ADEQ
ARKANSAS
Department of Environmental Quality

June 30, 2016

Guy Donaldson
Chief, Air Planning Section
U.S. EPA Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202–2733

Subject: 2010 1-Hour SO_2 National Ambient Air Quality Standard Modeling Protocol for Plum Point Services Company, LLC – Plum Point Energy Station

Dear Mr. Donaldson:

On June 3, 2010, the U.S. Environmental Protection Agency (EPA) set a 1-Hour "primary" National Ambient Air Quality Standard (NAAQS) for Sulfur Dioxide (SO_2) at 75 parts per billion (ppb). On August 21, 2015, the EPA promulgated the Final Data Requirements Rule (DRR) for the 2010 1-Hour SO_2 NAAQS. The EPA's Final DRR for the 2010 1-Hour SO_2 Primary NAAQS (80 FR 510052) requires air agencies to submit a list to EPA that identifies SO_2 sources with emissions that exceed 2,000 tons per year (tpy) and to conduct SO_2-related ambient monitoring at a listed source or an air quality modeling characterization of the area associated with a listed source.

On January 8, 2016, the Arkansas Department of Environmental Quality (ADEQ) submitted a letter to the EPA R6 identifying sources as required by the DRR that included Plum Point Services Company, LLC – Plum Point Energy Station (Plum Point). Find here, the ADEQ's proposed Modeling Protocol for the Plum Point Energy Station due to the EPA for review and consultation by July 1, 2016.

The proposed air dispersion modeling using AERMOD and, its preprocessors, will be performed as described in this modeling protocol and will allow ADEQ to demonstrate the levels of SO_2 emissions from Plum Point Services Company, LLC – Plum Point Energy Station relative to the 2010 1-Hour SO_2 NAAQS.

If you have any questions regarding this submittal, please contact me at (501) 682-0070 or clarkd@adeq.state.ar.us or Mark McCorkle at (501) 682-0736 or mac@adeq.state.ar.us.

Sincerely,

David W. Clark

David Clark
Epidemiologist
Office of Air Quality
Arkansas Department of Environmental Quality

cc: Erik Snyder, U.S. EPA Region 6

2010 1-HOUR SO_2 NAAQS DATA REQUIREMENTS RULE MODELING PROTOCOL

for

Plum Point Services Company, LLC – Plum Point Energy Station
2732 South County Road 623
Osceola, AR. 72370
AFIN 47-00461; FIPS 0509300461 (Mississippi County)

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1. INTRODUCTION

On June 3, 2010, the U.S. Environmental Protection Agency (EPA) set a 1-Hour "primary" National Ambient Air Quality Standard (NAAQS) for Sulfur Dioxide (SO_2) at 75 parts per billion (ppb). On August 21, 2015, the EPA promulgated the *Data Requirements Rule for the 2010 1-Hour Sulfur Dioxide (SO_2) Primary National Ambient Air Quality Standard (NAAQS)*[1] (hereafter *2010 SO_2 DRR*) whereby states use predictive dispersion modeling or monitoring to evaluate specific contributors of SO_2 with annual emissions exceeding 2,000 tons per year (tpy). Because the EPA's view is that SO_2 is a "source-oriented" criteria pollutant that is relatively stable in the first few kilometers from the source, this rule directs agencies to focus on specific sources as the main contributors to SO_2 air quality impacts and to determine those potential source contributions through either dispersion modeling or source-oriented ambient air monitoring.

On January 8, 2016, the Arkansas Department of Environmental Quality (ADEQ) submitted a letter to EPA R6 identifying sources as required by the *2010 SO_2 DRR* that included Plum Point Services Company, LLC – Plum Point Energy Station (Plum Point) with actual emissions of 2,549.46 tpy (2014 reporting year). Here, the ADEQ, along with Plum Point, proposes for EPA approval the modeling protocol for our undertaking of an AERMOD-based SO_2 predictive dispersion modeling project to analyze Plum Point's SO_2 emissions per the *2010 SO_2 DRR*.

