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 Southwestern Electric Power Company d/b/a Flint Creek Power Plant (FIPS 0500700107)

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 that 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 the Flint Creek Power Plant (Flint Creek). Find here, Flint Creek's proposed Modeling Protocol, reviewed by the Arkansas Department of Environmental Quality (ADEQ), and being submitted to the EPA for review and consultation.

In May 2016, Flint Creek completed a retrofit project to install Dry Flue Gas Desulfurization, a Pulse Jet Fabric Filter, and Activated Carbon Injection on the Boiler (SN-01) resulting in an allowable emission rate of 948.6 lb/hr (per Arkansas Permit # 0276-AOP-R7; Issued July 2, 2015) which will be used in this modeling analysis. The modeling analyses will be conducted by Flint Creek and reviewed by ADEQ prior to submittal to the EPA. The results of the analysis will be documented in a report and also include a complete electronic modeling archive.

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

1-Hour SO_2 Data Requirement Rule
Air Quality Modeling Protocol
for the
Flint Creek Power Plant
Gentry, AR

Prepared for
Southwestern Electric Power Company

For Submittal
to
The Arkansas Department of Environmental Quality

Prepared by
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June 13, 2016
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INTRODUCTION

American Electric Power Service Corporation (AEPSC) on behalf of the American Electric Power subsidiary Southwestern Electric Power Company, has been requested to perform modeling under the USEPA 1-Hour SO_2 Data Requirements Rule (40 CFR 51.1200) for the Flint Creek Power Plant (Flint Creek) located in Gentry, Arkansas. The modeling conducted under this protocol will be submitted to the Arkansas Department of Environmental Quality to demonstrate compliance with the 1-Hour SO_2 Standard by the Flint Creek Power Plant under the USEPA 1-Hour SO_2 Data Requirements Rule and will allow Flint Creek to follow the provisions of 40 CFR 51.1205(b).

DESCRIPTION OF FACILITY AND AREA

The Flint Creek Power Plant consists of one electric generating unit rated at 558 MW gross. The unit is equipped with dry flue gas desulfurization (DFGD) with a pulse jet fabric filter (PJFF) and activated carbon injection (ACI). The plant is located in Northwest Arkansas, approximately 40 kilometers northwest of Fayetteville, Arkansas. The elevation of the plant site averages 352 m MSL. The area around the plant is classified as rural for purposes of air quality modeling as the only significant population area is the town of Gentry, AR.

