 Georgia Pacific Road No. 2
Gloster, Mississippi

LAND USE MAP

FIGURE NUMBER 2

APPENDIX B

TABLES

TABLE 1 - FACILITY POTENTIAL TO EMIT

EQT	Description	Release Type	Stack Flow Rate (acfm)	Stack Diameter (ft)	Stack Height (ft)	Stack Temp. (°F)	Stack Velocity (ft/sec)	UTM Easting	UTM Northing	Acetaldehyde (TPY)	Formaldehyde (TPY)	Methanol (TPY)	Phenol (TPY)
AA-201	WESP and RTO with Natural Gas Burner	Vertical	202,067	8.00	50.00	170.0	67.00	687,404	3,451,566	1.542	3.855	6.916	2.991
AA-203b	Furnace By-Pass Start/Stop	Vertical	202,067	8.00	50.00	170.0	67.00	687,345	3,451,582	0.001	0.004	0.00E+00	4.25E-05
AA-203c	Furnace By-Pass Idle	Vertical	202,067	8.00	50.00	170.0	67.00	687,345	3,451,582	0.003	0.018	0.00E+00	2.11E-04
AA-204b	Dryer By-pass Start/Stop	Vertical	202,067	8.00	50.00	170.0	67.00	687,362	3,451,583	0.043	0.081	0.064	0.016
AA-301	Regenerative Catalytic Oxidizer	Vertical	293,042	10.67	60.00	134.0	54.62	687,393	3,451,662	1.156	1.093	12.806	6.934
AA-302	Primary Hammermill Feed Silo	Vertical	1,500	1.50	65.00	77.0	14	687,413	3,451,595	0.344	0.656	0.344	0.00E+00
AA-305	Secondary Hammermill Feed Silo 1, Bin Vent	Vertical	1,500	1.50	65.00	77.0	14.15	687,359	3,451,632	0.312	0.593	0.312	0.00E+00
AA-306	Secondary Hammermill Feed Silo 2, Bin Vent	Vertical	1,500	1.50	65.00	77.0	14.15	687,358	3,451,646	0.161	0.303	0.161	0.00E+00
AA-401A	Pellet Storage Silo 1, Bin Vent	Vertical	300	1.30	60.00	77.0	3.77	687,270	3,451,699	0.244	0.469	0.244	0.00E+00
AA-401B	Pellet Storage Silo 2, Bin Vent	Vertical	300	1.30	60.00	77.0	3.77	687,254	3,451,699	3.90E-05	7.50E-05	3.90E-05	0.00E+00
AA-401C	Sceened Materials Return System	Vertical	7,452	1.50	36.00	77.0	70.28	687,401	3,451,623	8.00E-05	1.50E-04	8.00E-05	0.00E+00
AA-401D	Pellet Loading System Pneumatic System Filter	Vertical	23,555	7.90	10.00	77.0	8.01	687,288	3,451,699	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AA-501	Fire Pump Engine	Vertical	1,402	0.50	10.00	967.0	119.00	687,368	3,451,781	0.00E+00	0.00E+00	0.00E+00	0.00E+00
AA-502	Emergency Generator	Vertical	5,054	0.50	10.00	1020.0	429.00	687,346	3,451,556	0.00E+00	0.00E+00	0.00E+00	0.00E+00