JOHN BEL EDWARDS
GOVERNOR

CHUCK CARR BROWN, PH.D.
SECRETARY

State of Louisiana

DEPARTMENT OF ENVIRONMENTAL QUALITY
OFFICE OF THE SECRETARY

Mr. Ron Curry
Regional Administrator (6RA)
U. S. Environmental Protection Agency, Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202-2733

RE: Applicable Sources under the SO2 Data Requirements Rule

Dear Mr. Curry:

On August 21, 2015, the Environmental Protection Agency (EPA) promulgated the "Data Requirements Rule (DRR) for the 2010 1-Hour Sulfur Dioxide (SO2) Primary National Ambient Air Quality Standard." The final rule requires the Louisiana Department of Environmental Quality (LDEQ) to submit a list of applicable SO2 sources identified pursuant to §51.1202 located in its jurisdiction to the EPA by January 15, 2016. This list was submitted to EPA on October 22, 2015. (See Attachment A)

For the next milestone, LDEQ must identify, for each listed source, the approach it will use to characterize air quality in the respective area, such as air quality modeling, ambient monitoring, or establishment of a federally enforceable emission limit.

For those sources that will be characterized by air quality modeling, a modeling protocol is included in this package. As outlined in the DRR, all completed modeling analyses will be submitted on or before January 13, 2017. (See Attachment B)

For those sources that will be characterized through ambient monitoring, the LDEQ has included the modeling analysis for monitor placement as well as a copy of the annual monitoring network plan. As outlined in the DRR, all ambient monitors will be operational by January 1, 2017. (See Attachment C)

For those sources that will have taken emission limits, the LDEQ has included a list and the emission limits as appropriate. (See Appendix D)

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www.deq.louisiana.gov

We look forward to working with you and your staff as LDEQ finalizes the implementation of the DRR requirements. If you should have any questions about this correspondence, please contact Vennetta Hayes of the Air Permits Division at (225)-219-3412.

Sincerely,

Chuck Carr Brown, Ph.D.
Secretary

6/30/16
Date

C: Mark Hansen, EPA Region 6
Guy Donaldson, EPA Region 6

1. Background

On June 2, 2010, EPA revised the primary ambient air quality standard for sulfur dioxide (SO_2) by establishing a 1-hour standard at a level of 75 parts per billion (ppb). EPA also revoked the existing 24-hour and annual primary standards, but retained the 3-hour secondary standard. The form of the 1-hour standard is a 3-year average of the 99th percentile of the annual distribution of daily maximum 1-hour average concentrations. Dispersion modeling can be used to demonstrate attainment of the 1-hour ambient air quality standard for SO2. The purpose of this document is to set forth procedures to be used Louisiana Department of Environmental Quality (LDEQ) in modeling efforts for attainment demonstration for SO2.

2. Area Backgrounds

2.1 Cabot Ville Platte

The Cabot Ville Platte facility is located in Evangeline Parish, Louisiana. Cabot is a carbon black facility. The population of Ville Platte is about 7,430. The area is mostly rural. SO2 emissions at the facility were 8,661.39 tons in 2014. The facility is currently under a consent decree that will dramatically reduce SO2 emissions in the future. Modeling for this area will only include emissions from the Ville Platte facility as Cabot is the major emitter in the area. Total emissions of SO2 in Evangeline Parish were 8,665.73 tons in 2014 of which 99.95% came from Cabot.

2.2 St. Mary Facilities

There are three DRR facilities in St. Mary Parish. These facilities are Cabot Canal, Columbian Chemicals, and Orion. The population of St. Mary parish is about 54,650. Major cities are Franklin, Morgan City, and Patterson. SO2 emissions in the parish were 18,946.68 tons in 2014. The three DRR facilities are within a 20 km radius and the total SO2 emissions in 2014 from the DRR facilities were 18,929 tons. Cabot Canal is currently under a consent decree and has taken limits below 2000 tons of SO2 per year. Modeling for this area will only include emissions from the DRR facilities as they account for 99.91% of emissions in the area.

3. Model Selection

3.1 AERMOD

For area designations under the 1-hour SO2 primary NAAQS, AERMOD should be used unless use of an alternative model can be justified (Section 3.2, Appendix W). LDEQ will be using the most current version AERMOD for this demonstration.

AERMOD is appropriate because SO2 concentrations result from direct emissions from combustion sources so that concentrations are highest relatively close to sources and are much lower at greater distances due to dispersion. Given the source-oriented nature of this pollutant (see, e.g., 75 FR at 35570), dispersion models are considered appropriate by EPA to predict the near-field concentrations of this pollutant.

The AERMOD modeling system includes several components. The regulatory components are:
AERMOD: the dispersion model (Version Date 15181)
AERMAP: the terrain processor for AERMOD (Version Date 11103)
AERMET: the meteorological data processor for AERMOD (Version Date 14134)
and non-regulatory components are:
BPIPPRIME: the building input processor (Version Date 04112)
AERMINUTE: the preprocessor to AERMET (Version Date 14237)
AERSURFACE: the surface characteristics processor for AERMET (Version Date 13016)
AERSCREEN: a recently released screening version of AERMOD (Version Date 14147)
For regulatory applications, the regulatory default option should be set which requires the use of terrain elevation data and stack-tip downwash, and assumes a 4-hour half-life for SO2 in urban areas.

3.2 Model Control Options

The regulatory default options within the modeling system will be set through the use of the MODELOPT keyword contained within the control pathway of the air quality model. The modeling will include terrain elevation data, routine processing of averages when missing data or calm meteorological data occurs and stack-tip downwash calculations for the facilities. If necessary, the protocol document will be updated to include alternate modeling procedures.

4. Modeling Domain

4.1 Determining Sources to Model

When considering other sources to include in the modeling, Appendix W states in Section 8.2.3.b that all sources expected to cause a significant concentration gradient in the vicinity of the source of interest should be explicitly modeled and that the number of such sources is expected to be small except in unusual cases. Other sources in the area, i.e. those not causing significant concentration gradients in the vicinity of the source of interest, should be included in the modeling via monitored background concentrations. Most sources in the 20 km surrounding the DRR sources are minor sources. Through analysis of emissions data within 20 km of the DRR sources, it was decided to only model DRR facilities. The remaining sources in the 20km radius in the area will be captured by background concentrations.

4.2 Receptor Grid

LDEQ's modeling is being performed around the data requirement rule facilities. The domain will be centered on the DRR facilities and extends 10km in each direction to result in a 20 km grid.

Receptor placement will be of sufficient density to provide resolution needed to detect significant gradients in the concentrations, with receptors placed closer together near sources to detect local gradients and placed farther apart away from the sources. In addition, receptors will be placed at key locations such as around facility fence lines (which define the ambient air boundary for a particular source). Receptors will be placed with 100 m spacing extending 2km from the fence line of the facilities; spacing will be 500 m from 2-5km; and 1000 m interval from 7 to 10 km.

5. Emissions Inputs

Consistent with the SO2 modeling guidance and regulatory modeling for other programs (Appendix W, Section 8.1), dispersion modeling for the purposes of SO2 designation should be based on the use of actual hourly emissions or enforceable permit limits. In the absence of actual hourly emissions, double annualized emissions, enforceable permit limits, or potential to emit emissions (i.e., design capacity) will be used. Intermittent sources will be omitted such as emergency equipment operated less than 100 hours and other small sources.

The spreadsheet with the building and fenceline receptors and emission inventory of sources and their emissions will be made available upon request.

6. Meteorological data

Modeling guidance states that 3 years of meteorological data should be used.

The recently released met processing tools, AERMINUTE and AERMET, should be used for processing 1-minute wind data. The 1-minute wind data address many of the issues with excess calm and missing data hours. The 1-minute data should be processed for use in regulatory modeling. 3 years of NWS meteorological data will be used for this modeling demonstration.

The meteorological data will be obtained from the National Weather Stations as determined by the LDEQ Primary Meteorological Data Source recommendation for the area. The most recent available 3 years of data will be used. For the Cabot Ville Platte facility, Baton Rouge will be used for surface data and Lake Charles will be used for upper air. For the St. Mary facilities, New Orleans will be used for both surface and upper air data.

Table 6-1 LDEQ Primary Meteorological Data Sources

Regional Office	Primary Surface Station	Surrogate Surface Station	Surrogate Cloud Cover Station	Upper Air Station
Acadiana	Case-by-case	Case-by-case	Case-by-case	Lake Charles (NWS 03937)
Capital	Baton Rouge (NWS 13970)	Case-by-case	Lafayette (NWS 13976	Lake Charles (NWS 03937)
Northeast	Shreveport (NWS 13957)	Barksdale (WBAN 12958)	Longview, TX (WBAN 03901)	Shreveport (NWS 13957)
Northwest	Shreveport (NWS 13957)	Barksdale (WBAN 12958)	Barksdale (WBAN 12958)	Shreveport (NWS 13957)
Southeast	New Orleans (NWS 12916)	Belle Chase (WBAN 12958)	New Orleans (NWS 12942)	Slidell (NWS 53813)
Southwest	Lake Charles (NWS 03937)	NA	Port Arthur (NWS 12917)	Lake Charles (NWS 03937)

7. Background concentrations

Hourly background data form the Shreveport Airport monitor will be used. This data will be used in a tiered approach as follows:

Tier 1 will be the 3 year design value which is based on the three-year average of the 99^{th} percentile daily 1 hour maximum.

Tier 2 will be a matrix of seasonal design background values calculated for each hour of the day in each of the four seasons using the three-year average of the 99^{th} percentile values for each season and hour of day.

8. Model Outputs and Results

LDEQ will make available electronic copies of all modeling files, including model input files, output files, met data with appropriate documentation, if processing performed, and building downwash files.

9. References

LDEQ, 2006, Air Quality Modeling Procedures, August 2006

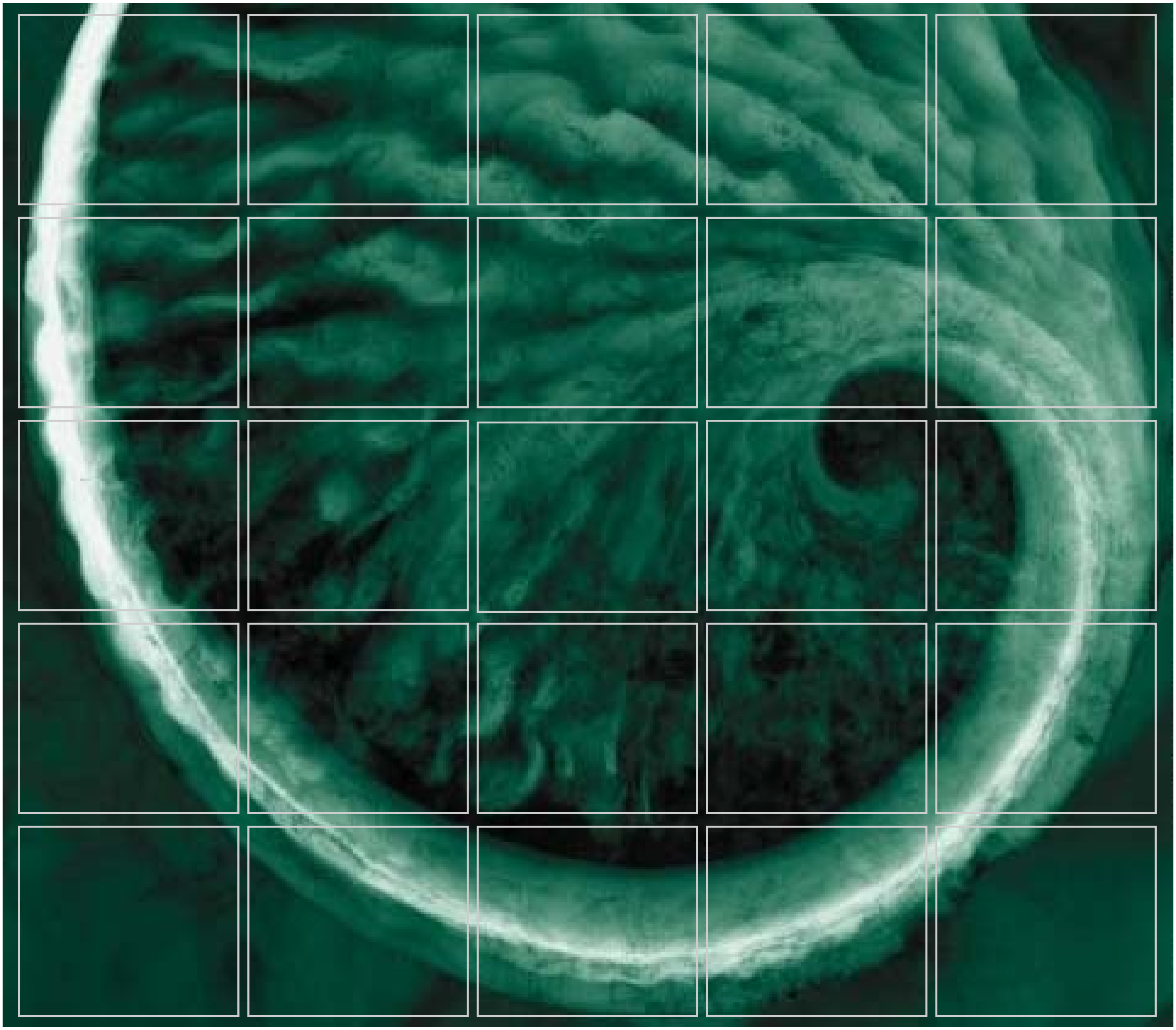
USEPA, 2005, Appendix W to Part 51 - Guideline on Air Quality Models, November 9, 2005

US EPA, 2010, Guidance Concerning the Implementation of the 1-hour SO2 NAAQS for the Prevention of Significant Deterioration Program, August 23, 2010

US EPA 2011, Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO2 National Ambient Air Quality Standard, March 1, 2011

USEPA, 2011, Area Designations for the 2010 Revised Primary Sulfur Dioxide National Ambient Air Quality Standards, March 24, 2011

USEPA, 2014, Guidance for 1-Hour SO2 Nonattainment Area SIP Submissions, April 24, 2014



SO_2 Air Dispersion Modeling Protocol for Big Cajun II Power Plant

Louisiana Generating, LLC

June 17, 2016

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SO_2 Air Dispersion Modeling Protocol for Big Cajun II Power Plant

June 17, 2016

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1.0 INTRODUCTION

Environmental Resources Management (ERM) presents this air dispersion modeling protocol on behalf of Louisiana Generating LLC for their Big Cajun II (BCII) Power Plant. The protocol is designed to assess the compliance status of the area surrounding BCII with respect to the 1-hour Sulfur Dioxide (SO_2) National Ambient Air Quality Standard (NAAQS).

This modeling protocol describes the modeling methodology that will be used to evaluate the impacts of SO_2 emissions from BCII on ambient air quality as well as the cumulative effect of nearby sources of SO_2.

