INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
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Eric J. Holcomb
Governor

Bruno Pigott
Commissioner

January 13, 2017

Mr. Robert A. Kaplan
Acting Regional Administrator
U.S. Environmental Protection Agency
Region 5
77 West Jackson Boulevard
Chicago, IL 60604-3950

Re: Preliminary Recommendations Concerning Round 3 Air Quality Designations for the 2010 Primary 1-Hour Sulfur Dioxide National Ambient Air Quality Standard

Dear Mr. Kaplan:

This letter is in response to United States Environmental Protection Agency's (U.S. EPA's) July 22, 2016, memorandum *Area Designations for the 2010 Primary Sulfur Dioxide National Ambient Air Quality Standard-Round 3* and prior guidance on area designations issued by U.S. EPA on March 20, 2015. The letter's primary purpose is to provide information for U.S. EPA's evaluation prior to Round 3 designations. As required, the Indiana Department of Environmental Management (IDEM) is providing new modeling analyses for areas where modeling is being used to characterize air quality around certain sulfur dioxide (SO_2) sources, as well as preliminary recommendations for Round 3 designations. IDEM is also including information about newly installed air monitors where air monitoring is being used to characterize air quality around certain SO_2 sources for Round 4 designations.

Implementation of the 2010 primary 1-hour SO_2 standard began in 2013 when U.S. EPA established nonattainment areas based on 2010-2012 monitoring data. Subsequently, on March 2, 2015, U.S. EPA entered into a consent decree with the Sierra Club and Natural Resources Defense Council (NRDC) establishing a timeline for the completion of air quality characterizations and designations in all remaining areas of the country. The court order directed U.S. EPA to complete the designations in three additional rounds: Round 2 by July 2, 2016, Round 3 by December 31, 2017, and Round 4 by December 31, 2020.

On June 30, 2016, U.S. EPA completed designations for all Round 2 sources. U.S. EPA has designated all of Indiana's Round 2 sources as unclassifiable/attainment. The final rule was published in the Federal Register on July 12, 2016 (81 FR 45039).

On August 10, 2015, U.S. EPA announced the Data Requirements Rule (DRR), which requires the characterization of air quality near sources with SO_2 emissions at or greater than 2,000 tons per year (tpy) or have been identified by IDEM or U.S. EPA "as requiring further air quality characterization." Under the DRR, states must submit air quality information to U.S. EPA according to timeframes that coincide with the court-ordered dates for designations in all remaining areas under Rounds 3 and 4.

IDEM has been working with U.S. EPA to identify all sources in Indiana that are subject to the DRR and provide data for the characterization of nearby air quality. As required, on January 7, 2016, IDEM submitted a list of 11 stationary sources identified for air quality characterization under the DRR, thus beginning the Round 3 designation process. On March 26, 2016, U.S. EPA added six sources to the list, including: five Round 2 sources that U.S. EPA identified as also meeting DRR characterization requirements; and one source, U.S. Mineral Products (Isolatek), for which U.S. EPA believed further study was necessary. IDEM disagrees with U.S. EPA's addition of U.S. Mineral Products to the list of Indiana sources subject to the DRR, as further explained in Attachment 3. Table 1 contains an up-to-date list of DRR sources identified by U.S. EPA and IDEM, along with the selected approaches for air quality characterization for each source area.

Table 1: Indiana SO_2 Sources Subject to the Data Requirements Rule

Facility	County	2014 SO_2 Emissions (Tons)	Selected Approach for Characterization
Duke – Gallagher	Floyd	3,524	Modeling
Duke – Gibson	Gibson	22,055	Round 2 Source[a]
U.S. Mineral Products (Isolatek)[b]	Huntington	< 2,000	See Attachment 3
NIPSCO – R.M. Schahfer	Jasper	8,412	Modeling
Indiana-Kentucky Electric Corporation - Clifty Creek	Jefferson	3,731	Round 2 Source[a]
ArcelorMittal USA	Lake	2,163	Modeling
Coke Energy	Lake	4,952	Modeling
U.S. Steel – Gary Works	Lake	3,285	Modeling
NIPSCO – Michigan City	LaPorte	15,991	Round 2 Source[a]
ArcelorMittal – Burns Harbor	Porter	12,189	Monitoring See Attachment 5
SABIC Innovative Plastics	Posey	4,030	Modeling
Vectren – A.B. Brown	Posey	8,080	Round 2 Source[a]
AEP – Rockport	Spencer	54,979	Round 2 Source[a]
Hoosier Energy – Merom	Sullivan	3,318	Modeling
Duke – Cayuga	Vermillion	3,448	Modeling
Alcoa Warrick Power Plant	Warrick	4,993	See Attachment 4
Alcoa Warrick Operations	Warrick	3,500	See Attachment 4

[a] IDEM completed a characterization for this source under Round 2 designation requirements. U.S. EPA issued final Round 2 designations on June 30, 2016 (81 FR 45039).

[b] Added by U.S. EPA.

By January 1, 2017, each state air agency must ensure that new ambient air monitors are operational where air monitoring is selected to inform Round 4 designations. Only one DRR source, ArcelorMittal – Burns Harbor, opted for ambient monitoring of SO_2 to characterize air quality. See Attachment 5 for information regarding the operation of SO_2 monitors at the ArcelorMittal – Burns Harbor facility. U.S. EPA will evaluate three complete years of air monitoring data from these monitors for the completion of Round 4 designations by the court-ordered date of December 31, 2020.

By January 13, 2017, each state air agency must provide to U.S. EPA its modeling analysis for source-areas where modeling is used to determine Round 3 designations. Table 2 contains IDEM's Round 3 designation recommendations, based on new air quality modeling analyses for the source areas.

Table 2: Indiana's Round 3 Designation Recommendations

Source	County	Boundary/Area	Recommendation
Duke Energy Gallagher	Floyd	County	Attainment
U.S. Mineral Products (Isolatek)	Huntington	See Attachment 3	See Attachment 3
NIPSCO R.M. Schahfer	Jasper (P)	Kankakee Township	Attainment
ArcelorMittal USA, Coke Energy, U.S. Steel Gary Works	Lake (P)	Calumet Township North Township	Attainment
SABIC Innovative Plastics	Posey (P)	Black Township	Attainment
Hoosier Energy Merom	Sullivan (P)	Gill Township	Attainment
Duke Energy Cayuga	Vermillion (P)	Eugene Township Vermillion Township	Attainment
Alcoa Warrick Power Plant, Alcoa Warrick Operations Plant	Warrick (P)	Anderson Township	Attainment See Attachment 4

(P) denotes partial county recommendation

IDEM is attaching new modeling analyses, as required, and several additional documents listed here, to provide U.S. EPA with detailed information for review prior to completing Round 3 designations.

Attachment 1: Indiana's Preliminary Recommendations Concerning Round 3 Designations for the 2010 Primary 1-Hour Sulfur Dioxide (SO_2) National Ambient Air Quality Standards (NAAQS)

Attachment 2: Indiana's Air Quality Modeling Technical Support Document Preliminary Designation Recommendations Data Requirements Rule (Round 3) for the 2010 Primary 1-Hour Sulfur Dioxide (SO_2) National Ambient Air Quality Standards (NAAQS)

Attachment 3: U.S. Mineral Products (Isolatek) Discussion

Attachment 4: Alcoa Warrick Attainment Discussion

Attachment 5: ArcelorMittal - Burns Harbor SO_2 Air Quality Monitor System Documentation

This submittal consists of one (1) hard copy of the required documentation. An electronic version of the submittal in PDF format that is identical to the hard copy has been sent to Doug Aburano, Chief of U.S. EPA Region 5's Attainment Planning and Maintenance Section and Chris Panos of U.S. EPA Region 5.

Thank you for this opportunity to submit information, including Indiana's new modeling analyses and preliminary recommendations, for Round 3 designations under the 2010 primary 1-hour SO_2 NAAQS. If you have any questions or need additional information, please contact Keith Baugues, Assistant Commissioner, Office of Air Quality, at (317) 232-8222 or kbaugues@idem.IN.gov.

Sincerely,

Bruno Pigott
Commissioner

BP/kb/sd/bc/gf/as
Attachments

cc: Chris Panos, U.S. EPA Region 5 (no enclosures)
John Summerhays, U.S. EPA Region 5 (no enclosures)
Doug Aburano, U.S. EPA Region 5 (no enclosures)
Keith Baugues, IDEM-OAQ (no enclosures)
Scott Deloney, IDEM-OAQ (no enclosures)
Brian Callahan, IDEM-OAQ (w/ enclosures)
Mark Derf, IDEM-OAQ (w/ enclosures)
Gale Ferris, IDEM-OAQ (w/ enclosures)
Amy Smith, IDEM-OAQ (w/ enclosures)
File Copy

Attachment 1

Indiana's Preliminary Recommendations
Concerning Round 3 Designations for the 2010 Primary
1-Hour Sulfur Dioxide (SO_2) National Ambient Air
Quality Standards (NAAQS)

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Source	County	Boundary/Area	Recommendation
Duke Energy Gallagher	Floyd	County	Attainment
U.S. Mineral Products (Isolatek)	Huntington	See Attachment 3	See Attachment 3
NIPSCO R.M. Schahfer	Jasper (P)	Kankakee Township	Attainment
ArcelorMittal USA, Coke Energy, U.S. Steel Gary Works	Lake (P)	Calumet Township and North Township	Attainment
SABIC Innovative Plastics	Posey (P)	Black Township	Attainment
Hoosier Energy Merom	Sullivan (P)	Gill Township	Attainment
Duke Energy Cayuga	Vermillion (P)	Eugene Township Vermillion Township	Attainment
Alcoa Warrick Power Plant, Alcoa Warrick Operations Plant	Warrick (P)	Anderson Township	Attainment See Attachment 4

(P) denotes partial county recommendation

The following sources, though identified by U.S. EPA as being subject to the Data Requirements Rule, were addressed under Round 2 designations and designated by U.S. EPA on June 30, 2016 (81 FR 45039).

Area Name	Source Area	County Name	Designation
Gibson County, IN	Duke Gibson	Gibson	Unclassifiable/Attainment
Jefferson County, IN	IKEC Clifty Creek	Jefferson (P)	Unclassifiable/Attainment
LaPorte County, IN	NIPSCO Michigan City	LaPorte	Unclassifiable/Attainment
Posey County, IN	Vectren A.B. Brown	Posey (P)	Unclassifiable/Attainment
Spencer County, IN	AEP Rockport	Spencer (P)	Unclassifiable/Attainment

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Attachment 2

Indiana's Air Quality Modeling Technical Support Document

Preliminary Designation Recommendations

Data Requirements Rule (Round 3)

2010 Primary 1-Hour Sulfur Dioxide (SO_2) National Ambient Air Quality Standard (NAAQS)

January 2017

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MODELING TECHNICAL SUPPORT DOCUMENT FOR PRELIMINARY DESIGNATION RECOMMENDATIONS

DATA REQUIREMENTS RULE (ROUND 3) FOR THE 2010 PRIMARY 1-HOUR SULFUR DIOXIDE (SO_2) NATIONAL AMBIENT AIR QUALITY STANDARD

1.0 1-Hour SO_2 NAAQS and Designation Process

The United States Environmental Protection Agency (U.S. EPA) established the 1-hour primary sulfur dioxide (SO_2) National Ambient Air Quality Standard (NAAQS) of 75 parts per billion (ppb) as published in the Federal Register (FR) on June 22, 2010 (75 FR 35519). This standard is based on the 3-year average of the annual 99th percentile of the 1-hour daily maximum concentrations. For air quality modeling purposes, the Indiana Department of Environmental Management (IDEM), Office of Air Quality (OAQ) uses an equivalent 1-hour SO_2 NAAQS of 196.2 micrograms per cubic meter ($\mu g/m^3$) as stated in 76 FR 69051. This is based on the 3-year average of the annual 99th percentile of the 1-hour daily maximum modeled SO_2 concentrations, representing the fourth high of the 1-hour daily maximum SO_2 modeled concentrations.

Implementation of the standard began in 2013, when U.S. EPA made initial designations based on 2010-2012 monitoring data (78 FR 47191). Subsequently, on March 2, 2015, U.S. EPA entered into a consent decree with the Sierra Club and the Natural Resources Defense Council establishing a timeline for the completion of air quality characterizations designations in all remaining areas of the country. The court order directed U.S. EPA to complete the designations in three additional rounds: Round 2 by July 2, 2016 (81 FR 45039), Round 3 by December 31, 2017, and Round 4 by December 31, 2020.

Round 3 and 4 designations are implemented through U.S. EPA's SO_2 Data Requirements Rule (DRR) (80 FR 51051). Round 3 designations apply to source areas that opt to characterize SO_2 through modeling and have ***not*** implemented ambient air monitoring by January 1, 2017. Round 4 designations apply to source areas that opt to characterize SO_2 by having implemented new ambient air monitoring by January 1, 2017. In addition, sources may opt to take permanent federally enforceable emission limits in order to reduce SO_2 emissions to below the DRR threshold of 2,000 tons per year.

2.0 Data Requirements Rule

As stated above, Round 3 designations are implemented through U.S. EPA's SO_2 DRR. Under this rule, SO_2 should be characterized in the vicinity of sources that had actual emissions in 2014 of 2,000 tons or more, or have been identified by IDEM or U.S. EPA "as requiring further air quality characterization."

Requirements specific to the DRR were followed in order to implement the 1-hour SO_2 NAAQS. Indiana identified 11 sources within the state that met the criteria established in the DRR. This list of sources was submitted to U.S. EPA – Region V on January 7, 2016. On March 25, 2016, U.S. EPA subsequently identified six additional sources meeting the criteria for air quality characterizations under the DRR. Five of these sources were "consent decree" sources and were designated unclassifiable/attainment under Round 2 (81 FR 45039). The sixth source, U.S. Mineral Products (U.S. Minerals) was listed by U.S. EPA as subject to the DRR due to concern for air quality in the area. All DRR sources, the counties they reside and their 2014 SO_2 emissions are listed in Table 2.1.

Table 2.1 - Indiana Sources Subject to the Data Requirements Rule

Facility	County	2014 SO_2 Emissions (tons)
Duke – Gallagher	Floyd	3,524
Duke – Gibson	Gibson	Round 2 Source [a]
U.S. Mineral Products (Isolatek)	Huntington	< 2,000 [b]
NIPSCO – R.M. Schahfer	Jasper	8,412
IKEC–Clifty Creek Generating Station	Jefferson	Round 2 Source [a]
ArcelorMittal – USA	Lake	2,163
Coke Energy	Lake	4,952
U.S. Steel – Gary Works	Lake	3,285
NIPSCO - Michigan City	LaPorte	Round 2 Source [a]
ArcelorMittal - Burns Harbor	Porter	12,189
SABIC Innovative Plastics	Posey	4,030
Vectren—A.B. Brown Generating Station	Posey	Round 2 Source [a]
AEP - Rockport	Spencer	Round 2 Source [a]
Hoosier Energy – Merom	Sullivan	3,318
Duke – Cayuga	Vermillion	3,448
Alcoa Warrick Power Plant	Warrick	4,993
Alcoa Warrick Operations Plant	Warrick	3,500 [c]

[a] IDEM completed characterization for this source under Round 2 designation requirements. U.S. EPA issued final Round 2 designations on June 30, 2016 (81 FR 45039).

[b] Added by U.S. EPA.

[c] Alcoa Warrick Operations shut down its smelter operations on March 31, 2016, reducing SO_2 emissions to < 1 ton source-wide.

As per the requirements of the DRR, air agencies were required to indicate whether they will rely on 1) air quality modeling, 2) ambient monitoring or 3) establishing a limit of a source's total SO_2 emissions to below 2,000 tons per year, to characterize air quality in the area surrounding the DRR sources. Indiana reviewed each source and determined that eight sources will conduct air dispersion modeling to characterize air quality including, where appropriate, modeling non-DRR sources. One source, ArcelorMittal – Burns Harbor, opted to rely on ambient monitoring to characterize air quality (see Section 10.0 and transmittal Attachment 5). For U.S. Mineral Products (Isolatek), Indiana disagrees with U.S. EPA on its inclusion as being subject to the DRR (see transmittal Attachment 3). Lastly, for Alcoa Warrick Operations and Alcoa Warrick Power Indiana feels that these two facilities and the surrounding area should be designated attainment based on historical SO_2 ambient monitoring showing attainment of the SO_2 standard and the fact that the Operations Plant shut down their aluminum smelting operations on March 31, 2016 and has negligible SO_2 emissions as a result of the shutdown (see transmittal Attachment 4).

U.S. EPA has established deadlines for each step of the 1-hour SO_2 designation process in the DRR. Indiana met the first deadline by submitting its list of DRR sources on January 7, 2016.

- **January 15, 2016 -** States were required to submit their list of SO_2 sources for characterizing air quality under the DRR to U.S. EPA.
- **July 1, 2016 –** States were required to submit modeling protocols for sources characterizing air quality in the area with air dispersion modeling.
- **July 1, 2016 –** States were required to submit Annual Monitoring Network Plans that detailed modifications to SO_2 monitors intended to satisfy the DRR.
- **January 1, 2017 –** SO_2 monitors intended to satisfy the DRR are required to be operational.
- **January 13, 2017 –** States electing to characterize air quality by air dispersion modeling are required to provide modeling analyses to U.S. EPA.
- **January 13, 2017 –** Federally enforceable and permanent emission limits to keep source emissions below 2,000 tons of SO_2 must be adopted and effective.
- **August 2017 –** Expected date by which U.S. EPA will notify states of intended designations.
- **December 2017 –** Date by which U.S. EPA will complete final designations for the majority of the country.
- **August 2019 –** Approximate due date for state attainment plans for areas designated nonattainment in 2017.
- **May 2020 –** Required certification of 2019 monitoring data; states have the opportunity to provide updated state recommendations to U.S. EPA.
- **August 2020 –** Expected date by which U.S. EPA would notify states of intended designations for reminder of the country not yet designated.

- **December 2020 –** Date by which the U.S. EPA would complete final designations for the remainder of the country.
- **August 2022 –** Approximate due date for state attainment plans for areas designated nonattainment in 2020.

3.0 Methodology for DRR Air Quality Modeling

The modeling methodology resembles modeling used to evaluate New Source Review (NSR) and Prevention of Significant Deterioration (PSD) sources. However, U.S. EPA provided further guidance in order to conduct an appropriate air dispersion modeling analysis to support 1-hour SO_2 designation recommendations. U.S. EPA's SO_2 NAAQS Designations Modeling Technical Assistance Document (TAD) guidance has several recommendations for modeling methodology for determining attainment designations, including:

1) Use of actual emissions to assess modeled concentrations to reflect current air quality.
2) Use of three years of modeling results to calculate a simulated 1-hour SO_2 design value consistent with the 3-year monitoring period to develop 1-hour SO_2 design values.
3) Placement of receptors only in locations where an air quality monitor could be placed.
   - Based on the SO_2 NAAQS Designations Modeling TAD, Section 4.2; Indiana placed modeling receptors only where feasible to place a monitor. Therefore, in bodies of water or an area where monitor siting criteria would not be reasonably met, Indiana did not place receptors.
   - Indiana matched up the modeling domain with Google map projections to ensure the proximity of the receptors to shorelines and have provided receptor/mapping details for each modeling analysis.
4) Use of actual stack heights rather than relying on Good Engineering Practice (GEP) stack heights when modeling actual emissions.

Indiana followed U.S. EPA's designation modeling recommendations to conduct 1-hour SO_2 modeling to determine whether there are modeled violations of the 1-hour SO_2 NAAQS. Modeling results looked at the 4^{th} high maximum daily 1-hour SO_2 concentrations averaged over the 3-year modeled period with representative temporally varying seasonal SO_2 background concentrations included within the AERMOD modeling run to determine the attainment status of the area in the vicinity of the DRR source.

4.0 Model Selection for DRR Modeling

4.1 AERMOD Dispersion Model

In accordance with Appendix A of Appendix W to 40 Code of Federal Regulations (CFR) Part 51, Indiana used the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) version 15181 for all dispersion modeling. U.S. EPA's SO_2 NAAQS Designations Modeling TAD, specific to attainment designation modeling, recommended using actual stack heights when modeling actual emissions instead of following the GEP stack height requirement. BPIPPRIME was used to account for any building downwash concerns.

4.2 AERMAP

The AERMOD terrain preprocessor mapping program, AERMAP, was used to determine all the terrain elevation heights for each receptor, building, and source locations using the Universal Transverse Mercator (UTM) coordinate system. The most recent AERMAP version 11103 assigned the elevations from the National Elevation Dataset (NED) using the North American Datum (NAD) 1983 as recommended in 40 CFR Part 51, Appendix W, Revision to the Guideline on Air Quality Models and later revised in the "AERMOD Implementation Guide."

4.3 Land Use Determination

The Auer Land Use Classification Scheme was used to determine land use in the area of each source, pursuant to 40 CFR Part 51, Appendix W section 7.2.3(c). Land use types were classified within a 3 kilometer radius about the source. If land use types I1 (heavy industrial), I2 (light moderate industrial), C1 (commercial), R2-R3 (compact residential) account for over 50 percent of the total land area, urban dispersion coefficients were used. If not, the rural dispersion coefficients were used.

5.0 Receptor Grid and Modeling Domain

The receptor grid and modeling domain was based on guidance provided in the memorandum "Updated Guidance for Area Designations for the 2010 Primary Sulfur Dioxide National Ambient Air Quality Standards", dated March 20, 2015 and the SO_2 NAAQS Designations Modeling TAD. Indiana used a multi-nested rectangular receptor grid with appropriate spacing of receptors based on the distance from the modeled emission points to detect significant concentration gradients. Indiana has conducted exploratory modeling on each of the DRR sources and did not find maximum modeled 1-hour SO_2 impacts or DRR source-culpable modeled violations that extended out beyond 10 kilometers. In situations where multiple sources covered by the DRR were evaluated in the same area, the modeling domain extended to include all sources and the appropriate distances to model maximum 1-hour SO_2 impacts to determine attainment designations for the area. Indiana generally used the following multi-nested rectangular receptor grid in all cases, with additional receptors added as needed:

- Receptor spacing at the fence line for each facility placed every 50 meters.
- Receptor spacing at 100 meters out to a distance of 3,000 meters (3 kilometers) beyond each facility (grid was extended if modeling results warranted).
- Receptor spacing at 250 meters out to a distance of 5,000 meters (5 kilometers) beyond each facility (grid was extended if modeling results warranted).
- Receptor spacing at 500 meters out to a distance of 10,000 meters (10 kilometers) beyond each facility (grid was extended if modeling results warranted).

6.0 Meteorology

6.1 AERMET

As stated in 40 CFR Part 51, Appendix W, section 8.3.1.2 and the SO_2 NAAQS Designations Modeling TAD, Indiana used three years (2012-2014 or 2013-2015) of National Weather Service (NWS) and on-site surface data and upper air meteorological data processed with the latest version of the AERMOD meteorological data preprocessor program AERMET (version 15181). Table 6.1 below lists the modeled facilities as mentioned in the DRR and the corresponding surface and upper air meteorological stations used to conduct modeling.

Table 6.1 - National Weather Service Stations/Onsite Meteorological Stations

DRR Facility	Surface Meteorology	Upper Air Meteorology
SABIC Innovative Plastics Hoosier Energy - Merom	Evansville, IN NWS	Lincoln, IL NWS
Duke – Gallagher	Louisville, KY NWS	Wilmington, OH NWS
Arcelormittal – USA Coke Energy U.S. Steel – Gary Works ArcelorMittal Burns Harbor	Gary-IITRI onsite meteorological data processed with South Bend, IN NWS	Lincoln, IL NWS
NIPSCO – R.M. Schahfer	South Bend, IN NWS	Lincoln, IL NWS
Duke –Cayuga	Indianapolis, IN NWS	Lincoln, IL NWS

Indiana requested on November 9, 2016 for concurrence by U.S. EPA for the use of the adjusted surface friction velocity (ADJ_U*) Beta option in order to more accurately model 1-hour SO_2 concentrations from DRR sources located in Lake County. On December 20, 2016, U.S. EPA finalized "Revisions to the Guidelines on Air Quality Models, Enhancements to the AERMOD Dispersion Modeling System and Incorporation of Approaches to Address Ozone and Fine

Particulate Matter". This rule approved ADJ_U* as a regulatory option and was used in the DRR modeling for Lake County.

6.2 AERMINUTE/AERSURFACE

The 1-minute wind speeds and wind directions, taken from the Automated Surface Observing System (ASOS) NWS stations and onsite meteorological stations, were processed with the U.S. EPA's 1-minute data processor AERMINUTE (version 15272) program.

The U.S. EPA's AERSURFACE (version 13016) program was used to determine the surface characteristics; albedo, Bowen ratio, and surface roughness for the Indianapolis, Evansville, South Bend, Indiana and Louisville, Kentucky NWS meteorological tower locations. Surface characteristics were determined at each NWS location for each of 12 wind direction sectors with a recommended default radius of one kilometer.

The albedo and the Bowen ratio surface characteristics were adjusted during the three winter months of January, February, and December in accordance with the U.S. EPA Region V document, "Regional Meteorological Data Processing Protocol," dated May 6, 2011. Additionally, a dry or wet Bowen ratio value was used during months when soil moisture conditions were abnormally dry or wet; otherwise the Bowen ratio value for average soil moisture conditions was used. The surface roughness value for snow cover was used if more than half of the month had days with at least one inch of snow on the ground. Otherwise, the no snow cover surface roughness value was used.

7.0 SO_2 Background Concentrations

The modeling of all DRR sources used adjusted temporally varying seasonal background concentrations or concentrations without upwind major source SO_2 impacts. Each source used 1-hour SO_2 monitoring data, taken from nearby monitors, considered representative of background concentrations for the area. Since most SO_2 monitoring sites located in the state are downwind of large SO_2 sources, impacts from the upwind direction of the large SO_2 source were removed from the monitoring data since those sources were included in the modeling inventory. The 99^{th} percentile SO_2 concentrations by season (winter, spring, summer and fall) for each hour of the day were calculated to determine the temporally varying seasonal SO_2 background, which were directly input into the model and were part of the final modeled results. This procedure was used to prevent double counting of SO_2 sources within the background concentration values used for this attainment designation modeling.

Temporally varying seasonal SO_2 background concentrations were developed in accordance with the recommended U.S. EPA guidance for establishment of such background concentrations in

Section 8.2 of 40 CFR Part 51, Appendix W and considered appropriate and representative of the area. The latest three years of SO_2 air quality monitoring data (2012-2014 or 2013-2015) were used to develop background concentrations for each of the areas mentioned in the DRR. The procedures used to develop the SO_2 background concentrations are included as Enclosure 1. Table 7.1 shows the DRR facility and corresponding 1-hour SO_2 monitoring sites used for representative background concentrations in the air quality characterization.

Table 7.1 - Indiana DRR Sources and Nearby Background Monitoring Sites

Facility	County	Monitoring Sites
SABIC Innovative Plastics	Posey	Evansville – Buena Vista
Duke – Gallagher	Floyd	New Albany – Green Valley
NIPSCO – R.M. Schahfer	Jasper	Wheatfield – Center St.
Hoosier Energy – Merom	Sullivan	Terre Haute – North Lafayette Road
Duke – Cayuga	Vermillion	Fountain County -North of State Road 234
ArcelorMittal – USA Coke Energy U.S. Steel – Gary Works	Lake	Gary-IITRI and Hammond
ArcelorMittal - Burns Harbor	Porter	Dunes Acres Substation

8.0 SO_2 Emissions Sources to be Modeled

8.1 DRR Sources

Indiana modeled the hourly continuous emissions monitoring (CEM) data from sources subject to the DRR, where available. Along with the hourly SO_2 emission data, hourly variable stack gas flow rate and temperature of the exhaust stream were modeled, if available. This variation in parameters may influence dispersion characteristics of the exhaust stream and impact modeled 1-hour SO_2 concentrations.

For those emission sources without continuous emissions data, actual short-term emissions taken from the source's latest available emissions reporting were used. The SO_2 NAAQS Designations Modeling TAD, Section 5 was referenced to best characterize any temporal and/or seasonal variability of emissions. This would include any seasonal, monthly, or daily variations that can be quantified. Specific emissions characterizations that were modeled will be addressed for each DRR source later in this document.

