Attachment B

TCEQ Analyses

Contents:

Attachment B, Part 1:

Summary of TCEQ's Analyses

In a letter to the Texas Commission on Environmental Quality (TCEQ) dated March 20, 2015, the U.S. Environmental Protection Agency (EPA) identified 12 power plants to be evaluated in order to determine their impacts, if any, on compliance with the 2010 SO_2 National Ambient Air Quality Standard (NAAQS). The TCEQ evaluated four of the 12 EPA-identified Texas sources meeting the consent decree criteria, being large emissions sources not announced for retirement as of March 2015, with 2012 SO_2 emissions greater than 16,000 tons, or with 2012 emissions greater than 2,600 tons and an average emission rate greater than 0.45 MMBtu.

This attachment identifies the information that the TCEQ considered in its evaluation of the four SO_2 emissions sources, being Sandy Creek Energy Station, located in McLennan County; Coleto Creek Power Station, located in Goliad County; Tolk Generating Station, located in Lamb County; and Twin Oaks Power Station, located in Robertson County.

The TCEQ evaluated Sandy Creek Energy Station based on McLennan County monitoring data, with further support from modeling performed by Sandy Creek, as described in Attachment C: *Evaluation of the Impact of Sandy Creek Energy Station SO_2 Emissions*.

While the TCEQ continues to support the use of ambient air monitoring data as the appropriate information for use in making designation decisions, the TCEQ modeled three of the four sources it evaluated. The TCEQ's analyses are contained in Attachment B, Part 2: *TCEQ's Modeling Analyses.*

One of the modeled facilities – Coleto Creek Power Station – provided additional information, contained in Attachment D: *Information Submitted to the TCEQ by Coleto Creek Power Station.* The TCEQ did not thoroughly evaluate this supplemental information due to time constraints.

The TCEQ's basis for evaluation and determinations made for each of the four sources are:

EPA Identified Source	County	Basis for Evaluation	Recommended Designation	Additional Information Submitted by the Source
Sandy Creek Energy Station	McLennan	Available monitoring data – Waco Mazanec C1037	Attainment	See Attachment C
Coleto Creek Power Station	Goliad	Modeled maximum concentration 38 parts per billion (ppb)	Unclassifiable/ Attainment	See Attachment D
Tolk Generating Station	Lamb	Modeled maximum concentration 64 ppb	Unclassifiable/ Attainment	None
Twin Oaks Power Station	Robertson	Modeled maximum concentration 38 ppb	Unclassifiable/ Attainment	None

The modeling files referenced in Attachment B, Part 2: *TCEQ's Modeling Analyses* are available to the EPA from the TCEQ's secure ftp site (https://ftps.tceq.texas.gov/). The "Help" link on that Web page provides instructions to sign up for an account.

Attachment B:

TCEQ Analyses

Part 2: ***TCEQ's Modeling Analyses***

A. The June 5, 2015 Modeling Analysis of Sulfur Dioxide for Coleto Creek Power, LP – **Coleto Creek Power Station** (RN100226919)

B. The June 5, 2015 Modeling Analysis of Sulfur Dioxide for Southwestern Public Service Company – **Tolk Station Power Plant** (RN100224534)

C. The June 5, 2015 Modeling Analysis of Sulfur Dioxide for Major Oak Power, LLC – **Twin Oaks** (RN100226570)

TCEQ Interoffice Memorandum

To: David Brymer, Director
Air Quality Division

From: Daniel Menendez, Team Leader
Air Dispersion Modeling Team (ADMT)
Air Permits Division

Date: June 5, 2015

Subject: Modeling Analysis of Sulfur Dioxide for Coleto Creek Power, LP – Coleto Creek Power Station (RN100226919)

1. Project Identification Information

On March 2, 2015, the U.S. District Court for the Northern District of California accepted as an enforceable order an agreement between the Environmental Protection Agency (EPA) and Sierra Club and Natural Resources Defense Council to resolve litigation concerning the deadline for completing 1-hour SO_2 designations.