Figure 1. Flint Creek Power Plant and surrounding area showing property holdings

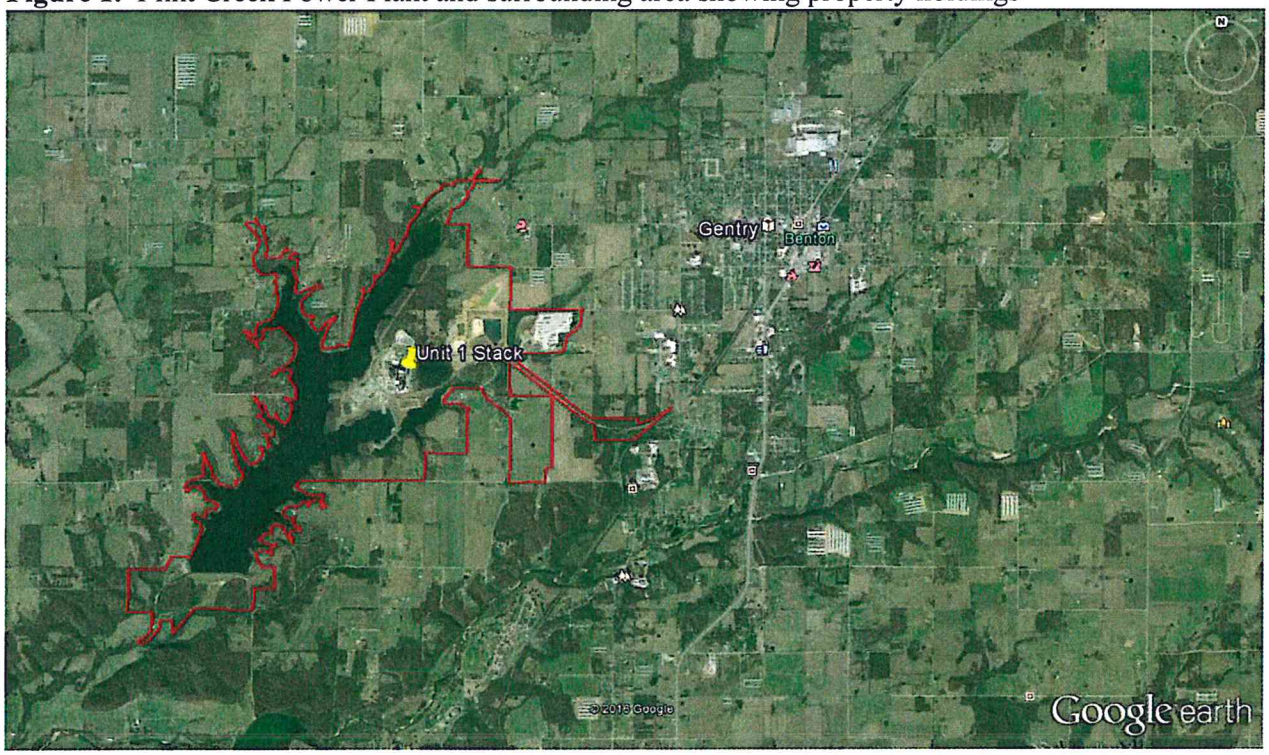
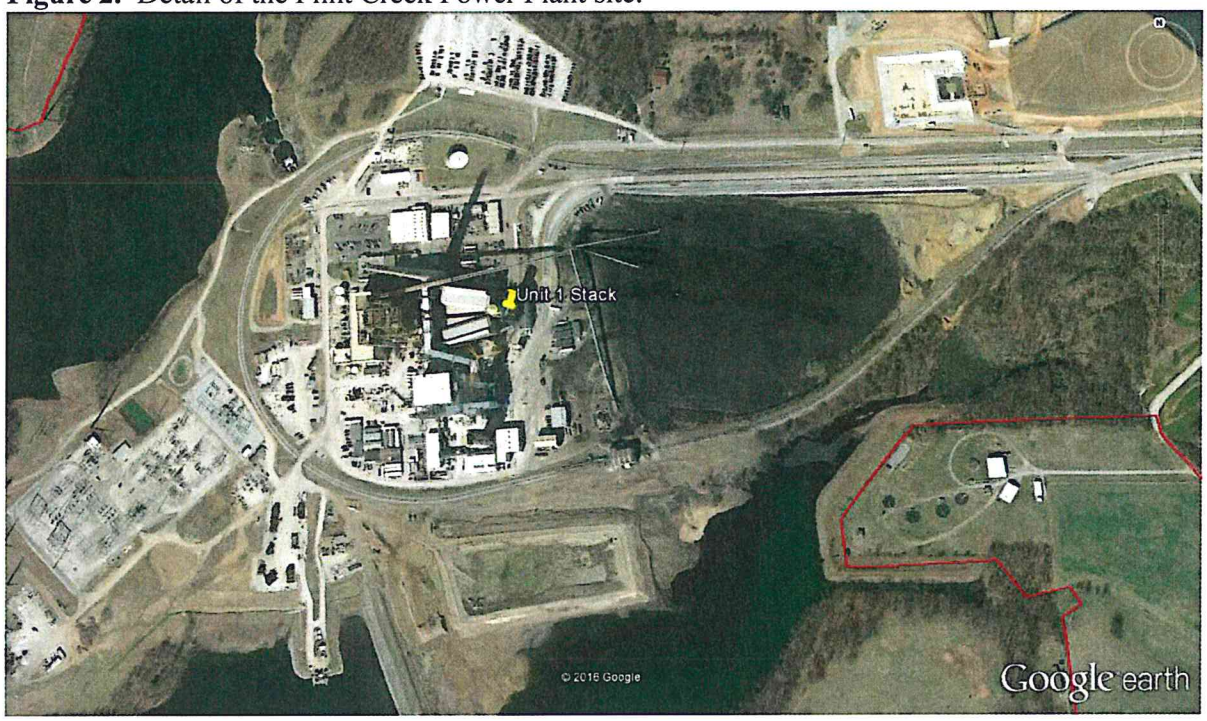


Figure 2. Detail of the Flint Creek Power Plant site.



SOURCES TO BE MODELED

There are no other significant sources of SO_2 in the area surrounding Flint Creek Power Plant that will need to be included in the DRR modeling demonstration. Flint Creek itself contains the main coal fired boiler, an emergency generator, and a fire pump. The emergency generator and fire pump are only used for maintenance and testing and in the event of an emergency or loss of power condition. Both engines are classified as emergency engines under the RICE MACT. Table 1 summarizes these additional sources and shows the emissions reported in the Annual Emissions Inventory filed with the Arkansas Department of Environmental Quality (ADEQ) for the years 2013 to 2015.