There are instances where sources emitted less than 2,000 tons of SO_2 in 2014 and are not listed as a DRR source, but are located in the vicinity of a DRR source within the modeling receptor grid. This was considered a cluster source and the source was evaluated along with the DRR source in the air quality modeling analysis to determine the air quality characterization in the area.

8.2 Inventory Sources

Based on the U.S. EPA memo "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 National Ambient Air Quality Standard", dated March 1, 2011, page 16, Indiana is focused on the characterization of air quality within 10 kilometers for each of the DRR sources. U.S. EPA's SO_2 NAAQS Designations Modeling TAD Section 4.1, page 7, mentions the number of sources to be explicitly modeled should cause a significant concentration gradient and the number of those sources to be modeled would generally be small. Indiana developed a list of SO_2 emission sources in the county of the DRR source, as well as larger SO_2 emission sources in adjacent counties and states, as requested by U.S. EPA – Region 5, that were explicitly modeled.

Emission sources near the DRR source were evaluated to determine if those sources could cause or contribute to a 1-hour SO_2 NAAQS violation. Indiana used the following threshold as a screening method to narrow the focus of sources that could potentially have an impact on designations: sources with SO_2 emissions greater than 250 tons per year and located within 30 kilometers of the DRR source. While this method was applied on an area-by-area basis, Indiana felt this was an accurate representation of air quality in the area, especially since the hourly seasonal background concentrations adequately captures SO_2 impacts from surrounding sources. IDEM also identified sources with emissions less than 250 tons that were included in DRR modeling due to their proximity within the DRR source receptor grid used in the dispersion modeling. Actual emissions taken from the latest available emissions inventories were modeled for sources identified by these threshold levels to determine air quality characteristics in the area.

8.3 Intermittent Sources

Emergency generators, fire pumps, and startup/shutdown emissions were handled consistent to the March 1, 2011 guidance "Additional Clarification Regarding Application of Appendix W Modeling Guidance for the 1-hour NO_2 NAAQS", dated March 1, 2011. U.S. EPA recommended using appropriate data based on emissions scenarios that are continuous enough or frequent enough to contribute significantly to the annual distribution of maximum daily 1-hour concentrations. Review of the hours of operations for combustion turbines, emergency generators, startup/shutdown, fire pumps, and other auxiliary operations associated with the sources addressed by the DRR have been determined to operate much less than 500 hours per year and have random and infrequent schedules that cannot be controlled. Indiana feels that the intent of the DRR is to determine the attainment status of the area surrounding large SO_2 emission sources based on actual emissions coming from the large units. As such, this is

Indiana's main focus of the designation determinations. This approach is consistent with previous 1-hour SO_2 nonattainment and designation modeling submitted by IDEM to U.S. EPA.

9.0 Analysis of Modeling Results

The purpose of this modeling demonstration is to characterize air quality and determine area designations as it relates to attainment of the 1-hour SO_2 NAAQS in accordance with the DRR. The 99th percentile of the 1-hour daily maximum modeled concentrations represents the fourth high of the 1-hour daily maximum SO_2 modeled concentrations and are averaged across three years to compare resulting concentrations to the 1-hour SO_2 NAAQS of 75 ppb (196.2 µg/m^3).

Modeled concentrations include representative temporally varying seasonal 1-hour SO_2 background values to determine the overall impact from the DRR sources. This resulting concentration is compared to the 1-hour SO_2 standard to indicate whether a modeled violation of the SO_2 NAAQS has occurred. All concentrations that fall at or below the 1-hour SO_2 NAAQS are determined to attain the standard and the area surrounding the DRR source is recommended as attainment.

10.0 ArcelorMittal – Burns Harbor (Source ID 18-127-00001)

10.1 Source Description

ArcelorMittal - Burns Harbor, LLC (Burns Harbor) is a stationary steel works plant for the production of coke, limited coal chemical, molten iron, molten steel, steel slabs, hot rolled steel, steel coils, steel plates, cold rolled and/or coated steel sheet and plate. Specific emission units associated with Burns Harbor include a coke oven process plant, coke by-products recovery plant, blast furnace granulated coal injection system, continuous sintering process plant, two blast furnaces, basic oxygen furnaces shop, slab/plate mill complex, hot strip mill, cold sheet mill operations, power station, service shop and technical maintenance operations and fugitive dust emission operations including sinter plant and blast furnace operations.

10.2 Characterization of Modeled Area

Burns Harbor opted to select the monitoring option for air quality characterization in the vicinity of its facility. Therefore, a modeling analysis was conducted to determine the location of maximum modeled 1-hour SO_2 impacts near the facility. Once the location of maximum impacts was determined, Burns Harbor located an ambient air monitor near that location in order to accurately measure the SO_2 impacts from Burns Harbor and nearby SO_2 sources to compare with the 1-hour SO_2 NAAQS.

10.3 Summary of DRR Monitoring Approach

Burns Harbor and IDEM completed a modeling analysis and SO_2 Monitor Quality Assurance and Project Plan (QAPP) to site an SO_2 monitor and submitted both to U.S. EPA- Region 5 on June 10, 2016. On August 5, 2016, U. S. EPA approved the analysis and general monitor site location based on "hot spot" modeling to determine the maximum modeled 1-hour SO_2 concentration. Burns Harbor procured monitoring equipment and obtained, from the Port of Indiana, a lease for land. U.S. EPA approved IDEM's monitoring network for 2017 on October 31, 2016, which included the Burns Harbor SO_2 monitor. Burns Harbor was able to construct a concrete pad and shelter, set up and calibrate the equipment in early December 2016 and began operation of the monitor in mid-December, well ahead of the January 1, 2017 deadline. Clean Air Engineering completed testing of the communications system and verified calibration of all monitoring equipment. This monitor has been assigned AQS Identification number: 18-127-0028 and was operational on or before January 1, 2017. The monitoring network, consisting of the ArcelorMittal – Burns Harbor and the Dunes Acres Substation (AQS ID #18-127-0011) monitors meets the DRR requirement.

11.0 SABIC Innovative Plastics (Source ID 18-129-00002)

11.1 Source Description

SABIC Innovative Plastics Mt. Vernon, LLC (SABIC) is a plastics manufacturing facility. SABIC produces plastics for industries such as automotive, consumer electronics and medical devices.

SABIC is retrofitting their facility with a cogeneration (CoGen) plant that will use natural gas to create a majority of the steam for the site. Currently, SABIC's coal-fired boilers provide approximately 40 percent of the facility's steam. The U.S. EPA recently issued a new Maximum Achievable Control Technology (MACT) standard for industrial, commercial, and institutional boilers. SABIC is building their CoGen plant to address those standards. Significant SO_2 emission reductions are a byproduct of this project as several coal-fired boilers at SABIC were shut down once the project became fully operational by the end of December of 2016.

SABIC was identified as a Data Requirements Rule (DRR) source based on their actual 2014 SO_2 emissions of 4,030 tons exceeding the DRR threshold of 2,000 tons of SO_2. While the CoGen project helped SABIC realize significant SO_2 emission reductions, potential SO_2 emissions from the facility were still above 2,000 tons. The modeling option was chosen to address the DRR.

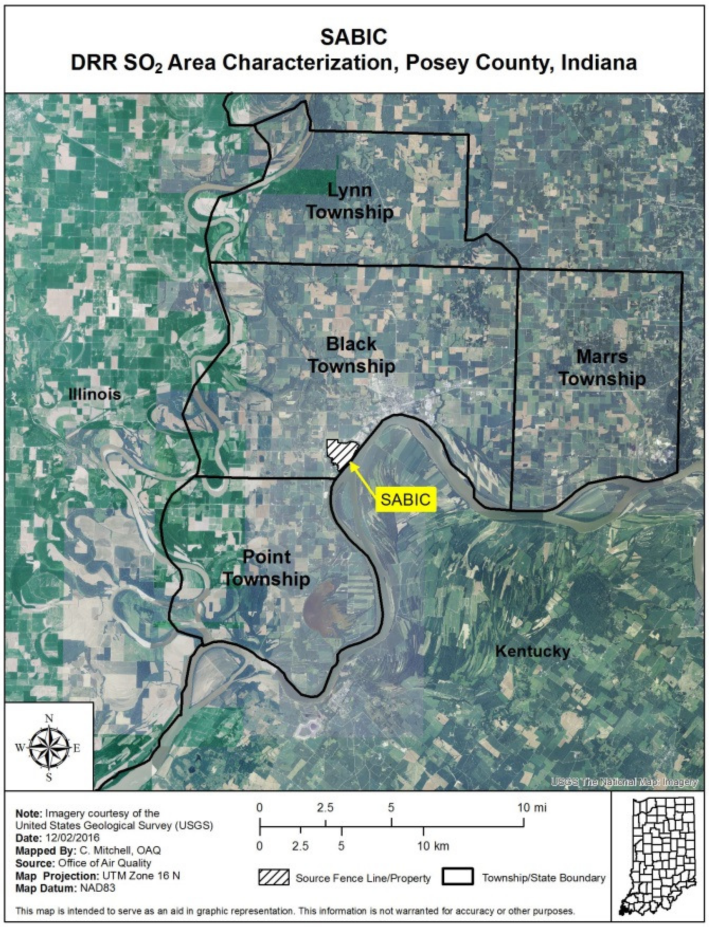
Initial modeling, using actual emissions data from 2014, showed higher modeled 1-hour SO_2 concentrations. However, after discussions with SABIC, it was decided they would request a

Commissioner's Order to establish plant-wide SO_2 emission limits that would be federally enforceable and permanent and would model attainment of the 1-hour SO_2 standard.

11.2 Characterization of Modeled Area

SABIC is located at 1 Lexan Lane, Mt. Vernon, Indiana, less than a mile from the Ohio River in Black Township, Posey County, Indiana. A map of the area surrounding the SABIC facility and the township in which SABIC is located is shown below in Figure 11.1.

Figure 11.1 - SABIC Innovative Plastics and Surrounding Area



11.3 Background Concentrations

The nearest 1-hour SO_2 monitored concentrations were taken from the Evansville – Buena Vista monitor (AQS #18-163-0021). The 99th percentile values from 2013 through 2015 and the 3-year design value are listed below in Table 11.1. Concentrations are well below the 1-hour SO_2 standard.

Table 11.1 – SABIC 99th Percentile 1-hour SO_2 Background Values
and 3-year Design Value (ppb)

Monitoring Site	2013	2014	2015	2013-2015
Evansville – Buena Vista	18.6	32.3	18	23

11.4 Modeling Methodology

The SABIC DRR modeling methodology resembles modeling used to evaluate New Source Review (NSR) and Prevention of Significant Deterioration (PSD) sources. However, Indiana has relied on U.S. EPA guidance "EPA's SO_2 NAAQS Designations Modeling Technical Assistance Document" in order to conduct an appropriate air dispersion modeling analysis for SABIC to support 1-hour SO_2 designation recommendations.

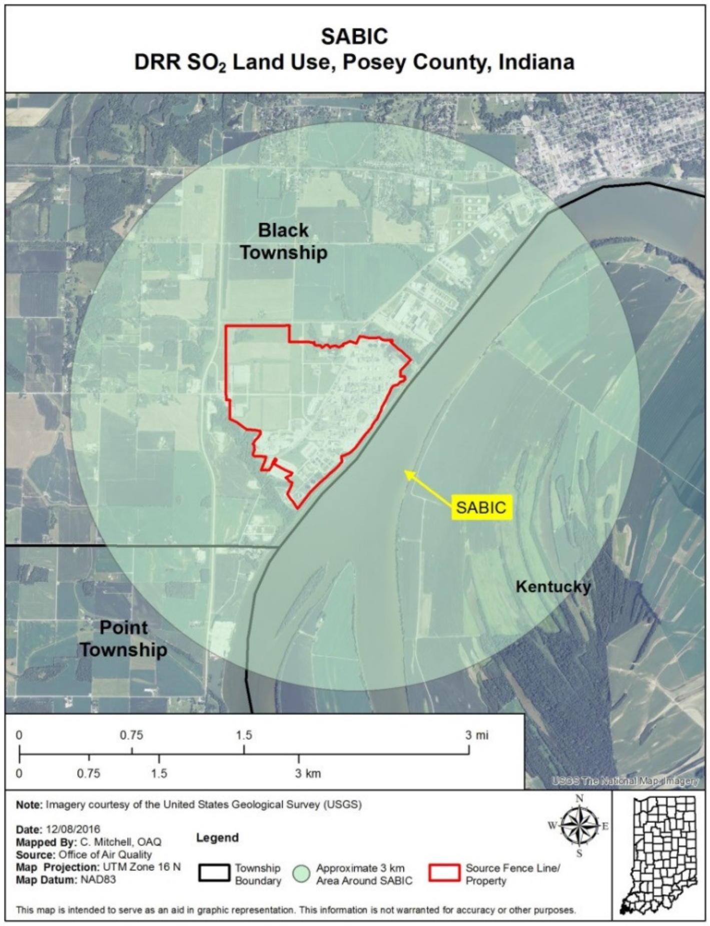
11.4.1 Model Selection

In accordance with Appendix A of Appendix W to 40 Code of Federal Regulations (CFR) Part 51, Indiana used the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) version 15181. BPIPPRIME was used to account for any building downwash concerns.

11.4.2 Model Options

All regulatory default options within AERMOD were used to determine the air quality characteristics surrounding SABIC. The area is considered primarily rural, based on the Auer's Classification Land Use methodology with a vast majority of the land use types within 3 kilometers of SABIC, classified as metropolitan natural (A1), agricultural rural (A2), water surfaces (A5) and estate residential (R4). Therefore, a rural classification was used, as provided for in the Guideline on Air Quality Models, Section 7.2.3 (EPA, 2005b). No variation of the population selection was necessary. Figure 11.2 shows the 3-kilometer radius area surrounding SABIC that was analyzed to determine the land use classification.

Figure 11.2 – SABIC 3-km Radius to Determine Auer Land Use



11.4.3 AERMAP

The AERMOD terrain preprocessor mapping program, AERMAP, was used to determine all the terrain elevation heights for each receptor, building, and source locations using the Universal Transverse Mercator (UTM) coordinate system. The most recent AERMAP version 11103 assigned the elevations from the National Elevation Dataset (NED) using the North American Datum (NAD) 1983 as recommended in the, "40 CFR Part 51, Revision to the Guideline on Air Quality Models" Appendix W and later revised in the "AERMOD Implementation Guide."

11.5 Meteorological Data

11.5.1 AERMET

As stated in 40 CFR Part 51, Appendix W, section 8.3.1.2 and the SO_2 NAAQS Designations Modeling TAD, Indiana used 2013-2015 National Weather Service (NWS) surface and upper air meteorological data processed with the latest version of the AERMOD meteorological data

preprocessor program AERMET (version 15181). Table 11.2 below lists surface and upper air meteorological stations used to conduct modeling.

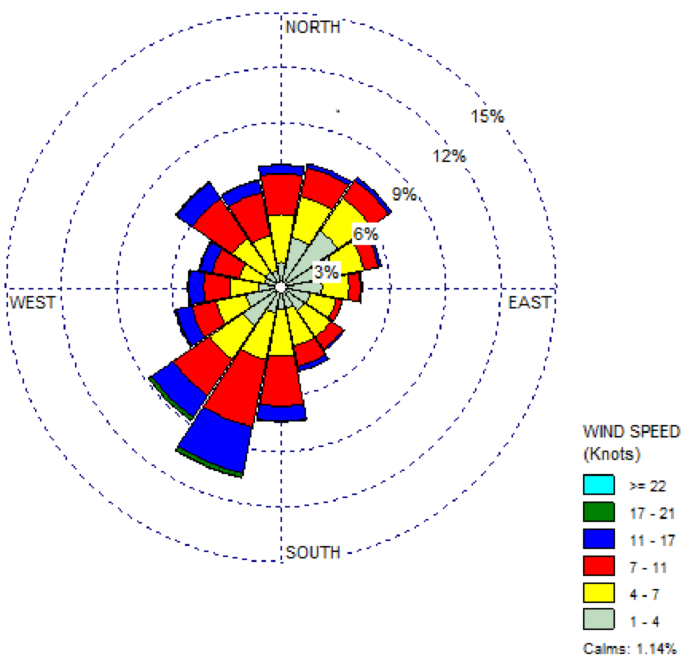
Table 11.2 – SABIC NWS Stations/Onsite Meteorological Stations

Facility	Surface Meteorology	Upper Air Meteorology
SABIC Innovative Plastics	Evansville, IN NWS	Lincoln, IL NWS

11.5.2 Wind Rose

The Evansville National Weather Service (NWS) surface meteorological data and the Lincoln, Illinois upper air meteorological data taken from 2013 through 2015 was used to determine the meteorological conditions for the area surrounding SABIC in AERMOD. The Evansville NWS wind rose for the 3-year modeled period 2013-2015 is shown as Figure 11.3 below. The Evansville NWS wind rose depicts the predominant wind direction as from the southwest for the 3-year modeled period of 2013-2015.

Figure 11.3 - Evansville 3-year Cumulative Wind Rose (2013 – 2015)



11.5.3 AERMINUTE/AERSURFACE

The 1-minute wind speeds and wind directions, taken from the Automated Surface Observing System (ASOS) NWS stations and onsite meteorological stations, were processed with the U.S. EPA 1-minute data processor program AERMINUTE version 15272.

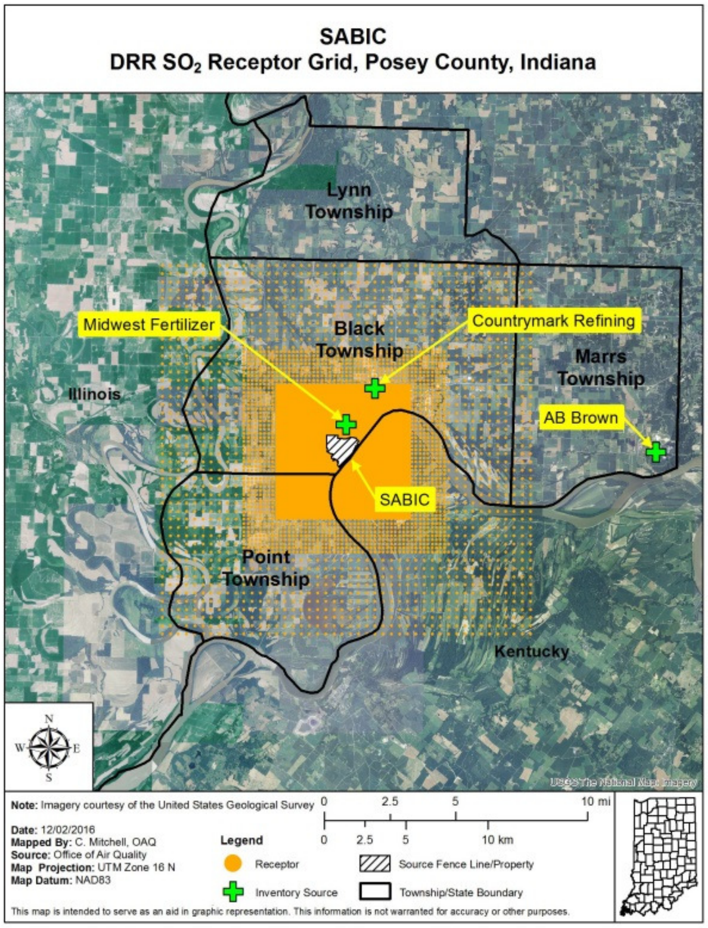
The U.S. EPA program AERSURFACE version 13016 was used to determine the surface characteristics; albedo, Bowen ratio, and surface roughness for the Evansville, Indiana NWS meteorological tower location. Surface characteristics were determined at the NWS location for each of 12 wind direction sectors with a recommended default radius of one kilometer. The albedo and the Bowen ratio surface characteristics were adjusted during the three winter months of January, February, and December in accordance with the U.S. EPA Region V document, "Regional Meteorological Data Processing Protocol," dated May 6, 2011. Additionally, a dry or wet Bowen ratio value was used during months when soil moisture conditions were abnormally dry or wet; otherwise the Bowen ratio value for average soil moisture conditions was used. The surface roughness value for snow cover was used if more than half of the month had days with at least one inch of snow on the ground. Otherwise, the no snow cover surface roughness value was used.

11.6 Receptor Grid and Modeling Domain

The receptor grid and modeling domain was based on guidance provided in the memorandum "Updated Guidance for Area Designations for the 2010 Primary Sulfur Dioxide National Ambient Air Quality Standards", dated March 20, 2015 and the SO_2 NAAQS Designations Modeling TAD. Indiana used a multi-nested rectangular receptor grid with appropriate spacing of receptors based on the distance from the modeled emission points to detect significant concentration gradients. The modeling domain extended out to include all sources and the appropriate distances to model maximum 1-hour SO_2 impacts to determine attainment designations for the area. Indiana used the following multi-nested rectangular receptor grid which are listed below and depicted in Figure 11.4:

- Receptor spacing at the fence line for the DRR facility was placed every 50 meters.
- Receptor spacing at 100 meters was placed out to a distance of 3,000 meters (3 kilometers) beyond the DRR facility.
- Receptor spacing at 250 meters was placed out to a distance of 5,000 meters (5 kilometers) beyond the DRR facility.
- Receptor spacing at 500 meters was placed out to a distance of 10,000 meters (10 kilometers) beyond the DRR facility.

Figure 11.4 – SABIC Receptor Grid



The SABIC property is fully fenced and has regular security patrols to keep unauthorized people off the property. Since this is the case, receptors were placed along the property lines.

11.7 Stack Heights

The use of actual stack heights rather than relying on Good Engineering Practice (GEP) stack heights when modeling actual emissions was utilized in the analysis per the SO_2 NAAQS Designations Modeling TAD.

11.8 Temporally Varying Seasonal 1-Hour SO_2 Background

Temporally varying seasonal SO_2 background concentrations were developed in accordance with the recommended U.S. EPA guidance for establishment of such background concentrations in Section 8.2 of 40 CFR Part 51, Appendix W and considered appropriate and representative of the area. The latest three years of SO_2 air quality monitoring data (2013-2015) was used.

The 99th percentile SO_2 concentrations by season (winter, spring, summer and fall) for each hour of the day were calculated to determine the temporally varying seasonal SO_2 background, which were directly input into the model and were part of the final modeled results.

Temporally varying seasonal 1-hour SO_2 background concentrations were taken from the Evansville – Buena Vista Road monitor for 2013 - 2015. The hourly seasonal SO_2 values used for representative background concentrations for the area surrounding SABIC are listed below in Table 11.3.

Table 11.3 – SABIC 99th Percentile Temporally Varying Seasonal SO_2 Background Values (ppb)

	Hr 1	Hr 2	Hr 3	Hr 4	Hr 5	Hr 6	Hr 7	Hr 8
Winter	6.30	4.83	4.63	4.36	5.77	4.84	4.70	7.39
Spring	5.12	3.89	4.09	3.98	3.40	4.20	6.83	7.59
Summer	2.70	2.48	1.00	1.00	1.96	2.65	2.80	5.55
Fall	4.44	4.52	4.50	4.50	4.80	4.60	4.97	5.70

	Hr 9	Hr 10	Hr 11	Hr 12	Hr 13	Hr 14	Hr 15	Hr 16
Winter	9.29	10.42	9.20	10.67	11.55	17.57	8.71	16.01
Spring	9.99	9.84	11.89	11.65	7.94	9.89	8.39	8.55
Summer	9.93	11.05	8.50	9.02	7.34	5.65	5.49	5.16
Fall	7.55	10.68	11.37	11.21	10.39	12.92	9.11	7.56

	Hr 17	Hr 18	Hr 19	Hr 20	Hr 21	Hr 22	Hr 23	Hr 24
Winter	9.94	16.85	8.28	6.67	5.74	6.58	6.79	7.98
Spring	11.04	12.53	9.99	8.40	5.81	3.92	7.04	6.65
Summer	4.11	6.99	5.88	4.05	3.36	2.45	3.58	2.19
Fall	8.20	6.95	5.23	8.60	5.70	4.68	4.46	4.40

11.9 SO_2 Emissions Included in the Modeling Analysis

11.9.1 DRR Source: SABIC Emissions

As a result of the CoGen project, a number of SO_2 emission units will shut down. The unit that will still have significant SO_2 emissions is the COS Vent Oxidizer. SABIC has 16 carbon monoxide (CO) reactors, or generators, that are used to manufacture carbon monoxide. The CO generators are located in the phosgene process area. CO is generated by combusting coke (a petroleum-based material that consists mostly of carbon, with minor amounts of sulfur as an impurity) in the CO generators under low-oxygen conditions. Because the coke contains low levels of sulfur, the raw CO from the CO generators contains sulfur-containing impurities (carbonyl sulfide, carbon disulfide, and hydrogen sulfide). These impurities need to be removed prior to the next step in the manufacturing process, where CO is combined with chlorine to make phosgene.

The raw CO is purified by passing it through one of several carbon adsorbers. At the outlet of the adsorber, a gas chromatograph measures the concentrations of the sulfur-containing compounds in the purified CO. Once a certain level of sulfur-containing compounds is detected, the flow of raw CO is switched to another adsorber and the spent adsorber is regenerated by desorbing the sulfur-containing compounds with heated nitrogen.

The adsorbed regeneration gas (primarily nitrogen, with low levels of sulfur-containing compounds) is then vented to either the COS Vent Oxidizer or the COS Flare. The regeneration gas passes through a valve that directs the flow to either the COS Vent Oxidizer or the COS Flare, but cannot direct the flow to both simultaneously. The COS Vent Oxidizer is the primary control device; the COS Flare serves as a back-up to the COS Vent Oxidizer or during safety interlock of the system. Both the COS Vent Oxidizer and COS Flare eliminate the sulfur-containing compounds in the regeneration gas by thermal combustion.

Since SO_2 emissions can be routed to either the COS Vent Oxidizer or COS Flare, modeling was performed for both scenarios to determine the worst-case dispersion. Other ancillary sources such as the liquid waste boilers were included in the inventory. Most of the other ancillary sources have small SO_2 emissions (i.e. generators and fire pumps) but were included in the modeling. All SABIC emission limits were based on fuel usage and emissions calculations taken from U.S. EPA's AP-42 emission factors. All the emission limits that are in the Commissioner's Order #2016-03 have been represented in the modeling analysis. The Commissioner's Order can be found in Enclosure 4.

11.9.2 Inventoried SO_2 Sources Included in the Modeling

SO_2 sources from the surrounding area were evaluated to determine if their SO_2 emissions had a potential impact on the air quality surrounding SABIC, beyond what is captured through background monitoring data. The latest available actual emissions were input for some of the inventory sources.

CountryMark had a reduction in SO_2 emissions as a result of installing equipment to recover the vacuum off-gas (a refinery fuel gas) rather than combusting it in the crude heater. The recovered vacuum off-gas is routed to the refinery amine unit and sulfur recovery unit where a high percentage of the sulfur compounds are converted to molten sulfur. Since this was the case, the 2015 emissions were used in the modeling analysis. A.B. Brown was modeled with the SO_2 emission limits listed in their Commissioner's Order #2016-01. Midwest Fertilizer is still under construction and is not in full operation so an SO_2 emission rate taken from their permit was modeled. Table 11.4 lists the sources that were included in the AERMOD run to determine overall air quality characteristics.

Table 11.4 – SABIC Modeling Source Inventory

Source	Source ID	Location	SO_2 Emissions (tpy)
CountryMark	129-00037	Posey County	65.7
A.B. Brown	129-00010	Posey County	Emission Limits [a]
Midwest Fertilizer	129-00059	Posey County	1.3

[a] A.B. Brown established SO_2 emission limits in response to Round 2 designation requirements

11.10 Modeling Results

The 99th percentile of the 1-hour daily maximum modeled concentrations represents the fourth high of the 1-hour daily maximum SO_2 modeled concentrations and were averaged across three years to compare resulting concentrations to the 1-hour SO_2 NAAQS of 75 ppb (196.2 $\mu g/m^3$). Modeled concentrations include representative temporally varying seasonal 1-hour SO_2 background values to determine the overall impact. The resulting concentrations were compared to the 1-hour SO_2 standard to indicate whether a modeled violation of the SO_2 NAAQS occurred. All concentrations fell below the 1-hour SO_2 NAAQS and were determined to attain the standard and the area surrounding SABIC is recommended as attainment.