On March 20, 2015, the EPA notified the Texas Commission on Environmental Quality (TCEQ) of Texas power plant sources that meet the criteria established in the court's order. In addition, the letter advised that the EPA will use the most recent available information when making designation and boundary decisions. The EPA requested updated recommendations and supporting information by September 18, 2015.

Due to time and resource constraints, the TCEQ conducted limited refined screening modeling to support attainment designations near selected sources.

2. Modeling Results

The predicted maximum ground level concentration (GLCmax) is 84 $\mu g/m^3$, and this represents a three-year average of the high, fourth high (or 99^{th} percentile) maximum daily 1-hour concentrations. The location of the GLCmax is approximately 1900 meters from the modeled stack to the north-northwest. Table 1 lists the location of the predicted GLCmax. The location is in the Universal Transverse Mercator (UTM) Zone 14 North, North American Datum of 1983 (NAD83) coordinate system.

Table 1. Modeling Results

Easting (meters)	Northing (meters)	Averaging Time	GLC ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total ($\mu g/m^3$)	Standard ($\mu g/m^3$)
673543.3	3179101.6	1-hr	84	15	99	196

Background concentrations for SO_2 were obtained from the EPA Aerometric Information Retrieval System (AIRS) monitor 483550032 located at 3810 Huisache Street, Corpus Christi, Nueces County. The three-year average (2012-2014) of the 99th percentile of the annual distribution of the maximum daily 1-hour concentrations was used for the 1-hour value. The use of this monitor is reasonable given the magnitude of emissions near the monitor site relative to the Coleto Creek Power Station site. TCEQ emissions inventory data from 2013 were reviewed and there are approximately 3 tons of SO_2 from sources within 25 kilometers of the Coleto Creek Power Station (nearest sources are located approximately 23 kilometers to the north-northeast). There are approximately 681 tons of SO_2 emissions from sources located within 25 kilometers of the monitor site.

3. Model Used and Modeling Techniques

AERMOD (Version 14134) was used in a refined screening mode. For refined screening, National Weather Service (NWS) meteorological raw input data are used with generalized surface characteristics of the application site.

A. Land Use

A land use/land cover analysis was performed using AERSURFACE consistent with guidance given in the AERMOD Implementation Guide (March 19, 2009). The recommended input data, the National Land Cover Data 1992 archives (NLCD92), were used for this analysis.

The AERSURFACE analysis conducted of the area surrounding the Coleto Creek Power Station site resulted in a calculated albedo of 0.17, a calculated Bowen ratio of 0.68, and a calculated surface roughness length of 0.058 meters. These values were used to develop the meteorological data set for this analysis.

Terrain elevations within the modeling domain were determined using AERMAP (Version 11103). The input data used for this analysis were National Elevation Data (NED) seamless data obtained from the United States Geological Survey (USGS).

B. Meteorological Data

Meteorological data for years 2012-2014 were used in the analysis. Raw surface and upper air meteorological data were processed using AERMET (Version 14134).

Surface Station and ID: Victoria, TX (Station #: 12912)
Upper Air Station and ID: Corpus Christi, TX (Station #: 12924)
Meteorological Dataset: 2012-2014
Profile Base Elevation: 36 meters

These meteorological stations are the nearest stations to the Coleto Creek Power Station site and are representative to use given that there are no significant terrain barriers between the site and the meteorological stations.

C. Receptor Grid

The receptor grid used in the modeling analysis consisted of receptors with 100 meter spacing along the fence line out to one kilometer, receptors with 500 meter spacing out to five kilometers, and receptors with one kilometer spacing out to 50 kilometers. The purpose of the receptor grid was to determine representative maximum ground-level concentrations.

D. Building Wake Effects (Downwash)

Input data to BPIP- Prime (Version 04274) were developed from a plot plan submitted during previous permitting actions. The building locations were validated by ADMT using aerial photography.