Table 1. Minor sources at Flint Creek and their reported 2013 to 2015 annual SO_2 emissions in tons

Equipment	2013	2014	2015
Emergency Generator	0.004	0.010	0.024
Diesel Fire Pump	0.009	0.009	0.014

Due to the limited emissions and operation of the emergency generator and fire pump at Flint Creek Power Plant, the main boiler will be the only source included in the modeling and analysis.

MODEL PLATFORM SELECTION

The current Gaussian model listed in Appendix A to 40 CFR 51 Appendix W, AERMOD will be used for this study. As of the date of this protocol Version 15181 of AERMOD and AERMET are approved for use in regulatory activities such as this study. No Beta Options present in AERMOD or AERMET will be used. Should an updated version of AERMOD or AERMET become available during the time this study is being conducted that removes the Beta designation for a model option, we reserve the right to move to the updated version of AERMOD or AERMET to take advantage of the model improvement. If this alternative is selected, it will be described in detail in the final modeling report.

The receptor grid has been developed using Version 11103 of AERMAP, the current version of the receptor processor software. In addition, the BPIP analysis of Flint Creek Power Plant has already been completed using Version 04274 of BPIPPRM, the current version listed on the USEPA TTN Web Site as applicable for studies of this nature.

RECEPTOR GRID

The receptor grid for the study uses DEM data sourced from the MRLC System at a 1/3 arc second resolution in geo tiff format and processed through AERMAP Version 11103. The receptor grid consists of a series of nested receptor grids starting at the Unit 1 stack (363080 E, 4013440 N, Zone 15, NAD 83) and extending out roughly 50 kilometers from that starting point. The inner nest around the plant has a resolution of 100 meters and extends out 4 kilometers in all directions. The next nest has a resolution of 250 meters covering the next 5 kilometers out from the stack. The third nest has a resolution of 500 meters covering the next 7 kilometers. The fourth nest has a resolution of 1000 meters and extends out an additional 10 kilometers. The final receptor field has a resolution of 2000 meters and extends out from 26 kilometers to 52 kilometers from the stack. Figure 3 shows the receptor grid configuration in Google Earth.

In preparing this grid, the following receptors were classified by AERMAP as being in locations with insufficient data in the geo tiff files to process the receptors:

250 meter grid	1000 meter grid
358830 E, 4005440 N	339080 E, 4035440 N
359080 E, 4005440 N	

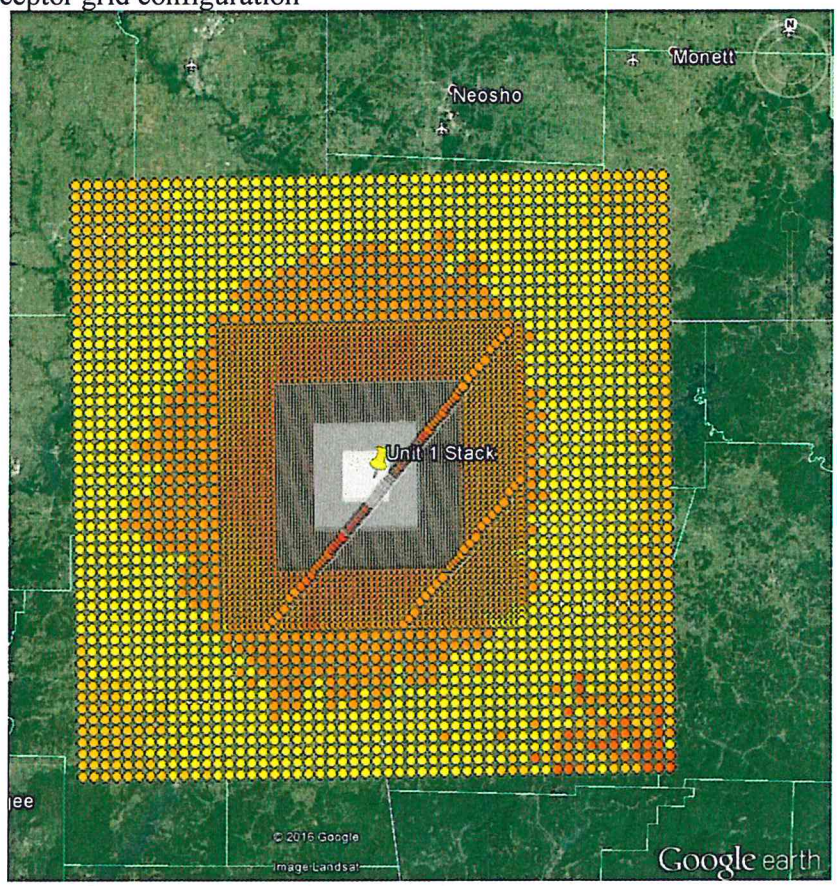
In addition to these three receptors, based on standard modeling practice, it is permissible to remove receptors from the simulation that fall on property with restricted public access controlled by the facility based on the definition of ambient air. Also, based on recent USEPA guidance[2], this practice has been extended to cover highways and significant bodies of water where an ambient monitor could not be placed and the likelihood of a lengthy exposure is low.