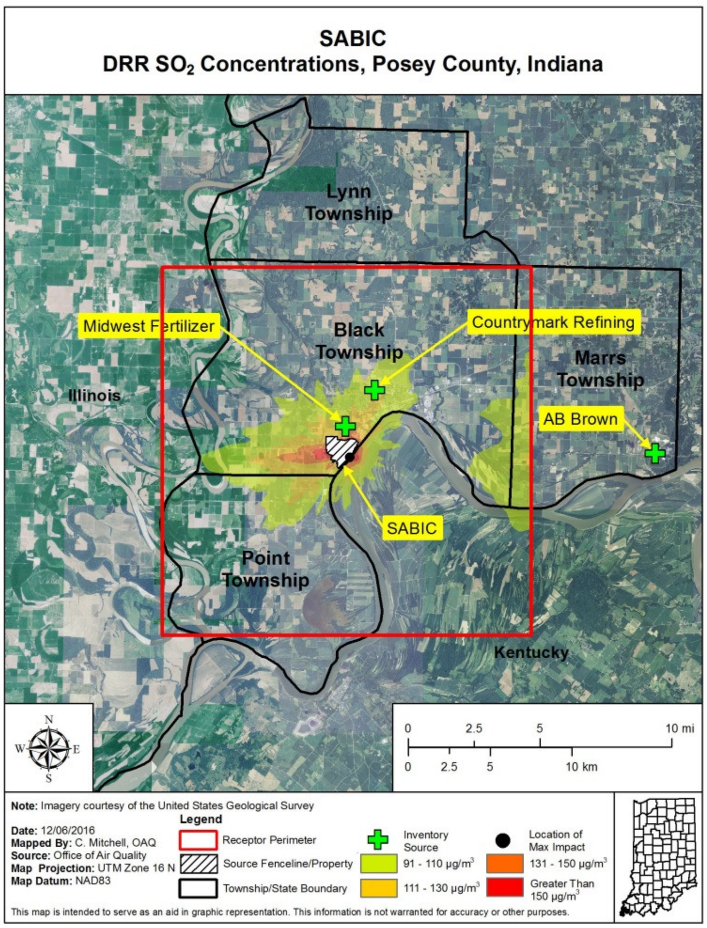
The COS Vent Oxidizer was the worst-case modeling scenario and was limited to 415 lbs of SO_2/hr which equates to a 269.21 lbs of SO_2/hr over a 24-hour averaging period. The COS Vent Oxidizer represented 93 percent of SABIC's total SO_2 modeled contributions. The other 7 percent of the modeled contributions were from SABIC's ancillary units, which also have SO_2 limits, as well as impacts from all other modeled inventory sources. Table 11.5 shows the modeled results used to establish SABIC's SO_2 emission limits. The overall maximum concentration was 191.9 $\mu g/m^3$; occurring at UTM coordinates: 418467.1 East, 4195409.8 North.

Table 11.5 – SABIC Modeling Results

Emission Scenarios	Maximum Modeled Concentration Including Seasonal Hourly Background (µg/m^3)	1-Hour SO_2 NAAQS (µg/m^3)	Facility Models Attainment
SABIC COS Flare	135.4	196.2	Yes
SABIC COS Vent Oxidizer	191.9	196.2	Yes

The concentration isopleths showing the maximum predicted 99th percentile daily 1-hour SO_2 concentration gradients can be found in Figure 11.5. The modeling demonstrated attainment of the 1-hour SO_2 standard with the emission limits listed in SABIC's Commissioner's Order.

Figure 11.5 – SABIC Modeling Results



12.0 Lake County: Source IDs ArcelorMittal – USA (18-089-00316)/Cokenergy (18-089-00383)/U.S. Steel (18-089-00121)

12.1 Source Description

ArcelorMittal - USA is an integrated steel mill consisting of two blast furnaces, one sinter plant, one basic oxygen furnace (BOF) complex, one hot metal Reladle/Desulf complex, an 84 inch hot strip mill with three reheat furnaces, mill finishing and sheet finishing operations, plate mill furnaces, two coke batteries, and five power station boilers. Some processes such as the BOF steel making processes have roof monitor emissions in addition to stack emissions. The blast furnaces also have non-point slag pit loadout fugitive emissions which are modeled as volume sources.

Cokenergy is an integrated steel mill consisting of one lime spray dryer Flue Gas Desulfurization unit and baghouse for the heat recovery coal carbonization facility (HRCC) waste gas stream operated by Indiana Harbor Coke Company (IHCC).

U.S. Steel is an integrated steel mill consisting of three coke batteries, a coke plant by-product recovery plant, one coke oven gas desulfurization facility, a coke plant boiler house, a sinter plant, four blast furnaces, two Basic Oxygen Process (BOP) shops with hot metal transfer and desulfurization stations, an 84 inch hot strip mill, a boiler house, and a TurboBlower boiler house. Some processes such as the BOF steel making processes have roof monitor emissions in addition to stack emissions. The blast furnaces also have non-point slag pit fugitive emissions which are modeled as volume sources.

The modeling option was chosen to address the DRR for each of the three DRR sources in Lake County.

12.2 Characterization of Modeled Area

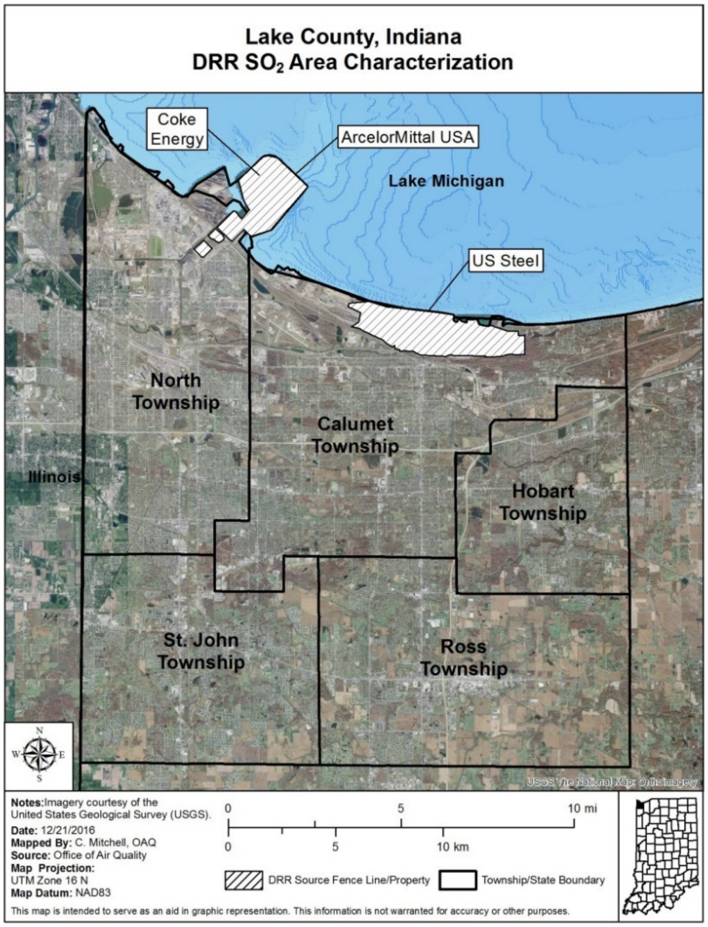
ArcelorMittal - USA is located at 3001 Dickey Road, East Chicago, in North Township, Lake County, Indiana. The northern end of the ArcelorMittal plant borders the southern shoreline of Lake Michigan.

Cokenergy is located at 3210 Watling Street, East Chicago, in North Township, Lake County, Indiana. CokeEnergy is located on the same property as ArcelorMittal – USA.

U.S. Steel is located at 1 North Broadway, Gary, in Calumet Township, Lake County, Indiana. The northern end of the U.S. Steel plant borders the southern shoreline of Lake Michigan.

A map of the area surrounding the three DRR facilities in Lake County and the townships in which wach DRR facility is located is shown in Figure 12.1

Figure 12.1 - Lake County DRR Sources and Surrounding Area



12.3 Background Concentrations

The nearest 1-hour SO_2 monitored concentrations were taken from the Hammond 141st Street (AQS #18-089-2008) and Gary-IITRI (AQS #18-089-0022) monitors. The Hammond monitor was used for the western half of the receptor grid and Gary-ITTRI for the eastern half. The 99th percentile values from 2013 through 2015 and the 3-year design value are listed below in Table 12.1

Table 12.1 – Lake County 99th Percentile 1-hour SO_2 Background Values and 3-year Design Value (ppb)

Monitoring Site	2013	2014	2015	2013-2015
Hammond 141st St	23.7	20.2	26.0 [a]	23
Gary-IITRI	43.2	53.1	35.0	44

[a] Incomplete data.

12.4 Modeling Methodology

The Lake County DRR modeling methodology resembles modeling used to evaluate New Source Review (NSR) and Prevention of Significant Deterioration (PSD) sources. However, Indiana has relied on U.S. EPA guidance "SO_2 NAAQS Designations Modeling Technical Assistance Document" in order to conduct an appropriate air dispersion modeling analysis for Lake County to support 1-hour SO_2 designation recommendations.

12.4.1 Model Selection

In accordance with Appendix A of Appendix W to 40 Code of Federal Regulations (CFR) Part 51, Indiana used the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) version 15181. BPIPPRIME was used to account for any building downwash concerns.

12.4.2 Model Options

ArcelorMittal - USA/Cokenergy/U.S. Steel used the adjustment to the surface friction velocity, (ADJ_U*), AERMET option in their modeling analysis. This option was recently accepted as a regulatory option in the final rule "Revisions to the Guidelines on Air Quality Models, Enhancements to the AERMOD Dispersion Modeling System and Incorporation of Approaches to Address Ozone and Fine Particulate Matter", signed on December 20, 2016. The ADJ_U* regulatory option provides for better model performance.

Non-regulatory options within AERMOD were used to determine the air quality characteristics for Lake County. This is due to the use of site-specific meteorology. The area is considered primarily urban, based on population density. The population value used was equal to the sum of population of cities where sources exist and any adjacent cities which meet the population density criteria. Technically, Gary, Indiana did not meet the strict definition of population density for urban classification. However, at least one-quarter of the area of Gary consists of U.S. Steel. By definition an integrated steel mill is considered urban with light-moderate to heavy industrial use. The entire population lives in the remainder of Gary. After factoring out 25% of the Gary's land area, Gary meets the 750 people/sq km population density threshold for using an urban dispersion coefficient. Therefore, an urban classification with an area population of 243,149 was used in the model input, as provided for in the Guideline on Air Quality Models, Section 7.2.3 (EPA, 2005b). Table 12.2 details the surrounding sizes and population densities of towns in the area to determine the overall population density for the appropriate urban land use characterization. All other regulatory default options were selected to perform the air quality analysis for the three Lake County DRR facilities.

Table 12.2 - Lake County Urban Population

City	Population	Area sq mi	Population Density per sq mi	Population Density per sq km	Adjusted Density per sq km
Gary	80,294	49.87	1,610	613	818
Hammond	80,830	22.78	3,548	1,344	N/A
East Chicago	29,698	14.09	2,108	950	N/A
Whiting	4,997	1.8	2,776	1,081	N/A
Munster	23,603	7.57	3,118	1,198	N/A
Highland, IN	23,727	6.94	3,419	1,318	N/A
Total	243,149				

12.4.3 AERMAP

The AERMOD terrain preprocessor mapping program, AERMAP, was used to determine all the terrain elevation heights for each receptor, building, and source locations using the Universal Transverse Mercator (UTM) coordinate system. The most recent AERMAP version 11103 assigned the elevations from the National Elevation Dataset (NED) using the North American Datum (NAD) 1983 as recommended in the, "40 CFR Part 51, Revision to the Guideline on Air Quality Models" Appendix W and later revised in the "AERMOD Implementation Guide."

12.5 Meteorological Data

12.5.1 AERMET

The Gary-IITRI surface meteorological data and the Lincoln, Illinois upper air meteorological data taken from 2013 through 2015 were used to determine the meteorological conditions surrounding the three Lake County DRR sources. The Gary-IITRI surface meteorological data was used to more accurately include the influence of Lake Michigan on the meteorological conditions in the area immediately surrounding the three Lake County DRR facilities. The Gary-IITRI surface data was processed without turbulence parameters in order to use the ADJ_U* option. This was processed with the latest version of the AERMOD meteorological data preprocessor program AERMET (version 15181). Table 12.3 below lists the surface and upper air meteorological stations used to conduct modeling.

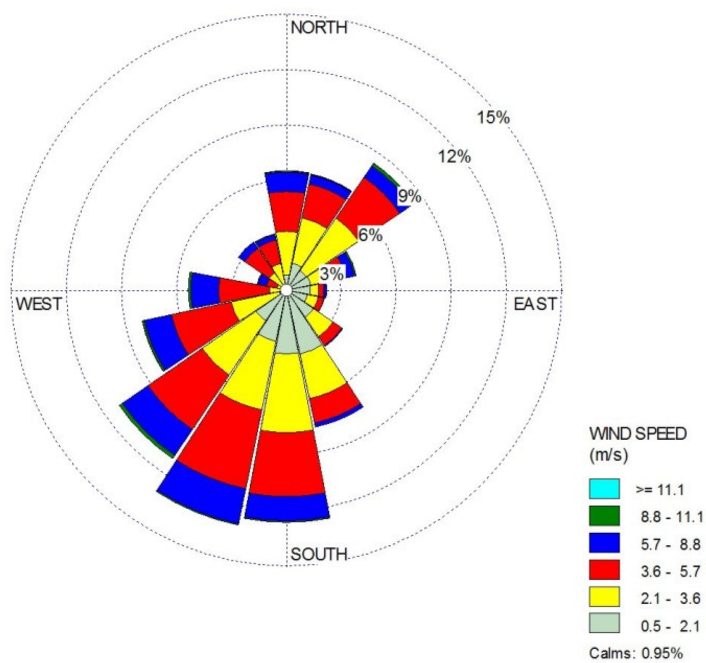
Table 12.3 – Lake County NWS Stations/Onsite Meteorological Stations

Facility	Surface Meteorology	Upper Air Meteorology
ArcelorMittal-USA/U.S. Steel/ Cokenergy	Gary-IITRI Monitor/ South Bend NWS	Lincoln, IL NWS

12.5.2 Wind Rose

The Gary-IITRI surface meteorological data and the Lincoln, Illinois upper air meteorological data taken from 2013 through 2015 were used to determine the meteorological conditions for the Lake County area. The Gary-IITRI wind rose for the 3-year modeled period 2013-2015 is shown as Figure 12.2 below. The Gary wind rose depicts the predominant wind direction as from the southwest for the 3-year modeled period.

Figure 12.2 – Gary-IITRI 3-year Cumulative Wind Rose (2013 – 2015)



12.5.3 AERMINUTE/AERSURFACE

The 1-minute wind speeds and wind directions, taken from the Automated Surface Observing System (ASOS) NWS stations and onsite meteorological stations, were processed with the U.S. EPA 1-minute data processor program AERMINUTE version 15272. All regulatory default options were selected with the exception of the use of the adjustment to the surface friction velocity, (ADJ_U*) option. The ADJ_U* option has been demonstrated to provide better model performance for determining 1-hour SO_2 concentrations. The ADJ_U* option has been accepted by U.S. EPA in a final rulemaking signed on December 20, 2016.

The U.S. EPA program AERSURFACE version 13016 was used to determine the surface characteristics; albedo, Bowen ratio, and surface roughness for the Gary-IITRI, Indiana meteorological tower location. Surface characteristics were determined at the NWS location for each of 12 wind direction sectors with a recommended default radius of one kilometer.

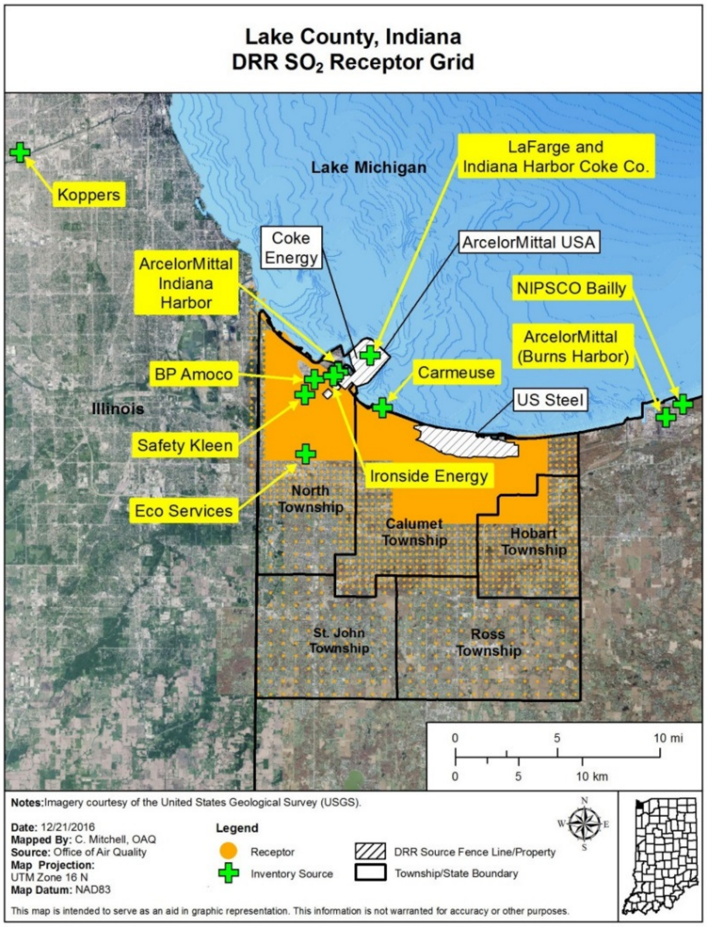
The albedo and the Bowen ratio surface characteristics were adjusted during the three winter months of January, February, and December in accordance with the U.S. EPA Region V document, "Regional Meteorological Data Processing Protocol," dated May 6, 2011. Additionally, a dry or wet Bowen ratio value was used during months when soil moisture conditions were abnormally dry or wet; otherwise the Bowen ratio value for average soil moisture conditions was used. The surface roughness value for snow cover was used if more than half of the month had days with at least one inch of snow on the ground. Otherwise, the no snow cover surface roughness value was used.

12.6 Receptor Grid and Modeling Domain

The receptor grid and modeling domain was based on guidance provided in the memorandum "Updated Guidance for Area Designations for the 2010 Primary Sulfur Dioxide National Ambient Air Quality Standards", dated March 20, 2015 and the SO_2 NAAQS Designations Modeling TAD. Indiana used a multi-nested rectangular receptor grid with appropriate spacing of receptors based on the distance from the modeled emission points to detect significant concentration gradients. The modeling domain extended out to include all sources and the appropriate distances to model maximum 1-hour SO_2 impacts to determine attainment designations for the area. Indiana used the following multi-nested rectangular receptor grids listed below and depicted in Figure 12.3. Focus was emphasized on receptor placement near each of the Lake County DRR sources; expected 1-hour SO_2 impacts would be anticipated to be very near each source.

- Receptor spacing at the fence line for each facility was placed every 50 meters.
- Receptor spacing at 100 meters was placed out to a distance of 5,000 meters (5 kilometers) beyond each facility.
- Receptor spacing at 500 meters was placed out to a distance of 10,000 meters (10 kilometers) beyond each facility and east to the Porter County line.
- Receptor spacing at 1000 meters was placed beyond 10,000 meters (10 kilometers) from each facility to the south to cover the southern extent of St. John, Ross and North townships.

Figure 12.3 – Lake County Receptor Grid



ArcelorMittal - USA, Cokenergy and U.S. Steel have fenced areas, natural boundaries and gated areas with regular security patrols to keep unauthorized people off the property. Since this is the case, receptors were placed along the property lines as appropriate.

12.7 Stack Heights

The use of actual stack heights rather than relying on Good Engineering Practice (GEP) stack heights when modeling actual emissions was utilized in the analysis per the SO_2 NAAQS Designations Modeling TAD.

12.8 Temporally Varying Seasonal 1-Hour SO_2 Background

Temporally varying seasonal SO_2 background concentrations were developed in accordance with the recommended U.S. EPA guidance for establishment of such background concentrations in Section 8.2 of 40 CFR Part 51, Appendix W and considered appropriate and representative of the area. The latest three years of SO_2 air quality monitoring data (2013-2015) was used from both the Hammond and Gary sites.

The 99th percentile SO_2 concentrations by season (winter, spring, summer and fall) for each hour of the day were calculated to determine the temporally varying seasonal SO_2 background, which were directly input into the model and were part of the final modeled results.

Temporally varying seasonal 1-hour SO_2 background concentrations were taken from the Hammond (west) and Gary (east) monitors for 2013 - 2015. Two sets of 1-hour SO_2 background were used to best represent the Lake County DRR sources, ArcelorMittal – USA and Cokenergy are located in the western portion of the county and U.S. Steel is located in the eastern portion of the county. Hammond monitor will also measure the SO_2 impacts from Illinois. The hourly seasonal SO_2 values used for representative background concentrations for the Lake County DRR sources are listed below in Table 12.4 for the Hammond monitor and in Table 12.5 for the Gary-IITRI monitor.

Table 12.4 – Lake County Hammond Monitor 99th Percentile Temporally Varying Seasonal SO_2 Background Values (ppb)

	Hr 1	Hr 2	Hr 3	Hr 4	Hr 5	Hr 6	Hr 7	Hr 8
Winter	5.4	5.7	5.94	6.08	6.12	6.18	5.8	6.14
Spring	5.74	5.53	5.44	5.34	5.6	6.07	6.4	7.03
Summer	4.87	4.63	4.6	4.8	5.57	5.28	6.01	6.57
Fall	5.03	4.13	5.34	3.84	4.61	6.35	6.1	6.28

	Hr 9	Hr 10	Hr 11	Hr 12	Hr 13	Hr 14	Hr 15	Hr 16
Winter	6.73	7.03	8.76	7.72	7.89	7.18	8.78	7.84
Spring	8.27	8.43	9.19	7.68	8.2	8.09	8.14	8.86
Summer	8.97	7.54	8.77	8.31	9	7.96	8.95	6.51
Fall	8.1	8.04	8.11	6.84	8.08	7.52	8.16	7.74

	Hr 17	Hr 18	Hr 19	Hr 20	Hr 21	Hr 22	Hr 23	Hr 24
Winter	6.9	6.18	6.44	5.74	5.58	5.74	5.68	5.58
Spring	8.85	9.4	9.24	7.76	7.9	6.84	7	7.84
Summer	7.76	7.87	7.97	6.31	6.04	8.07	5.69	5.14
Fall	8.91	6.81	7.12	7.31	6.75	5.37	4.9	3.8

Table 12.5 – Lake County Gary - IITRI 99th Percentiles Temporally Varying Seasonal SO_2 Background Values (ppb)

	Hr 1	Hr 2	Hr 3	Hr 4	Hr 5	Hr 6	Hr 7	Hr 8
Winter	9.69	7.35	7.1	6.74	6.87	7.03	6.32	7.42
Spring	7.31	4.59	7.82	4.88	6.88	7.84	8.58	6.96
Summer	1.37	1	1	1	1	1	1	1
Fall	6.98	5.64	5.44	5.56	7.57	4.64	5.24	8.02

	Hr 9	Hr 10	Hr 11	Hr 12	Hr 13	Hr 14	Hr 15	Hr 16
Winter	8.35	9.35	9.52	9.35	8.66	8.5	12.29	10.44
Spring	8.22	8.17	10.34	15.5	9.62	9.02	9.54	9.05
Summer	5.83	9.03	7.29	7.47	5.47	4.47	3.93	3.77
Fall	6.9	6.81	8.5	8.82	8.84	8.96	7	6.45

	Hr 17	Hr 18	Hr 19	Hr 20	Hr 21	Hr 22	Hr 23	Hr 24
Winter	9.33	6.84	7.22	8.35	6.4	6.81	8.64	9.04
Spring	8.24	7.84	7.38	6.34	7.32	6.44	8.73	7.58
Summer	3.72	3.97	2.53	2.41	2.4	1	2.24	2.83
Fall	6.46	4.62	4.71	7.14	4.64	4.94	7.01	7.19

12.9 SO_2 Emissions Included in the Modeling Analysis

12.9.1 DRR Source Emissions

ArcelorMittal - USA and U.S. Steel were modeled using different emission methodologies. Continuous emission monitoring data (CEM) data was available for several emission units while others had seasonal or weekly varying emission rates that were modeled. Cokenergy has emission data collected by a continuous emission monitor; therefore, CEM data was modeled. ArcelorMittal – USA and U.S. Steel have processes with varying hourly emissions rates that were based on a daily maximum emission rate. Emissions were allocated for each hour of the day. Emission units without CEM data or daily emission records were averaged across the three modeled years (2013-2015). Enclosure 2 contains a listing of all of the AERMOD inputs of all the DRR and inventory sources for Lake County.

12.9.2 Carmeuse Lime's Commissioner's Order – SO_2 Emission Limits

Carmeuse Lime, Inc. (Carmeuse) is a stationary lime manufacturing plant (Source I.D. 089-00112) located at 1 North Carmeuse Drive in Gary in Lake County. Carmeuse is not a DRR source but was identified as potentially impacting SO_2 air quality near the Lake County DRR sources. SO_2 sources from the surrounding area in Lake County were evaluated to determine if their emissions would impact the air quality surrounding the DRR sources, beyond what is captured through background SO_2 ambient air monitoring data. Initial modeling, using actual emissions data from Carmeuse showed potential 1-hour SO_2 concentrations higher than the 1-hour SO_2 NAAQS. Therefore, Carmeuse submitted a request on November 15, 2016 for a Commissioner's Order to establish SO_2 emission limits that would be federally enforceable and permanent which demonstrate attainment of the 1-hour SO_2 standard. The Commissioner's Order #2016-04 was signed on November 16, 2016 and is included in Enclosure 3.

Carmeuse's SO_2 emissions are distributed amongst their five kilns. In order to establish hourly emissions limits for Carmeuse through the Commissioner's Order, modeling was conducted to determine limits that demonstrated compliance with the 1-hour SO_2 standard. Each kiln has six stacks so modeling determined each kiln would be limited to 12.0 pounds of SO_2/hour or 2.0 pounds of SO_2/hour for each stack of each kiln. The three DRR sources, surrounding SO_2 source inventories, and temporally varying seasonal SO_2 background concentrations were included in the modeling to establish Carmeuse's emission limits through a Commissioner's Order.

The 720 operating hour rolling average emission limit listed in the Commissioner's Order was based on the 12.0 pound/hour limit modeled for each kiln. U.S. EPA recommended using a flat averaging ratio for emission units with no emission controls, as referenced in Table 1 of U.S. EPA's "Guidance for 1-hour SO_2 Nonattainment Area SIP Submissions". Based on the average ratio of 99^{th} percentile 30-day average SO_2 emission values to the 99^{th} percentile of hourly SO_2 emission values of 0.79, the corresponding 720 operating hour average for each kiln was calculated to be 9.48 lb/hr.

12.9.3 Inventoried SO_2 Sources Included in the Modeling

Inclusion of sources in the DRR modeling was based upon their actual emissions from 2013-2015. The only exception was BP Products (BP), which modeled 2015 SO_2 emissions. BP completed its Whiting Refinery Modernization Project (WRMP) on May 10, 2014. This project was permitted with a significant source modification (Permit #089-25484-00453 issued May 1, 2008) and significant permit modification (Permit #089-25488-00453 issued June 16, 2008), authorizing the construction of new emission units, modifications to existing emission units and operational changes as necessary. A Consent Decree (Civil No. 2:12-cv-00207) was issued to address revisions to BP's WRMP. SO_2 emissions as a result of the WRMP were modeled for the Lake County DRR analysis.

All facilities greater than one-half of the PSD significance threshold of 40 tpy were included. The sources which were explicitly modeled had overall SO_2 emissions of 16,233 tpy. This accounts for 99.8% of the Lake County SO_2 inventory. Continuous emissions monitoring data, seasonal or daily varying emissions or an average of 3-year annual SO_2 emissions were modeled for all sources.

The modeled inventory included two Porter County SO_2 sources (ArcelorMittal – Burns Harbor and the NIPSCO – Bailly Generating Station). Koppers Inc. in Chicago, Illinois, was also included in the inventory. Two coal-fired power plants in Cook County, Illinois shut down in 2012 and as a result were not included in the modeling analysis. The following facilities were included in the air quality modeling analysis to determine the overall SO_2 air quality impact in the area and are listed in Table 12.6.