The 1-Hour SO_2 characterization modeling described in this modeling protocol will adhere to the following guidance documents: the February 2016 *SO_2 NAAQS Designations Modeling Technical Assistance Document*[2] (*SO_2 Modeling TAD*) issued in draft form by the EPA, the August 2015 *2010 SO_2 DRR,* the March 2011 *Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-Hour NO_2 National Ambient Air Quality Standard*[3] (*NO_2 Memorandum*), and any direction received from the EPA. The 1-Hour SO_2 characterization modeling will be conducted using AERMOD (version 15181) using only default model options, meteorological data from 2012-2014 (data already AERMOD-processed and possessed by ADEQ from a previous project) as described in Sections 5.1 and 7.1, allowable SO_2 emissions (Permit Number: 1995-AOP-R7; Issued March 30, 2016) of the Unit #1 Boiler (4,684 tpy; 1,069 lb/hr) and the Auxiliary Boiler (0.2 tpy; 0.5 lb/hr) as discussed in Section 5.4 of the *SO_2 Modeling TAD*, an extensive receptor grid as described in Section 4.2 of the *SO_2 Modeling TAD*, and a 2012-2014 ambient background concentration (data already AERMOD-processed and possessed by ADEQ from a previous project) as described in Section 8.1 of the *SO_2 Modeling TAD*. Three intermittent emergency sources (Emergency Generator #1 [SN-06], Emergency Diesel Generator #1 [SN-07], and Emergency Diesel Fire Booster Pump #1 [SN-47]) have been omitted from the analysis per Section 5.5 of the *SO_2 Modeling TAD* and the *NO_2 Memorandum*.

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[1] https://www.regulations.gov/#!documentDetail;D=EPA-HQ-OAR-2013-0711-0125
[2] https://www3.epa.gov/airquality/sulfurdioxide/pdfs/SO2ModelingTAD.pdf
[3] https://www.epa.gov/sites/production/files/2015-07/documents/appwno2_2.pdf

These three intermittent emergency sources are limited to not exceeding 500 hours of 12-month operation by Arkansas Permit: 1995-AOP-R7.

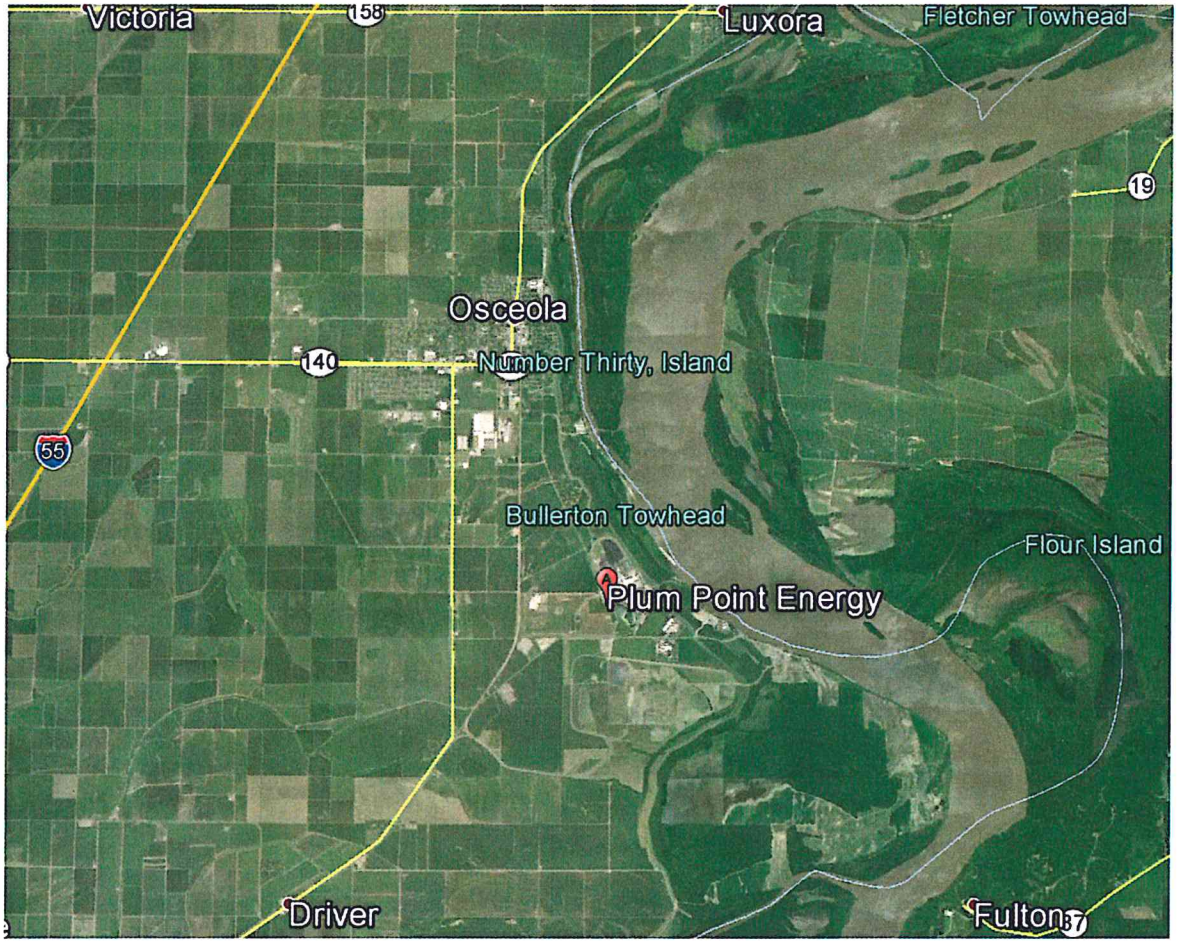
The modeled concentrations predicted by AERMOD (including background) will be calculated based on the form of the 1-Hour SO_2 NAAQS. The total design concentration will be compared to the 1-Hour SO_2 primary NAAQS to determine how the area surrounding Plum Point should be designated. The results of the analysis will be documented in a report from ADEQ and submitted to the EPA, which will also include a complete electronic modeling archive.