1.1 PROJECT OVERVIEW

Unlike previous NAAQS attainment demonstrations, in the 1-hour SO_2 Data Requirements Rule (DRR) EPA has proposed to make 1-hour SO_2 NAAQS attainment determinations using ambient air monitoring data and/or air dispersion modeling. In situations where air modeling is used to make this determination, the recommended approach is described in EPA's proposed "Modeling Technical Assistance Document" (TAD)[1], which sets forth a significantly different technical approach compared to conventional regulatory modeling prescribed by 40 CFR Part 51, Appendix W (EPA's *Guideline on Air Quality Models*).

EPA distinguishes the approaches described in the SO_2 Modeling TAD from those used for other regulatory purposes as being designed to "reflect a view that designations are intended to address current actual air quality (i.e., modeling simulates a monitor), and thus are unlike attainment plan modeling, which must provide assurances that attainment will occur." EPA's proposed methodology utilizes several distinctive technical approaches, including but not limited to the following:

- Simulating actual emissions and exhaust conditions (e.g., temperature and flowrate) on an hourly basis reflecting actual operations for a specified historical time period;
- Representing actual stack heights, irrespective of the GEP limitations;
- Limiting modeled ambient air receptors to locations where monitoring could actually take place and locations that would conventionally be considered "ambient air" for regulatory and permitting purposes, by excluding waterways, roadways, railways, restricted access property, and other locations not accessible to the general public or where a monitor could not reasonably be sited; and
- Simulating a three-year period of meteorological and background monitoring data, concurrent with the actual operating conditions and emissions, to meet EPA's objective that "modeling simulates monitoring" in this context.

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[1] http://epa.gov/oaqps001/sulfurdioxide/pdfs/SO2ModelingTAD.pdf

ERM will perform a modeling analysis evaluating the impacts on ambient air quality from SO_2 emissions at BCII. In addition, although the approach for considering cumulative ambient impacts with other SO_2 sources in the region is not specifically covered in the proposed DRR, ERM will consider other sources in the vicinity of BCII for inclusion in the modeling.

As discussed in this protocol, ERM's approach to the modeling analysis will use the methods directly addressed in the proposed DRR, such as using actual hourly emissions, actual stack heights and variable (seasonal diurnal) ambient background concentrations.

The first section of this protocol describes the modeling methodology that will be followed. Section 2 provides a description of the facility and the emissions to be included in the modeling. Model selection and the methodology to be used in the modeling are described in Section 3.

1.2 OVERVIEW OF METHODOLOGY

ERM's assessments will be conducted in a manner consistent with United States Environmental Protection Agency (EPA) and the Louisiana Department of Environmental Quality (LDEQ) air quality regulations and modeling guidelines, including the following EPA documents:

- *Guideline on Air Quality Models* – 40 CFR Part 51, Appendix W, Revised November 9, 2005.
- AERMOD Implementation Guide, Revised March 19, 2009;
- "SO_2 NAAQS Designations Modeling Technical Assistance Document (Draft)," February 2016;
- "SO_2 NAAQS Designations Monitoring Technical Assistance Document (Draft)," February 2016;
- "Data Requirements Rule for the 1-Hour Sulfur Dioxide (SO_2) Primary National Ambient Air Quality Standard (NAAQS)," Final rule, August 11th, 2015 (published in the Federal Register on August 21st, 2015 80FR No. 162);
- Sierra Club and Natural Resources Defense Council vs. Gina McCarthy Consent Decree, Case No. 3:13-cv-3953-SI, United States District Court for the Northern District of California, March 2nd, 2015; and
- "Guidance for 1-hour SO_2 Nonattainment Area SIP Submissions," April 23, 2014.

The steps to be undertaken by ERM for conducting the air dispersion modeling analyses are summarized below:

- Compile information on the parameters and characteristics for sources of SO_2 emissions at BCII including the 3 primary EGU's.

- Develop a comprehensive receptor grid to capture the maximum off-site impacts from BCII sources using AERMAP (v.11103).
- Review regional ambient background monitors to determine the most appropriate ambient background concentration data for SO_2 to represent sources not explicitly included in the modeling runs.
- Develop 3 years (2012-2014) of meteorological data using surface observations from Baton Rouge Regional Airport with upper air data from Lake Charles, LA using the most recent version (v.15181) of AERMET, the meteorological data processor for AERMOD, and its two preprocessors: AERSURFACE (v.13016) and AERMINUTE (v.15272).
- Review all major sources of SO_2 in the vicinity of BCII for possible inclusion in the cumulative modeling analysis using the 2011 National Emission Inventory Database[2] and the Louisiana Emissions Reporting and Inventory Center (ERIC)[3], based on guidance included in the SO_2 Modeling TAD.
- Conduct an air dispersion modeling analysis using the most recent version of EPA's regulatory dispersion model, AERMOD (v.15181) and 3 years (2012-2014) of actual operating data from BCII sources, consistent with the methodology described in the proposed SO_2 Data Requirements Rule and SO_2 Modeling TAD.
- Summarize the results and compare them with the 1-hour SO_2 NAAQS to determine a recommended attainment designation for the vicinity of BCII.

[2] http://www.epa.gov/ttnchie1/net/2011inventory.html
[3] http://www.deq.louisiana.gov/portal/tabid/109/Default.aspx

2.0 FACILITY DESCRIPTION AND REGULATORY SETTING

2.1 FACILITY LOCATION

The Big Cajun II Power Plant is located in New Roads, LA. The station is located about 23 miles northwest of downtown Baton Rouge, LA. The site is accessed by state road 10 off state highway 964. Approximate site coordinates are 30.73^{o} North Latitude, 91.37^{o} West Longitude. The Universal Transverse Mercator ("UTM") coordinates of the facility are 656,100Easting and 3,400,621Northing (using North American Datum of 1983 - NAD83) in UTM Zone 15. The base elevation of the facility is 39.4' (12.0 m) above sea level. A full scale site plan of BCII is shown in Figure 2.1, and Figure 2.2 shows the site location marked on a United States Geological Survey ("USGS") topographic map.

2.2 SO_2 ATTAINMENT STATUS

In July 2013, EPA issued a rule designating 29 counties or partial counties as non-attainment for 1-hour SO_2. However, the vast majority of the country was not designated by EPA at that time. None of the parishes surrounding Big Cajun II, including Pointe Coupee, the parish in which BCII is located, have been designated as attainment or non-attainment for the 1-hour SO_2 NAAQS as of this time.

FIGURE 2-1: Big Cajun II Site Plan

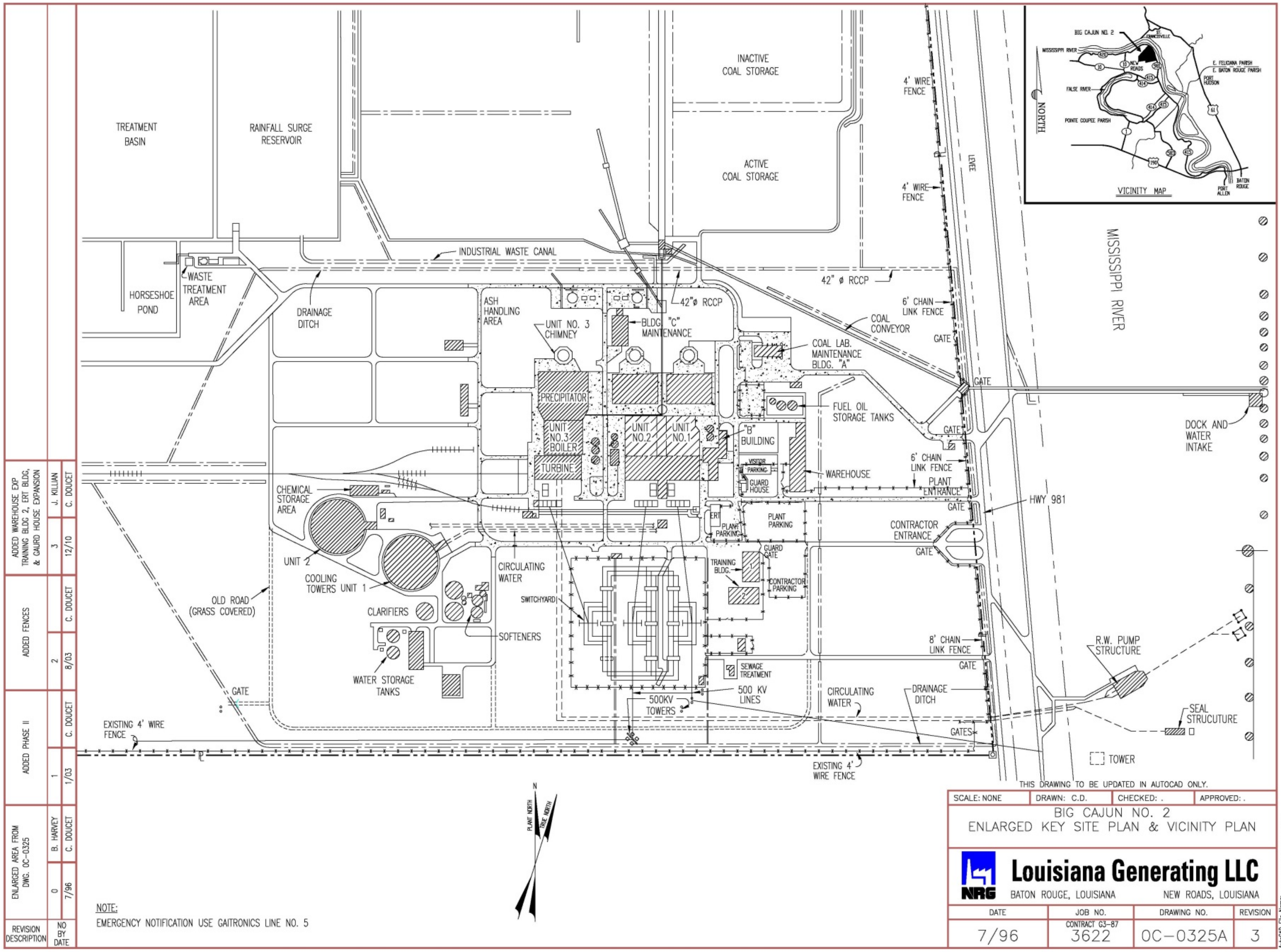
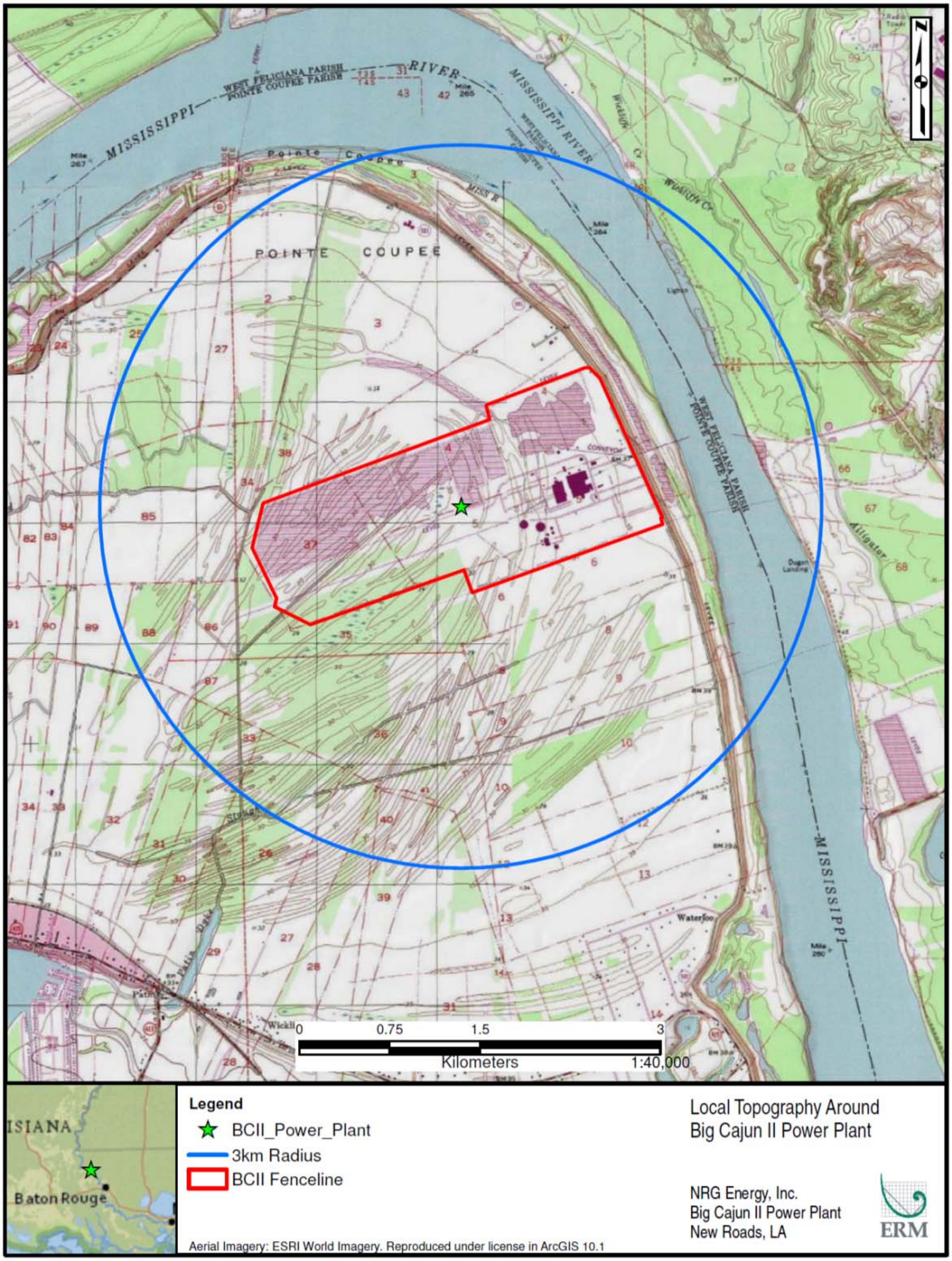


FIGURE 2-2: Big Cajun II Local Topography



2.3 SOURCE PARAMETERS AND EMISSION RATES

For this 1-hour SO_2 NAAQS modeling demonstration, all major sources of SO_2 at the facility will be included in the modeling. Per the proposed 1-hour SO_2 Data Requirements Rule and SO_2 Modeling TAD, the most recent 3 years of actual operating data, along with the actual stack heights of all sources, will be used in the modeling. The following provides a description of all BCII SO_2 emission sources represented in the model. Table 2-1 summarizes the characteristics of the emissions sources located at BCII that will be included in the modeling.

TABLE 2-1: Big Cajun II Point Sources – Stack Parameters

Description	Model Source	Stack Height		Exit Temperature		Exit Velocity		Stack Diameter	
		(ft)	(m)	(F)	(K)	(ft/sec)	(m/s)	(ft.)	(m)
Unit 1 Boiler[1]	UNIT1	600	183	---	---	---	---	26.5	8.1
Unit 2 Boiler[1]	UNIT2	600	183	305.0	424.8	18.3	60.0	26.5	8.1
Unit 3 Boiler[1]	UNIT3	600	183	---	---	---	---	26.5	8.1

1. For Units 1 and 3, exit temperature and exit velocity varied on an hourly basis based on CEMS data. Unit 2 will be modeled with a constant exit temperature and exit velocity based on parameters related to gas-fired operations that began in June, 2015.