Table 12.6 - Lake County Modeling Inventory

Source	Source ID	Location	2013-2015 Average SO_2 Emissions (tpy)
BP Products, North America Inc.	18-089-00003	Lake County, IN	400.2 [a]
Carmeuse Lime, Inc	18-089-00112	Lake County, IN	Emission Limits [b]
Eco Services Corp	18-089-00242	Lake County, IN	255.6
Safety-Kleen Systems Inc.	18-089-00301	Lake County, IN	62.6
ArcelorMittal - USA	18-089-00318	Lake County, IN	1,430.8
Indiana Harbor Coke Company	18-089-00382	Lake County, IN	2,441.1
Ironside Energy LLC	18-089-00448	Lake County, IN	204.5
ISPAT Inland LaFarge NA	18-089-00458	Lake County, IN	122.9
ArcelorMittal – Burns Harbor	18-127-00001	Porter County, IN	12,189
NIPSCO Bailly Generating Station	18-127-00002	Porter County, IN	2013-2015 CEMS Data
Koppers Inc.	170000035076	Cook County, IL	1,785.7

[a] IDEM utilized BP Products' 2015 SO_2 emissions due to the Whiting Refinery Modernization Project, completed on May 10, 2014

[b] Carmeuse Lime, Inc. established SO_2 emission limits in Commissioner's Order #2016-04

12.10 Modeling Results

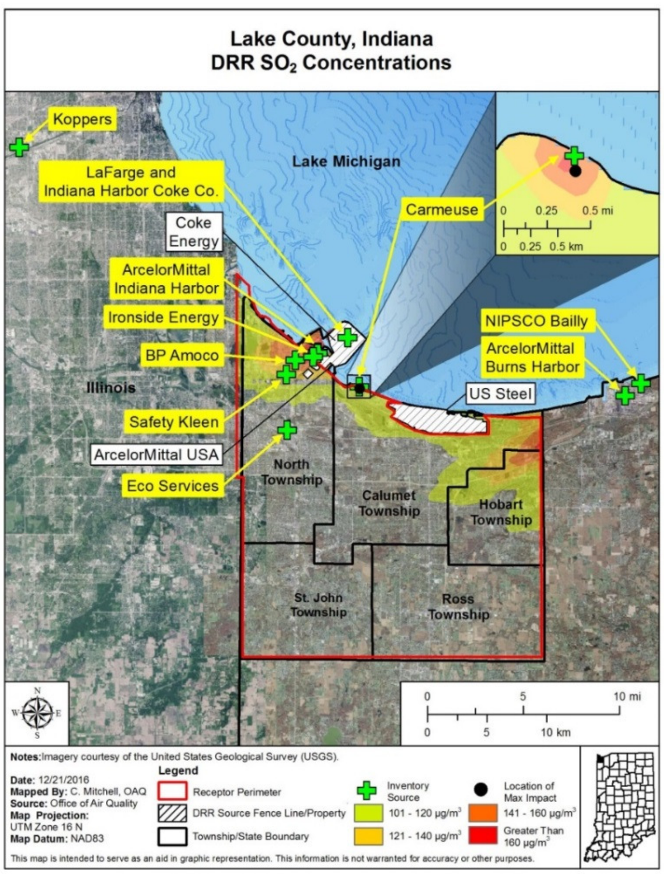
The 99th percentile of the 1-hour daily maximum modeled concentrations represents the fourth high of the 1-hour daily maximum SO_2 modeled concentrations and were averaged across three years to compare resulting concentrations to the 1-hour SO_2 NAAQS of 75 ppb (196.2 µg/m^3). Modeled concentrations include representative temporally varying seasonal 1-hour SO_2 background values to determine the overall impact. The resulting concentrations were compared to the 1-hour SO_2 standard to indicate whether a modeled violation of the SO_2 NAAQS occurred. All concentrations fell below the 1-hour SO_2 NAAQS and were determined to attain the standard and the area surrounding the DRR sources is recommended as attainment. Table 12.6 shows the modeled localized peaks for all DRR sources in Lake County and including the Carmeuse's SO_2 emission limits established through the Commissioner's Order. The overall maximum concentration was 192.2 µg/m^3, occurring at UTM coordinates 466100.0 East, 4609900.0 North, associated with Carmeuse's maximum impacts. 1-hour SO_2 impacts east of Lake County are being addressed through the air quality characterization of Porter County using the monitoring option for ArcelorMittal – Burns Harbor facility, a DRR source.

Table 12.7 – Lake County Modeling Results

Source	Maximum Modeled Concentration Including Seasonal Hourly Background (µg/m^3)	1-Hour SO_2 NAAQS (µg/m^3)	Models Attainment
Carmeuse Lime	192.2	196.2	Yes
U.S. Steel	128.1	196.2	Yes
Cokenergy	182.8	196.2	Yes
ArcelorMittal USA	182.8	196.2	Yes
Porter County Line	168.7	196.2	Yes

The concentration isopleths showing the maximum predicted 99th percentile daily 1-hour SO_2 concentration gradients can be found in Figure 12.5.

Figure 12.4 – Lake County Modeling Results



13.0 Duke-Gallagher (Source ID 153-00005)

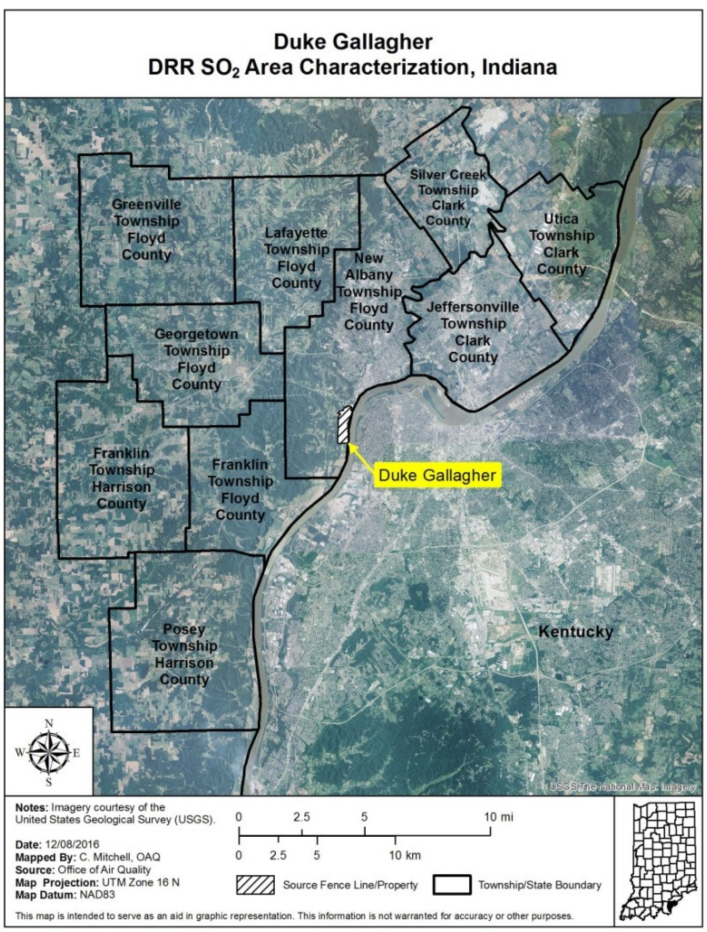
13.1 Source Description

Duke - Gallagher Generating Station (Duke - Gallagher) is a 280 MW coal-fired power plant in Floyd County located in southeast Indiana. Duke - Gallagher has two coal-fired boilers rated at 1,390 MMBtu/hr each. The plant is operated by Duke Energy Indiana, LLC. Duke - Gallagher was identified as a Data Requirements Rule (DRR) source based on their actual 2014 SO_2 emissions of 3,524 tons exceeding the DRR threshold of 2,000 tons of SO_2.

13.2 Characterization of Modeled Area

Duke - Gallagher is located at 30 Jackson St, New Albany, Indiana, on the banks of the Ohio River in New Albany Township, Floyd County, Indiana. A map of the area surrounding Duke - Gallagher is shown below in Figure 13.1.

Figure 13.1 – Duke - Gallagher and Surrounding Area



13.3 Background Concentrations

The nearest 1-hour SO_2 monitored concentrations were taken from the Green Valley monitor (AQS #18-043-1004) located in Floyd County. The 99^{th} percentile values from 2013 through 2015 and the 3-year design value are listed below in Table 13.1.

Table 13.1 – Duke – Gallagher 99^{th} Percentile 1-hour SO_2 Background Values and 3-year Design Value (ppb)

Monitoring Site	2013	2014	2015	2013-2015
Floyd Co – Green Valley	30.0	65.0	28.0	41

13.4 Modeling Methodology

The Duke - Gallagher DRR modeling methodology resembles modeling used to evaluate New Source Review (NSR) and Prevention of Significant Deterioration (PSD) sources. However, Indiana has relied on U.S. EPA guidance "SO_2 NAAQS Designations Modeling Technical Assistance Document" in order to conduct an appropriate air dispersion modeling analysis for Duke - Gallagher to support 1-hour SO_2 designation recommendations.

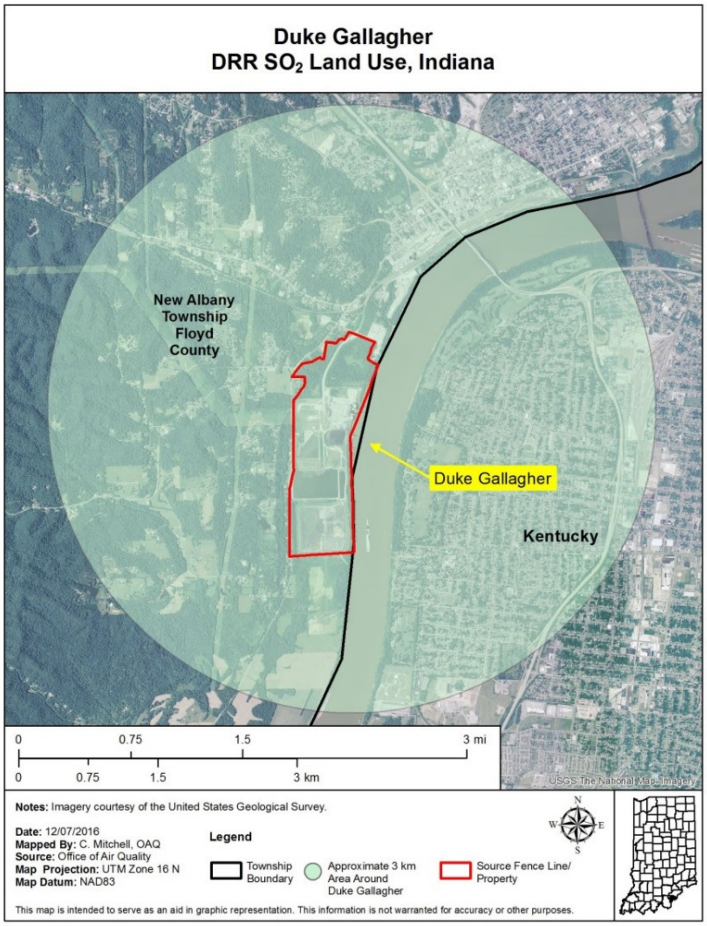
13.4.1 Model Selection

In accordance with Appendix A of Appendix W to 40 Code of Federal Regulations (CFR) Part 51, Indiana used the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) version 15181. BPIPPRIME was used to account for any building downwash concerns.

13.4.2 Model Options

All regulatory default options within AERMOD were used to determine the air quality characteristics surrounding Duke - Gallagher. The area is considered primarily rural, based on the Auer's Classification Land Use methodology with a vast majority of the land use types classified as undeveloped rural (A4), water surfaces (A5) and estate residential (R4). Therefore, a rural classification was used, as provided for in the Guideline on Air Quality Models, Section 7.2.3 (EPA, 2005b). No variation of the population selection was necessary. Figure 13.2 shows the 3-kilometer radius area surrounding Duke - Gallagher that was analyzed to determine the land use classification.

Figure 13.2 – Duke – Gallagher 3-kilometer Radius to Determine Auer Land Use



13.4.3 AERMAP

The AERMOD terrain preprocessor mapping program, AERMAP, was used to determine all the terrain elevation heights for each receptor, building, and source locations using the Universal Transverse Mercator (UTM) coordinate system. The most recent AERMAP version 11103 assigned the elevations from the National Elevation Dataset (NED) using the North American Datum (NAD) 1983 as recommended in the, "40 CFR Part 51, Revision to the Guideline on Air Quality Models" Appendix W and later revised in the "AERMOD Implementation Guide."

13.5 Meteorological Data

13.5.1 AERMET

As stated in 40 CFR Part 51, Appendix W, section 8.3.1.2 and the SO_2 NAAQS Designations Modeling TAD, Indiana used 2013-2015 National Weather Service (NWS) surface and upper air meteorological data processed with the latest version of the AERMOD meteorological data

preprocessor program AERMET (version 15181). Table 13.2 below lists surface and upper air meteorological stations used to conduct modeling.

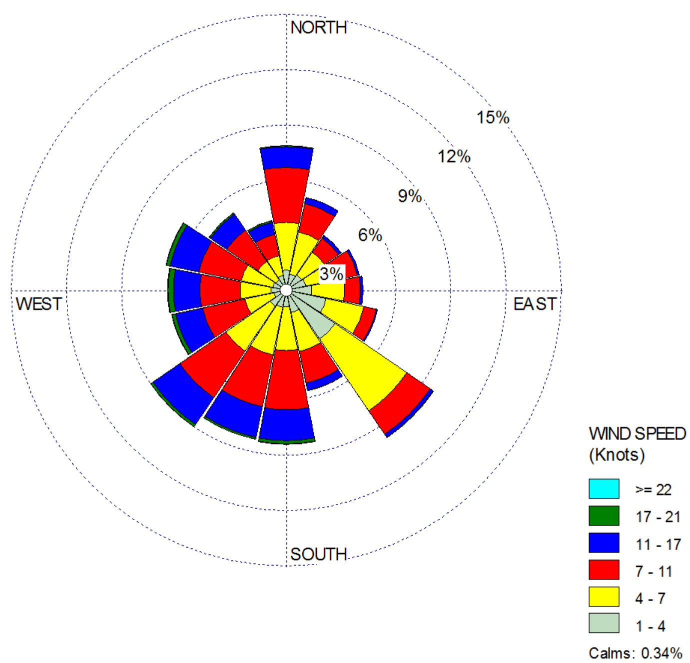
Table 13.2 – Duke - Gallagher NWS Stations/Onsite Meteorological Stations

Facility	Surface Meteorology	Upper Air Meteorology
Duke – Gallagher	Louisville, KY NWS	Wilmington, OH NWS

13.5.2 Wind Rose

The Louisville, Kentucky National Weather Service (NWS) surface meteorological data and Wilmington, Ohio upper air meteorological data taken from 2013 through 2015 were used to determine the meteorological conditions for the area surrounding Duke - Gallagher in AERMOD. The Louisville NWS wind rose for the 3-year modeled period 2013-2015 is shown as Figure 13.3 below. The Louisville NWS wind rose depicts the predominant wind direction as from the southwest for the 3-year modeled period 2013-2015.

Figure 13.3 - Louisville 3-year Cumulative Wind Rose (2013 – 2015)



13.5.3 AERMINUTE/AERSURFACE

The 1-minute wind speeds and wind directions, taken from the Automated Surface Observing System (ASOS) NWS stations and onsite meteorological stations, were processed with the U.S. EPA 1-minute data processor program AERMINUTE version 15272.

The U.S. EPA program AERSURFACE version 13016 was used to determine the surface characteristics; albedo, Bowen ratio, and surface roughness for the Louisville, Indiana NWS meteorological tower location. Surface characteristics were determined at the NWS location for each of 12 wind direction sectors with a recommended default radius of one kilometer.

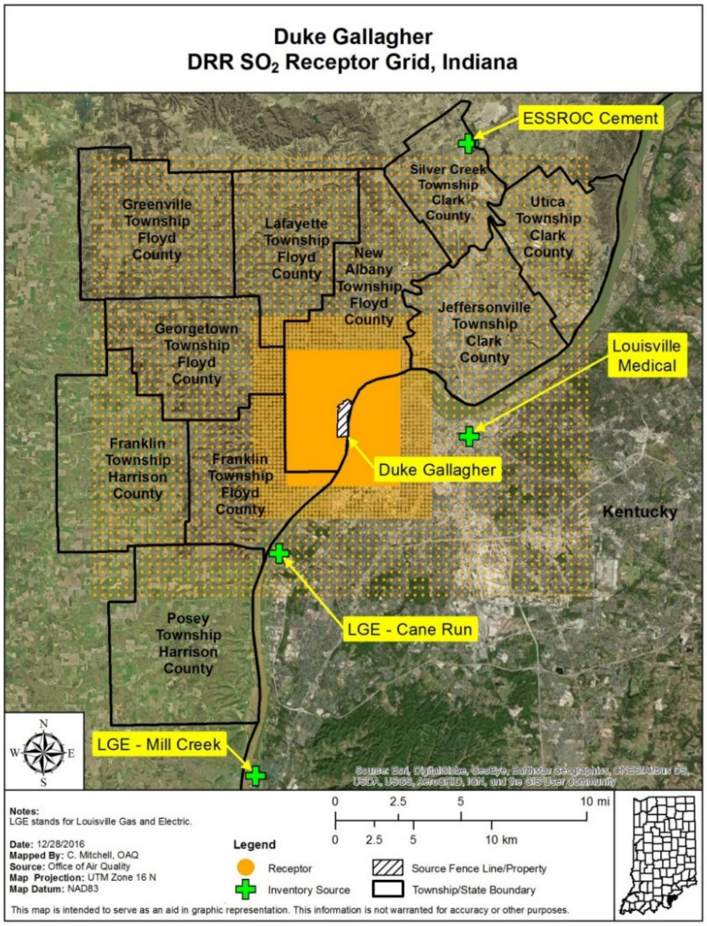
The albedo and the Bowen ratio surface characteristics were adjusted during the three winter months of January, February, and December in accordance with the U.S. EPA Region V document, "Regional Meteorological Data Processing Protocol," dated May 6, 2011. Additionally, a dry or wet Bowen ratio value was used during months when soil moisture conditions were abnormally dry or wet; otherwise the Bowen ratio value for average soil moisture conditions was used. The surface roughness value for snow cover was used if more than half of the month had days with at least one inch of snow on the ground. Otherwise, the no snow cover surface roughness value was used.

13.6 Receptor Grid and Modeling Domain

The receptor grid and modeling domain was based on guidance provided in the memorandum "Updated Guidance for Area Designations for the 2010 Primary Sulfur Dioxide National Ambient Air Quality Standards", dated March 20, 2015 and the SO_2 NAAQS Designations Modeling TAD. Indiana used a multi-nested rectangular receptor grid with appropriate spacing of receptors based on the distance from the modeled emission points to detect significant concentration gradients. The modeling domain extended out to include all sources and the appropriate distances to model maximum 1-hour SO_2 impacts to determine attainment designations for the area. Indiana used the following multi-nested rectangular receptor grid which are listed below and depicted in Figure 13.4:

- Receptor spacing at the fence line for each facility was placed every 50 meters.
- Receptor spacing at 100 meters was placed out to a distance of 3,000 meters (3 kilometers) beyond the DRR facility.
- Receptor spacing at 250 meters was placed out to a distance of 5,000 meters (5 kilometers) beyond the DRR facility.
- Receptor spacing at 500 meters was placed out to a distance of 10,000 meters (10 kilometers) beyond the DRR facility.

Figure 13.4 – Duke – Gallagher Receptor Grid



Duke - Gallagher has a fenceline, natural features, and security patrols that restrict public access to its property. Receptors were therefore placed along the property boundary where public access is not restricted.

13.7 Stack Heights

The use of actual stack heights rather than relying on Good Engineering Practice (GEP) stack heights when modeling actual emissions was utilized in the analysis per the SO_2 NAAQS Designations Modeling TAD.

13.8 Temporally Varying Seasonal 1-Hour SO_2 Background

Temporally varying seasonal SO_2 background concentrations were developed in accordance with the recommended U.S. EPA guidance for establishment of such background concentrations in Section 8.2 of 40 CFR Part 51, Appendix W and considered appropriate and representative of the area. The latest three years of SO_2 air quality monitoring data (2013-2015) was used.

The 99th percentile SO_2 concentrations by season (winter, spring, summer and fall) for each hour of the day were calculated to determine the temporally varying seasonal SO_2 background, which were directly input into the model and were part of the final modeled results.

Temporally varying seasonal 1-hour SO_2 background concentrations were taken from the Green Valley monitor (AQS #18-043-1004) located in Floyd County for 2013 - 2015. The hourly seasonal SO_2 values used for representative background concentrations for the area surrounding Duke - Gallagher are listed below in Table 13.3.

Table 13.3 – Duke – Gallagher 99th Percentile Temporally Varying Seasonal SO_2 Background Values (ppb)

	Hr 1	Hr 2	Hr 3	Hr 4	Hr 5	Hr 6	Hr 7	Hr 8
Winter	7.27	6.90	6.40	5.80	5.82	6.69	4.36	7.85
Spring	8.01	7.38	4.23	7.32	4.86	3.90	4.28	6.25
Summer	5.60	3.46	4.10	3.47	2.57	1.89	2.30	3.70
Fall	3.70	3.76	4.23	4.06	3.13	3.30	6.33	7.51

	Hr 9	Hr 10	Hr 11	Hr 12	Hr 13	Hr 14	Hr 15	Hr 16
Winter	7.24	9.10	8.98	10.66	9.42	6.60	9.96	9.70
Spring	8.39	8.87	9.50	16.88	13.04	15.89	9.10	14.09
Summer	7.70	8.10	13.52	13.08	13.15	8.94	8.57	7.78
Fall	6.96	9.52	9.46	8.82	8.87	9.06	13.28	8.62

	Hr 17	Hr 18	Hr 19	Hr 20	Hr 21	Hr 22	Hr 23	Hr 24
Winter	10.21	9.54	8.78	8.45	7.77	8.32	7.92	6.43
Spring	15.33	9.21	9.63	9.94	8.06	7.24	7.70	8.15
Summer	6.22	8.08	6.56	4.87	3.73	3.47	4.16	3.46
Fall	11.71	6.29	6.93	6.42	5.47	3.60	3.53	5.31

13.9 SO_2 Emissions Included in the Modeling Analysis

13.9.1 DRR Source: Duke - Gallagher Emissions

Duke - Gallagher has two coal-fired units, Units 2 and 4 that have continuous emission monitoring (CEM) data for SO_2. This hourly CEM data from both units was formatted and used in the 1-hour SO_2 AERMOD model run.

13.9.2 Inventoried SO_2 Sources Included in the Modeling

SO_2 sources from the surrounding area were evaluated to determine if their SO_2 emissions had a potential impact on the air quality surrounding the DRR source, beyond what is captured through background monitoring data. The average actual emissions from 2013-2015 were input for ESSROC and Louisville Medical Center Steam Plant. Louisville Gas & Electric facilities at Cane Run and Mill Creek have reduced their SO_2 emissions with federal regulatory measures including the Mercury and Air Toxics rule, Cross State Air Pollution rule and several other federal rule-makings. SO2 emission reductions will be achieved through conversion of the coal-fired electric generating units to a natural gas combined cycle unit for Cane Run and additional SO_2 flue-gas desulfurization (FGD) controls and upgrades at the Mill Creek facility. Permitted limits were modeled for each of the Louisville Gas and Electric sources as the emission reductions are federally enforceable and permanent. The following list of sources, found below in Table 13.4, were included in the AERMOD run to determine overall air quality characteristics.

Table 13.4 – Duke – Gallagher Modeling Source Inventory

Source	Source ID	Location	2013-2015 SO_2 Emissions (tpy)
ESSROC Cement Corporation	18-019-00008	Clark County, IN	416
LG & E – Cane Run	21-111-00126	Jefferson County, KY	21
LG & E – Mill Creek	21-111-00127	Jefferson County, KY	13,485
Louisville Medical Center	21-111-00148	Jefferson County, KY	415

13.10 Modeling Results

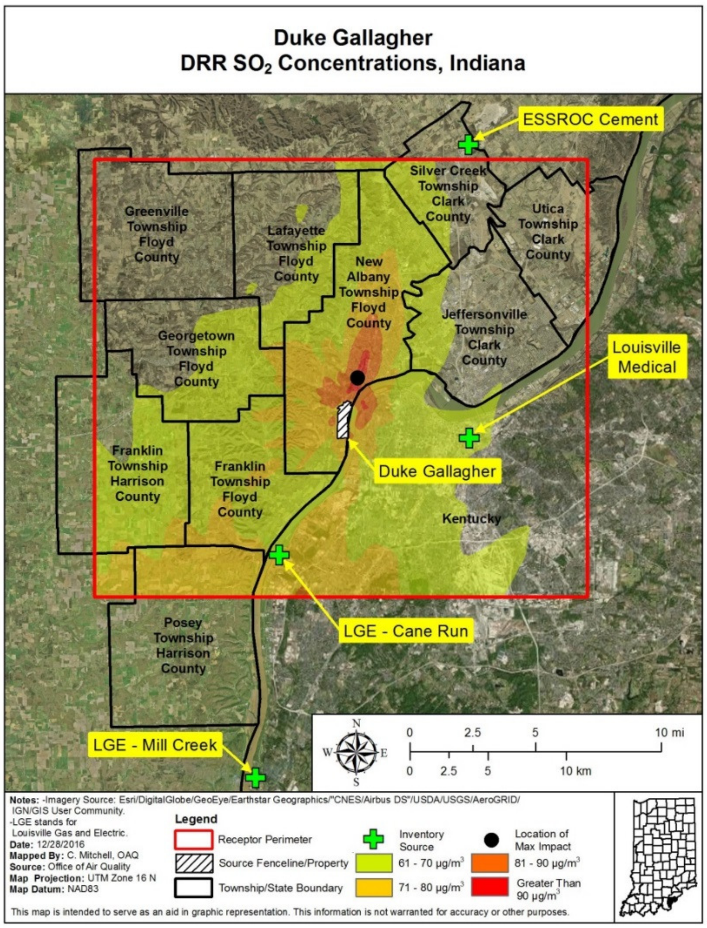
The 99th percentile of the 1-hour daily maximum modeled concentrations represents the fourth high of the 1-hour daily maximum SO_2 modeled concentrations and were averaged across three years to compare resulting concentrations to the 1-hour SO_2 NAAQS of 75 ppb (196.2 µg/m^3). Modeled concentrations include representative temporally varying seasonal 1-hour SO_2 background values to determine the overall impact. The resulting concentrations were compared to the 1-hour SO_2 standard to indicate whether a modeled violation of the SO_2 NAAQS occurred. All concentrations fell below the 1-hour SO_2 NAAQS and were determined to attain the standard and the area surrounding Gallagher is recommended as attainment. The maximum predicted 99th percentile daily 1-hour SO_2 concentration is shown in Table 13.5. The overall maximum concentration was 99.5 µg/m^3, occurring at UTM coordinates 602300.0 East, 4238000.0 North.

Table 13.5 - Duke – Gallagher Modeling Results

Emission Scenario	Maximum Modeled Concentration Including Seasonal Hourly Background (µg/m^3)	1-Hour SO_2 NAAQS (µg/m^3)	Facility Models Attainment
Gallagher	99.5	196.2	Yes

The concentration isopleths showing the maximum predicted 99th percentile daily 1-hour SO_2 concentration gradients can be found in Figure 13.5.