2. FACILITY LOCATION

Plum Point is located approximately 4.2 kilometers (km) south of Osceola in Mississippi County, Arkansas. Figure 1 provides an overview of the immediate area surrounding Plum Point's facility. The approximate central Universal Transverse Mercator (UTM) coordinates of the facility are 232,855 meters (m) east and 3,950,471 m north in Zone 16 [World Geodetic System 1984 (WGS 84)]. As shown in Figure 2, the facility is located in a rural area of the Arkansas River Valley, comprised mainly of agricultural land with flat terrain.

Figure 1: Plum Point facility and immediate surrounding area

Figure 2: Plum Point and broader surrounding area (Osceola and Plum Point are 4.2 km apart)



3. DISPERSION MODELING ANALYSIS

This section describes the input data and modeling methodology that will be used in this SO_2 NAAQS modeling demonstration. The modeling methodology conforms to the *SO_2 Modeling TAD* and other relevant documents.

3.1 Model Selection

The AERMOD Model Version 15181, the most current version released by EPA on July 24, 2015 on the Support Center for Regulatory Air Modeling (SCRAM) website[4], will be used to perform the dispersion modeling. However, should an updated version of AERMOD or AERMET become available prior to the completion of this project, we may use the updated version(s) to take advantage of the model improvement.

3.2 Source Descriptions

Per EPA's *NO_2 Memorandum* regarding intermittent emergency sources such as an emergency diesel-fired generator and fire water pump engines, all SO_2 emitting sources at Plum Point will be modeled except for three very small intermittent emergency SO_2 sources (Emergency

[4] http://www.epa.gov/ttn/scram/dispersion_prefrec.htm#aermod

Generator #1 [SN-06], Emergency Diesel Generator #1 [SN-07], and Emergency Diesel Fire Booster Pump #1 [SN-47]) with a combined allowable total SO_2 emissions of 0.4 tpy (0.8 lb/hr):

> *"Given the implications of the probabilistic form of the 1-Hour NO_2 NAAQS discussed above, we are concerned that assuming continuous operations for intermittent emissions would effectively impose an additional level of stringency beyond that intended by the level of the standard itself. As a result, we feel that it would be inappropriate to implement the 1-Hour NO_2 standard in such a manner and recommend that compliance demonstrations for the 1-Hour NO_2 NAAQS be based on emission scenarios that can logically be assumed to be relatively continuous or which occur frequently enough to contribute significantly to the annual distribution of daily maximum 1-Hour concentrations. EPA believes that existing modeling guidelines provide sufficient discretion for reviewing authorities to exclude certain types of intermittent emissions from compliance demonstrations for the 1-Hour NO_2 standard under these circumstances."*[5]

The modeled sources (Unit #1 Boiler [SN-01] and Auxiliary Boiler [SN-05]) account for 99.9% of allowable SO_2 emissions from the facility.

3.3 Modeled Emission Rates

As described in Section 5.4 of the *SO_2 Modeling TAD*, we will use the worst-case more conservative measure of allowable SO_2 emissions (Unit #1 Boiler [4,684 tpy; 1,069 lb/hr] and Auxiliary Boiler [0.2 tpy; 0.5 lb/hr]) per the current active permit (Permit Number: 1995-AOP-R7; Issued March 30, 2016)[6] for the period of 2012-2014 (timeframe matches AERMOD-processed meteorological data and background data already possessed by ADEQ from a previous project). Table 1 provides the stack characteristics for the two modeled sources.