Since the past actual emissions do not reflect the current emission limitations imposed in the 2012 USA and LDEQ vs. Louisiana Generating LLC Consent Decree (United States District Court – Middle District of Louisiana, Civil Action No. 09-100-JJB-DLD), hourly emissions were developed that conform to the following current Big Cajun II Title V permit requirements:

1. Unit 2 may fire only natural gas;
2. A dry sorbent injection (DSI) system must be operated on Unit 1; the unit must meet a 30-day rolling average SO_2 emissions limit of 0.38 lbs/MMBtu; and
3. Total SO_2 emissions from the plant may not exceed 18,950 tons/year starting in calendar year 2016.

Unit 2 converted to gas in June 2015 and the DSI system was installed on Unit 1 in April 2015. Actual emissions for input to AERMOD on an hourly basis were developed as follows based on these currently federally enforceable limits:

1. Unit 2 emissions will equal the maximum hourly SO_2 emission rate from the CEMs data since the unit started burning gas only,
2. Unit 3 emissions will be modeled at the actual hourly rate for 2012-2014 as recorded by CEMs, and
3. Unit 1 emissions will be adjusted to assure that, when added to emissions from Unit 1 and 3, total plant-wide SO_2 emissions are no more than the federally enforceable annual allowable cap of 18,950 tons. This assumption is more conservative than assuming continuous compliance with the 0.38 lb/MMBtu limit that also applies to Unit 1.

3.0 AIR DISPERSION MODELING ANALYSIS

ERM will conduct the modeling analysis for BCII to quantify ambient impacts of SO_2 relative to the 1-hour NAAQS following the proposed approach described in the SO_2 Modeling TAD.

3.1 MODEL SELECTION AND APPLICATION

The latest version of USEPA's AERMOD model (v.15181) will be used for predicting ambient impacts for 1-hour SO_2. Regulatory default options will be used in the analysis. Model predicted impacts of emissions from BCII and nearby background sources will be combined with the appropriate ambient background concentrations and compared to the 1-hour SO_2 NAAQS to determine the recommended attainment status of the area in the vicinity of the facility.

3.2 THE 1-HOUR SO_2 NAAQS

This study will focus on the maximum estimated 1-hour SO_2 concentrations and compare them to the 1-hour SO_2 NAAQS. The new standard came into effect in August, 2010. The form of the standard is the 99th percentile of the 3-year average 1-hour daily maximum concentration, and the standard was set to 75 ppb (196.5 $\mu g/m^3$).

3.3 METEOROLOGICAL DATA

Guidance for regulatory air quality modeling recommends the use of one year of on-site meteorological data or five years of representative off-site meteorological data. The SO_2 Modeling TAD however, specifies that 3 years of meteorological data concurrent with the actual emissions data being input into the model be used.

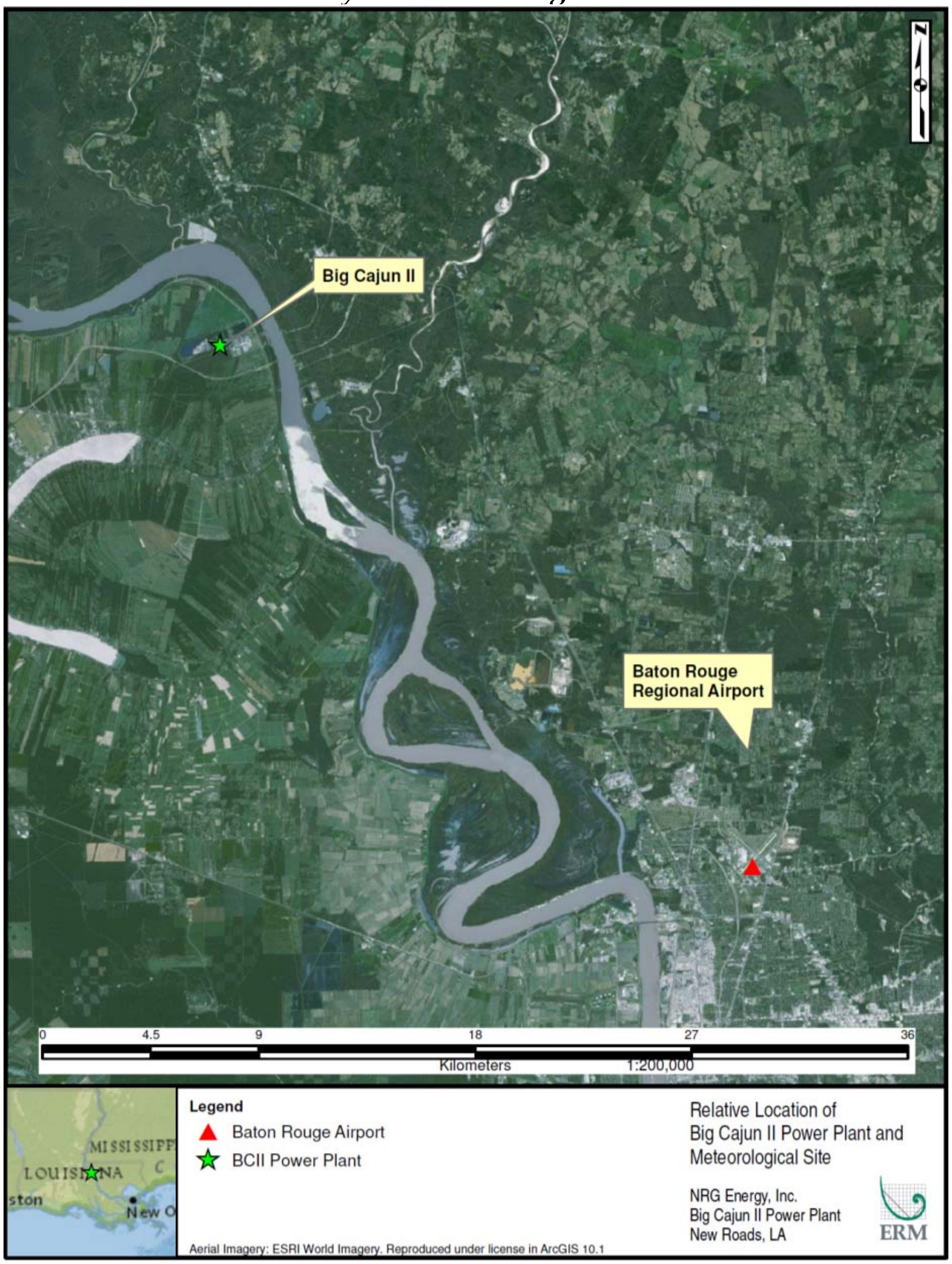
Three years (2012-2014) of surface observations from the National Weather Service (NWS) tower at Baton Rouge Regional Airport in Baton Rouge, LA (WBAN No. 13970) and concurrent upper air data from Lake Charles, LA (WBAN No. 03937) will be processed as described in Section 3.3.1. The meteorological data will be generated with the most recent version of AERMET (v.15181), the meteorological preprocessor for AERMOD, along with the two pre-processors to AERMET: AERSURFACE (v.13016) and AERMINUTE (v.15272). AERMET will be applied to create the two meteorological data files required for input to AERMOD.

The data characteristics of Baton Rouge Regional Airport are shown in Table 3-1. Figure 3-1 shows the relative location of the airport and BCII Power Plant.

TABLE 3-1: Characteristics of the Baton Rouge Regional Airport Meteorological Data

Distance from Big Cajun II Station	18.5 miles
Average Wind Speed	2.93 m/s
Percent Calm Hours	1.24%
Data Completeness	99.71%

FIGURE 3-1: Relative Location of Facility and Meteorological Site



3.3.1 *Surface Characteristics*

EPA and LDEQ guidelines recommend that meteorological data from a representative measurement station be used in modeling analyses to address ambient impacts. This section describes how the surface and upper air data were processed to generate AERMOD-ready input files.

AERMET is the recommended processor for developing inputs to AERMOD. AERMET requires, at a minimum, hourly surface data and once-daily (morning) upper air sounding profiles. The processing program produces two files for input to AERMOD: a surface file containing calculated micrometeorological variables (heat flux, stability, and turbulence parameters) that represent the dispersive potential of the atmosphere, and a profile file that provides vertical profiles of wind speed, wind direction, and temperature. In the case of meteorological data files developed from NWS data, the profiles contain only one level (the surface level) and a meteorological interface within AERMOD generates vertical profiles of wind, temperature, and turbulence from the input data files.

AERMET requires specification of site characteristics including surface roughness (z_o), albedo (r), and Bowen ratio (B_o). These parameters were developed according to the guidance provided by EPA in the AERMOD Implementation Guide (AIG)[4]. The AIG provides the following recommendations for determining the site characteristics:

1. The determination of the surface roughness length should be based on an inverse distance weighted geometric mean for a default upwind distance of one km relative to the measurement site. Surface roughness length may be varied by sector to account for variations in land cover near the measurement site; however, the sector widths should be no smaller than 30 degrees. As discussed further below, twelve sectors were used in this application.
2. The determination of the Bowen ratio was based on a simple un-weighted geometric mean (no direction or distance dependency) for a representative domain, with a default domain defined by a 10-km by 10-km region centered on the measurement site.
3. The determination of the albedo should be based on a simple un-weighted arithmetic mean (i.e., no direction or distance dependency) for the same representative domain as defined for Bowen ratio, with a default domain defined by a 10-km by 10-km region centered on the measurement site.

The AIG recommends that the surface characteristics be determined based on digitized land cover data. EPA has developed the AERSURFACE tool that was used to determine the site characteristics based on digitized land cover data in accordance with the recommendations from the AIG discussed above. AERSURFACE incorporates look-up tables of representative surface

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[4] EPA 2009. AERMOD Implementation Guide (AIG). Office of Air Quality Planning and Standards, Research Triangle Park, NC. March.

characteristic values by land cover category and seasonal category. AERSURFACE was applied with the instructions provided in the *AERSURFACE User's Guide*[5] to determine the land-use characteristics around the airport.

The current version of AERSURFACE (Version 13016) supports the use of land cover data from the USGS National Land Cover Data 1992 archives (NLCD92)[6]. The NLCD92 archive provides data at a spatial resolution of 30 meters based on a 21-category classification scheme applied over the continental U.S.

The 1-km radius circular area centered at the meteorological station site was divided into twelve 30-degree sectors for this analysis. Figure 3-2 shows the land use within 1 km (the extent for the surface roughness analysis) of the anemometer for the meteorological site using the NLCD92 data.

In AERSURFACE, the various land cover categories are linked to a set of seasonal surface characteristics. As such, AERSURFACE requires specification of the seasonal category for each month of the year. The following five seasonal categories are supported by AERSURFACE, with the applicable months of the year specified for this site.

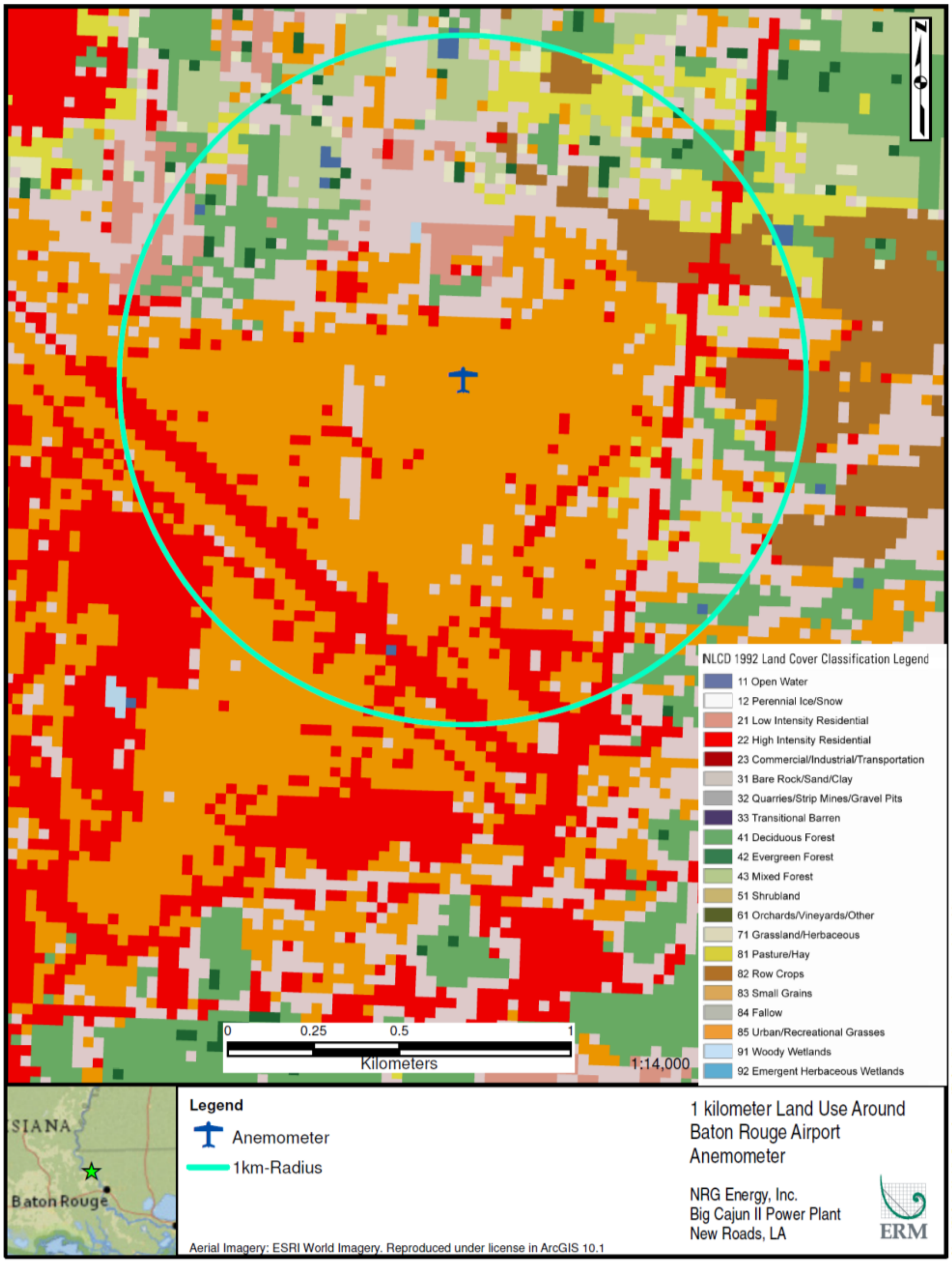
1. Midsummer with lush vegetation (June-August).
2. Autumn with un-harvested cropland (September-October).
3. Late autumn after frost and harvest, or winter with no snow (November, December, January, February, and March)
4. Winter with continuous snow on ground (December, January, February, and March).
5. Transitional spring with partial green coverage or short annuals (April-May).