Figure 13.5 – Duke - Gallagher Modeling Results



14.0 NIPSCO – R.M. Schahfer Generating Station (Source ID 18-073-00008)

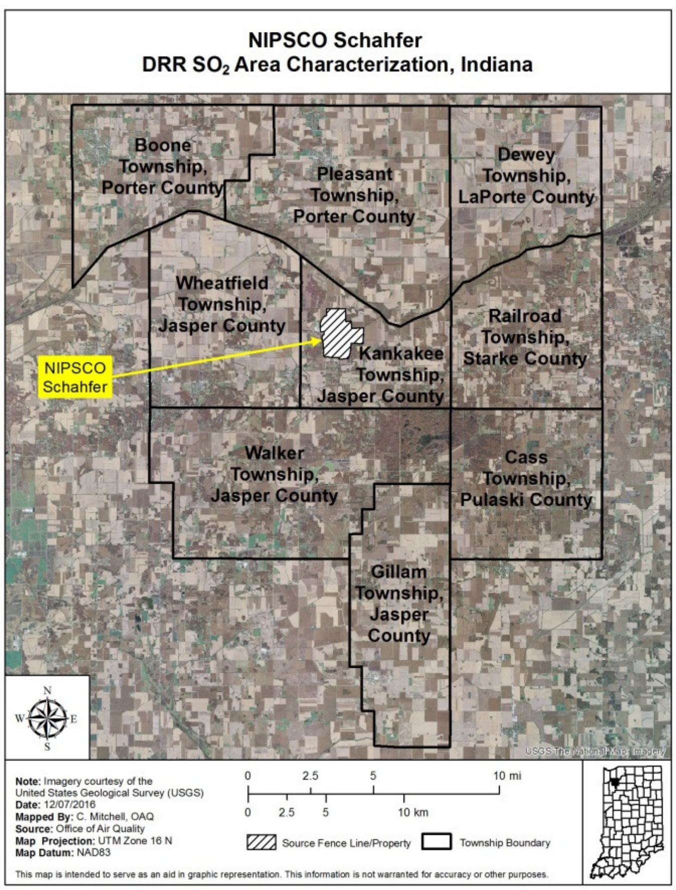
14.1 Source Description

The Northern Indiana Public Service Company (NIPSCO) - R.M. Schahfer Generating Station (NIPSCO - Schahfer) is a stationary electric utility generating station consisting of four units that have a capacity to generate 1,943 megawatts (MW) of electricity combined. NIPSCO - Schahfer has four coal-fired boilers; one boiler is rated at 4,650 MMBtu/hr, one boiler is rated at 5,100 MMBtu/hr, and two boilers are rated at 3,967 MMBtu/hr each. The plant is operated by NiSource.

14.2 Characterization of Modeled Area

The NIPSCO - Schahfer is located at 2723 East 1500 North, Wheatfield, in Kankakee Township, Jasper County, Indiana; approximately 5 miles west of State Road 421. A map of the area surrounding the NIPSCO - Schahfer facility is shown below in Figure 14.1.

Figure 14.1 - NIPSCO - Schahfer and Surrounding Area



14.3 Background Concentrations

The nearest 1-hour SO_2 monitored concentrations were taken from the Wheatfield – Jasper County monitor (AQS #18-073-0002). The 99^{th} percentile values from 2012 through 2014 and the 3-year design value are listed below in Table 14.1.

Table 14.1 – NIPSCO – Schahfer 99^{th} Percentile 1-hour SO_2 Background Values and 3-year Design Value (ppb)

Monitoring Site	2012	2013	2014	2012-2014
Wheatfield – Jasper County	33	40	18	30

14.4 Modeling Methodology

The NIPSCO - Schahfer DRR modeling methodology resembles modeling used to evaluate New Source Review (NSR) and Prevention of Significant Deterioration (PSD) sources. However, Indiana has relied on U.S. EPA guidance "SO_2 NAAQS Designations Modeling Technical Assistance Document" in order to conduct an appropriate air dispersion modeling analysis for NIPSCO - Schahfer to support 1-hour SO_2 designation recommendations.

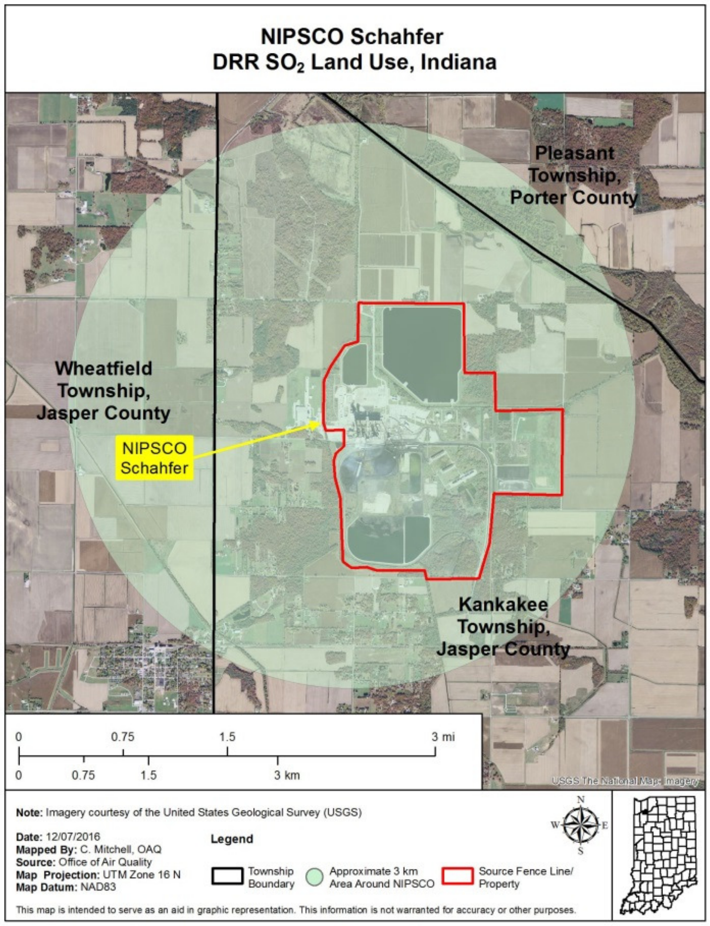
14.4.1 Model Selection

In accordance with Appendix A of Appendix W to 40 Code of Federal Regulations (CFR) Part 51, Indiana used the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) version 15181. BPIPPRIME was used to account for any building downwash concerns.

14.4.2 Model Options

All regulatory default options within AERMOD were used to determine the air quality characteristics surrounding NIPSCO - Schahfer. The area is considered primarily rural, based on the Auer's Classification Land Use methodology with a vast majority of the land use types classified as agricultural rural (A2), undeveloped rural (A4), water surfaces (A5) and estate residential (R4). Therefore, a rural classification was used, as provided for in the Guideline on Air Quality Models, Section 7.2.3 (EPA, 2005b). No variation of the population selection was necessary. Figure 14.2 shows the 3-kilometer radius area surrounding NIPSCO - Schahfer that was analyzed to determine the land use classification.

Figure 14.2 – NIPSCO – Schahfer 3-km Radius to Determine Auer Land Use



14.4.3 AERMAP

The AERMOD terrain preprocessor mapping program, AERMAP, was used to determine all the terrain elevation heights for each receptor, building, and source locations using the Universal Transverse Mercator (UTM) coordinate system. The most recent AERMAP version 11103 assigned the elevations from the National Elevation Dataset (NED) using the North American Datum (NAD) 1983 as recommended in the, "40 CFR Part 51, Revision to the Guideline on Air Quality Models" Appendix W and later revised in the "AERMOD Implementation Guide."

14.5 Meteorological Data

14.5.1 AERMET

As stated in 40 CFR Part 51, Appendix W, section 8.3.1.2 and the SO_2 NAAQS Designations Modeling TAD, Indiana used 2013-2015 National Weather Service (NWS) surface and upper air meteorological data processed with the latest version of the AERMOD meteorological data

preprocessor program AERMET (version 15181). Table 14.2 below lists surface and upper air meteorological stations used to conduct modeling.

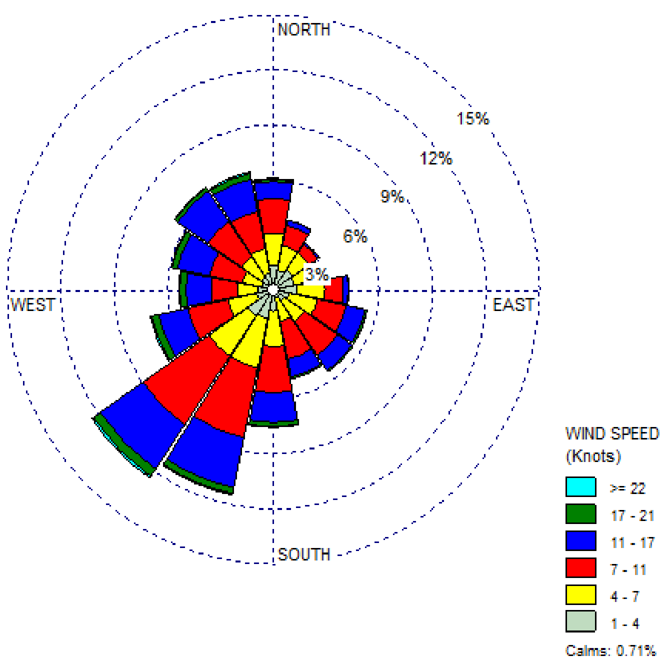
Table 14.2 – NIPSCO – Schahfer NWS Stations/Onsite Meteorological Stations

Facility	Surface Meteorology	Upper Air Meteorology
NIPSCO - Schahfer	South Bend, IN NWS	Lincoln, IL NWS

14.5.2 Wind Rose

The South Bend National Weather Service (NWS) surface meteorological data and the Lincoln, Illinois upper air meteorological data taken from 2012 through 2014 were used to determine the meteorological conditions for the area surrounding NIPSCO - Schahfer in AERMOD. The South Bend NWS wind rose for the 3-year modeled period 2012-2014 is shown as Figure 14.3 below. The South Bend NWS wind rose depicts the predominant wind direction as from the southwest for the 3-year modeled period 2012-2014.

Figure 14.3 - South Bend 3-year Cumulative Wind Rose (2012 – 2014)



14.5.3 AERMINUTE/AERSURFACE

The 1-minute wind speeds and wind directions, taken from the Automated Surface Observing System (ASOS) NWS stations and onsite meteorological stations, were processed with the U.S. EPA 1-minute data processor program AERMINUTE version 15272.

The U.S. EPA program AERSURFACE version 13016 was used to determine the surface characteristics; albedo, Bowen ratio, and surface roughness for the South Bend, Indiana NWS meteorological tower location. Surface characteristics were determined at the NWS location for each of 12 wind direction sectors with a recommended default radius of one kilometer.

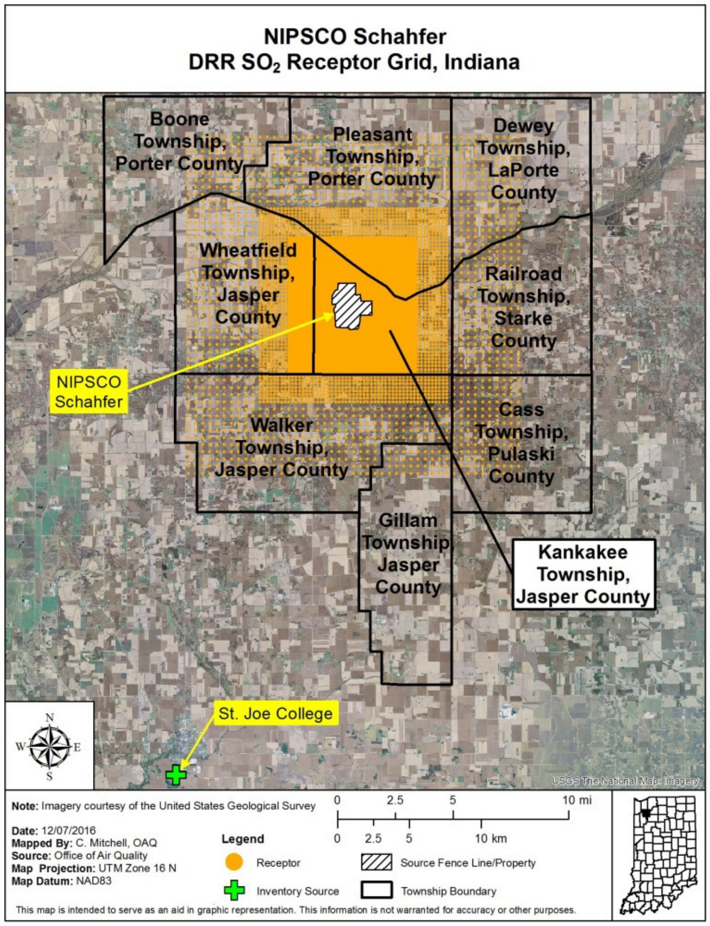
The albedo and the Bowen ratio surface characteristics were adjusted during the three winter months of January, February, and December in accordance with the U.S. EPA Region V document, "Regional Meteorological Data Processing Protocol," dated May 6, 2011. Additionally, a dry or wet Bowen ratio value was used during months when soil moisture conditions were abnormally dry or wet; otherwise the Bowen ratio value for average soil moisture conditions was used. The surface roughness value for snow cover was used if more than half of the month had days with at least one inch of snow on the ground. Otherwise, the no snow cover surface roughness value was used.

14.6 Receptor Grid and Modeling Domain

The receptor grid and modeling domain was based on guidance provided in the memorandum "Updated Guidance for Area Designations for the 2010 Primary Sulfur Dioxide National Ambient Air Quality Standards", dated March 20, 2015 and the SO_2 NAAQS Designations Modeling TAD. Indiana used a multi-nested rectangular receptor grid with appropriate spacing of receptors based on the distance from the modeled emission points to detect significant concentration gradients. The modeling domain extended out to include all sources and the appropriate distances to model maximum 1-hour SO_2 impacts to determine attainment designations for the area. Indiana used the following multi-nested rectangular receptor grid, which are listed below and depicted in Figure 14.4:

- Receptor spacing at the fence line for the DRR facility was placed every 50 meters.
- Receptor spacing at 100 meters was placed out to a distance of 3,000 meters (3 kilometers) beyond the DRR facility.
- Receptor spacing at 250 meters was placed out to a distance of 5,000 meters (5 kilometers) beyond the DRR facility.
- Receptor spacing at 500 meters was placed out to a distance of 10,000 meters (10 kilometers) beyond the DRR facility.

Figure 14.4 – NISPCO - Schahfer Receptor Grid



NIPSCO - Schahfer's property line is very extensive. Their property is nearly two miles long and is approximately 1.6 miles wide. NIPSCO - Schahfer is largely fenced and has regular security patrols to keep unauthorized people off the property. Since this is the case, receptors were placed along the property lines.

14.7 Stack Heights

The use of actual stack heights rather than relying on Good Engineering Practice (GEP) stack heights when modeling actual emissions was utilized in the analysis per the SO_2 NAAQS Designations Modeling TAD.

14.8 Temporally Varying Seasonal 1-Hour SO_2 Background

Temporally varying seasonal SO_2 background concentrations were developed in accordance with the recommended U.S. EPA guidance for establishment of such background concentrations in

Section 8.2 of 40 CFR Part 51, Appendix W and considered appropriate and representative of the area. The latest three years of SO_2 air quality monitoring data (2012-2014) was used.

The 99th percentile SO_2 concentrations by season (winter, spring, summer and fall) for each hour of the day were calculated to determine the temporally varying seasonal SO_2 background, which were directly input into the model and were part of the final modeled results.

Temporally varying seasonal 1-hour SO_2 background concentrations were taken from the Wheatfield monitor for 2012 - 2014. The hourly seasonal SO_2 values used for representative background concentrations for the area surrounding NIPSCO - Schahfer are listed below in Table 14.3.

Table 14.3 – NIPSCO – Schahfer 99th Percentile Temporally Varying Seasonal SO_2 Background Values (ppb)

	Hr 1	Hr 2	Hr 3	Hr 4	Hr 5	Hr 6	Hr 7	Hr 8
Winter	4.75	5.00	4.71	4.68	4.00	5.00	5.40	4.00
Spring	5.54	4.57	5.60	6.16	4.55	5.00	4.47	7.00
Summer	2.44	3.43	3.00	3.45	3.00	3.00	3.49	6.53
Fall	5.26	4.00	4.00	4.00	9.00	7.41	5.29	5.49

	Hr 9	Hr 10	Hr 11	Hr 12	Hr 13	Hr 14	Hr 15	Hr 16
Winter	5.00	7.00	7.00	7.00	7.64	7.00	7.00	7.00
Spring	9.52	8.53	8.06	8.00	7.57	7.00	7.98	6.71
Summer	10.16	8.63	8.00	8.86	9.00	9.28	7.66	7.00
Fall	9.00	7.00	7.69	7.64	5.00	6.00	6.62	5.62

	Hr 17	Hr 18	Hr 19	Hr 20	Hr 21	Hr 22	Hr 23	Hr 24
Winter	7.00	7.00	6.32	5.00	5.68	6.66	6.00	6.00
Spring	5.00	4.66	7.18	7.60	6.57	5.00	4.57	4.55
Summer	4.56	4.54	6.00	7.44	5.00	3.00	3.40	2.52
Fall	5.00	6.18	6.02	5.48	4.00	5.00	4.00	7.99

14.9 SO_2 Emissions Included in the Modeling Analysis

14.9.1 DRR Source: NIPSCO - Schahfer Generating Station Emissions

NIPSCO - Schahfer has four units, Units BLR4, BLR15, BLR17, and BLR18 that have continuous emission monitoring (CEM) data for SO_2. This hourly CEM data from the four units were formatted and used in the 1-hour SO_2 AERMOD model run. Total annual emissions from NIPSCO – Schahfer from 2015 are approximately one-eighth of the emissions from 2012 through 2014 emissions. Therefore, modeling the 2012-2014 emissions is conservative in nature and will be used for this analysis.

14.9.2 Inventoried SO_2 Sources Included in the Modeling

SO_2 sources from the surrounding area were evaluated to determine if their SO_2 emissions had a potential impact on the air quality surrounding the DRR source, beyond what is captured through background monitoring data. Saint Joseph's College was found to be within 30 kilometers of NIPSCO - Schahfer. Saint Joseph's College is no longer a Title V source. The college's last emission report was in 2012. Those emissions were used in the modeling analysis for NIPSCO - Schahfer as listed in Table 14.4.

Table 14.4 – NIPSCO – Schahfer Modeling Source Inventory

Source	Source ID	Location	2012 SO_2 Emissions (tpy)
St. Joseph College	073-00001	Jasper County	120.5

14.10 Modeling Results

The 99th percentile of the 1-hour daily maximum modeled concentrations represents the fourth high of the 1-hour daily maximum SO_2 modeled concentrations and were averaged across three years to compare resulting concentrations to the 1-hour SO_2 NAAQS of 75 ppb (196.2 µg/m^3). Modeled concentrations include representative temporally varying seasonal 1-hour SO_2 background values to determine the overall impact. The resulting concentrations were compared to the 1-hour SO_2 standard to indicate whether a modeled violation of the SO_2 NAAQS occurred. All concentrations fell below the 1-hour SO_2 NAAQS and were determined to attain the standard and the area surrounding NIPSCO - Schahfer is recommended as attainment.

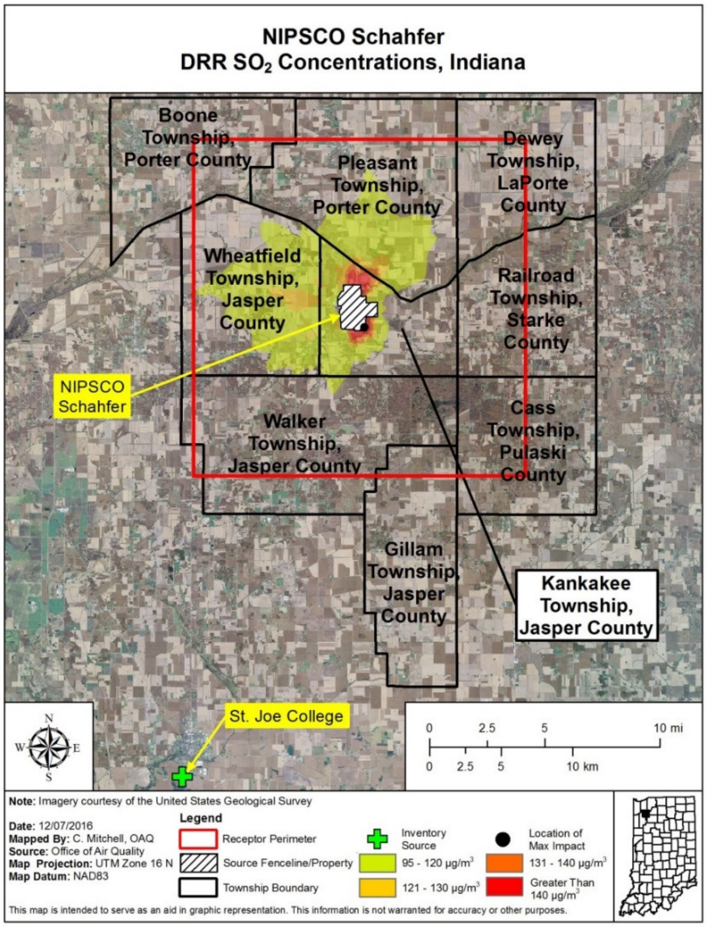
The maximum predicted 99th percentile daily 1-hour SO_2 concentration is shown in Table 14.5. The overall maximum concentration was 162.7 µg/m^3, occurring at UTM coordinates 499354.6 East, 4561322.6 North.

Table 14.5 – NIPSCO – Schahfer Modeling Results

Emission Scenarios	Maximum Modeled Concentration Including Seasonal Hourly Background (µg/m^3)	1-Hour SO_2 NAAQS (µg/m^3)	Facility Models Attainment
NIPSCO - Schahfer	162.7	196.2	Yes

The concentration isopleths showing the maximum predicted 99th percentile daily 1-hour SO_2 concentration gradients can be found in Figure 14.5. The modeling showed attainment of the 1-hour SO_2 standard.

Figure 14.5 – NIPSCO - Schahfer Modeling Results



15.0 Hoosier Energy - Merom (Source ID 153-00005)

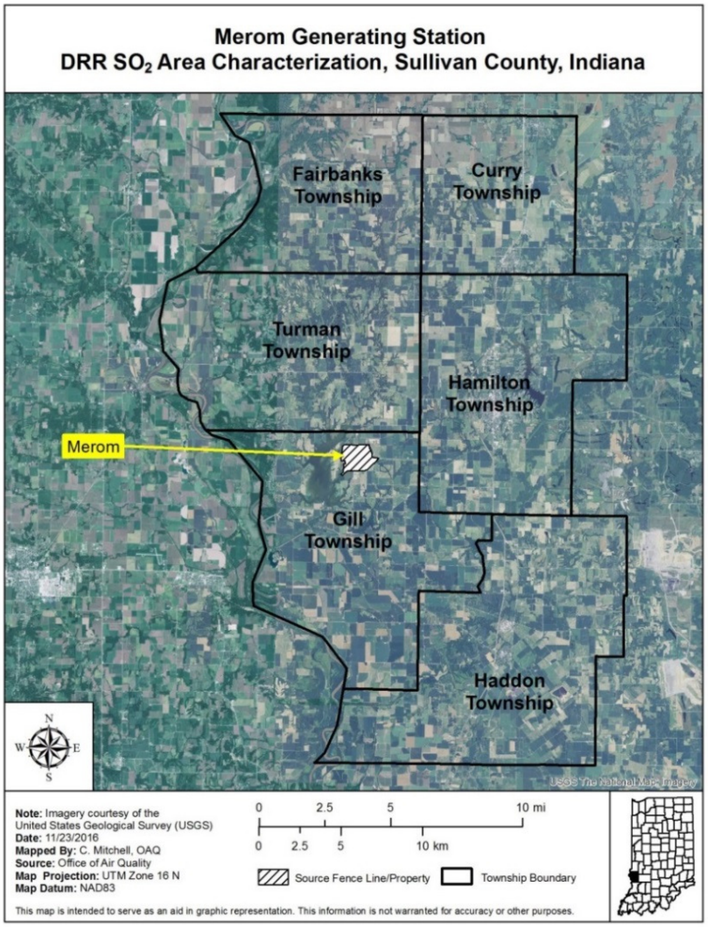
15.1 Source Description

Hoosier Energy - Merom Generating Station (Hoosier Energy - Merom) is a 1070 MW coal fired power plant located in Sullivan County in Southwest Indiana. Hoosier Energy - Merom operates two coal-fired boilers each rated at 5,088 mmBtu/hr. SO_2 emission controls at the facility include a flue gas desulfurization system. Hoosier Energy - Merom was identified as a Data Requirements Rule (DRR) source based on their actual 2014 SO_2 emissions of 3,318 tons exceeding the DRR threshold of 2,000 tons of SO_2.

15.2 Characterization of Modeled Area

Hoosier Energy - Merom is located at 5500 W Old 54, Sullivan, Indiana, approximately 5 miles east of the Wabash River in Gill Township, Sullivan County, Indiana. A map of the area is shown below in Figure 15.1.

Figure 15.1 – Hoosier Energy - Merom and Surrounding Area



15.3 Background Concentrations

The nearest 1-hour SO_2 monitored concentrations were taken from the Terre Haute – Lafayette Road monitor (AQS #18-167-0018). The 99th percentile values from 2013 through 2015 and the 3-year design value are listed below in Table 15.1. The area surrounding the Lafayette Road monitor has been addressed through revisions to the 1-hour SO_2 Nonattainment Area State Implementation Plan.

Table 15.1 – Hoosier Energy – Merom 99th Percentile 1-hour SO_2 Background Values and 3-year Design Value (ppb)

Monitoring Site	2013	2014	2015	2013-2015
Terre Haute – Lafayette Rd	79.1	85.0	71.0	78

15.4 Modeling Methodology

The Hoosier Energy - Merom DRR modeling methodology resembles modeling used to evaluate New Source Review (NSR) and Prevention of Significant Deterioration (PSD) sources. However, Indiana has relied on U.S. EPA guidance "SO_2 NAAQS Designations Modeling Technical Assistance Document" in order to conduct an appropriate air dispersion modeling analysis for Hoosier Energy -Merom to support 1-hour SO_2 designation recommendations.

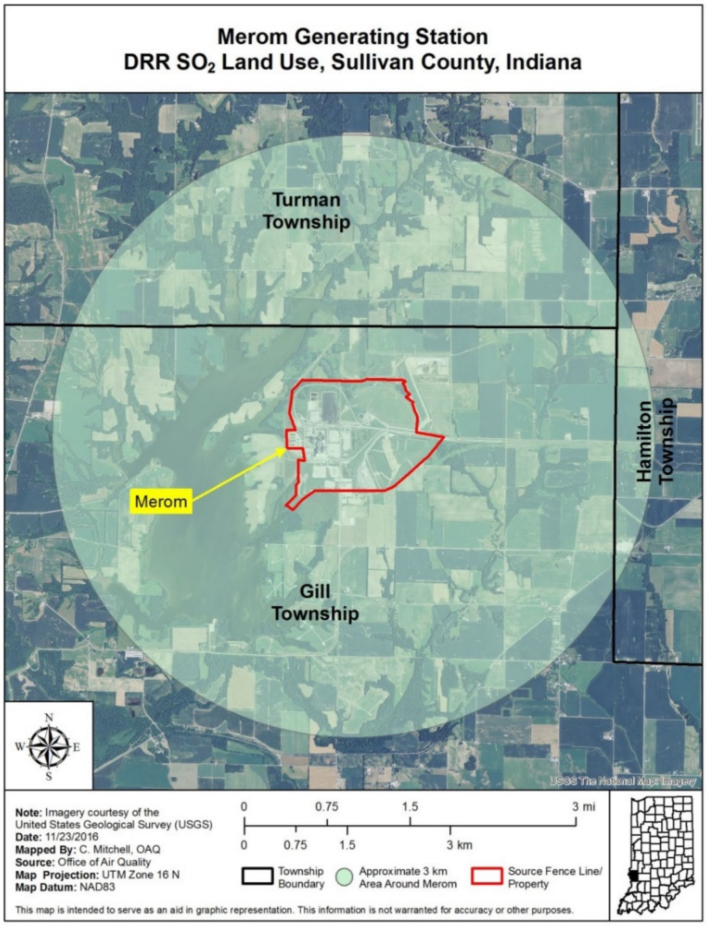
15.4.1 Model Selection

In accordance with Appendix A of Appendix W to 40 Code of Federal Regulations (CFR) Part 51, Indiana used the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) version 15181. BPIPPRIME was used to account for any building downwash concerns.

15.4.2 Model Options

All regulatory default options within AERMOD were used to determine the air quality characteristics surrounding the Hoosier Energy - Merom. The area is considered primarily rural, based on the Auer's Classification Land Use methodology with a vast majority of the land use types classified as agricultural rural (A2) and water surfaces (A5). Therefore, a rural classification was used, as provided for in the Guideline on Air Quality Models, Section 7.2.3 (EPA, 2005b). No variation of the population selection was necessary. Figure 15.2 shows the 3-kilometer radius area surrounding Hoosier Energy - Merom that was analyzed to determine the land use classification.