Table 1: Source Stack Characteristics

Source Description	***Source ID***	***Stack Height (m)***	***Exit Temperature (K)***	***Exit Velocity (m/s)***	***Stack Diameter (m)***	***UTM-E UTM-N (m)***
Unit 1 Boiler	SN01	144.78	352	25.8	7.32	233,374.7 3,950,641.8
Auxiliary Boiler	SN05	57.91	619	22.4	1.83	233,374.0 3,950,618.4

[5] https://www3.epa.gov/ttn/scram/guidance/clarification/Additional_Clarifications_AppendixW_Hourly-NO2-NAAQS_FINAL_03-01-2011.pdf

[6] https://www.adeq.state.ar.us/home/pdssql/pds.aspx

While the *2010 SO_2 DRR* provides an option of basing SO_2 designations on modeling of actual emissions data that reflects the view that designations are intended to address current actual air quality where modeling simulates a monitor, Section 5.1 of the *SO_2 Modeling TAD* also states that "*It also remains acceptable to use allowable emissions instead of actuals for designations purposes because allowable emissions would provide a more conservative estimate*". While we intend to use the worst-case scenario of allowable emissions as described in this protocol, if this approach of using the more conservative allowable emissions indicates a potential issue, ADEQ reserves the right to revise the modeling to simulate actual emissions on an hourly basis to reflect the actual operations during the relevant time period.

3.4 Good Engineering Practice & Stack Height

Per the *SO_2 Modeling TAD,* because we intend to use allowable emissions we will also use the Good Engineering Practice (GEP) stack height policy:

> Section 6.1: "*If modeling with allowable emissions as discussed in Section 5.4, however, the GEP stack height policy should be used in the model. For those stacks that are above the GEP stack height, the GEP height should be used. For stacks below the GEP stack height, the actual stack height is used. The reasoning for following the GEP stack height policy when using allowable emissions is that since those emissions limits were set with GEP heights, the GEP height policy should be followed even for designations.*"

3.5 Building Downwash

Since the proposed modeling exercise will utilize allowable emissions and the GEP stack height policy, the BPIPPRIME program[7] will be used to input building parameters for building downwash.

3.6 Ambient SO_2 Background Concentrations

Ambient background data from the closest Arkansas SO_2 monitor (Figure 3), located in North Little Rock (Monitor ID# 05-119-0007), will be used to represent background concentrations other sources of SO_2. EPA Guidance allows the inclusion of background values that vary by season and hour of day that could simulate a lower value than the 99th percentile design value from the monitor. The modeled concentrations will be paired with a set of 2012-2014 seasonal diurnal values (data already possessed by ADEQ from a previous project) that was developed using methodology described in the *NO_2 Memorandum*, which addresses NO_2 modeling and is applicable for developing seasonal diurnal background values for SO_2. Table 2 shows the seasonal diurnal values that will be used in the model.

[7] U.S. EPA, 2004d: User's Guide to the Building Profile Input Program. EPA-454/R-93-038. U.S. Environmental Protection Agency, Research Triangle Park, North Carolina 27711.

Figure 3: Relative locations of Plum Point, SO_2 Monitor ID# 05-119-0007 and airport meteorological site