In addition, for the Bowen ratio, the land use values are linked to three categories of surface moisture corresponding to average, wet, and dry conditions. The surface moisture condition for the site may vary depending on the meteorological data period for which the surface characteristics will be applied. AERSURFACE applies the surface moisture condition for the entire data period. Therefore, if the surface moisture condition varies significantly across the data period, then AERSURFACE can be applied multiple times to account for those

[5] EPA 2008. AERSURFACE User's Guide (EPA 454/B-08-001). Office of Air Quality Planning and Standards. January 2008.

[6] http://edcftp.cr.usgs.gov/pub/data/landcover/states/

FIGURE 3-2: Land-use around 1km of the Baton Rouge Regional Airport Anemometer



variations. As recommended in the AERSURFACE User's Guide, the surface moisture condition for each month was determined by comparing precipitation for the period of data to be processed to the 30-year climatological record from the Baton Rouge Regional Airport, selecting "wet" conditions if precipitation was in the upper 30th-percentile, "dry" conditions if precipitation was in the lower 30th-percentile, and "average" conditions if precipitation was in the middle 40th-percentile. The monthly designations of surface moisture that will be input to AERSURFACE are summarized in Table 3-2.

AERMINUTE will be processed using one-minute wind speed and direction data from Baton Rouge Regional Airport, LA, to compute hourly averaged wind speed and direction data for input into AERMET in accordance with EPA guidance[7]. A wind rose of the Baton Rouge Regional Airport wind data is provided in Figure 3-3. As shown by the wind rose, winds are predominantly from the north, northeast, and east. Consistent with EPA guidance[8] issued on March 8, 2013, the starting threshold wind speed for AERMET processing was set to 0.5 m/s.

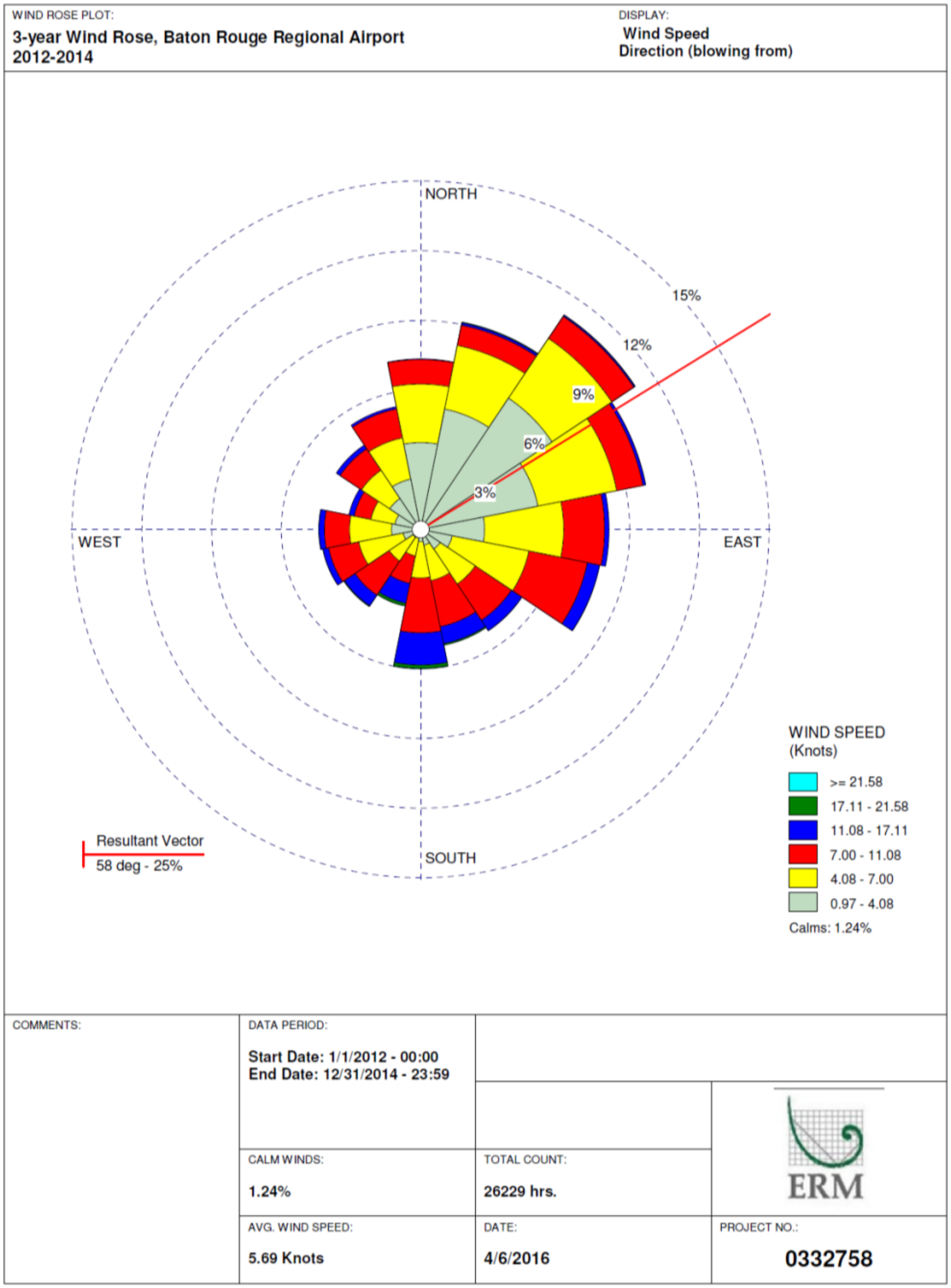
TABLE 3-2: AERSURFACE Bowen Ratio Designations for Baton Rouge, LA

Month	Bowen Ratio Category		
	2012	2013	2014
January	Wet	Wet	Dry
February	Wet	Wet	Wet
March	Wet	Dry	Average
April	Average	Wet	Average
May	Average	Wet	Wet
June	Average	Wet	Wet
July	Wet	Average	Wet
August	Wet	Dry	Average
September	Average	Wet	Average
October	Dry	Average	Average
November	Dry	Average	Average
December	Wet	Average	Average

[7] EPA, 2010b: Addendum – User's Guide for the AERMOD Meteorological Preprocessor (AERMET). EPA-454/B-03-002. U.S. Environmental Protection Agency, Research Triangle Park, NC 27711

[8] http://www.epa.gov/ttn/scram/guidance/clarification/20130308_Met_Data_Clarification.pdf.

FIGURE 3-3: Three-year Wind Rose (2012-2014): Baton Rouge Regional Airport



3.4 RECEPTOR GRID

A comprehensive Cartesian receptor grid extending out to approximately 20 kilometers (km) from Big Cajun II will be used in the AERMOD modeling analysis to assess maximum ground-level 1-hour SO_2 concentrations. The Modeling TAD states that the receptor grid must be sufficient to determine ambient air quality in the vicinity of the source being studied.

Specifically, the Cartesian receptor grid will consist of the following receptor spacing:

- 50-meter spacing along the facility fence line;
- 100-meter spacing extending from the fence line to 3 kilometers;
- 200-meter spacing extending from 3 to 5 kilometers;
- 500-meter spacing extending from 5 to 10 kilometers; and
- 1,000-meter spacing extending from 10 to 20 kilometers.

Receptor locations will be reviewed and, in accordance with the 1-hour SO_2 Modeling TAD, receptors located over areas where monitors could not reasonably be sited will be excluded from the modeling.

Terrain elevations from National Elevation Data ("NED") from USGS will be processed using the most recent version of AERMAP (v.11103) to develop the receptor terrain elevations required by AERMOD. NED data files contain profiles of terrain elevations, which in conjunction with receptor locations are used to generate receptor height scales. The height scale is the terrain elevation in the vicinity of a receptor that has the greatest influence on dispersion at that location and is used for model computations in complex terrain areas. The near-field (within 5 kilometers) and far-field (full grid) receptor grids are shown in Figures 3-4 and 3-5, respectively.

FIGURE 3-4: Near-Field Model Receptors

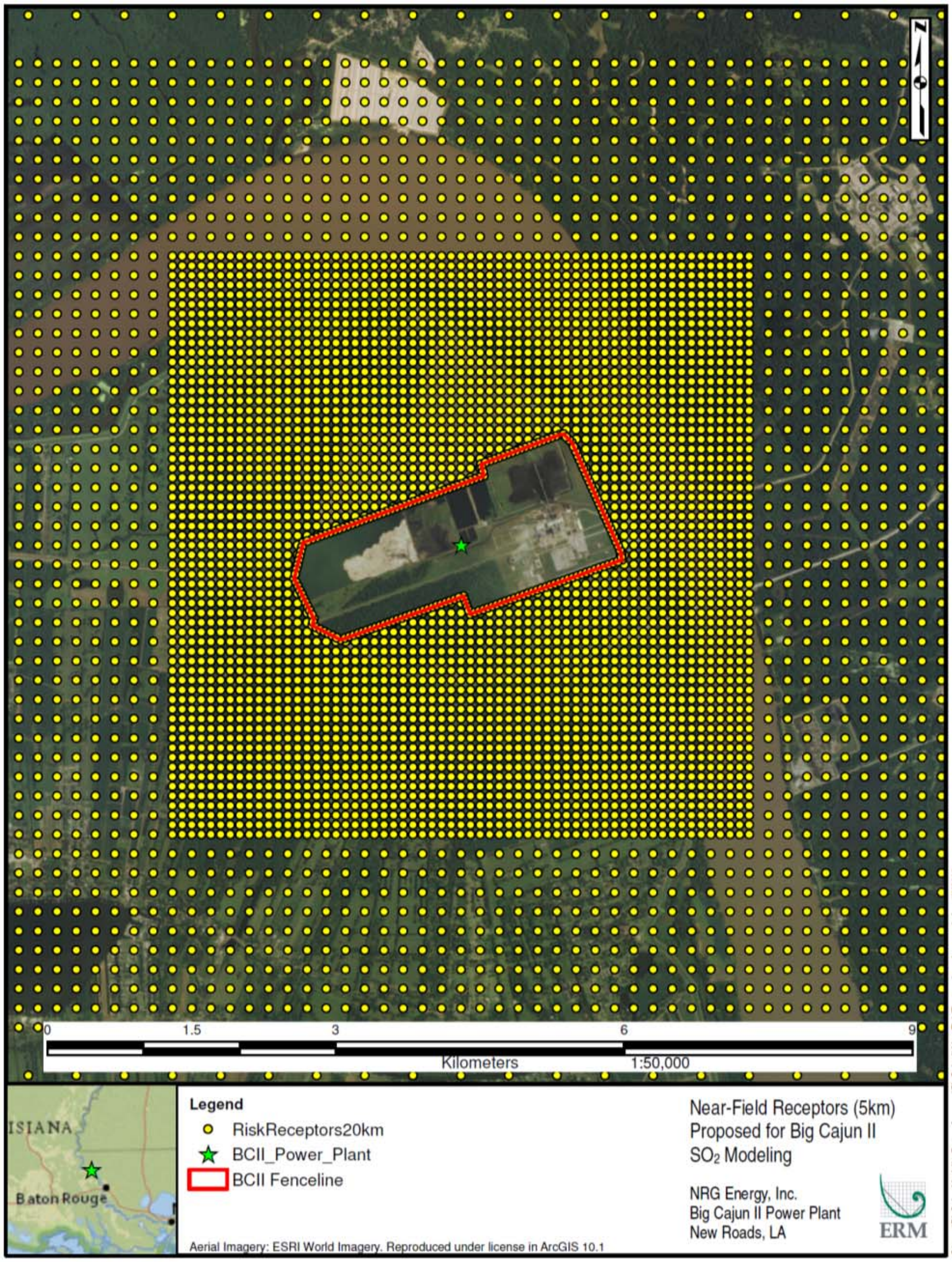
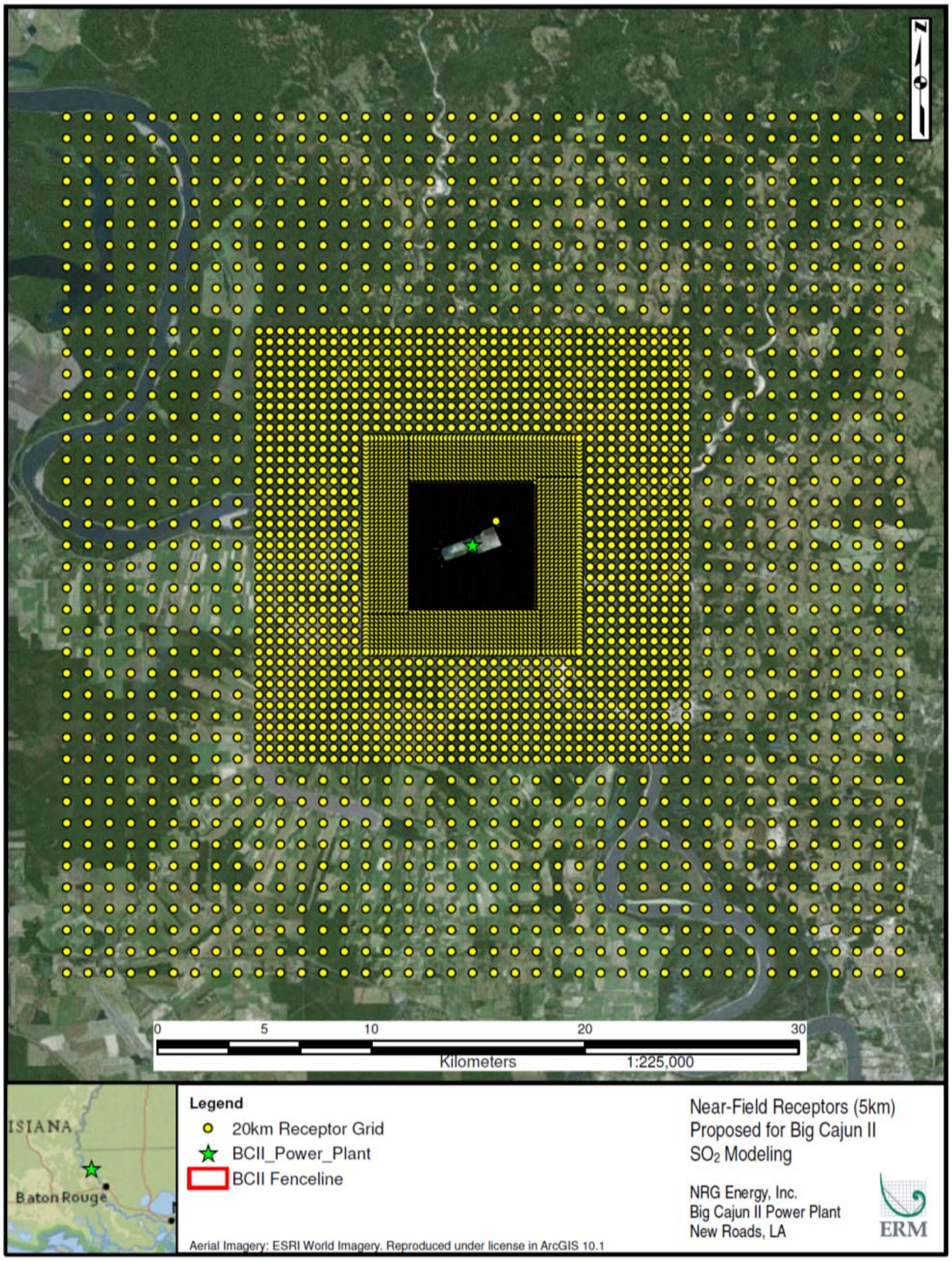


FIGURE 3-5: Far-Field Model Receptors



3.5 GOOD ENGINEERING PRACTICE STACK HEIGHT ANALYSIS

Good engineering practice ("GEP") stack height is defined as the stack height necessary to ensure that emissions from the stack do not result in excessive concentrations of any air pollutant as a result of atmospheric downwash, wakes, or eddy effects created by the source, nearby structures, or terrain features.