4. Modeling Emissions Inventory

Source locations were validated by ADMT using aerial photography. The emission source coordinates are in the UTM Zone 14 North, NAD83 coordinate system.

Table 2. On-Property Point Source Parameter Information

EPN	Source ID	Easting (meters)	Northing (meters)	Stack Height (meters)	Stack Temperature (K)	Stack Exit Velocity (meters/sec)	Stack Diameter (meters)
1	1	674407	3177477	124.6	435.9	36.5	6.1

An hourly emissions file (coleto_creek_emissions.txt) for years 2012-2014 was developed for the modeling analysis. The emissions data were obtained from the EPA's

Acid Rain Program database. The modeled emission rates represent the actual 1-hour average emission rates reported for the modeled stack.

With respect to other nearby sources of SO_2, the Coleto Creek Power Station is a relatively isolated source. TCEQ emissions inventory data from 2013 were reviewed and there are two sources within 25 kilometers with approximately 3 tons of SO_2 emissions. There are an additional seven sources located between 25 and 50 kilometers with a total of approximately 70 tons of SO_2 emissions. Given the distance and magnitude of emissions, these sources would not be expected to cause significant concentration gradients in the vicinity of Coleto Creek and are represented in the modeling via monitored background concentrations.

5. Modeling Files Listing

Table 3. Modeling Files

File Name	File Description
VCTCRP2012_2014.SFC	AERMET surface output file
VCTCRP2012_2014.PFL	AERMET profile output file
coleto_creek_2012-2014.DTA	AERMOD input file
coleto_creek_2012-2014.GRF	AERMOD plot file
coleto_creek_2012-2014.LST	AERMOD output file
coleto_creek_2012-2014.SUM	AERMOD summary file
coleto_creek_emissions.txt	Hourly emissions file
bpip.PIP	BPIP-PRIME input file
bpip.SO	BPIP-PRIME output file
bpip.SUM	BPIP-PRIME summary file

TCEQ Interoffice Memorandum

To: David Brymer, Director
Air Quality Division

Thru: Daniel Menendez, Team Leader
Air Dispersion Modeling Team (ADMT)
Air Permits Division

From: Dan Jamieson
ADMT
Air Permits Division

Date: June 5, 2015

Subject: Modeling Analysis of Sulfur Dioxide for Southwestern Public Service Company – Tolk Station Power Plant (RN100224534)

1. Project Identification Information

On March 2, 2015, the U.S. District Court for the Northern District of California accepted as an enforceable order an agreement between the Environmental Protection Agency (EPA) and Sierra Club and Natural Resources Defense Council to resolve litigation concerning the deadline for completing 1-hour SO_2 designations.

On March 20, 2015, the EPA notified the Texas Commission on Environmental Quality (TCEQ) of Texas power plant sources that meet the criteria established in the court's order. In addition, the letter advised that the EPA will use the most recent available information when making designation and boundary decisions. The EPA requested updated recommendations and supporting information by September 18, 2015.

Due to time and resource constraints, the TCEQ conducted limited refined screening modeling to support attainment designations near selected sources.

2. Modeling Results

The predicted maximum ground level concentration (GLCmax) is 150 $\mu g/m^3$, and this represents a three-year average of the high, fourth high (or 99^{th} percentile) maximum daily 1-hour concentrations. The location of the GLCmax is approximately 1400 meters from the two modeled stacks to the south-southwest. Table 1 lists the location of the predicted GLCmax. The location is in the Universal Transverse Mercator (UTM) Zone 13 North, North American Datum of 1983 (NAD83) coordinate system.