Figure 15.2 – Hoosier Energy – Merom 3-km Radius to Determine Auer Land Use



15.4.3 AERMAP

The AERMOD terrain preprocessor mapping program, AERMAP, was used to determine all the terrain elevation heights for each receptor, building, and source locations using the Universal Transverse Mercator (UTM) coordinate system. The most recent AERMAP version 11103 assigned the elevations from the National Elevation Dataset (NED) using the North American Datum (NAD) 1983 as recommended in the, “40 CFR Part 51, Revision to the Guideline on Air Quality Models” Appendix W and later revised in the “AERMOD Implementation Guide.”

15.5 Meteorological Data

15.5.1 AERMET

As stated in 40 CFR Part 51, Appendix W, section 8.3.1.2 and the SO_2 NAAQS Designations Modeling TAD, Indiana used 2013-2015 National Weather Service (NWS) surface and upper air meteorological data processed with the latest version of the AERMOD meteorological data

preprocessor program AERMET (version 15181). Table 15.2 below lists surface and upper air meteorological stations used to conduct modeling.

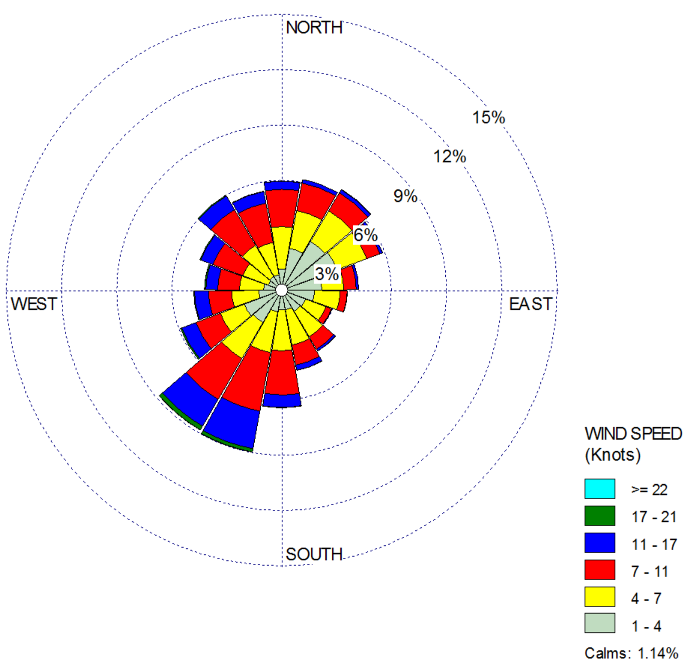
Table 15.2 – Hoosier Energy – Merom NWS Stations/Onsite Meteorological Stations

Facility	Surface Meteorology	Upper Air Meteorology
Hoosier Energy – Merom	Evansville, IN NWS	Lincoln, IL NWS

15.5.2 Wind Rose

The Evansville, Indiana National Weather Service (NWS) surface meteorological data and the Lincoln, Illinois upper air meteorological data taken from 2013 through 2015 were used to determine the meteorological conditions for the area surrounding Hoosier Energy - Merom in AERMOD. The Evansville NWS wind rose for the 3-year modeled period 2013-2015 is shown as Figure 15.3 below. The Evansville NWS wind rose depicts the predominant wind direction as from the southwest for the 3-year modeled period 2013-2015.

Figure 15.3 - Evansville 3-year Cumulative Wind Rose (2013 – 2015)



15.5.3 AERMINUTE/AERSURFACE

The 1-minute wind speeds and wind directions, taken from the Automated Surface Observing System (ASOS) NWS stations and onsite meteorological stations, were processed with the U.S. EPA 1-minute data processor program AERMINUTE version 15272.

The U.S. EPA program AERSURFACE version 13016 was used to determine the surface characteristics; albedo, Bowen ratio, and surface roughness for the Evansville, Indiana NWS meteorological tower location. Surface characteristics were determined at the NWS location for each of 12 wind direction sectors with a recommended default radius of one kilometer.

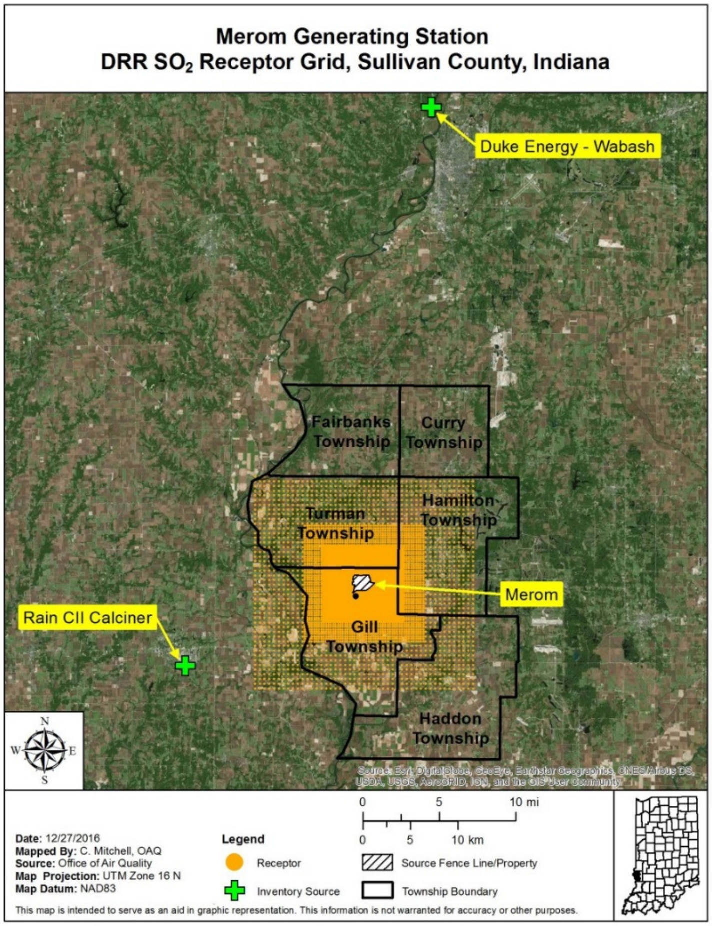
The albedo and the Bowen ratio surface characteristics were adjusted during the three winter months of January, February, and December in accordance with the U.S. EPA Region V document, "Regional Meteorological Data Processing Protocol," dated May 6, 2011. Additionally, a dry or wet Bowen ratio value was used during months when soil moisture conditions were abnormally dry or wet; otherwise the Bowen ratio value for average soil moisture conditions was used. The surface roughness value for snow cover was used if more than half of the month had days with at least one inch of snow on the ground. Otherwise, the no snow cover surface roughness value was used.

15.6 Receptor Grid and Modeling Domain

The receptor grid and modeling domain was based on guidance provided in the memorandum "Updated Guidance for Area Designations for the 2010 Primary Sulfur Dioxide National Ambient Air Quality Standards", dated March 20, 2015 and the SO_2 NAAQS Designations Modeling TAD. Indiana used a multi-nested rectangular receptor grid with appropriate spacing of receptors based on the distance from the modeled emission points to detect significant concentration gradients. The modeling domain extended out to include all sources and the appropriate distances to model maximum 1-hour SO_2 impacts to determine attainment designations for the area. Indiana used the following multi-nested rectangular receptor grid which are listed below and depicted in Figure 15.4:

- Receptor spacing at the fence line for each facility was placed every 50 meters.
- Receptor spacing at 100 meters was placed out to a distance of 3,000 meters (3 kilometers) beyond the DRR facility.
- Receptor spacing at 250 meters was placed out to a distance of 5,000 meters (5 kilometers) beyond the DRR facility.
- Receptor spacing at 500 meters was placed out to a distance of 10,000 meters (10 kilometers) beyond the DRR facility.

Figure 15.4 – Hoosier Energy – Merom Receptor Grid



Hoosier Energy - Merom has a fence surrounding the property with security gates restricting public access to all Merom property. Natural barriers immediately surround the property with a reservoir west of the facility and a landfill to the north. Receptors were therefore placed along the property boundary where public access is not restricted.

15.7 Stack Heights

The use of actual stack heights rather than relying on Good Engineering Practice (GEP) stack heights when modeling actual emissions was utilized in the analysis per the SO_2 NAAQS Designations Modeling TAD.

15.8 Temporally Varying Seasonal 1-Hour SO_2 Background

Temporally varying seasonal SO_2 background concentrations were developed in accordance with the recommended U.S. EPA guidance for establishment of such background concentrations in

Section 8.2 of 40 CFR Part 51, Appendix W and considered appropriate and representative of the area. The latest three years of SO_2 air quality monitoring data (2013-2015) was used.

The 99th percentile SO_2 concentrations by season (winter, spring, summer and fall) for each hour of the day were calculated to determine the temporally varying seasonal SO_2 background, which were directly input into the model and were part of the final modeled results.

Temporally varying seasonal 1-hour SO_2 background concentrations were taken from the Terre Haute – Lafayette Road monitor for 2013 - 2015. The hourly seasonal SO_2 values used for representative background concentrations for the area surrounding Hoosier Energy - Merom are listed below in Table 15.3.

Table 15.3 – Hoosier Energy – Merom 99th Percentile Temporally Varying Seasonal SO_2 Background Values (ppb)

	Hr 1	Hr 2	Hr 3	Hr 4	Hr 5	Hr 6	Hr 7	Hr 8
Winter	4.99	5.61	5.59	5.17	5.56	5.96	6.30	6.69
Spring	5.25	6.70	7.97	4.37	6.82	4.37	5.46	4.78
Summer	2.78	2.54	2.69	2.17	1.81	2.13	2.71	3.81
Fall	8.21	5.06	5.17	4.07	5.87	3.72	3.81	4.35

	Hr 9	Hr 10	Hr 11	Hr 12	Hr 13	Hr 14	Hr 15	Hr 16
Winter	6.22	5.45	9.07	11.45	10.06	9.25	7.76	8.97
Spring	6.86	6.29	24.67	11.51	14.16	10.08	6.30	9.29
Summer	4.44	8.83	8.55	10.09	8.43	24.15	26.75	29.68
Fall	6.35	6.03	34.92	18.80	11.22	14.39	7.32	15.27

	Hr 17	Hr 18	Hr 19	Hr 20	Hr 21	Hr 22	Hr 23	Hr 24
Winter	10.45	16.58	8.77	8.84	7.05	6.47	8.66	6.99
Spring	8.60	16.86	5.33	4.59	8.55	4.05	5.73	6.31
Summer	12.49	6.59	5.55	3.94	6.82	4.93	4.07	2.74
Fall	5.14	5.22	5.23	5.65	9.28	7.68	9.08	8.03

15.9 SO_2 Emissions Included in the Modeling Analysis

15.9.1 DRR Source: Hoosier Energy - Merom Emissions

Hoosier Energy - Merom operates two coal-fired units each of which are equipped with Continuous Emission Monitoring (CEM) systems. CEM data from 2013 through 2015 was formatted into an AERMOD ready hourly input file and used in the final modeling.

15.9.2 Inventoried SO_2 Sources Included in the Modeling

SO_2 sources from the surrounding area were evaluated to determine if their SO_2 emissions had a potential impact on the air quality surrounding Hoosier Energy - Merom, beyond what is captured through background monitoring data. The latest available actual emissions were used for inventory sources. Two sources were included in the model in addition to the Hoosier Energy - Merom facility: Rain II Carbon in Illinois and the Duke - Wabash facility in Vigo County, Indiana.

Rain CII Carbon is a green petroleum coke calcining facility that produces aluminum and other raw materials. Rain CII Carbon is located in Crawford County, Illinois, 20 km southwest of Hoosier Energy - Merom and produced 3,132 tpy of SO_2 in 2014. Hourly continuous emission monitoring data from 2013 through 2015 were used in AERMOD for the Rain II facility.

Duke Energy - Wabash was an electric generating facility in located 51 km to the north of Hoosier Energy - Merom in Vigo County, Indiana. The facility retired all of its coal-fired electric generating units (Units 2-6). Units 2-5 were retired on April 16, 2016 and Unit 6 was retired on December 7, 2016. Although this source was outside of the 30 km radius Indiana used to determine background sources, Indiana included this source in the modeling of Hoosier Energy - Merom due to high background concentrations over the 2013-2015 time period. Upwind impacts in the background data from the Wabash facility were adjusted to prevent double counting. Average actual emissions from 2013 through 2015 was used in the modeling and listed in Table 15.4.

Table 15.4 – Hoosier Energy – Merom Modeling Source Inventory

Source	Source ID	Location	SO_2 Emissions (tpy)
Rain CII Carbon	033025AAJ	Crawford County, IL	2,750
Duke - Wabash	167-00021	Vigo County	28,154

15.10 Modeling Results

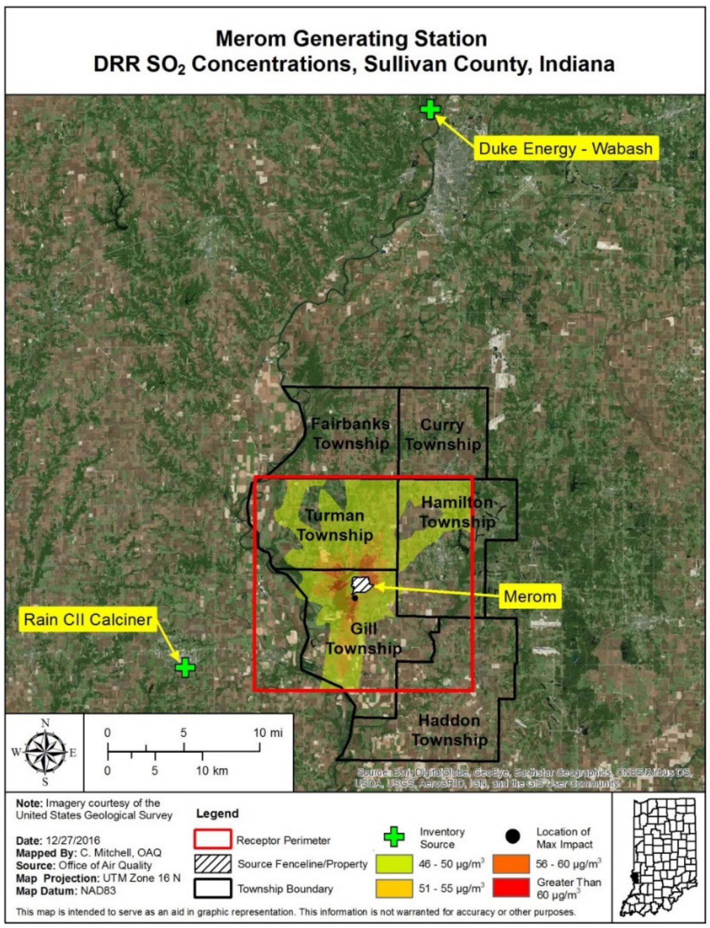
The 99th percentile of the 1-hour daily maximum modeled concentrations represents the fourth high of the 1-hour daily maximum SO_2 modeled concentrations and were averaged across three years to compare resulting concentrations to the 1-hour SO_2 NAAQS of 75 ppb (196.2 $\mu g/m^3$). Modeled concentrations include representative temporally varying seasonal 1-hour SO_2 background values to determine the overall impact. The resulting concentrations were compared to the 1-hour SO_2 standard to indicate whether a modeled violation of the SO_2 NAAQS occurred. All concentrations fell below the 1-hour SO_2 NAAQS and were determined to attain the standard and the area surrounding Hoosier Energy - Merom is recommended as attainment. The maximum predicted 99th percentile daily 1-hour SO_2 concentration is shown in Table 15.5. The overall maximum concentration was 63.0 $\mu g/m^3$, occurring at UTM coordinates 455600.0 East, 4323300.0 North.

Table 15.5 – Hoosier Energy – Merom Modeling Results

Emission Scenarios	Maximum Modeled Concentration Including Seasonal Hourly Background (µg/m^3)	1-Hour SO_2 NAAQS (µg/m^3)	Facility Models Attainment
Hoosier Energy – Merom	63.0	196.2	Yes

The concentration isopleths showing the maximum predicted 99th percentile daily 1-hour SO_2 concentration gradients can be found in Figure 15.5.

Figure 15.5 – Hoosier Energy - Merom Modeling Results



16.0 - Duke - Cayuga Generating Station (Source ID 18-165-00001)

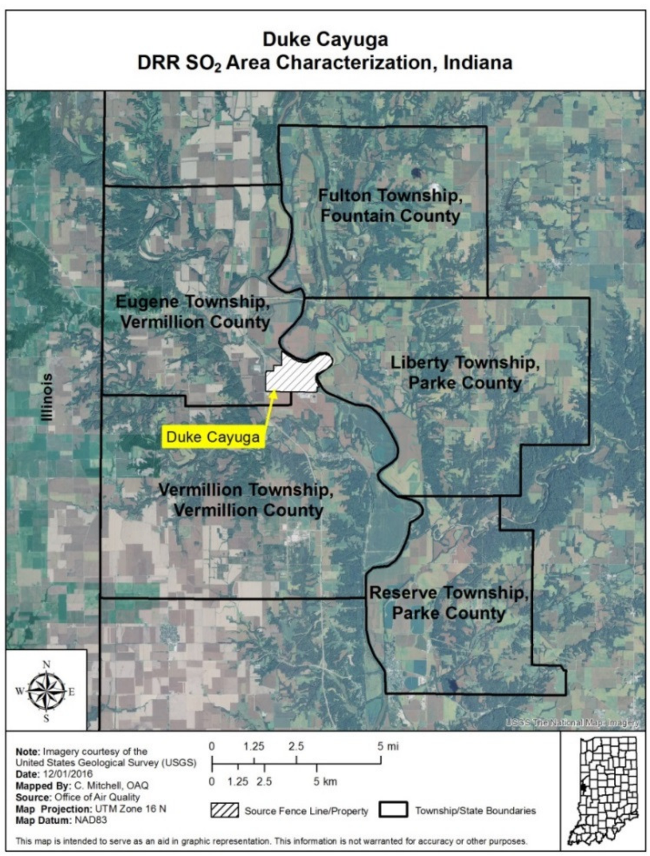
16.1 Source Description

Duke - Cayuga Generating Station (Duke - Cayuga) is an electric generating station owned by Duke Energy Indiana, LLC. Duke - Cayuga is a two-unit generating facility built between 1967 and 1968. Units 1 and 2 are equipped with scrubbers to reduce the stations sulfur dioxide emissions by approximately 95 percent. The two coal-fired boilers are rated at 4,802 MMBtu/hour each and have a generating capacity of 1104 megawatts. Duke - Cayuga was identified as a Data Requirements Rule (DRR) source based on their actual 2014 SO_2 emissions of 3448.4 tons exceeding the DRR threshold of 2,000 tons of SO_2.

16.2 Characterization of Modeled Area

The Duke - Cayuga is located off of State Road 63, Cayuga, Indiana on the banks of the Wabash River, Eugene Township, Vermillion County, Indiana. A map of the area surrounding Duke - Cayuga used for DRR modeling is shown in Figure 16.1.

Figure 16.1 - Duke - Cayuga and Surrounding Area



16.3 Background Concentrations

The nearest 1-hour SO_2 monitored concentrations were taken from the Fountain County monitor (AQS #18-045-0001). The 99^{th} percentile values from 2012 through 2014 and the 3-year design value are listed below in Table 16.1.

Table 16.1 – Duke – Cayuga 99^{th} Percentile 1-hour SO_2 Background Values and 3-year Design Value (ppb)

Monitoring Site	2012	2013	2014	2012-2014
Fountain County	30	34	22	29

16.4 Modeling Methodology

The Duke - Cayuga DRR modeling methodology resembles modeling used to evaluate New Source Review (NSR) and Prevention of Significant Deterioration (PSD) sources. However, Indiana has relied on U.S. EPA guidance "SO_2 NAAQS Designations Modeling Technical Assistance Document" in order to conduct an appropriate air dispersion modeling analysis for Duke - Cayuga to support 1-hour SO_2 designation recommendations.

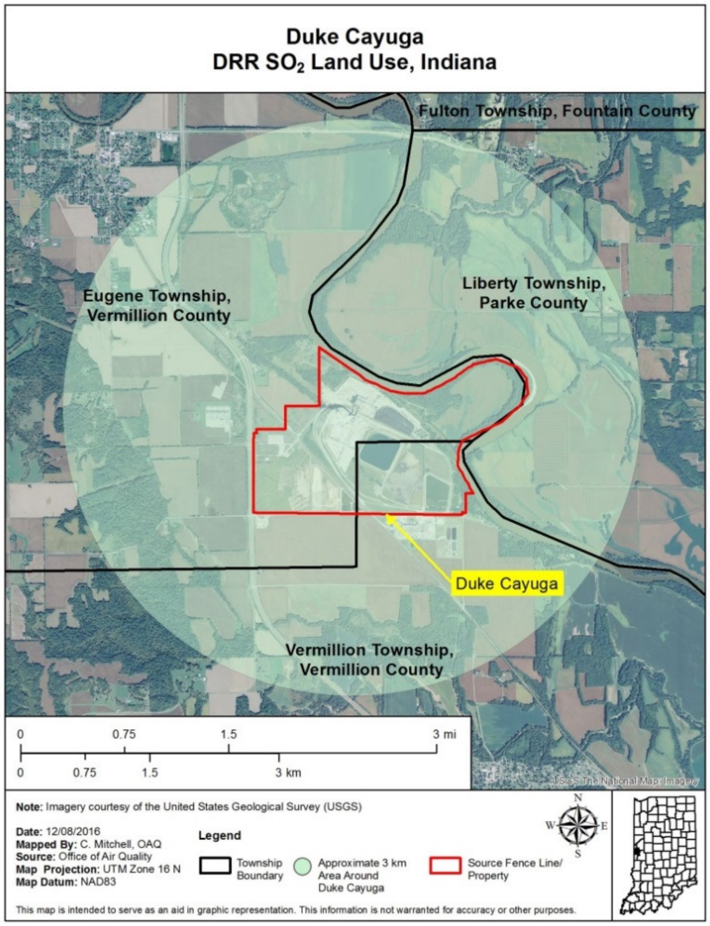
16.4.1 Model Selection

In accordance with Appendix A of Appendix W to 40 Code of Federal Regulations (CFR) Part 51, Indiana used the American Meteorological Society/Environmental Protection Agency Regulatory Model (AERMOD) version 15181. BPIPPRIME was used to account for any building downwash concerns.

16.4.2 Model Options

All regulatory default options within AERMOD were used to determine the air quality characteristics surrounding Duke. The area is considered primarily rural, based on the Auer's Classification Land Use methodology with a vast majority of the land use types classified as agricultural rural (A2), undeveloped rural (A4) and water surfaces (A5). Therefore, a rural classification was used, as provided for in the Guideline on Air Quality Models, Section 7.2.3 (EPA, 2005b). No variation of the population selection was necessary. Figure 16.2 shows the 3-kilometer radius area surrounding Duke - Cayuga that was analyzed to determine the land use classification.

Figure 16.2 – Duke – Cayuga 3-km Radius to Determine Auer Land Use



16.4.3 AERMAP

The AERMOD terrain preprocessor mapping program, AERMAP, was used to determine all the terrain elevation heights for each receptor, building, and source locations using the Universal Transverse Mercator (UTM) coordinate system. The most recent AERMAP version 11103 assigned the elevations from the National Elevation Dataset (NED) using the North American Datum (NAD) 1983 as recommended in the, “40 CFR Part 51, Revision to the Guideline on Air Quality Models” Appendix W and later revised in the “AERMOD Implementation Guide.”

16.5 Meteorological Data

16.5.1 AERMET

As stated in 40 CFR Part 51, Appendix W, section 8.3.1.2 and the SO_2 NAAQS Designations Modeling TAD, Indiana used 2013-2015 National Weather Service (NWS) surface and upper air meteorological data processed with the latest version of the AERMOD meteorological data

preprocessor program AERMET (version 15181). Table 16.2 below lists surface and upper air meteorological stations used to conduct modeling

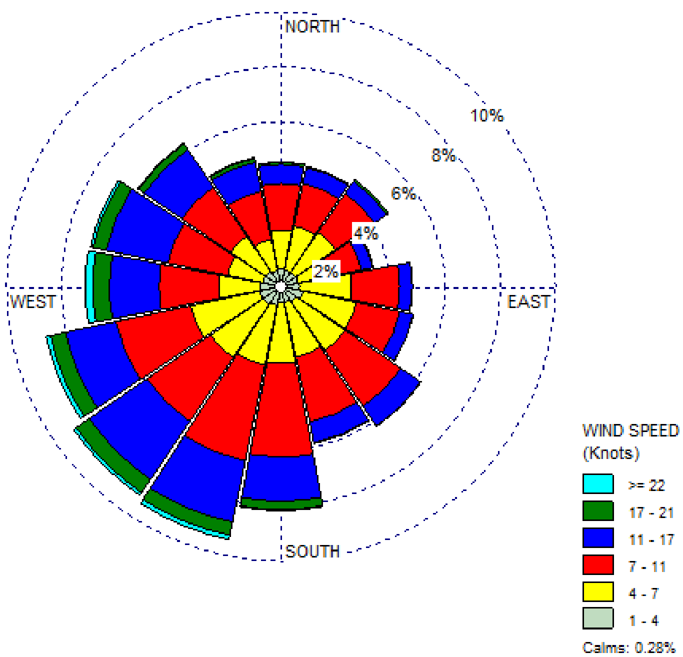
Table 16.2 – Duke – Cayuga NWS Stations/Onsite Meteorological Stations

Facility	Surface Meteorology	Upper Air Meteorology
Duke - Cayuga	Indianapolis, IN NWS	Lincoln, IL NWS

16.5.2 Wind Rose

The Indianapolis, Indiana National Weather Service (NWS) surface meteorological data and the Lincoln, Illinois upper air meteorological data taken from 2012 through 2014 was used to determine the meteorological conditions for the area surrounding Duke - Cayuga in AERMOD. The Indianapolis NWS wind rose for the 3-year modeled period 2012-2014 is shown as Figure 16.3 below. The Indianapolis NWS wind rose depicts the predominant wind direction as from the southwest for the 3-year modeled period 2012-2014.

Figure 16.3 – Indianapolis 3-year Cumulative Wind Rose (2012 – 2014)



16.5.3 AERMINUTE/AERSURFACE

The 1-minute wind speeds and wind directions, taken from the Automated Surface Observing System (ASOS) NWS stations and onsite meteorological stations, were processed with the U.S. EPA 1-minute data processor program AERMINUTE version 15272.

The U.S. EPA program AERSURFACE version 13016 was used to determine the surface characteristics; albedo, Bowen ratio, and surface roughness for the Indianapolis, Indiana NWS meteorological tower location. Surface characteristics were determined at the NWS location for each of 12 wind direction sectors with a recommended default radius of one kilometer.

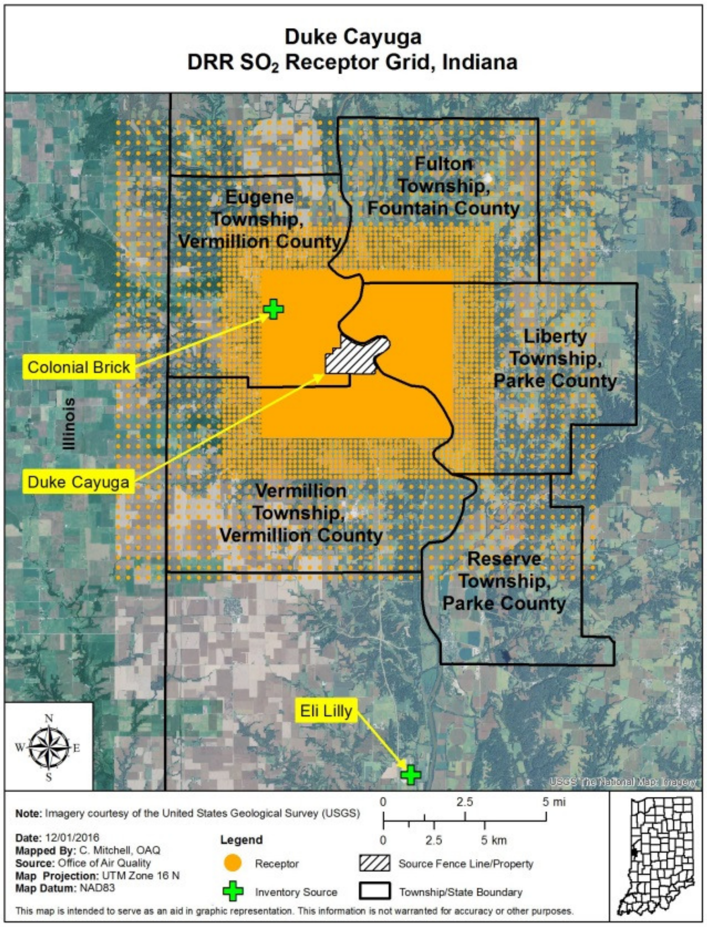
The albedo and the Bowen ratio surface characteristics were adjusted during the three winter months of January, February, and December in accordance with the U.S. EPA Region V document, "Regional Meteorological Data Processing Protocol," dated May 6, 2011. Additionally, a dry or wet Bowen ratio value was used during months when soil moisture conditions were abnormally dry or wet; otherwise the Bowen ratio value for average soil moisture conditions was used. The surface roughness value for snow cover was used if more than half of the month had days with at least one inch of snow on the ground. Otherwise, the no snow cover surface roughness value was used.