A GEP stack height analysis has been performed for all stacks using the Building Profile Input Program (BPIP) in accordance with USEPA's guidelines (USEPA 1985). Per the guidelines, the physical GEP height, (H_{GEP}), is determined from the dimensions of all buildings which are within the region of influence using the following equations, depending on the construction data of the stack:

(1) For stacks in existence on January 12, 1979 and for which the owner or operator had obtained all applicable permits or approvals required,

$$H_{GEP} = 2.5H,$$

provided the owner or operator produces evidence that this equation was actually relied on in establishing an emission limitation;

(2) For all other stacks:

$$H_{GEP} = H + 1.5L$$

where:

H = height of the structure within 5L of the stack which maximizes H_{GEP}; and
L = lesser dimension (height or projected width) of the structure.

For a squat structure, i.e., height less than projected width, the formula reduces to:

$$H_{GEP} = 2.5H$$

In the absence of influencing structures, a "default" GEP stack height is creditable up to 65 meters (213 feet).

A summary of the GEP stack height analyses is presented in Table 3-3. As described in the SO_2 Modeling TAD, modeling to determine the attainment status of the facility when compared to the 1-hour SO_2 NAAQS, the full height of all stacks is allowed in the modeling regardless of their GEP Formula Heights. The Unit 1 and 2 stacks at BCII are below their respective GEP heights, yet the actual stack height for Unit 3 was just above GEP height. As provided in the SO_2 Modeling TAD the actual stack heights hence will be used in the modeling for each of the stacks. The locations of all structures and sources included in the GEP analysis are shown in Figure 3-6. The output from BPIP will be input into AERMOD to represent aerodynamic downwash caused by structures around the stacks.

FIGURE 3-6: Structures Included in the Big Cajun II GEP Analysis

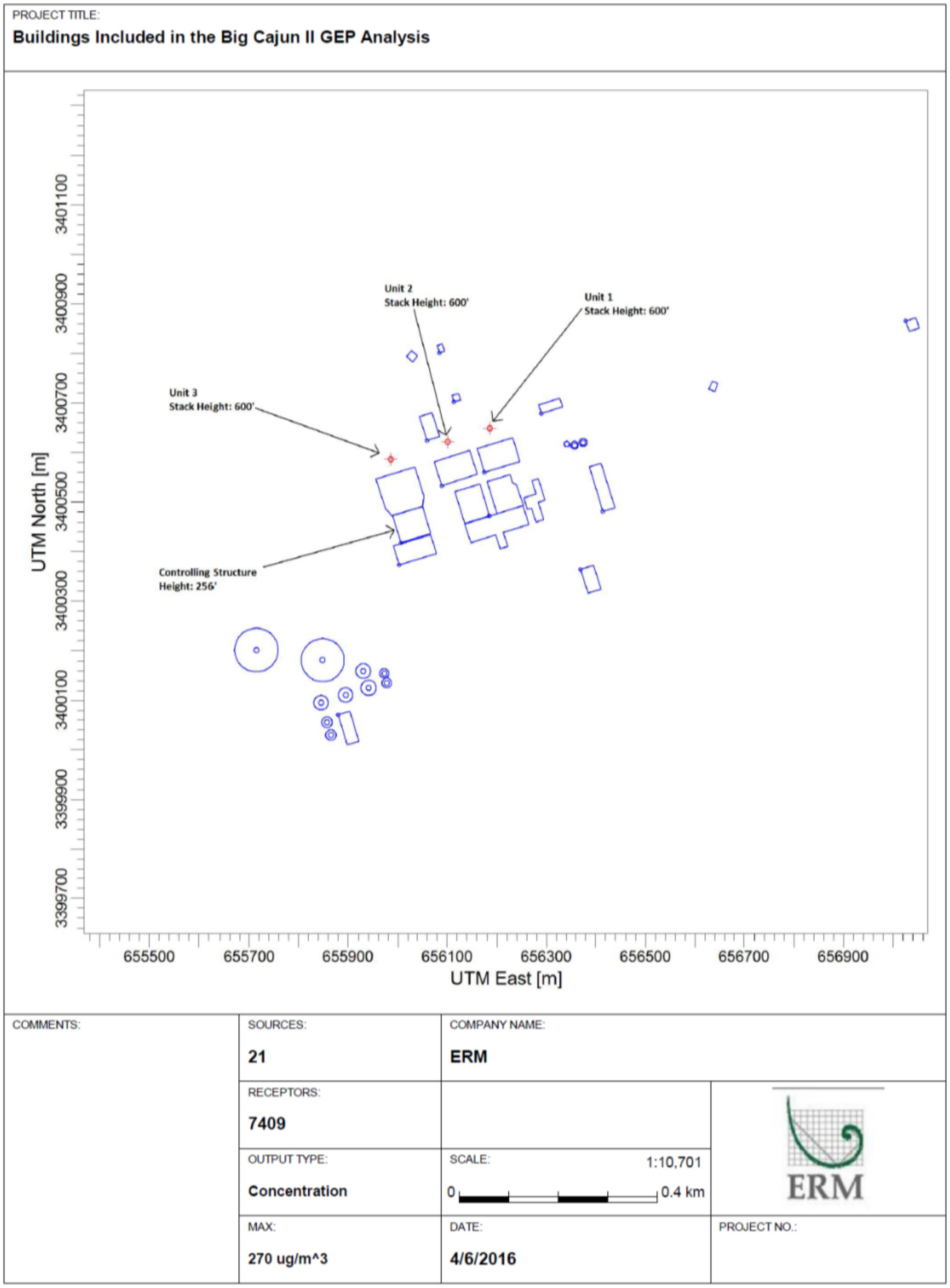


TABLE 3-3: Summary of Big Cajun II Power Plant GEP Analysis

Emission Source	Stack Height (m)	Controlling Buildings / Structures	Building Height (m)	Projected Width (m)	GEP Formula Height (m)[1]
UNIT 1	182.9	Unit 3 Boiler Bldg.	78.0	78.4	183.1
UNIT 2	182.9	Unit 3 Boiler Bldg.	78.0	82.4	183.1
UNIT 3	182.9	Unit 3 Boiler Bldg.	78.0	77.0	181.5
1. In the absence of influencing structures, a "default" GEP stack height is creditable up to 65 meters (213 feet).					

3.6 AMBIENT SO_2 BACKGROUND DATA FOR CUMULATIVE MODELING

In addition to assessing impacts from Big Cajun II sources, the impacts from other sources of SO_2 in the region will be considered in order to demonstrate that the air quality in the region is in attainment with the NAAQS. There are two sources of SO_2 in the vicinity of BCII that warrant inclusion in the modeling as discussed in Section 3.7. In order to account for other minor sources of SO_2 in the area an ambient background concentration will be added to model-predicted impacts from BCII for comparison to the NAAQS.

The criteria for determining the monitor best suited to characterize air quality at a given location include:

- Stations with similar influencing SO_2 sources as the source being modeled (not necessarily the closest).
- Avoid stations influenced by the source(s) being modeled to prevent double-counting impacts.

Figure 3-7 shows the location of the ambient monitor proposed for the Big Cajun II modeling, as well as the location of all relevant SO_2 sources that will be explicitly included in the modeling. An analysis of SO_2 emissions surrounding the Shreveport monitor, compared to SO_2 emissions surrounding Big Cajun II, was performed to determine which data would better represent contributions from the smaller sources that will not be explicitly modeled.

SO_2 emissions recorded in the 2011 NEI were summed for two distance ranges (0-10 km and 10-25 km); the results are shown in Table 3-4. The SO_2 emissions listed for the area surrounding Big Cajun II are shown twice: first for all sources, and next excluding the sources that will be modeled explicitly (as discussed in Section 3.7). The second entry, which reflects sources that should be captured by the selected background monitor, compares well with the entry for Shreveport and supports the use of Shreveport measured SO_2 concentrations for use in the modeling for Big Cajun II.

FIGURE 3-7: SO_2 Sources and Monitors in the Region

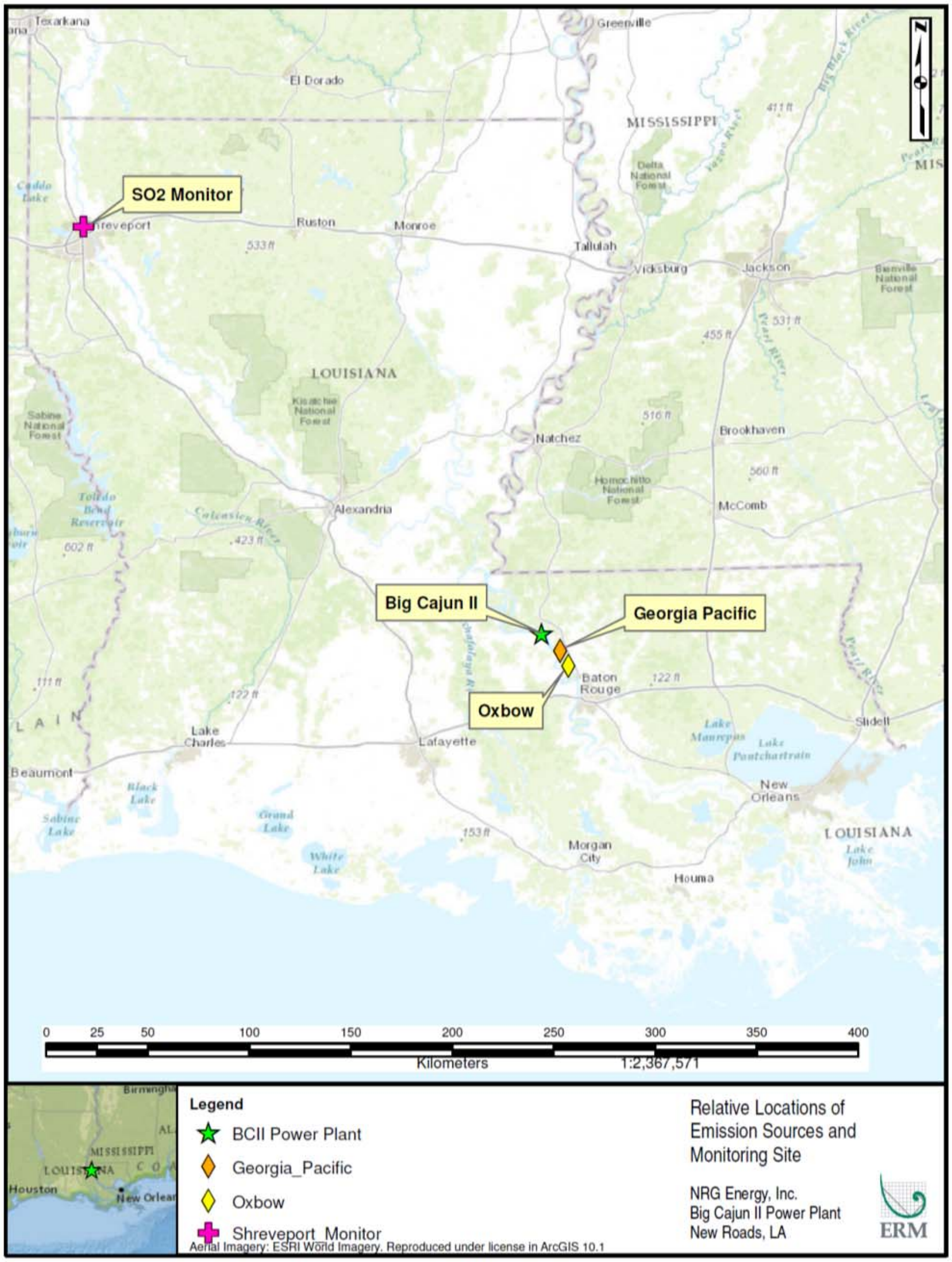


TABLE 3-4: SO_2 Emissions Surrounding Big Cajun II and Shreveport

Distance From	Includes	SO_2 by Distance (km)	
		0-10	10-25
Big Cajun II	All Sources	135.3	5088.9
Big Cajun II	All Sources not explicitly modeled	135.3	212.1
Shreveport	All Sources	211.8	255.0
SO_2 emissions are in tons per year (tpy)			

The Shreveport monitor was chosen over the more proximal Port Allen monitor since the emissions from sources around the Shreveport monitor (AIRS No. 22-015-0008) better represents the surroundings around Big Cajun II.

EPA guidance allows simulation of background values that vary by season and hour of day that could simulate a lower value than the 99th percentile. The modeling will be performed with a set of seasonal diurnal values developed using the methodology described in the USEPA March 1st, 2011 Clarification Memorandum for 1-hour NO_2 Modeling. Though this memorandum primarily addresses NO_2 modeling, page 20 describes the process for developing seasonal diurnal background values for SO_2 as well. The seasonal diurnal values used are shown in Table 3-5.

TABLE 3-5: Seasonal Diurnal Ambient SO_2 Concentrations for the Shreveport Monitor ($\mu g/m^3$)

Hour[1]	Winter	Spring	Summer	Fall
1	4.28	5.15	4.71	4.1
2	6.54	5.15	4.89	4.28
3	4.8	4.62	4.89	4.28
4	5.58	4.54	4.71	4.28
5	5.15	4.54	4.71	4.1
6	4.89	4.71	4.97	3.84
7	4.19	4.97	4.97	3.66
8	4.28	5.32	10.21	4.45
9	6.2	6.46	19.28	7.07
10	4.62	8.46	19.81	10.91
11	9.69	7.85	15.62	15.44
12	11.6	8.11	10.56	9.51
13	12.04	7.85	9.42	7.07
14	9.69	6.72	6.98	7.85
15	7.68	6.19	6.89	6.19
16	6.98	5.41	7.77	7.94
17	6.89	5.76	5.76	5.5
18	5.32	5.76	5.93	7.33

Hour[1]	*Winter*	*Spring*	*Summer*	*Fall*
19	5.67	4.8	7.59	4.36
20	4.54	4.54	6.19	4.01
21	6.19	4.8	6.19	3.66
22	4.89	5.67	4.97	3.58
23	7.42	5.93	4.97	3.49
24	5.32	5.06	4.62	3.58
[1] Hours in AERMOD are defined as hour-ending. i.e., Hour 1 is the period from midnight through 1 AM, etc.				