At this time it is not planned to remove any additional receptors from the above described grid. Should receptors be removed from the Flint Creek Power Plant site, a 50 meter resolution fence line grid will be established around the areas of plant property where the receptors are removed.

Receptors may also be removed from any significant bodies of water or major highways in accordance with applicable USEPA Guidance. Receptors removed for any reason will be identified in the final modeling report along with the reason for the removal of the receptor(s) identified.

Should a modeled value of regulatory interest occur outside of the 100 meter grid, a set of 100 meter receptors will be developed around the receptor(s) of interest to further examine the modeled impacts in that area.

Figure 3. Receptor grid configuration



METEOROLOGICAL DATA

The meteorological data set to be used for this study will be the 2013 – 2015 Northwest Arkansas Regional Airport surface data, paired with Springfield, Missouri Upper Air Data. One minute and five minute surface data from Northwest Arkansas Regional Airport in Fayetteville for 2013 to 2015 has been processed through AERMINUTE Version 15272 to augment the hourly surface data in an effort to reduce the number of missing and calm hours in the final

meteorological data files for use in AERMOD Version 15181. No Beta Options were used in the processing of the data.

Surface conditions based on the Northwest Arkansas Regional Airport site were developed by AERSURFACE in accordance with USEPA guidance using a 1 km distance from the grid center point. Monthly precipitation data for use in determining the surface moisture levels for the 2013 to 2015 period based on the 30 year historic average for the location was sourced from the National Climatic Data Center[3]. Table 2 shows the monthly precipitation data and classification for the Northwest Arkansas Regional Airport for the period from 2013 to 2015. The classifications were based on average being classified as precipitation being between +/- 20% of the 30 year average precipitation value and the dry and wet classifications being outside of the +/- 20% of the 30 year average range.

Table 2. Precipitation Data for Northwest Arkansas Regional Airport from 2013 through 2015

		Precipitation				Classification		
Month	**30 Year AVG**	**2013**	**2014**	**2015**		**2013**	**2014**	**2015**
January	2.54	3.20	1.35	0.91		WET	DRY	DRY
February	2.61	2.24	0.48	1.70		AVG	DRY	DRY
March	4.10	4.13	2.85	4.20		AVG	DRY	AVG
April	4.44	5.75	1.98	2.44		WET	DRY	DRY
May	5.82	10.01	1.85	12.26		WET	DRY	WET
June	5.11	2.24	6.61	5.33		DRY	WET	AVG
July	3.42	4.65	1.70	5.71		WET	DRY	WET
August	3.45	6.63	1.70	5.05		WET	DRY	WET
September	4.78	3.25	4.42	1.44		DRY	AVG	DRY
October	4.14	5.4	7.89	3.10		WET	WET	DRY
November	4.25	1.65	2.56	7.52		DRY	DRY	WET
December	3.24	2.85	2.65	12.63		AVG	AVG	WET

Following processing, the 2013 – 2015 meteorological data set was tested in AERMOD Version 15181. From this test, it was determined that there were 330 calm hours (1.26%) in the final data set and 121 hours of missing data (0.46%) over the 26280 hours of data. Based on the low level of missing and calm hours, the 2013 to 2015 Northwest Arkansas Regional Airport – Springfield, MO data set is deemed suitable for use in AERMOD and is the recommended data set and time period for use in this study.

BACKGROUND VALUE

The nearest SO_2 monitors to the Flint Creek Power Plant are located southwest of the plant in Stilwell (40-001-9009), Muskogee (40-101-0167), and Oklahoma City (40-109-1037), west of the plant in Tulsa (40-143-0175, 40-143-0179, 40-143-0235, 40-143-1127) and Ponca City (40-071-0604), and southeast of the plant in North Little Rock (41-190-007). Upon further investigation, many of these monitors are located near major SO2 sources including coal fired

power plants or refineries and therefore do not accurately represent background ambient air conditions around Flint Creek Power Plant. These monitors have been removed from consideration (40-071-0604, 40-101-0167, 40-143-0175, 40-143-0179, 40-143-0235). Tables 3 and 4 contain various high level metrics for the potential background ambient monitors that may be useful in screening the various remaining monitors from consideration as a source of background data. Table 3 shows the percentage of data captured, by year for the period 2013 to 2015 at each monitor.