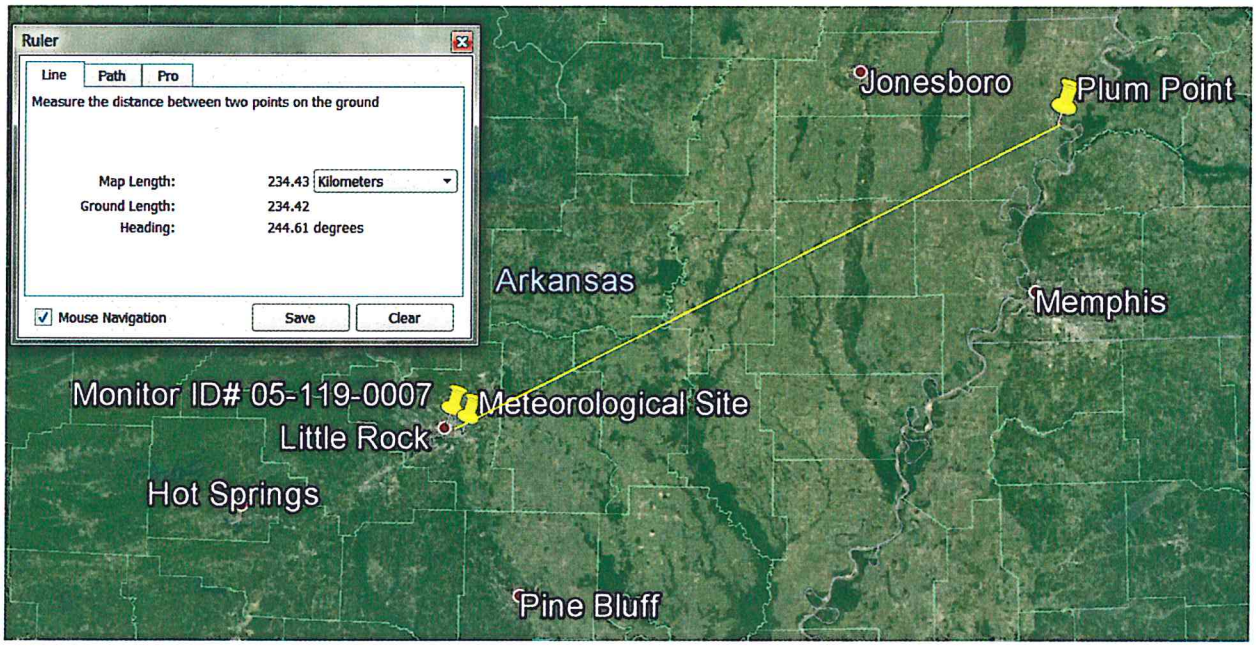


Table 2: 2012-2014 seasonal diurnal SO_2 concentrations ($\mu g/m^3$) at SO_2 Monitor ID# 05-119-0007

Hour[1]	Winter	Spring	Summer	Fall
1	6.89	5.67	4.80	5.50
2	7.85	5.32	4.28	6.19
3	7.33	6.19	4.45	6.02
4	6.89	5.76	4.19	4.71
5	8.55	4.97	4.19	5.15
6	9.60	4.80	5.41	5.85
7	9.60	6.28	5.50	6.63
8	8.99	5.24	6.11	6.54
9	7.50	6.46	7.68	7.85
10	8.38	8.20	7.42	9.07
11	9.16	8.46	9.95	8.20
12	10.73	15.09	10.38	9.34
13	9.69	11.08	10.91	11.17
14	10.56	9.34	9.86	9.51
15	10.03	8.20	13.18	9.95
16	9.42	7.94	9.34	10.47
17	7.15	9.86	11.08	9.16
18	7.50	7.42	9.69	7.24
19	9.25	6.37	9.86	6.98
20	12.30	6.54	8.73	5.93
21	9.07	6.02	6.19	6.28
22	6.11	8.99	5.76	5.67
23	6.46	7.07	5.67	5.85
24	7.24	6.81	5.41	6.11

[1]Hours in AERMOD are defined as hour-ending. (i.e., Hour 1 is midnight through 1 AM)

3.7 Meteorological Data

Since on-site data are not available for the Plum Point facility, meteorological data available from the National Weather Service (NWS) will be used in this analysis. NWS data for 2012-2014 (data already possessed by ADEQ from a previous project), has been prepared using the latest version of the EPA's AERMET meteorological processing utility (version 15181) and will be used for this analysis.

Three years (2012-2014) of surface observations from the NWS tower at Adams Field Airport in Little Rock, AR (WBAN No. 13963) will be used in this analysis. In addition to surface meteorological data, concurrent upper air data from North Little Rock Municipal Airport in North Little Rock, AR (WBAN No. 03952) was processed with the most recent version of AERMET (version 15181) along with the two pre-processors to AERMET: AERSURFACE (version 13016) and AERMINUTE (version 14337). As 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)[8] using AERSURFACE. In addition, the following seasonal distribution will be used: December, January, and February were categorized as winter with no snow, March, April, and May as spring, June, July, and August as summer, and September, October, and November as fall. The precipitation will be assumed to be average over the 3-year period.

3.8 Receptor Grid

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

- 50 m spacing along the Plum Point fenceline;
- 100 m spacing extending from the Plum Point emission points to 5 km;
- 500 m spacing extending from 5 km to 10 km; and
- 1,000 m spacing extending from 10 km to 20 km.

AERMOD is capable of handling both simple and complex terrain. Through the use of AERMAP, AERMOD incorporates not only the receptor heights, but also an effective height (hill height scale) that represents the significant terrain features surrounding a given receptor. 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.

[8] https://www3.epa.gov/ttn/scram/7thconf/aermod/aermod_implmtn_guide_3August2015.pdf

4. CONCLUSION

This proposed air dispersion modeling using AERMOD and its preprocessors will be performed as described in this modeling protocol and will allow ADEQ to demonstrate the levels of SO_2 emissions from Plum Point Services Company, LLC – Plum Point Energy Station relative to the 2010 1-Hour SO_2 NAAQS. The modeling analyses described herein will be conducted and submitted by ADEQ to the EPA prior to January 13, 2017.