3.7 INVENTORY SOURCES FOR CUMULATIVE MODELING

Two SO_2 monitors in the Baton Rouge area: Port Allen (AIRS No. 22-121-0001) and Capitol (AIRS No. 22-033-0009) are located approximately 30 km to the southeast of BCII. These two monitors have recorded design values for 2012-2014 that are less than half the 1-hour SO_2 NAAQS. Based on a review of the 2011 NEI and the LDEQ ERIC system, there are several sources of SO_2 within approximately 5 kilometers of these monitors, and a large source of SO_2 approximately 15 kilometers to the south of these monitors (and approximately 45 kilometers from BCII). Since these monitors record design values substantially below the NAAQS and are positioned to record concentrations due to these sources, there is no need to further investigate the attainment status in this area, nor to include sources that have an influence on these monitors in the modeling for BCII.

Other sources within approximately 20 km of BCII were investigated. The two largest sources of SO_2 are Georgia Pacific and Oxbow Calcining. These two facilities will be included in the modeling as background sources. Accounting for these emissions directly, and adding a background concentration as described in the previous section to account for the impact from smaller sources, will ensure that the results will accurately reflect the cumulative effect of BCII and other sources on the existing 1-hour SO_2 ambient concentration.

Emissions and stack parameters from the LDEQ inventory for Georgia Pacific and Oxbow Calcining will be incorporated into the final modeling to assess attainment with the NAAQS. In accordance with verbal guidance from LDEQ, the maximum annual emissions from Georgia Pacific for the most recent 3 years available in ERIC will be doubled and converted to a short-term emission rate for input to AERMOD. An hourly data file, provided by LDEQ, will be used to characterize hourly emissions, stack temperatures, and exit velocities for Oxbow sources. This hourly data file was developed by Oxbow in response to a request LDEQ made to all of the sources in the state that meet the criteria for requiring an assessment of the attainment status for the area around it. Georgia Pacific is not subject to the DRR and has therefore not been asked by LDEQ to develop actual hourly emissions. Doubling the annual emissions is a conservative way to account for the potential for higher short-term emissions.

4.0 REFERENCES

Sierra Club and Natural Resources Defense Council vs. Gina McCarthy Consent Decree, Case No. 3:13-cv-3953-SI, United States District Court for the Northern District of California, March 2, 2015.

United States of America and Louisiana Department of Environmental Quality vs. Louisiana Generating LLC Consent Decree (United States District Court – Middle District of Louisiana, Civil Action No. 09-100-JJB-DLD).

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U.S. Environmental Protection Agency. (USEPA 2016) "SO_2 NAAQS Designations Modeling Technical Assistance Document (Draft)," February 2016.

U.S. Environmental Protection Agency. (USEPA 2016) "SO_2 NAAQS Designations Monitoring Technical Assistance Document (Draft)," February 2016.

U.S. Environmental Protection Agency. (USEPA 2014) "Data Requirements Rule for the 1-Hour Sulfur Dioxide (SO_2) Primary National Ambient Air Quality Standard (NAAQS)," Final rule, August 21, 2015.

U.S. Environmental Protection Agency. (USEPA 2014) "Guidance for 1-hour SO_2 Nonattainment Area SIP Submissions," April 23, 2014.

Protocol for Air Quality Modeling for Brame Energy Center for 1-Hour SO_2 Impact

CLECO Power, LLC
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June 30, 2016

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List of Acronyms and Abbreviations

$\mu g/m^3$	micrograms per cubic meter
AQS	Air Quality System
BEC	Brame Energy Center
BPIP	Building Profile Input Program
CEMs	continuous emission monitoring system
CLECO	CLECO Corporation
ft	feet
km	kilometers
LDEQ	Louisiana Department of Environmental Quality
m	meters
MMBTu/hr	Million British Thermal Units per Hour
NAAQS	National Ambient Air Quality Standard
SO_2	sulfur dioxide
TAD	Technical Assistance Document
USEPA	U.S. Environmental Protection Agency

1.0 Background

The U.S. Environmental Protection Agency (USEPA) issued the final primary National Ambient Air Quality Standard (NAAQS) for 1-hour sulfur dioxide (SO_2) on June 2, 2010 (2010 SO_2 standard). On August 5, 2013, the USEPA published a notice announcing designation of nonattainment for the 2010 SO_2 standards, based on certified ambient air quality monitoring data for the years 2009-2011 that showed these areas exceeding the standard. For all other areas, the USEPA developed and proposed a Data Requirement Rule that would require states to gather and submit additional information characterizing SO_2 in areas with larger SO_2 emissions. The information will be used by the USEPA for future area designations.

Separately, in a consent decree signed with the Sierra Club in the District Court in Northern California on March 2, 2015, the USEPA is required to complete area designations with available monitoring data within 16 months of date of the consent decree. Also, for areas without adequate monitoring data, the area designations are to be completed in two phases by December 31, 2020.

The first phase is for areas where the states have not installed a monitoring network by January 1, 2017 and the designations for these areas are scheduled by December 31, 2017, potentially using modeling. The second phase is for areas where the states have installed and operating monitoring network on or before January 1, 2017 and these areas will be allowed to collect data for three years and the designations will be finalized in 2020.

If CLECO's Brame Energy Center (BEC) were to conduct air modeling of the SO_2 sources in the facility to determine the 1-hour SO_2 air quality in the Rapides parish and submit the results to LDEQ as supporting information for future area designation in this parish for the 1-hour SO_2 NAAQS, this protocol describes the methodology that would be used to conduct the modeling.

1.1 SO_2 Emission Sources in BEC

BEC operates four (4) electric generating units: Nesbitt 1 (Unit 1); Rodemacher II (Unit 2); Madison 3-1; and Madison 3-2. **Table 1-1** shows the details of the units**. Figure 1-1** shows the locations of the units at the facility.

Table 1-1 Description of Electric Generating Units at BEC

Unit	Capacity (MMBTu/Hr)	Fuel	Stack height (ft)
Unit 1 (Nesbitt 1)	4170	Natural gas (primary), Used fuel oil, Fuel oil 2 and 6	195
Unit 2 (RPS II)	5445	Coal (primary): startups with NG	250
Unit 3-1 (Madison)	3006	Petroleum Coke (primary): startups with NG	450
Unit 3-2 (Madison)	3006	Petroleum Coke (primary): startups with NG	450

1.2 Description of Surrounding Area

Figure 1-2 shows a Google Earth view of the area surrounding the facility, which is primarily rural in nature and heavily wooded on all sides except in the west and southwest where there is a large water body (Lake Rodemacher). The nearest city is Alexandria, Louisiana, approximately 28 kilometers (km) to the southeast of the facility. BEC is bound to the east by Interstate 49, to the south by Highway 121, and to the north by Highway 8. CLECO owns a large tract of land surrounding the facility shown in red outline in **Figure 1-3**. These areas are not fenced and can be accessed without going through the facility (lake, railroad, interstate, bayou jean de jean). There are guard gates to the north and west of the facility restricting access.

1.3 SO_2 Emission Sources in Rapides Parish

BEC is the largest SO_2 emission source in the Rapides parish. **Figure 1-4** shows the locations of permitted SO_2 emission sources in the Rapides parish and **Figure 1-5** shows the SO_2 emissions sources within 20 km radius of BEC. The nearest large emission source for SO_2 is Martco Chopin Mill - approximately 18 km east of the facility in the adjacent Natchitoches parish.

Table 1-2 shows the actual emissions of SO_2 from sources within Rapides Parish for last three years of available data. **Table 1-3** shows actual emission of other SO_2 emissions from sources within 20 km of the BEC facility for the last three years of available data. The emissions include the Martco Chopin Mill in the adjacent Natchitoches parish.

Table 1-2 SO_2 Emissions within Rapides Parish

Facilities Within Rapides Parish	2014		2013		2012	
	tons/yr	% of Total	tons/yr	% of Total	tons/yr	% of Total
CLECO	9711	99.82%	12524	99.86%	12153	99.85%
All Other Off-site Sources	17.9	0.18%	18.0	0.14%	17.9	0.15%
Total in Rapides Parish	**9729**	**100.00%**	**12542**	**100.00%**	**12171**	**100.00%**

Table 1-3 SO_2 Emissions within 20 Km from BEC

Facilities	2014		2013		2012	
	tons/yr	% of Total	tons/yr	% of Total	tons/yr	% of Total
CLECO	9711	99.58%	12524	99.68%	12153	99.68%
Off-site Sources in Rapides Parish (Boise Cascade)	0.348	<0.001%	0.304	<0.001%	0.263	<0.001%
Off-site Sources in Adjacent Parishes (Martco Chopin Mill)	40.69	0.42%	40.32	0.32%	39.51	0.32%
Total	**9752**	**100.00%**	**12564**	**100.00%**	**12193**	**100.00%**

The data shows that BEC is the largest source impacting the SO_2 ambient concentration in Rapides parish and a the modeled impact from the BEC would be representative of the ambient air quality data for SO_2 in this parish, which could be used for the area designation process for the 1-hour SO_2 NAAQS.

2.0 Modeling Methodology

The USEPA has published a Technical Assistance Document (2013 Modeling TAD) for modeling the SO_2 impacts from a source for area designation purposes (SO_2 NAAQS Designation Modeling Technical Assistance Document – Draft dated December 2013). This methodology will be used in modeling the impact from BEC sources. The methodology is described below.

2.1 Modeling Domain and Receptor Network

A Cartesian receptor grid extending to 10 km from the BEC will be used in the modeling. The spacing of the receptor grid will follow 2013 Modeling TAD and LDEQ air modeling guidance as follows:

- Along property line – receptors spaced 100 meters (m) apart
- From property line to 1 km – receptors spaced 100 m apart
- From 1 km to 10 km – receptors spaced 1000 m apart

Figure 2-1 shows the receptor grid to be used in the modeling. Receptor elevations will be obtained from national elevation dataset (NED) in the North American Datum 83 (NAD 83) format and processed with the latest version of AERMAP (v 11103).

CLECO owns a large tract of land surrounding the facility shown in red outline in **Figure 1-3**. These areas are not fenced and can be accessed without going through the facility (lake, railroad, interstate, bayou jean de jean). However, public access is restricted in the facility by two (2) manned guard shacks and two (2) gates as shown in redlines in **Figure 2-2**. The receptor network will extend in all directions from these restricted areas. There is a large water body (Lake Rodemacher) to the west and south west of BEC. There are also small islands within this lake. These areas have unrestricted public access and therefore will be considered as ambient air.

2.2 Air Quality Model

The latest version of the USEPA's AERMOD model (version 15181) will be used for the analysis using all regulatory default parameters.

2.3 Meteorological Data

The 2013 TAD requires modeling with at least three (3) years of meteorological data. CLECO plans to use latest three (3) years of surface and upper air hourly meteorological data (2013-2015) from the national weather station at Shreveport, Louisiana. This weather station is approved by LDEQ for air impact modeling of sources in Rapides parish. The meteorological data will be processed using the latest version of AERMET (v 15181). **Figure 2-3** shows the wind rose at the Shreveport meteorological station. The wind is predominantly from south, southeast, and southwest.

2.4 Stack Parameters and Emission Rates

BEC is the largest SO_2 emission source within Rapides parish accounting for >99% of the emissions in last three years of available data as shown in **Table 1-2**. Also, there are no major SO_2 emission sources within 20 km of BEC as shown in **Table 1-3**. Therefore, it is expected that the 1-hour SO_2 impacts in the Rapides parish will be influenced solely by emissions from BEC and that the other SO_2 emission sources (such as the Boise Cascade facility near BEC and the Martco Chopin Mill facility in the nearby Natchitoches parish) are not required to be included in the modeling.

Hourly values of actual emission rate will be used in the model using the HOUREMIS keyword in the AERMOD model. The hourly raw data for the units for CY 2013-2015 not corrected for CEMS bias (i.e. the unbiased) will be used in generating the hourly emission file in AERMOD. The data will be obtained from the continuous emission monitoring system (CEMs) installed on the units.

The purpose of the analysis is to reflect actual impacts based on actual operating data over last 3 years; therefore, the following procedure will be followed for filling in missing data:

- For the hours the emission data are unavailable due to CEMs malfunction and the units were running as evidenced by operating logs, the emission data will be filled in using the Acid Rain Program data filling procedure in 40 CFR Part 75; and

- For the hours the units were shutdown as evidenced by the operating logs, no attempt will be made to substitute the data and these hours will be excluded from modeling by entering an emission rate of zero in the AERMOD input file.

Hourly stack gas flowrate and stack gas temperatures concurrent with the hourly emissions will be used to develop realistic estimates of the hourly impacts. There are few hours for each unit in each year, where SO_2 emission rates are available but stack temperature and flow data are missing. The units are presumed to be operating at these hours and the missing data are presumed to be due to malfunction of the temperature and/or flow monitoring instruments. For these hours, the missing data will be replaced by 3 year average value on a unit by unit basis.

Unit 1 (Nesbitt 1) does not have a flow monitor and therefore hourly stack flow data is not available. Stack test at 90% load was conducted for this unit in 2006. The stack test provided both stack flow rate and stack temperature. The stack flow rate for each hour will be based on this flow rate after adjusting for the change in hourly stack temperature. For all other units, the hourly stack flow data will be obtained from the flow monitors. Because Nesbitt 1 uses pipeline quality natural gas as the primary fuel, the SO_2 emissions are orders of magnitude lower than the other units at BEC using solid fuels. Therefore, the effect on the modeled results due to the adjustments to the stack gas parameters as described above is expected to be insignificant.

The hourly data for input to model for each unit for 2011-2015 will be the following:

- Hourly SO_2 emission rates
- Hourly stack temperature
- Hourly stack flow data

Appendix 1 includes the raw data from the CEMs and the data processing to convert the data suitable for input to AERMOD model. These hourly data will be used in the AERMOD via an external file using the HOUREMIS keyword. The HOUREMIS input data is also included in **Appendix 1**.

2.5 Building Downwash

Building downwash will be considered in the modeling to obtain a realistic impact. All buildings and structures in the facility surrounding the units will be included in the aerodynamic downwash calculations using the USEPA's Building Profile Input Program (BPIP). **Figure 2-4** shows the buildings and structure to be included in the downwash analysis.

2.6 Background Concentration

Hourly SO_2 background data is available for latest three (3) years (2013-2015) at the Shreveport, LA monitor. This data will be used in a tiered approach as follows:

> Tier 1: A single design background concentration will be selected based on 3 year average of the 99^{th} percentile of daily 1 hour maximum at this monitor. This design background value will be assumed constant over the entire modeling period of 2013-2015.
>
> Tier 2: A seasonal design background value will be determined for each hour of day in each of the four (4) seasons by averaging the 99^{th} percentile of the 3 year values for each hour of day for each season. This design value will be fixed for respective hour of day for each season.
>
> Tier 3: A monthly design background concentration will be for each hour of day for each month determined in the same manner as the seasonal hourly design background concentration in Tier 2.