16.6 Receptor Grid and Modeling Domain

The receptor grid and modeling domain was based on guidance provided in the memorandum "Updated Guidance for Area Designations for the 2010 Primary Sulfur Dioxide National Ambient Air Quality Standards", dated March 20, 2015 and the SO_2 NAAQS Designations Modeling TAD. Indiana used a multi-nested rectangular receptor grid with appropriate spacing of receptors based on the distance from the modeled emission points to detect significant concentration gradients. The modeling domain extended out to include all sources and the appropriate distances to model maximum 1-hour SO_2 impacts to determine attainment designations for the area. Indiana used the following multi-nested rectangular receptor grid which are listed below and depicted in Figure 16.4:

- Receptor spacing at the fence line for each facility was placed every 50 meters.
- Receptor spacing at 100 meters was placed out to a distance of 3,000 meters (3 kilometers) beyond each facility.
- Receptor spacing at 250 meters was placed out to a distance of 5,000 meters (5 kilometers) beyond each facility.
- Receptor spacing at 500 meters was placed out to a distance of 10,000 meters (10 kilometers) beyond each facility.

Figure 16.4 – Duke – Cayuga Receptor Grid



Duke – Cayuga is largely fenced and has regular security patrols to keep unauthorized people off the property. Since this is the case, receptors were placed along the property line. Duke – Cayuga's concentrations increase extending out from the property line, indicating that maximum modeled concentrations occur further away from the Duke – Cayuga property.

16.7 Stack Heights

The use of actual stack heights rather than relying on Good Engineering Practice (GEP) stack heights when modeling actual emissions was utilized in the analysis per the SO_2 NAAQS Designations Modeling TAD.

16.8 Temporally Varying Seasonal 1-Hour SO_2 Background

Temporally varying seasonal SO_2 background concentrations were developed in accordance with the recommended U.S. EPA guidance for establishment of such background concentrations in

Section 8.2 of 40 CFR Part 51, Appendix W and considered appropriate and representative of the area. The latest three years of SO_2 air quality monitoring data (2012-2014) was used.

The 99th percentile SO_2 concentrations by season (winter, spring, summer and fall) for each hour of the day were calculated to determine the temporally varying seasonal SO_2 background, which were directly input into the model and were part of the final modeled results.

Temporally varying seasonal 1-hour SO_2 background concentrations were taken from the Fountain County monitor for 2012 - 2014. The hourly seasonal SO_2 values used for representative background concentrations for the area surrounding Duke - Cayuga are listed below in Table 16.3.

Table 16.3 – Duke – Cayuga 99th Percentile Temporally Varying Seasonal SO_2 Background Values (ppb)

	Hr 1	Hr 2	Hr 3	Hr 4	Hr 5	Hr 6	Hr 7	Hr 8
Winter	7.76	7.52	7.00	6.49	8.00	7.00	6.00	6.51
Spring	7.69	8.00	7.55	8.00	8.00	7.53	7.54	6.56
Summer	4.50	5.00	4.00	3.48	3.42	3.00	3.00	3.00
Fall	6.58	5.62	6.00	5.00	7.56	6.57	7.18	6.55

	Hr 9	Hr 10	Hr 11	Hr 12	Hr 13	Hr 14	Hr 15	Hr 16
Winter	8.55	9.60	9.98	9.00	9.00	8.26	7.65	8.30
Spring	8.63	9.00	10.00	8.00	8.63	9.00	9.00	7.64
Summer	6.22	7.24	8.62	8.00	9.00	8.00	6.57	6.60
Fall	6.60	6.63	9.00	8.67	8.00	7.62	9.00	8.68

	Hr 17	Hr 18	Hr 19	Hr 20	Hr 21	Hr 22	Hr 23	Hr 24
Winter	6.00	8.42	8.62	11.00	8.00	8.18	8.85	8.00
Spring	8.00	8.00	9.00	8.60	9.00	7.00	8.00	7.38
Summer	6.58	5.56	6.58	5.00	4.00	4.00	6.52	4.00
Fall	8.63	8.14	7.55	7.56	6.48	7.53	8.00	7.53

16.9 SO_2 Emissions Included in the Modeling Analysis

16.9.1 DRR Source: Duke - Cayuga Emissions

Duke - Cayuga has two units, Units BLR1 and BLR2 that have continuous emission monitoring (CEM) data for SO_2 from 2012 - 2014. This hourly CEM data from both units was formatted and used in the 1-hour SO_2 AERMOD model run. Total annual emissions from Duke - Cayuga from 2015 are approximately one-half of the emissions from 2012 through 2014 emissions.

Therefore, modeling the 2012-2014 emissions is conservative in nature. The auxiliary boiler will also be modeled based on the 2014 emissions reporting.

16.9.2 Inventoried SO_2 Sources Included in the Modeling

SO_2 sources from the surrounding area were evaluated to determine if their SO_2 emissions had a potential impact on the air quality surrounding the DRR source, beyond what is captured through background monitoring data. The latest available actual emissions over three years (2012-2014) were used. The following list of sources were included in the AERMOD run to determine overall air quality characteristics. Table 16.4 lists the inventory source to be included in the AERMOD run to determine overall air quality characteristics for the area surrounding Duke - Cayuga.

Table 16.4 – Duke – Cayuga Modeling Source Inventory

Source	Source ID	Location	2012-2014 SO_2 Emissions (tpy)
Eli Lilly	165-00009	Vermillion County	1618.8[a]
Colonial Brick	165-00002	Vermillion County	76.5[b]

[a] A short-term emission rate for the three-year (2012-2014) average was modeled for Eli Lilly.

[b] A three-year (2012-2014) annual average was calculated for Colonial Brick. Colonial Brick was shut down in 2016. They still have an active Title V permit on file.

16.10 Modeling Results

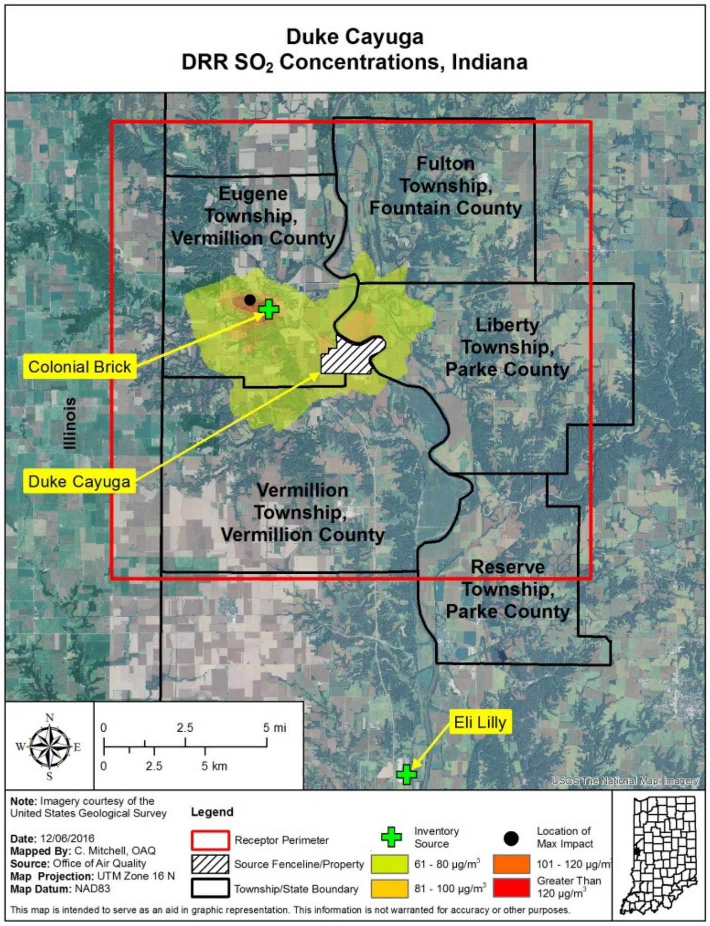
The 99th percentile of the 1-hour daily maximum modeled concentrations represents the fourth high of the 1-hour daily maximum SO_2 modeled concentrations and were averaged across three years to compare resulting concentrations to the 1-hour SO_2 NAAQS of 75 ppb (196.2 $\mu g/m^3$). Modeled concentrations include representative temporally varying seasonal 1-hour SO_2 background values to determine the overall impact. The resulting concentrations were compared to the 1-hour SO_2 standard to indicate whether a modeled violation of the SO_2 NAAQS occurred. All concentrations fell below the 1-hour SO_2 NAAQS and were determined to attain the standard and the area surrounding Duke - Cayuga is recommended as attainment. The maximum predicted 99th percentile daily 1-hour SO_2 concentration is shown in Table 16.5. The overall maximum concentration was 176.4 $\mu g/m^3$, occurring at UTM coordinates 458750.0 East, 4421750.0 North.

Table 16.5 – Duke – Cayuga Modeling Results

Emission Scenarios	Total Modeled Concentration Including Seasonal Hourly Background ($\mu g/m^3$)	1-Hour SO_2 NAAQS ($\mu g/m^3$)	Facility Models Attainment
Duke - Cayuga	176.4	196.2	Yes

The concentration isopleths showing the maximum predicted 99th percentile daily 1-hour SO_2 concentration gradients can be found in Figure 16.5.

Figure 16.5 – Duke - Cayuga Modeling Results



ENCLOSURE 1

1-Hour SO_2 Background Determination

U.S. EPA revised the SO_2 National Ambient Air Quality Standard (NAAQS) by instituting a 1-hour primary standard of 75 parts per billion (ppb). Therefore, an analysis was necessary to determine ambient 1-hour SO_2 background concentrations representative for all regions in the state. This determination is needed in order to make attainment designations, attainment demonstrations and perform New Source Review (NSR) and Prevention of Significant Deteoriation (PSD) modeling. Indiana has reviewed the 1-hour SO_2 monitoring and meteorological data from 2012 through 2014 to calculate representative ambient 1-hour SO_2 background concentrations. U.S. EPA's "SO_2 NAAQS Designations Modeling Technical Assistance Document, December 2013" was followed to calculate the background concentrations in order to eliminate overly conservative cumulative impacts from nearby major SO_2 emission sources when performing air quality dispersion modeling.

Overview

Indiana has 21 SO_2 monitors located throughout the state. Table 1 shows the 99th percentile for the years 2012, 2013, 2014, and 2015 and the 2012-2014 and 2013-2015 1-hour SO_2 design values for the 7 SO_2 monitors that the attainment designation are based on.

Table 1 - 1-Hour SO_2 Design Values for SO_2 Monitors (ppb) in Indiana

County	Monitor ID	99th Percentile				2012-2014 Design Value	2013-2015 Design Value
		2012	2013	2014	2015		
Floyd	18-043-1004	32.0	20.5	43.8	26.0	32	30
Fountain	18-045-0001	30.0	34.0	22.0	19.0	29	25
Jasper	18-073-0002	33.0	40.0	18.0	10.0	30	23
Lake	18-089-0022	47.0	43.2	53.1	35.0	48	44
Porter	18-127-0011	36.0	36.0	27.0	39.0	33	34
Vanderburgh	18-163-0021	16.5	18.6	32.3	18.0	22	23
Vigo	18-167-0018	72.5	79.1	85.0	71.0	79	78

Data Retrieval

Monitoring data for the SO_2 monitors near the DRR sources were retrieved from U.S. EPA's AirData database. The concentration data were supplied for each hour and day of every month from 2012 through 2014. Meteorological data was collected in order to correlate the wind directions and concentrations for each hour of each day of every month. Meteorological data was either collected at a monitor near the monitoring site or the nearest National Weather Service (NWS) station or Automated Surface Observation Stations (ASOS). This data was collected and distributed by the Midwest Regional Climate Center (mrcc.isws.illinois.edu). The nearest meteorological data to each of the SO_2 monitors is summarized below.

Table 2 - Locations of SO_2 Monitors and Meteorological Stations for Background Analysis

County/Site	Monitor ID	Monitor Location	Meteorological Station	Station Location
Floyd Co. / New Albany	18-043-1004	38.31° N 85.83° W	Charlestown State Park meteorological station	38.39° N 85.66° W
Fountain Co. / North of S.R. 234	18-045-0001	39.96° N 87.42° W	Indianapolis NWS station	39.79° N 86.18° W
Jasper Co. / Wheatfield	18-073-0002	41.19° N 87.05° W	South Bend NWS station	41.69° N 86.25° W
Lake Co. / Gary - IITRI	18-089-0022	41.72° N 86.91° W	Gary IITRI meteorological station	41.61° N 87.30° W
Porter Co. / Dunes Acres	18-127-0011	41.63° N 87.10° W	Gary IITRI meteorological station	41.61° N 87.30° W
Vanderburgh Co. / Buena Vista	18-063-0021	38.01° N 87.58° W	Evansville NWS station	38.05° N 87.52° W
Vigo Co. / Lafayette Ave	18-167-0018	39.49° N 87.40° W	Indianapolis NWS station	39.79° N 86.18° W

Methodology for Determining Ambient SO_2 Background Concentrations

Each set of SO_2 data was paired with the corresponding meteorological conditions for every hour of the year in order to determine the wind direction for each hour that SO_2 concentrations were recorded. Data was processed in chronological order with daily and seasonal trends analyzed.

The initial analysis created pollution roses to determine the wind directions from which the highest SO_2 concentrations were coming. This analysis helped to identify the nearest upwind SO_2 emission sources impacting the SO_2 monitor. With those wind directions identified, SO_2 concentrations (10 ppb and above) resulting from SO_2 emission sources from those wind directions were removed from the analysis, in order to calculate a representative ambient SO_2 background concentration for each SO_2 monitor. This analysis helps to prevent double-counting SO_2 emission source impacts in an air quality modeling analysis. Once data for the SO_2 monitors were processed, the data was re-formatted in order to calculate the hourly-seasonal 99th percentile averages over a 3-year period, as detailed in U.S. EPA's "SO_2 NAAQS Designations

Modeling Technical Assistance Document, December 2013 Section 8 – Background Concentrations". The 99th percentile concentrations, based on each hour of the day and each of the four seasons of the year, were calculated for each SO_2 monitor.

In order to calculate the seasonal hourly 99th percentile average, the data was grouped by the seasonal months. Spring was represented by concentrations recorded in March, April and May; summer represented by June, July and August; fall represented by September, October and November and winter represented by December, January and February. Once this data was grouped by seasons, the 99th percentile was calculated for each hour of the day, making 24 separate 99th percentiles for each SO_2 monitoring site per season. The average of these 99th percentiles over the three-year period represents the hourly-seasonal 1-hour SO_2 background.

Summary

For purposes of the modeling analysis related to the DRR, adjusted 1-hour SO_2 background values were used for the Posey, Floyd, Sullivan, Vermillion, Jasper, Lake and Porter counties DRR sources. Calculations to determine adjusted 1-hour SO_2 background concentrations were made according to U.S. EPA's "SO_2 NAAQS Designations Modeling Technical Assistance Document, February 2016 Section 8 – Background Concentrations". This approach calls for the removal of SO_2 concentrations emitted from large SO_2 emission sources located directly upwind of a SO_2 monitor. This allows for more representative ambient background values to be determined, not overly conservative values that could possibly double-count direct SO_2 source impacts and 1-hour SO_2 background concentrations when modeling inventory sources.

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Enclosure 2
Lake County DRR Source Modeling Inventory
Point Sources

	Company	Source ID	Source Description	East (X)	North (Y)	Stack Height	Stack Temperature	Exit Velocity	Stack Diameter	SO2 Emissions	Emission Determination CEM/Varying/Annual
				(m)	(m)	(m)	(K)	(m/s)	(m)	(tpy)	
1	AMUSA	7	Sinter Plant East Windbox	463341	4612705	48.768	383.15	25.146	3.6576	355.17	CEM
2	AMUSA	26	4SP HMD South	464015	4613844	7.9248	314.26	22.443439	2.2555	3.89	CEM
3	AMUSA	27	4SP HMD North	464049	4613882	5.7912	314.26	22.23516	2.4384	3.89	CEM
4	AMUSA	37	4SP Secondary Vent	464129	4613916	6.096	299.82	15.23492	4.8646	0.95	CEM
5	AMUSA	38	4SP Steelmaking Off Gas	464111	4613786	45.72	338.71	22.9616	3.9624	27.3	CEM
6	AMUSA	101	101	464125	4612000	38.4048	519.26	18.81	1.676	4.71E-04	CEM
7	AMUSA	102	102	464115	4611990	38.4	519.26	18.81	1.676	4.71E-04	CEM
8	AMUSA	107	107	464100	4612030	67.06	672.04	7.596	3.3528	0.001052852	CEM
9	AMUSA	108	108	464090	4611930	67.06	672.04	7.596	3.353	0.001035227	CEM
10	AMUSA	134	5 BH 501-503	464897	4614738	68.58	407.04	14.1224	5.1816	338.15	CEM
11	AMUSA	141	EAF Melting	461960	4610940	43.5864	377.04	2.86512	10.2443	85.93	CEM
12	AMUSA	143	EAF LMF	461859	4610982	13.8684	340.37	18.39976	1.143	13.94	CEM
13	AMUSA	147	2SP 10 Furnace Off Gas	463272	4612185	77.724	1922.04	13.49758	1.8288	28.02	CEM
14	AMUSA	148	2SP 20 Furnace Off Gas	463383	4612297	73.152	1922.04	13.49758	1.8288	28.01	CEM
15	AMUSA	149	2SP Secondary Vent	463461	4612335	64.008	302.04	8.712199	3.6576	11.2	CEM
16	AMUSA	152	2SP HMD	463393	4612307	4.572	316.48	12.79144	3.81	0	
17	AMUSA	154	2SP LMF	463202	4612155	18.288	339.82	10.24128	1.8288	20.01	CEM
18	AMUSA	166	IH7 Casthouse Baghouse 2 (W)	464670	4614630	4.572	310.93	33.67531	2.987	203.9	CEM
19	AMUSA	167	IH7 Casthouse Baghouse 1 (E)	464870	4614500	46.9392	327.59	16.03756	3.3528	203.9	CEM
20	AMUSA	170	IH7 Stoves	464800	4614500	70.104	533.15	14.1732	5.1816	398.77	CEM
21	AMUSA	195	IH7 BFG Flare	464870	4614490	55.7784	922.04	2	2.6518	136.9	CEM

Lake County DRR Source Modeling Inventory
Point Sources

	Company	Source ID	Source Description	East (X)	North (Y)	Stack Height	Stack Temperature	Exit Velocity	Stack Diameter	SO2 Emissions	Emission Determination CEM/Varying/Annual
				(m)	(m)	(m)	(K)	(m/s)	(m)	(tpy)	
22	Cokenergy	201	Cokenergy	465354	4614325	89.9	422.04	20.33016	5.4864	5236	CEM
23	IHCC	220	Boiler 504	464920	4614849	96.012	404.97	16.1544	3.048	236.25	CEM
24	AMUSA	45A	No. 1 Lime Kiln Bghse Stack A	463894	4613596	21.3055	477.59	18.5674	0.9662	5.55	CEM
25	AMUSA	45B	No. 1 Lime Kiln Bghse Stack B	463897	4613600	21.3055	477.59	18.5674	0.9662	5.55	CEM
26	AMUSA	45C	No. 2 Lime Kiln Bghse Stack A	463883	4613607	21.3055	477.59	18.5674	0.9662	5.55	CEM
27	AMUSA	45D	No. 2 Lime Kiln Bghse Stack B	463887	4613610	21.3055	477.59	18.5674	0.9662	5.55	CEM
28	IHCC	IHCCCH1	Charging-Battery A/B	465174	4614512	18.2911	394.26	17.61134	2.7402	2.385	3-yr ave annual
29	IHCC	IHCCCH2	Charging-Battery C/D	465150	4614134	18.2911	394.26	17.61134	2.7402	2.385	3-yr ave annual
30	IHCC	IHCCPS	Pushing	465154	4614232	7.7602	394.26	25.99944	0.8595	6.2	3-yr ave annual
31	IHCC	IHCCQ1	Quenching A/B	465264	4614353	18.3002	373.15	3.191256	11.9786	1.95	3-yr ave annual
32	IHCC	IHCCQ2	Quenching C/D	465258	4614315	18.3002	373.15	3.191256	11.9786	1.95	3-yr ave annual
33	IHCC	IHCCVS	IHCC Vent Stacks	465166	4614224.5	25.3	983.15	18.37944	2.3896	2419.7	CEM
34		IHCC102		465199.13	4614569.39	25.2984	983	12.246864	2.3866	0	
35		IHCC103		465178.47	4614116.45	25.2984	983	12.246864	2.3866	0	
36		IHCC104		465174.04	4614010.86	25.2984	983	12.246864	2.3866	0	
37		IHCC105		465202.47	4614661.37	25.2984	983	12.246864	2.3866	0	
38		IHCC106		465179.9	4614182.35	25.2984	983	12.246864	2.3866	0	
39		IHCC107		465192.44	4614485.78	25.2984	983	12.246864	2.3866	0	
40		IHCC108		465189.1	4614403.84	25.2984	983	12.246864	2.3866	0	
41		IHCC109		465127.22	4614295.14	25.2984	983	12.246864	2.3866	0	
42		IHCC110		465126.54	4614212.11	25.2984	983	12.246864	2.3866	0	
43		IHCC111		465123.81	4614104.15	25.2984	983	12.246864	2.3866	0	

Enclosure 2
Lake County DRR Source Modeling Inventory
Point Sources

	Company	Source ID	Source Description	East (X)	North (Y)	Stack Height	Stack Temperature	Exit Velocity	Stack Diameter	SO2 Emissions	Emission Determination CEM/Varying/Annual
				(m)	(m)	(m)	(K)	(m/s)	(m)	(tpy)	
44		IHCC112		465114.24	4614024.89	25.2984	983	12.246864	2.3866	0	
45		IHCC113		465150.63	4614659.69	25.2984	983	12.246864	2.3866	0	
46		IHCC114		465143.95	4614574.41	25.2984	983	12.246864	2.3866	0	
47		IHCC115		465138.93	4614495.81	25.2984	983	12.246864	2.3866	0	
48		IHCC116		465133.91	4614407.18	25.2984	983	12.246864	2.3866	0	
49	AMIH	S1A	IH3 Stoves	462621	4612774	65.2272	533.15	9.99744	3.2918	105.45	CEM
50	AMIH	S1B	IH4 Casthouse Baghouse	462629	4612930	22.7076	339.26	8.966201	3.6881	117.03	CEM
51	AMIH	S1C	IH4 Stoves	462629	4612787	62.1792	533.15	9.99744	3.9929	244.3	CEM
52	AMIH	S1D	IH4 Bleeder	462645	4612785	31.0896	922.04	5.916168	1.7242	138.7	CEM
53	AMIH	S1E	IH3 Bleeder	462624	4612765	31.0896	922.04	3.837432	1.7242	81.7	CEM
54	AMIH	S301	IH7 Granulator - Lafarge	464750	4614550	99.44	336	5.479999	3.96	28.5	CEM
55	AMIH	S3B	3SP HMD Baghouse	462734	4613566	8.8087	304.82	8.102599	1.204	54.65	CEM
56	AMIH	S4A	HSM Reheat Furnace 1	462645	4614319	65.2272	977.59	8.74776	4.572	0	
57	AMIH	S4B	HSM Reheat Furnace 2	462668	4614311	65.2272	977.59	8.74776	4.572	0	
58	AMIH	S4C	HSM Reheat Furnace 3	462691	4614305	65.2272	977.59	8.74776	4.572	0	
59	AMIH	S8E	No. 6 Boiler	462286	4612566	46.9392	683.15	26.79192	3.048	180.5	CEM
60	AMIH	S8G	No. 8 Boiler	462273	4612540	46.9392	688.71	17.31264	3.5052	356.7	CEM
61	Ironside	S8H	No. 9 Boiler	462269	4612577	46.9392	683.15	26.79192	3.048	204.3	CEM
84	US Steel	94011	Sinter Plant Windbox	473218	4607057	56.388	385.93	20.23872	3.4442	534.9	3-yr ave annual
85	US Steel	940541	TBBH Boiler 1	472661	4607149	45.72	572.04	14.478	3.6576	72.18	3-yr ave annual
86	US Steel	940542	TBBH Boiler 2	472661	4607136	45.72	572.04	14.478	3.6576	124.14	3-yr ave annual

Enclosure 2
Lake County DRR Source Modeling Inventory
Point Sources

	Company	Source ID	Source Description	East (X)	North (Y)	Stack Height	Stack Temperature	Exit Velocity	Stack Diameter	SO2 Emissions	Emission Determination CEM/Varying/Annual
				(m)	(m)	(m)	(K)	(m/s)	(m)	(tpy)	
87	US Steel	940543	TBBH Boiler 3	472661	4607123	45.72	572.04	14.478	3.6576	126.2	3-yr ave annual
88	US Steel	940545	TBBH Boiler 5	472661	4607096	45.72	572.04	14.478	3.6576	63	3-yr ave annual
89	US Steel	94053	TBBH Boiler 6	472655	4607079	45.72	499.82	12.16152	3.6576	72.3	3-yr ave annual
90	US Steel	94017	84 inch Hot Strip Mill Reheat Furnaces	468755	4608468	49.6824	701.48	50.81016	2.4689	107.8	Seasonal Varying
91	US Steel	940121	No. 4 BH Boiler 1	472592	4607817	35.3568	460.93	18.83664	2.8956	153.3	Seasonal Varying
92	US Steel	940122	No. 4 BH Boiler 2	472592	4607792	35.3568	460.93	18.83664	2.8956	168.81	Seasonal Varying
93	US Steel	940123	No. 4 BH Boiler 3	472592	4607767	35.3568	460.93	18.83664	2.8956	110.92	Seasonal Varying
94	US Steel	940401	CPBH Boiler 8	474393	4606802	94.1832	535.93	5.66928	3.048	23.6	Seasonal Varying
95	US Steel	940402	CPBH Boiler 9	474436	4606850	60.96	535.93	5.66928	2.8042	23.6	Seasonal Varying
96	US Steel	940403	CPBH Boiler 10	474436	4606866	60.96	535.93	5.66928	2.8042	23.6	Seasonal Varying
97	US Steel	94070	Tail Gas Incinerator	474470	4606815	97.536	894.26	22.86	0.5791	1.2	3-yr ave annual
98	US Steel	94026	No. 2 Underfiring	473903	4606522	106.68	368.71	3.2004	6.096	67.3	3-yr ave annual
99	US Steel	94038	CPBH Boiler 6	474362	4606775	40.5384	535.93	5.334	2.5908	23.6	Seasonal Varying
100	US Steel	94037	CPBH Boilers 4 an 5	474337	4606775	40.5384	535.93	5.334	2.5908	23.6	Seasonal Varying
101	US Steel	94066	No. 14 BF Casthouse	472643	4607841	50.292	329.82	20.4216	3.9624	719.9	Seasonal Varying
102	US Steel	94039	Coke Plant Boiler No. 7	474370	4606803	32.004	535.93	5.12064	2.5908	23.6	3-yr ave annual
103	US Steel	94036	Coke Plant Boiler No. 3	474315	4606782	39.3192	535.93	9.26592	1.8898	23.6	3-yr ave annual
104	US Steel	94021	No. 4 BF Stoves	472694	4606861	68.58	314.82	3.47472	3.9014	53.9	Seasonal Varying
105	US Steel	94022	No. 6 BF Stoves	472697	4607006	68.58	319.82	8.13816	3.9014	92.2	Seasonal Varying
106	US Steel	94023	No. 8 BF Stoves	472701	4607166	76.2	313.71	5.88264	3.9014	59.4	Seasonal Varying
107	US Steel	94013BFSTOVE	#13 BF Stoves	472696	4607680	76.2	325.37	6.21792	15.5143	101.7	Seasonal Varying