Table 1. Modeling Results

Easting (meters)	Northing (meters)	Averaging Time	GLC ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total ($\mu g/m^3$)	Standard ($\mu g/m^3$)
723614	3783986	1-hour	150	16	166	196

Background concentrations for SO_2 were obtained from the EPA Aerometric Information Retrieval System (AIRS) monitor 483091037 located at 4472 Mazanec Road, Waco McLennan County. The three-year average (2012-2014) of the 99th percentile of the annual distribution of the maximum daily 1-hour concentrations was used for the 1-hour value. The use of this monitor is reasonable given the magnitude of emissions near the monitor site relative to the Tolk Station Power Plant site. TCEQ emissions inventory data from 2013 were reviewed and there are approximately five tons of SO_2 from the nearest source to the Tolk Station Power Plant (located approximately 15 kilometers away). There are approximately 360 tons of SO_2 emissions from sources located within 20 kilometers of the monitor site.

3. Model Used and Modeling Techniques

AERMOD (Version 14134) was used in a refined screening mode. For refined screening, National Weather Service (NWS) meteorological raw input data are used with generalized surface characteristics of the application site.

A. Land Use

A land use/land cover analysis was performed using AERSURFACE consistent with guidance given in the AERMOD Implementation Guide (March 19, 2009). The recommended input data, the National Land Cover Data 1992 archives (NLCD92), were used for this analysis.

The AERSURFACE analysis conducted of the area surrounding the Tolk Station Power Plant site resulted in a calculated albedo of 0.18, a calculated Bowen ratio of 0.79, and a calculated surface roughness length of 0.122 meters. These values were used to develop the meteorological data set for this analysis.

Terrain elevations within the modeling domain were determined using AERMAP (Version 11103). The input data used for this analysis were National Elevation Data (NED) seamless data obtained from the United States Geological Survey (USGS).

B. Meteorological Data

Meteorological data for years 2012-2014 were used in the analysis. Raw surface and upper air meteorological data were processed using AERMET (Version 14134).

Surface Station and ID: Lubbock, TX (Station #: 23042)
Upper Air Station and ID: Amarillo, TX (Station #: 23047)
Meteorological Dataset: 2012-2014
Profile Base Elevation: 988 meters

These meteorological stations are the nearest stations to the Tolk Station Power Plant site and are representative to use given that there are no significant terrain barriers between the site and the meteorological stations.

C. Receptor Grid

The receptor grid used in the modeling analysis consisted of receptors with 100 meter spacing along the fence line out to one kilometer, receptors with 500 meter spacing out to five kilometers, and receptors with one kilometer spacing out to 50 kilometers. The purpose of the receptor grid was to determine representative maximum ground-level concentrations.

D. Building Wake Effects (Downwash)

Input data to BPIP- Prime (Version 04274) were developed from a plot plan submitted during previous permitting actions. The building locations were validated by ADMT using aerial photography.

4. Modeling Emissions Inventory

Source locations were validated by ADMT using aerial photography. The emission source coordinates are in the UTM Zone 13 North, NAD83 coordinate system.

Table 2. On-Property Point Source Parameter Information

EPN	Source ID	Easting (meters)	Northing (meters)	Stack Height (meters)	Stack Temperature (K)	Stack Exit Velocity (meters/sec)	Stack Diameter (meters)
1-1	171B	724046	3785356	121.92	408.15	27.43	6.86
2-1	172B	723957	3785355	121.92	408.15	27.43	6.86

An hourly emissions file (tolk_emissions.txt) for years 2012-2014 was developed for the modeling analysis. The emissions data were obtained from the EPA's Acid Rain

Program database. The modeled emission rates represent the actual 1-hour average emission rates reported for the two modeled stacks.

With respect to other nearby sources of SO_2, the Tolk Station Power Plant is a relatively isolated source. TCEQ emissions inventory data from 2013 were reviewed and there is a source located approximately 15 kilometers east of the site with five tons of SO_2 emissions. There is another source located approximately 50 kilometers north-northwest of the site with 63 tons of SO_2 emissions. Given the distance and magnitude of emissions, these sources would not be expected to cause significant concentration gradients in the vicinity of Tolk Power Plant and are represented in the modeling via monitored background concentrations.