The seasonal and monthly design values for Tier 2 and Tier 3 will be used in the AERMOD using the BACKGRND keyword.

3.0 Report

On completion of the modeling, a modeling report will be submitted to LDEQ, documenting the modeling methodology and results. The report will include the details identified below.

- Brief overview of SO_2 emission sources in the facility
- Facility plot plan indicating the SO_2 sources, restricted access property line, clear scale, and true north
- Hourly emission rate, stack temperature, and stack gas flow rate data used in the modeling in units consistent with modeling
- Summary of all model inputs (e.g., model used, met data, rural or urban dispersion coefficients, etc.)
- Derivation of design background concentrations
- Comparison of all modeling results to the 1-hour SO_2 NAAQS
- Electronic copies of all modeling files, including model input files, output files, meteorological data with appropriate documentation if processing performed, and building downwash files

.

Appendix 1
Hourly Emission and Stack Parameters Used in Modeling

Figures

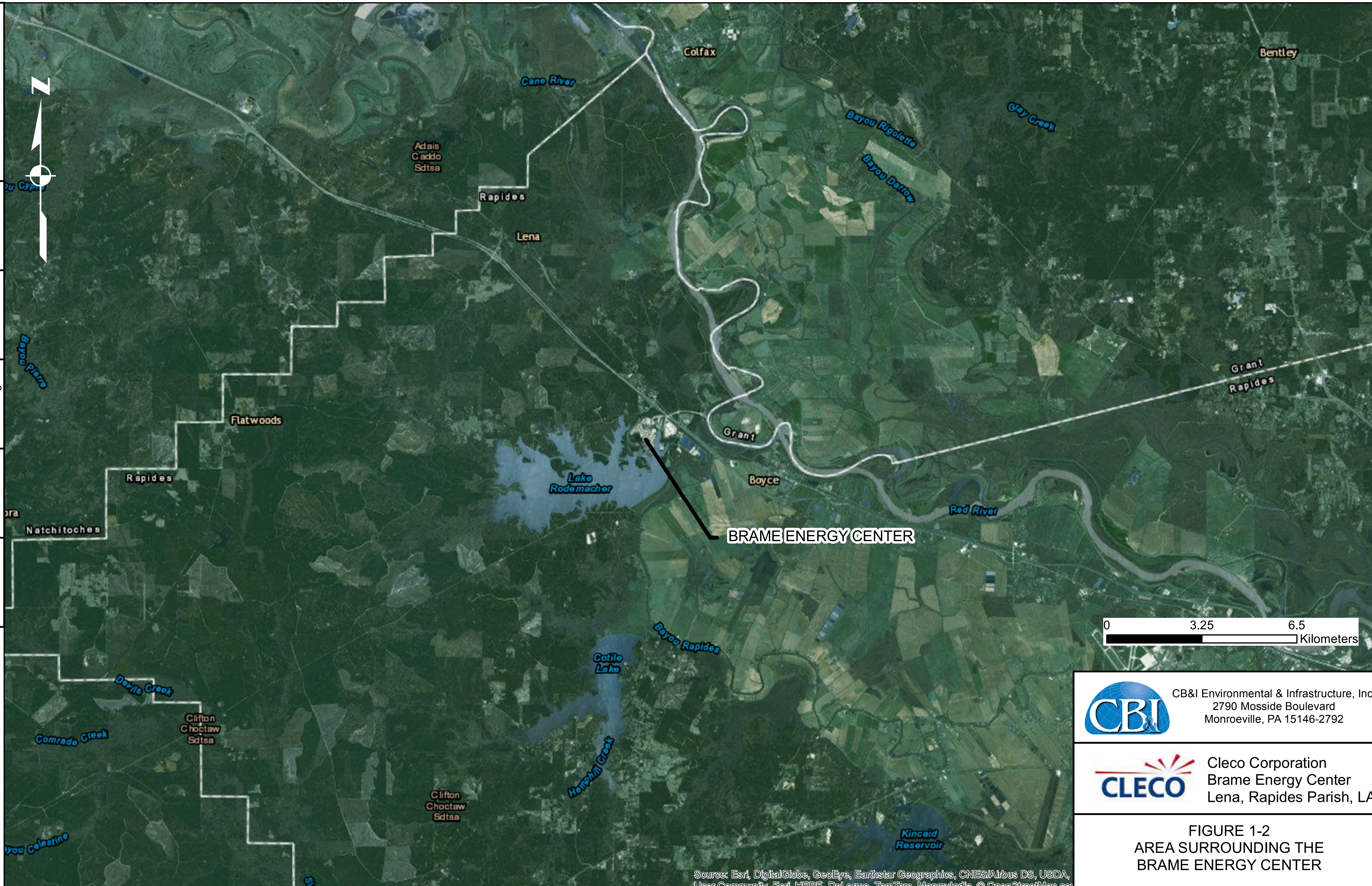
CB&I Environmental & Infrastructure, Inc.
2790 Mosside Boulevard
Monroeville, PA 15146-2792

Cleco Corporation
Brame Energy Center
Lena, Rapides Parish, LA

FIGURE 1-1
LOCATION OF SO2 EMISSION SOURCES
IN BRAME ENERGY CENTER

DATE	DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
5/16/16	--	E. Schlegel	--	--	631215357-B1-1

Document Path: O:\PROJECT\631215357\631215357-B1-1.mxd



CB&I Environmental & Infrastructure, Inc.
2790 Mosside Boulevard
Monroeville, PA 15146-2792

Cleco Corporation
Brame Energy Center
Lena, Rapides Parish, LA

FIGURE 1-2
AREA SURROUNDING THE
BRAME ENERGY CENTER

DRAWING NUMBER	APPROVED BY	CHECKED BY	DRAWN BY	DESIGNED BY	DATE
631215357-B1-2	--	--	E. Schlegel	--	5/16/16

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FIGURE 1-3
CLECO BRAME ENERGY CENTER
PROPERTY BOUNDARY

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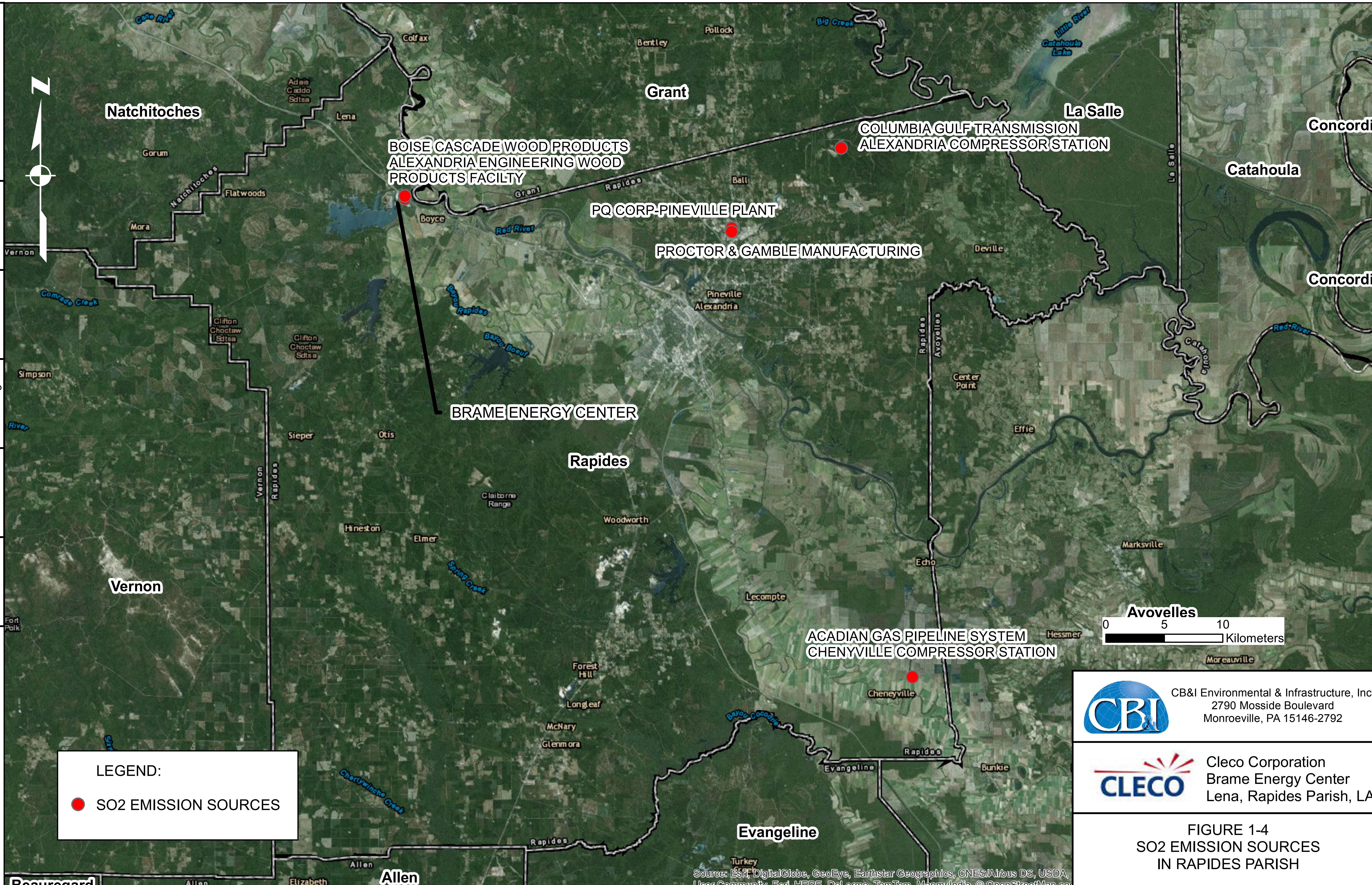

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FIGURE 1-4
SO2 EMISSION SOURCES
IN RAPIDES PARISH

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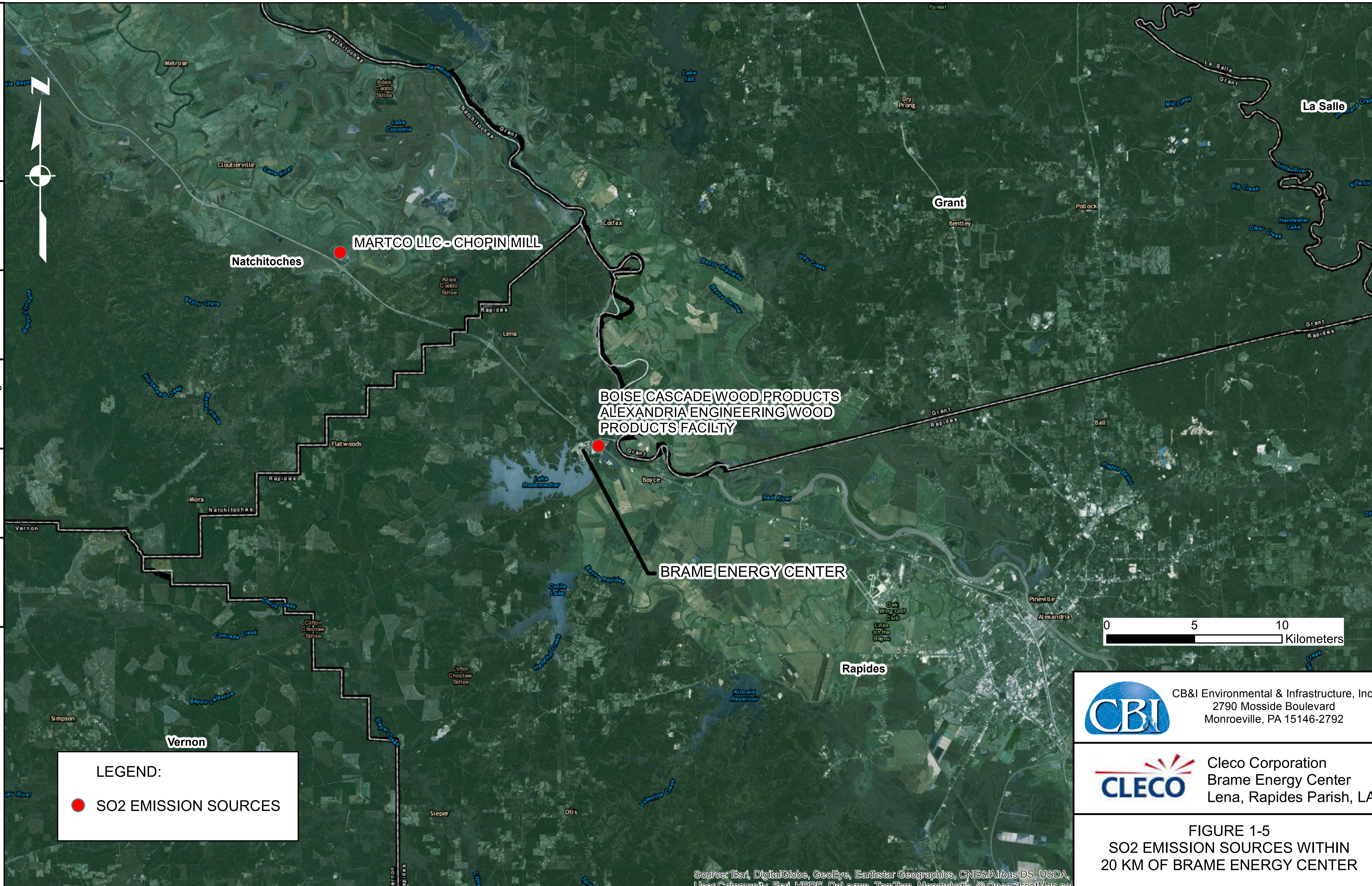