Table 3. Annual Hourly Data Capture Rate for the Monitors Examined

Monitor	2013		2014		2015		Acceptable Capture
	Hrs	Capture	Hrs	Capture	Hrs	Capture	
40-001-9009	7520	86%	7345	84%	7978	91%	YES
40-109-1037	8681	99%	8692	99%	8381	96%	YES
40-143-1127	8593	98%	8100	92%	8578	98%	YES
51-190-007	8720	100%	8731	100%	8724	100%	YES

Table 4 then considers the high level 1-hour and annual data from the Stilwell, Oklahoma City, Tulsa, and Little Rock monitors shown in the USEPA Air Data system to give an indication of the nature of the monitor values in the data set.

Table 4. Air Data 1-Hour and annual SO_2 metrics by year for potential background monitors

Monitor	2013				2014				2015			
	1 hr Max	1 hr 2nd Max	99th pctle	Annual Avg	1 hr Max	1 hr 2nd Max	99th pctle	Annual Avg	1 hr Max	1 hr 2nd Max	99th pctle	Annual Avg
40-001-9009	5.7	4.8	5	0.44	43.2	35.4	35	0.63	34.8	8.7	6	0.54
40-109-1037	5	3	3	0.22	7	4	3	0.08	4	4	3	0.50
40-143-1127	36.3	22.7	20	0.49	9.3	9	6	0.31	13.7	10	9	0.82
51-190-007	8.8	8.5	7	1.54	11.1	10.6	10	1.34	29.3	28.4	23	1.12

In examining the data in Table 4, the Stilwell monitor (40-001-9009) does not show stability throughout the three years examined, indicating it is likely affected by a nearby source that is unlikely to affect the area around Flint Creek. Therefore it is not an accurate representation of background near the Flint Creek Power Plant. The next closest monitor is the Tulsa monitor (40-143-1127). This monitor is fairly consistent and does not appear to be largely impacted by nearby sources, making it suitable for use to determine the recommended background value. Since the data at this monitor is stable, we are recommending that the three year average of the 99^{th} percentile values be used for all hours in this study, resulting in a background value of 11.7 ppb (30.6 ug/m3).

PLANT OPERATING DATA

Under the Data Requirements Rule, sources have the option to model actual or allowable emissions. Flint Creek Power Plant recently completed a retrofit project to install Dry Flue Gas Desulfurization, a Pulse Jet Fabric Filter, and Activated Carbon Injection in May 2016 resulting in reduced allowable emissions which will be used in this modeling analysis. Since allowable emissions are being modeled, the Good Engineering Practice (GEP) stack height must be used in this study. The GEP stack height for Flint Creek Power Plant is 163.85 meters, 0.75 meters less than the actual stack height of 164.6 meters.

The emission rate used in this modeling analysis will be derived from the current permitted allowable emission rate of 948.6 lb/hr on a three hour rolling average. This limit was divided by a factor of 0.9 in order to estimate the equivalent 1-hour limit[4] resulting in an emission rate of 1,054 lb/hr or 132.8 g/s. Table 5 summarizes the input data for the modeling study.

Table 5. Proposed modeling inputs for the Flint Creek Power Plant simulations

Unit	Flue Easting (m)	Flue Northing (m)	Stack Base (m)	Emission Rate (g/sec)	Stack Height (m)	Exit Temp (K)	Exit Velocity (m/sec)	Exit Diameter (m)
Unit 1	**363080**	**4013440**	**341**	**132.8**	**163.85**	**352.6**	**30.4**	**6.1**

REFERENCES

1. US EPA, Office of Air Quality Planning and Standards, *Data Requirements Rule for the 2010 1-Hour Sulfur Dioxide (SO_2) National Ambient Air Quality Standard* (NAAQS), Federal Register, Vol 80 No 162, August 21, 2015, page 51078.
2. US EPA, Office of Air and Radiation, Office of Air Quality Planning and Standards, Air Quality Assessment Division, *SO_2 NAAQS Modeling Technical Assistance Document*, February 2016 Draft, pages 8 – 9.
3. National Climatic Data Center, http://www.ncdc.noaa.gov, last checked May 25, 2016.
4. US EPA, Office of Air Quality Planning and Standards, *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised*, October 1992, page 4-16.