5. Modeling Files Listing

Table 3. Modeling Files

File Name	File Description
LBBAMA12_14.SFC	AERMET surface output file
LBBAMA12_14.PFL	AERMET profile output file
Tolk_2012_2014_SO2.DTA	AERMOD input file
Tolk_2012_2014_SO2.GRF	AERMOD plot file
Tolk_2012_2014_SO2.LST	AERMOD output file
Tolk_2012_2014_SO2.SUM	AERMOD summary file
tolk_emissions.txt	Hourly emissions file
prime.PIP	BPIP-PRIME input file
prime.SO	BPIP-PRIME output file
prime.SUM	BPIP-PRIME summary file

TCEQ Interoffice Memorandum

To: David Brymer, Director
Air Quality Division

From: Daniel Menendez, Team Leader
Air Dispersion Modeling Team (ADMT)
Air Permits Division

Date: June 5, 2015

Subject: Modeling Analysis of Sulfur Dioxide for Major Oak Power, LLC – Twin Oaks (RN100226570)

1. Project Identification Information

On March 2, 2015, the U.S. District Court for the Northern District of California accepted as an enforceable order an agreement between the Environmental Protection Agency (EPA) and Sierra Club and Natural Resources Defense Council to resolve litigation concerning the deadline for completing 1-hour SO_2 designations.

On March 20, 2015, the EPA notified the Texas Commission on Environmental Quality (TCEQ) of Texas power plant sources that meet the criteria established in the court's order. In addition, the letter advised that the EPA will use the most recent available information when making designation and boundary decisions. The EPA requested updated recommendations and supporting information by September 18, 2015.

Due to time and resource constraints, the TCEQ conducted limited refined screening modeling to support attainment designations near selected sources.

2. Modeling Results

The predicted maximum ground level concentration (GLCmax) is 84 $\mu g/m^3$, and this represents a three-year average of the high, fourth high (or 99^{th} percentile) maximum daily 1-hour concentrations. The location of the GLCmax is approximately 1300 meters from the two modeled stacks to the north. Table 1 lists the location of the predicted GLCmax. The location is in the Universal Transverse Mercator (UTM) Zone 14 North, North American Datum of 1983 (NAD83) coordinate system.

Table 1. Modeling Results

Easting (meters)	Northing (meters)	Averaging Time	GLC ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total ($\mu g/m^3$)	Standard ($\mu g/m^3$)
719635	3443500	1-hour	84	16	100	196

Background concentrations for SO_2 were obtained from the EPA Aerometric Information Retrieval System (AIRS) monitor 483091037 located at 4472 Mazanec Road, Waco McLennan County. The three-year average (2012-2014) of the 99th percentile of the annual distribution of the maximum daily 1-hour concentrations was used for the 1-hour value. The monitor is located approximately 70 kilometers north-northwest of the site, which is in the direction of the predominant wind flow for the region. TCEQ emissions inventory data from 2013 were reviewed and there were not any emissions of SO_2 reported within 20 kilometers of the Twin Oaks site. There are approximately 360 tons of SO_2 emissions from sources located within 20 kilometers of the monitor site. The use of this monitor is reasonable given the location of the monitor and the magnitude of emissions near the monitor site relative to the Twin Oaks site.

The nearest source, located approximately 21 kilometers away, to the Twin Oaks site is the Oak Grove Steam Electric Station. In 2013, the Oak Grove Steam Electric Station reported 6950 tons of SO_2. Although this source would be unlikely to cause a significant concentration gradient in the vicinity of the Twin Oaks site, it was included in the modeling since there are no sources near the monitor with a similar magnitude of reported emissions.

3. Model Used and Modeling Techniques

AERMOD (Version 14134) was used in a refined screening mode. For refined screening, National Weather Service (NWS) meteorological raw input data are used with generalized surface characteristics of the application site.

A. Land Use

A land use/land cover analysis was performed using AERSURFACE consistent with guidance given in the AERMOD Implementation Guide (March 19, 2009). The recommended input data, the National Land Cover Data 1992 archives (NLCD92), were used for this analysis.