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FIGURE 1-5
SO2 EMISSION SOURCES WITHIN
20 KM OF BRAME ENERGY CENTER

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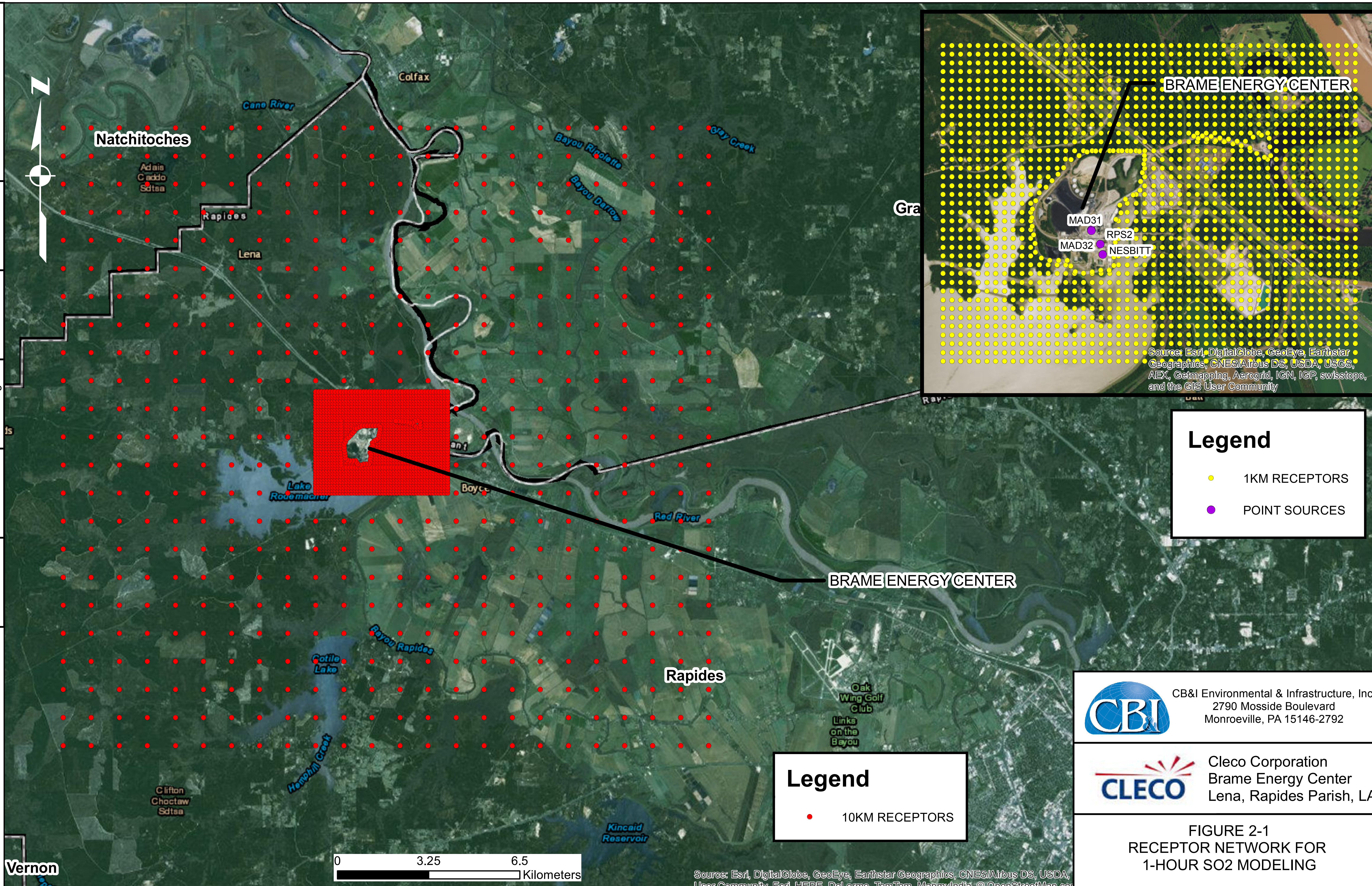

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FIGURE 2-1
RECEPTOR NETWORK FOR
1-HOUR SO2 MODELING

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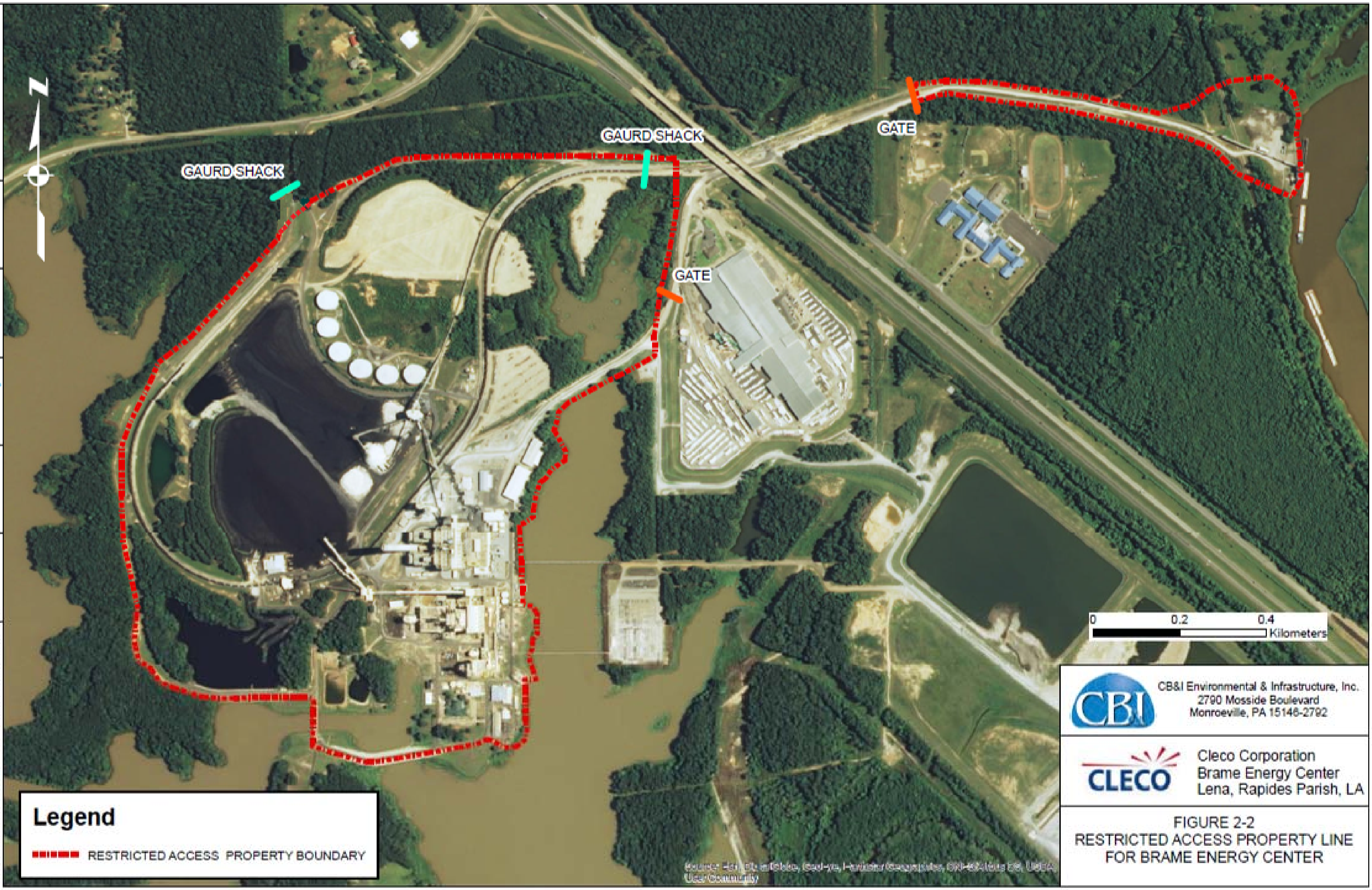
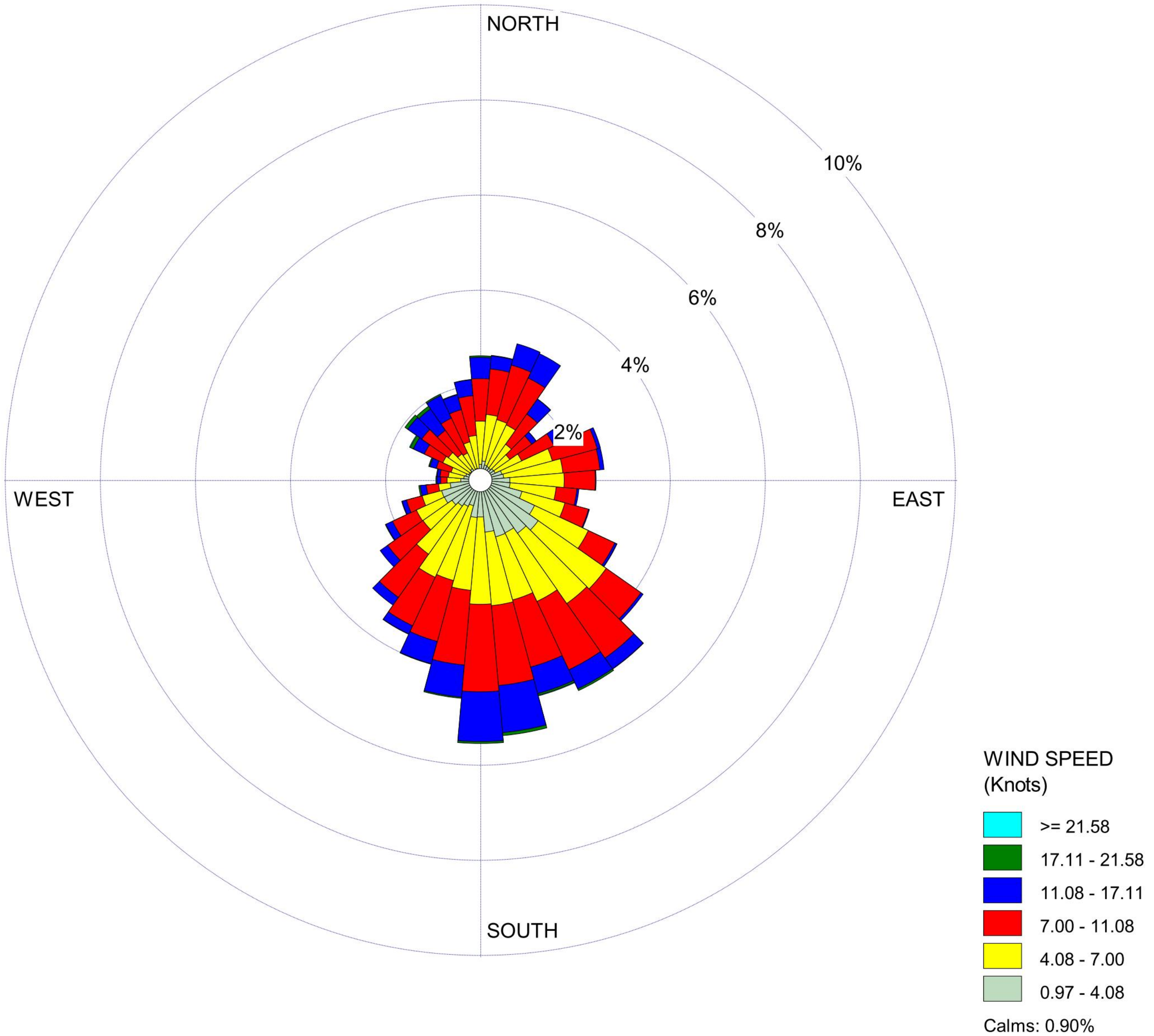


FIGURE 2-2
RESTRICTED ACCESS PROPERTY LINE
FOR BRAME ENERGY CENTER



DATA PERIOD:

START DATE: 1/1/2013 - 00:00
END DATE: 12/31/2015 - 23:59

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FIGURE 2-3

3-YEAR COMPOSITE WINDROSE
FROM SHREVEPORT
METEOROLOGICAL STATION

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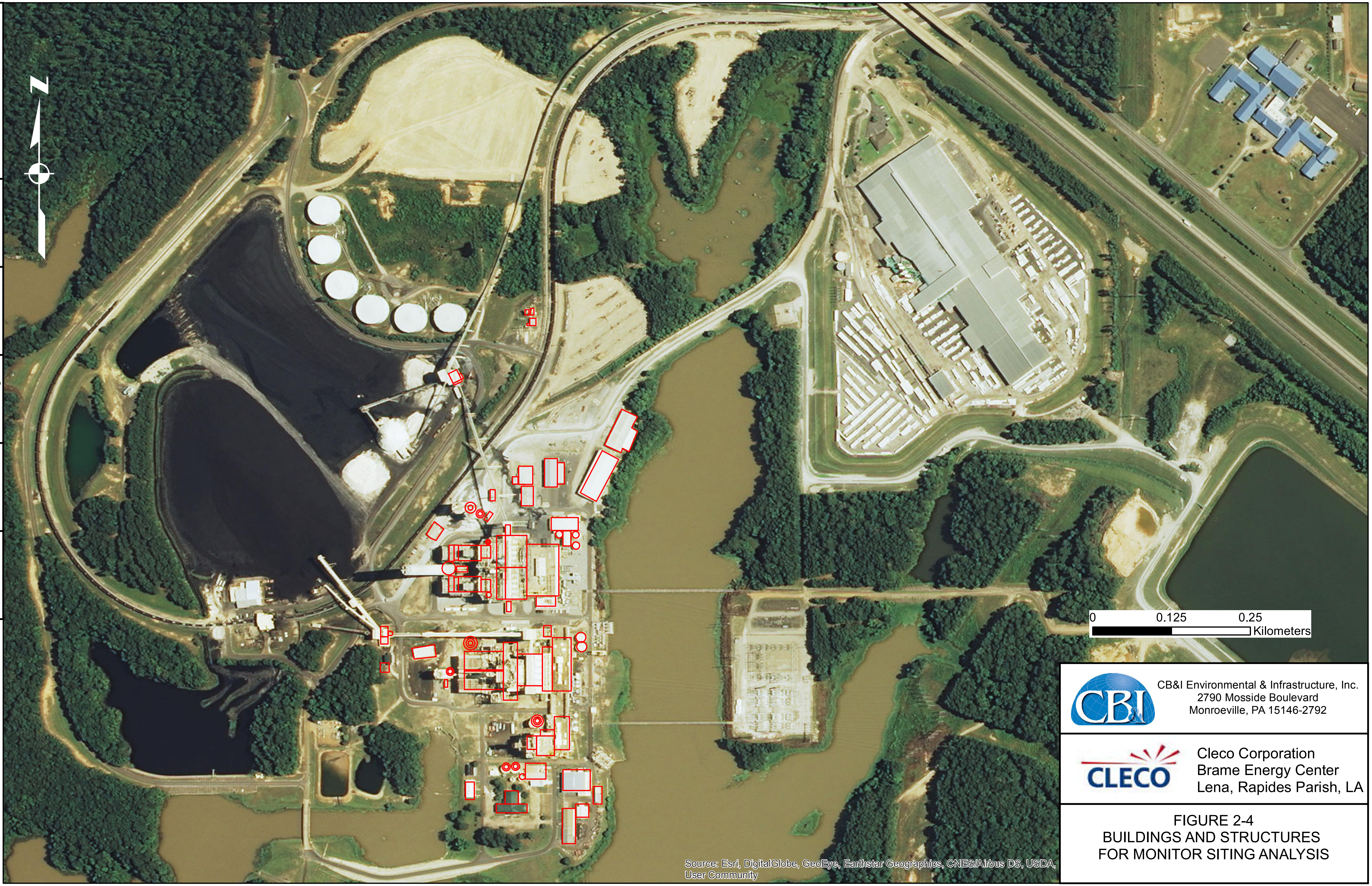

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FIGURE 2-4
BUILDINGS AND STRUCTURES
FOR MONITOR SITING ANALYSIS

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