The AERSURFACE analysis conducted of the area surrounding the Twin Oaks site resulted in a calculated albedo of 0.17 a calculated Bowen ratio of 0.70, and a calculated surface roughness length of 0.043 meters. These values were used to develop the meteorological data set for this analysis.

Terrain elevations within the modeling domain were determined using AERMAP (Version 11103). The input data used for this analysis were National Elevation Data (NED) seamless data obtained from the United States Geological Survey (USGS).

B. Meteorological Data

Meteorological data for years 2012-2014 were used in the analysis. Raw surface and upper air meteorological data were processed using AERMET (Version 14134).

Surface Station and ID: College Station, TX (Station #: 3904)
Upper Air Station and ID: Fort Worth, TX (Station #: 3990)
Meteorological Dataset: 2012-2014
Profile Base Elevation: 100 meters

These meteorological stations are the nearest stations to the Twin Oaks site and are representative to use given that there are no significant terrain barriers between the site and the meteorological stations.

C. Receptor Grid

The receptor grid used in the modeling analysis consisted of receptors with 100 meter spacing along the fence line out to one kilometer, receptors with 500 meter spacing out to five kilometers, and receptors with one kilometer spacing out to 50 kilometers. The purpose of the receptor grid was to determine representative maximum ground-level concentrations.

D. Building Wake Effects (Downwash)

Input data to BPIP-Prime (Version 04274) were developed from a plot plan submitted during previous permitting actions. The building locations were validated by ADMT using aerial photography.

4. Modeling Emissions Inventory

Source locations were validated by ADMT using aerial photography. The emission source coordinates are in the UTM Zone 14 North, NAD83 coordinate system.

Table 2. On-Property Point Source Parameter Information

EPN	Source ID	Easting (meters)	Northing (meters)	Stack Height (meters)	Stack Temperature (K)	Stack Exit Velocity (meters/sec)	Stack Diameter (meters)
1-1	U1	719731.92	3442182.39	103.63	437.98	24.57	3.8
2-1	U2	719768.86	3442220.88	103.63	451.32	23.16	3.8

An hourly emissions file (TwinOaks_OakGrove_emissions.txt) for years 2012-2014 was developed for the modeling analysis. The emissions data were obtained from the EPA's Acid Rain Program database. The modeled emission rates represent the actual 1-hour average emission rates reported for the two modeled stacks.

As in section 2, the TCEQ emissions inventory data from 2013 were reviewed to determine if any nearby sources should be modeled. The nearest source, the Oak Grove Steam Electric Station, is located within approximately 21 kilometers and reported 6950 tons of SO_2 in 2013. The emissions data for the Oak Grove Steam Electric Station were obtained from the EPA's Acid Rain Program database and included in the hourly emissions file. The modeled emission rates represent the actual 1-hour average emission rates reported for the Oak Grove Steam Electric Station.

With respect to any additional nearby sources of SO_2, Twin Oaks is a relatively isolated source. TCEQ emissions inventory data from 2013 were reviewed and the next closest sources are located approximately 29-35 kilometers east of the site with a total of 69 tons of SO_2 emissions. Given the distance and magnitude of emissions, these sources would not be expected to cause significant concentration gradients in the vicinity of Twin Oaks and are represented in the modeling via monitored background concentrations.

5. Modeling Files Listing

Table 3. Modeling Files

File Name	File Description
CLLFWD2012_2014.SFC	AERMET surface output file
CLLFWD2012_2014.PFL	AERMET profile output file
Twin_oaks_2012-2014.DTA	AERMOD input file
Twin_oaks_2012-2014.GRF	AERMOD plot file
Twin_oaks_2012-2014.LST	AERMOD output file
Twin_oaks_2012-2014.SUM	AERMOD summary file
TwinOaks_OakGrove_emissions.txt	Hourly emissions file
bpip.PIP	BPIP-PRIME input file
bpip.SO	BPIP-PRIME output file
bpip.SUM	BPIP-PRIME summary file