Enclosure 2
Lake County DRR Source Modeling Inventory
Point Sources

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				(m)	(m)	(m)	(K)	(m/s)	(m)	(tpy)	
108	US Steel	94041	No. 1 BOP Desulf Caster	472325	4606631	24.384	299.82	22.82952	3.109	41.6	3-yr ave annual
109	US Steel	94007	Sinter Cooler	473194	4607100	30.48	455.37	18.8976	5.4864	86.3	3-yr ave annual
110	US Steel	USPRECA	Precarbon #2 (by Coke Battery #2) includes CASP C	473933	4606552	49.9872	499.98	9.99744	2.0117	3	3-yr ave annual
111	US Steel	USBFGFL	BFG Flare Stacks (closer to BF #4)	472724	4606895	200.0098	922.04	9.99744	4.9987	90.3	3-yr ave annual
112	US Steel	94045QBOP2	No 2 QBOP Desulf Caster	472524	4607641	16.764	331.48	16.3068	1.1582	0	
113	US Steel	940CB5	Coke Battery #5 Underfire	473200	4606400	76.2	499.82	4.38912	3.048	23.8	3-yr ave annual
114	US Steel	940CB7	Coke Battery #7 Underfire	473200	4606600	76.2	533.15	5.6388	3.048	33.1	3-yr ave annual
115	US Steel	COGBYPROD	Coke Oven Gas Recovery	473200	4606600	30.48	366.48	2.98704	1.0058	0	
116	US Steel	940CASPC	CASP C	474393	4606802	16.764	366.48	3.048	2.0117	10.36	3-yr ave annual
117	US Steel	USCOGFLARE	COG stack Desulf	473534.18	4606500.83	45.72	922.04	3.048	5.7912	69.6	3-yr ave annual
118	US Steel	US1BOPCAST		472477	4607429	24.4145	394.26	20.20824	2.4384	0	
132	BP AMOCO	BP1	3SPS Boiler 1	459991.4	4613228.4	18.3948	508.36	7.7852016	0.8083	15.91	3-yr ave annual
133	BP AMOCO	BP2	3SPS Boiler 2	459991.4	4613237.1	18.3948	508.36	7.7852016	0.8083	15.76	3-yr ave annual
134	BP AMOCO	BP3	3SPS Boiler 3	459973.9	4613228.4	18.3948	508.36	7.7852016	0.8083	15.51	3-yr ave annual
135	BP AMOCO	BP4	3SPS Boiler 4	459973.9	4613237.1	18.3948	508.36	7.7852016	0.8083	16.68	3-yr ave annual
136	BP AMOCO	BP5	3SPS Boiler 6	459955.8	4613231.5	18.3948	508.36	7.7852016	0.8083	17.45	3-yr ave annual
137	BP AMOCO	BP6	FCU 500 CAT	460103	4612576	23.2258	567	10.451592	0.8361	25.1	3-yr ave annual
138	BP AMOCO	BP7	11 PS - H-1X	459829.8	4613338.8	18.4877	496.94	2.3783544	0.8826	6.06	3-yr ave annual
139	BP AMOCO	BP9	11 PS - H-3	459861.8	4613314.7	15.329	607.12	3.5396424	0.3995	1.25	3-yr ave annual
140	BP AMOCO	BP10	11 PS - H-200	459792.5	4613422.1	18.209	536.13	3.0751272	0.9104	7.38	3-yr ave annual
141	BP AMOCO	BP11	11 PS- H-300	459792.5	4613443.9	18.209	536.13	2.4990552	0.8268	4.75	3-yr ave annual

Enclosure 2
Lake County DRR Source Modeling Inventory
Point Sources

	Company	Source ID	Source Description	East (X)	North (Y)	Stack Height	Stack Temperature	Exit Velocity	Stack Diameter	SO2 Emissions	Emission Determination CEM/Varying/Annual
				(m)	(m)	(m)	(K)	(m/s)	(m)	(tpy)	
142	BP AMOCO	BP12	#1 CRU/ ARU PROCESS HEATER	459703	4612854	16.258	514.53	0.4273296	1.1241	2.13	3-yr ave annual
143	BP AMOCO	BP13	#2 CRU/ ARU PROCESS HEATER	459666	4612852	15.6077	631.81	3.0470856	0.4831	1.1	3-yr ave annual
144	BP AMOCO	BP14	FCU 600 CAT	459945	4612578	14.8645	605.58	6.1222128	0.7432	16.25	3-yr ave annual
145	BP AMOCO	BP15	ALKY	460095	4612741.85	18.1161	962.68	6.094476	0.3066	1.55	3-yr ave annual
146	BP AMOCO	BP16	DDU or South ? 800-04	459855.11	4613618.24	18.5806	962.68	6.094476	0.3809	90.97	3-yr ave annual
147	BP AMOCO	BP17	FCU	459721.53	4612637.23	18.5806	962.68	6.094476	0.3716	1.25	3-yr ave annual
148	BP AMOCO	BP18	4UF	459550	4612830	18.5806	962.68	6.094476	0.6039	13.75	3-yr ave annual
149	BP AMOCO	BP19	UIU	459751.57	4612755.58	19.9742	962.68	6.094476	0.4274	7.4	3-yr ave annual
150	BP AMOCO	BP20	VRU	460280	4612423.82	18.1161	962.68	6.094476	0.1951	2.39	3-yr ave annual
151	BP AMOCO	BP21	ARU - F200A, F-200B	459993	4613060	18.5806	474.41	1.161288	1.0684	8.22	3-yr ave annual
152	BP AMOCO	BP22	4UF - F-1, F-8A, F-8B	459707	4613011	15.9793	554.66	2.5270968	1.1241	4.64	3-yr ave annual
153	BP AMOCO	BP23	4UF - F-2	459635	4613011	19.7883	548.79	1.9510248	1.0684	3.86	3-yr ave annual
154	BP AMOCO	BP24	4UF - F-3	459645	4613011	18.3948	560.52	2.1646896	0.9755	4.14	3-yr ave annual
155	BP AMOCO	BP25	4UF - F-4, F-5, F-6	459665	4613011	17.1871	505.27	1.8022824	1.0684	4.31	3-yr ave annual
156	BP AMOCO	BP27	New 12 PS Atmospheric Heater H-101A	460629	4612809.3	18.3019	505.27	2.4804624	0.9941	21.4	3-yr ave annual
157	BP AMOCO	BP28	New 12 PS Vacuum Heater H-102	460619.9	4612706.6	18.3948	496.01	2.3411688	0.9941	7.78	3-yr ave annual
158	BP AMOCO	BP30	New Coker Heater	460567	4612560	18.4877	506.81	2.1089112	0.6968	6.31	3-yr ave annual
159	BP AMOCO	BP31	New Coker Heater	460566	4612515	18.4877	506.81	2.1089112	0.6968	6.54	3-yr ave annual
160	BP AMOCO	BP32	New Coker Heater	460566	4612477	18.4877	506.81	2.1089112	0.6968	6	3-yr ave annual
161	BP AMOCO	BP33	New Hydrogen Plant	461343	4612750	9.2903	505.27	4.645152	1.0498	0	
162	BP AMOCO	BP34	New Hydrogen Plant	461401	4612695	9.2903	505.27	4.645152	1.0498	0	

Enclosure 2
Lake County DRR Source Modeling Inventory
Point Sources

	Company	Source ID	Source Description	East (X)	North (Y)	Stack Height	Stack Temperature	Exit Velocity	Stack Diameter	SO2 Emissions	Emission Determination CEM/Varying/Annual
				(m)	(m)	(m)	(K)	(m/s)	(m)	(tpy)	
163	BP AMOCO	BP35	COT1 and COT2	460224	4612806	11.6129	573.17	6.670548	0.576	52.52	3-yr ave annual
164	BP AMOCO	BP36	New GOHT Heater	459477.4	4613541.6	13.0064	628.73	4.3665648	0.3345	0	
165	BP AMOCO	BP37	New 12 PS Atmospheric Heater H-101B	460629	4612839.8	18.3019	505.27	2.4804624	0.9941	0	
166	BP AMOCO	BP39	ISOM - H-1	459822	4612853	11.6129	517.62	2.6849832	0.7618	4.69	3-yr ave annual
167	BP AMOCO	BP42	DDU - WB-301 and WB-301	459443	4613297	13.1922	644.16	5.9457336	0.3623	4.92	3-yr ave annual
168	BP AMOCO	BP43	HU - B-501	459586	4613330	23.2258	505.27	5.8527696	0.641	2.23	3-yr ave annual
169	Carmeuse	KILN1A	Carmeuse 1	466117.95	4610027.09	24.3596	477.59	3.048	1.9812	8.76	SO2 Limit
170	Carmeuse	KILN1B		466119.57	4610029.22	24.3596	477.59	3.048	1.9812	8.76	SO2 Limit
171	Carmeuse	KILN1C		466121.19	4610031.35	24.3596	477.59	3.048	1.9812	8.76	SO2 Limit
172	Carmeuse	KILN1D		466122.81	4610033.47	24.3596	477.59	3.048	1.9812	8.76	SO2 Limit
173	Carmeuse	KILN1E		466124.43	4610035.6	24.3596	477.59	3.048	1.9812	8.76	SO2 Limit
174	Carmeuse	KILN1F		466126.05	4610037.73	24.3596	477.59	3.048	1.9812	8.76	SO2 Limit
175	Carmeuse	KILN2A	Carmeuse 2	466108.24	4610034.44	26.4932	477.59	3.048	1.9812	8.76	SO2 Limit
176	Carmeuse	KILN2B		466109.85	4610036.58	26.4932	477.59	3.048	1.9812	8.76	SO2 Limit
177	Carmeuse	KILN2C		466111.47	4610038.72	26.4932	477.59	3.048	1.9812	8.76	SO2 Limit
178	Carmeuse	KILN2D		466113.09	4610040.86	26.4932	477.59	3.048	1.9812	8.76	SO2 Limit
180	Carmeuse	KILN2F		466116.32	4610045.14	26.4932	477.59	3.048	1.9812	8.76	SO2 Limit
181	Carmeuse	KILN3A	Carmeuse 3	466096.38	4610042.8	26.4932	477.59	3.048	1.9812	8.76	SO2 Limit
182	Carmeuse	KILN3B		466097.99	4610044.93	26.4932	477.59	3.048	1.9812	8.76	SO2 Limit
183	Carmeuse	KILN3C		466099.6	4610047.07	26.4932	477.59	3.048	1.9812	8.76	SO2 Limit
184	Carmeuse	KILN3D		466101.22	4610049.2	26.4932	477.59	3.048	1.9812	8.76	SO2 Limit

Lake County DRR Source Modeling Inventory
Point Sources

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				(m)	(m)	(m)	(K)	(m/s)	(m)	(tpy)	
185	Carmeuse	KILN3E		466102.83	4610051.34	26.4932	477.59	3.048	1.9812	8.76	SO2 Limit
186	Carmeuse	KILN3F		466104.44	4610053.47	26.4932	477.59	3.048	1.9812	8.76	SO2 Limit
187	Carmeuse	KILN4A	Carmeuse 4	466086.05	4610050.06	28.956	477.59	3.048	1.9812	8.76	SO2 Limit
188	Carmeuse	KILN4B		466087.66	4610052.19	28.956	477.59	3.048	1.9812	8.76	SO2 Limit
189	Carmeuse	KILN4C		466089.27	4610054.33	28.956	477.59	3.048	1.9812	8.76	SO2 Limit
190	Carmeuse	KILN4D		466090.88	4610056.46	28.956	477.59	3.048	1.9812	8.76	SO2 Limit
191	Carmeuse	KILN4E		466092.49	4610058.6	28.956	477.59	3.048	1.9812	8.76	SO2 Limit
192	Carmeuse	KILN4F		466094.1	4610060.73	28.956	477.59	3.048	1.9812	8.76	SO2 Limit
193	Carmeuse	KILN5A	Carmeuse 5	466076.28	4610057.34	26.8224	477.59	3.048	1.9812	8.76	SO2 Limit
194	Carmeuse	KILN5B		466077.89	4610059.47	26.8224	477.59	3.048	1.9812	8.76	SO2 Limit
195	Carmeuse	KILN5C		466079.51	4610061.61	26.8224	477.59	3.048	1.9812	8.76	SO2 Limit
196	Carmeuse	KILN5D		466081.13	4610063.75	26.8224	477.59	3.048	1.9812	8.76	SO2 Limit
197	Carmeuse	KILN5E		466082.74	4610065.88	26.8224	477.59	3.048	1.9812	8.76	SO2 Limit
198	Carmeuse	KILN5F		466084.36	4610068.02	26.8224	477.59	3.048	1.9812	8.76	SO2 Limit
199	Koppers	KOPPER24		437771.4	4630123.7	25.908	508.1	22.06752	1.524	569.8	3-yr ave annual
200	Koppers	KOPPER77		437763	4630123.6	25.908	508.1	22.06752	1.524	569.8	3-yr ave annual
201	Koppers	KOPPER53		437576.5	4630111.5	23.4696	794.2	14.23	0.76	333.6	3-yr ave annual
202	Koppers	KOPPER76		437577.2	4630093.9	23.4696	777.6	9.31	0.76	312.5	3-yr ave annual
203	AMBH	AMSRC12	Battery 2 Pushing Stack	488266.6	4609400.9	64.008	1088.71	41.57472	1.524	0	
204	AMBH	AM57	BOF Hot Metal Desulf 1 Baghouse Stack	488498.4	4609914.4	25.9111	305.37	12.94892	2.0513	0	
205	AMBH	AM59	BOF Hot Metal Desulf 2 Baghouse Stack	488512	4609940.1	25.9111	305.37	5.887721	3.0389	0	
206	AMBH	AM60	BOF Hot Metal Desulf 3 Baghouse Stack	488514.6	4609952.1	12.192	319.26	12.94892	2.664	0	

Lake County DRR Source Modeling Inventory
Point Sources

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				(m)	(m)	(m)	(K)	(m/s)	(m)	(tpy)	
207	AMBH	P6	AMBurns PwrStn Blr 8-12	488403	4609297	67.9704	505.37	13.939519	3.5113	4312.5	Seasonal Varying
208	NIPSCO	PU78FGD	NIPSCO Bailly	489738	4610321	146.304	327.59	26.634989	6.2484	1368.7	CEM
211	LaFarge	LAFAR1		465166	4614224.5	25.3	983.15	18.37944	2.39	98.45	3-yr ave annual
212	Safety Kleen	SK4		460158.59	4610790.08	30.48	1080.37	6.767	1.3716	34.9	3-yr ave annual
213	Safety Kleen	SK7		460162.05	4610772.05	30.48	1019.26	4.572	0.9693	21.36	3-yr ave annual
214	Safety Kleen	SK8		460153.73	4610772.75	30.48	1055.37	7.132	0.8534	6	3-yr ave annual
215	Eco Service	00242_2		460128.5	4606396.7	10.668	810.93	15.651	1.3716	3.76	3-yr ave annual
216	Eco Service	00242_3		460053.5	4606385.4	91.44	334.26	12.89304	1.8288	251.29	3-yr ave annual
225	AMUSA	AMUSA166	2SP BOF Charge Aisle	463400	4612140	4.572	316.48	33.6804	2.987	6.48	3-yr ave annual
226	AMBH	P7001	110 Plate Mill #1 & 2 Stack	489029.6	4608811	54.5592	838.71	2.1336	4.4409	0.4	3-yr ave annual
227	AMBH	P6503	160 Plate Mill #1 Slab Reheat Furnace	489014	4609043	54.2544	672.04	4.368802	3.1029	15.2	3-yr ave annual
228	AMBH	P6504	160 Plate Mill #2 Slab Reheat Furnace	489035	4609043	54.2544	672.04	4.08432	3.2095	16.6	3-yr ave annual
229	AMBH	P6509	160 PM #5 IN/OUT REHEAT FURNACE	489053.9	4609039	39.9288	783.15	12.476479	1.9507	0	
230	AMBH	P6502	160 PM #7 IN/OUT REHEAT FURNACE	489042.2	4608914	32.9184	783.15	9.987281	2.2372	0	
231	AMBH	P6505	160 PM #8 BATCH FURNACE	489042.2	4608894	50.9016	672.04	2.98704	1.7374	0	
232	AMBH	P3018	BATTERY #1 PECS	488053.3	4608389	30.48	360.93	25.26585	2.4384	53.61	3-yr ave annual
233	AMBH	P3026	#1 Underfire Coke Oven	487967.9	4608346	76.8096	560.93	9.144	3.7795	1759.97	Seasonal Varying
234	AMBH	P3024	BATTERY #2 PECS	488059.1	4608115	26.8224	360.93	25.26585	2.4384	60.7	3-yr ave annual
235	AMBH	P3027	#2 Underfire Coke Oven	487958.6	4608191	75.8952	560.93	9.144	4.0447	2261.91	Seasonal Varying
236	AMBH	P3547	C Furnace Stoves/Stacks (4 stoves)	488244.3	4609339	61.2648	533.15	15.8496	3.4839	864.44	Seasonal Varying
237	AMBH	P3560	D Furnace Stoves/Stacks (4 stoves)	488229.2	4609496	61.2648	533.15	14.894558	3.5936	1629.1	Seasonal Varying
238	AMBH	P90A	HOT STRIP MILL #1 WALKING BEAM FCE E	489029.2	4609235	96.012	810.93	7.061201	3.2004	21.8	3-yr ave annual

Lake County DRR Source Modeling Inventory
Point Sources

	Company	Source ID	Source Description	East (X)	North (Y)	Stack Height	Stack Temperature	Exit Velocity	Stack Diameter	SO2 Emissions	Emission Determination CEM/Varying/Annual
				(m)	(m)	(m)	(K)	(m/s)	(m)	(tpy)	
239	AMBH	P90B	HOT STRIP MILL #1 WALKING BEAM FCE W	489009	4609235	96.012	810.93	7.061201	3.2004	21.8	3-yr ave annual
240	AMBH	P91A	HOT STRIP MILL #2 WALKING BEAM FCE E	489051.1	4609236	96.012	810.93	7.02564	3.2004	11.3	3-yr ave annual
241	AMBH	P91B	HOT STRIP MILL #2 WALKING BEAM FCE W	489030.1	4609235	96.012	810.93	7.02564	3.2004	11.3	3-yr ave annual
242	AMBH	P92A	HOT STRIP MILL #3 REHEAT FURNACE STACK E	489069	4609236	41.4528	810.93	8.8392	3.9624	27.2	3-yr ave annual
243	AMBH	P92B	HOT STRIP MILL #3 REHEAT FURNACE STACK W	489053.1	4609236	41.4528	810.93	8.8392	3.9624	27.2	3-yr ave annual
254	AMBH	P2501	Power Station Boiler #7	488405.1	4609255	67.9704	505.37	14.43228	3.2004	879.84	Seasonal Varying
255	AMBH	P3513	SINTER PLANT WINDBOX SCRUBBER STACK	488038.3	4609329	24.0792	322.04	13.9446	5.1816	702.78	Seasonal Varying
256	AMBH	P4002	STEELMAKING HMD STATION #1	488512.1	4609936	25.9111	305.37	12.948919	2.0513	10.7	3-yr ave annual
257	AMBH	P59	STEELMAKING HMD STATION #2	488512	4609940	25.9111	305.37	5.887721	3.0389	10.7	3-yr ave annual
260	AMBH	P4008	STEELMAKING HMD STATION #3	488514.6	4609952	12.192	319.26	12.948919	2.664	9.6	3-yr ave annual
261	AMBH	P3091	Coke Oven Export Gas Flare	487988	4608372	30.48	1922.04	9.397999	0.9144	1.8	3-yr ave annual
262	AMBH	P3540	C Furnace BFG Flare (2 flareheads)	488274.8	4609359	64.008	1088.71	41.57472	1.524	18.6	3-yr ave annual
263	AMBH	P3553	D Furnace BFG Flare (2 flareheads)	488278.3	4609495	64.008	1088.71	41.57472	1.524	18.64	3-yr ave annual

AMUSA - ArcelorMittal - USA
Cokenergy - Cokenergy, Inc
AMIH - ArcelorMittal - Indiana Harbor
Ironside - Ironside Energy, Inc
US Steel - U.S. Steel - Gary Works
BP AMOCO - BP Products - North America Inc.
Carmeuse - Carmeuse Lime, Inc
Koppers - Koppers Inc - Illinois
AMBH - ArcelorMittal - Burns Harbor
NIPSCO - NIPSCO Bailly Generating Station
LaFarge - ISPAT Inland LaFarge North America
Safety Kleen - Safety Kleen
Eco Service - Eco Services Corp (formerly Rhodia, Solvay)

Lake County DRR Source Modeling Inventory
Volume Sources

	Company	Source ID	Source Description	East (X)	North (Y)	Release Height	Initial Horizontal Dimension	Initial Vertical Dimension	SO2 Emissions	Emission Determination CEM/Varying/Annual
				(m)	(m)	(m)	(m)	(m)	(tpy)	
62	AMIH	V3B1	3SP HMD Fugitives	462672	4613541	16.15	2.23	7.51	0.278	3-yr ave annual
63	AMIH	V3B2	3SP HMD Fugitives	462734	4613566	16.15	2.23	7.51	0.278	3-yr ave annual
64	AMIH	V3B3	3SP HMD Fugitives	462717	4613529	16.15	2.23	7.51	0.278	3-yr ave annual
65	AMIH	V3B4	3SP HMD Fugitives	462738	4613525	16.15	2.23	7.51	0.278	3-yr ave annual
66	AMIH	V1A1	IH3 Casthouse	462562	4612734	23.8	0.85	11.1	1.41	3-yr ave annual
67	AMIH	V1A2	IH3 Casthouse	462561	4612733	23.8	0.85	11.1	1.41	3-yr ave annual
68	AMIH	V1A3	IH3 Casthouse	462560	4612731	23.8	0.85	11.1	1.41	3-yr ave annual
69	AMIH	V1A4	IH3 Casthouse	462559	4612730	23.8	0.85	11.1	1.41	3-yr ave annual
70	AMIH	V1A5	IH3 Casthouse	462558	4612728	23.8	0.85	11.1	1.41	3-yr ave annual
71	AMIH	V1A6	IH3 Casthouse	462556	4612727	23.8	0.85	11.1	1.41	3-yr ave annual
72	AMIH	V1A7	IH3 Casthouse	462555	4612725	23.8	0.85	11.1	1.41	3-yr ave annual
73	AMIH	V1A8	IH3 Casthouse	462554	4612724	23.8	0.85	11.1	1.41	3-yr ave annual
74	AMIH	V1A9	IH3 Casthouse	462553	4612722	23.8	0.85	11.1	1.41	3-yr ave annual
75	AMIH	V1A10	IH3 Casthouse	462552	4612721	23.8	0.85	11.1	1.41	3-yr ave annual
76	AMIH	V1B1	IH4 Casthouse	462697	4612866	31.1	0.99	14.5	3.27	3-yr ave annual
77	AMIH	V1B2	IH4 Casthouse	462696	4612864	31.1	0.99	14.5	3.27	3-yr ave annual
78	AMIH	V1B3	IH4 Casthouse	462695	4612863	31.1	0.99	14.5	3.27	3-yr ave annual
79	AMIH	V1B4	IH4 Casthouse	462693	4612861	31.1	0.99	14.5	3.27	3-yr ave annual
80	AMIH	V1B5	IH4 Casthouse	462692	4612860	31.1	0.99	14.5	3.27	3-yr ave annual
81	AMIH	V1B6	IH4 Casthouse	462690	4612858	31.1	0.99	14.5	3.27	3-yr ave annual
82	AMIH	V1B7	IH4 Casthouse	462689	4612856	31.1	0.99	14.5	3.27	3-yr ave annual

Lake County DRR Source Modeling Inventory
Volume Sources

	Company	Source ID	Source Description	East (X)	North (Y)	Release Height	Initial Horizontal Dimension	Initial Vertical Dimension	SO2 Emissions	Emission Determination CEM/Varying/Annual
				(m)	(m)	(m)	(m)	(m)	(tpy)	
83	AMIH	V1B8	IH4 Casthouse	462688	4612855	31.1	0.99	14.5	3.27	3-yr ave annual
119	US Steel	221	CB2UNDERFUG	473900	4606300	19.9949	9.9974	9.9974	10.8	
120	US Steel	222	CB5UNDERFUG	473913	4606438	19.9949	9.9974	9.9974	1	
121	US Steel	447110	#4 BF Casthouse Roof M	472679.5	4606687.4	18.1051	4.2977	8.7996	6.32	Emission Factor
122	US Steel	447210	#4 BF Casthouse Roof M	472685.4	4606667.7	18.1051	4.2977	8.7996	6.32	Emission Factor
123	US Steel	447310	#4 BF Casthouse Roof M	472691.3	4606648	18.1051	4.2977	8.7996	6.32	Emission Factor
124	US Steel	447410	#6 BF Casthouse Roof M	472683	4606848	17.4986	4.2977	8.7996	6.34	Emission Factor
125	US Steel	447510	#6 BF Casthouse Roof M	472688.9	4606828.3	17.4986	4.2977	8.7996	6.34	Emission Factor
126	US Steel	447610	#6 BF Casthouse Roof M	472694.7	4606808.5	17.4986	4.2977	8.7996	6.34	Emission Factor
127	US Steel	447710	#8 BF Casthouse Roof M	472686.7	4606991.9	17.1999	4.2977	8.3972	5.9	Emission Factor
128	US Steel	447810	#8 BF Casthouse Roof M	472692.5	4606972.2	17.1999	4.2977	8.3972	5.9	Emission Factor
129	US Steel	447910	#8 BF Casthouse Roof M	472698.4	4606952.4	17.1999	4.2977	8.3972	5.9	Emission Factor
130	US Steel	448110	#13 BF Casthouse RM	472710.6	4607478.3	34.3997	6.3978	15.999	12.75	Emission Factor
131	US Steel	448210	#13 BF Casthouse RM	472713.1	4607461.2	34.3997	6.3978	15.999	12.75	Emission Factor
209	AMBH	P133		488222	4609449	50	16	3.6576	0	
210	AMBH	P134		488220	4609591	50	16	3.6576	0	
217	AMIH	AMIH142		461896	4610979	47.5488	4.9378	21.97	0	
218	AMIH	AMIH165		464750	4614615	21.9456	7.4981	1.4204	0	
219		F1C		462531	4612706	49.9994	15.999	12	37.5	3-yr ave annual
220		F1D		462726	4612870	49.9872	15.999	12	69.5	3-yr ave annual
221	AMUSA	171A	IH7 Casthouse Fugitives	464721	4614598	21.9456	7.6352	19.56	0	
222	AMUSA	171B	IH7 Casthouse Fugitives	464731	4614598	21.9456	7.6352	19.56	0	

Lake County DRR Source Modeling Inventory
Volume Sources

	Company	Source ID	Source Description	East (X)	North (Y)	Release Height	Initial Horizontal Dimension	Initial Vertical Dimension	SO2 Emissions	Emission Determination CEM/Varying/Annual
				(m)	(m)	(m)	(m)	(m)	(tpy)	
223	AMUSA	171C	IH7 Casthouse Fugitives	464741	4614598	21.9456	7.6352	19.559	0	
224	AMUSA	171D	IH7 Casthouse Fugitives	464751	4614598	21.9456	7.6352	19.559	0	
244	AMBH	PFE101		488022.5	4608137.9	16.43	13.6	7.65	0.465817359	3-yr ave annual
245	AMBH	PFE102		488023.4	4608163.5	16.43	13.6	7.65	0.465817359	3-yr ave annual
246	AMBH	PFE103		488022.8	4608185.1	16.43	13.6	7.65	0.465817359	3-yr ave annual
247	AMBH	PFE104		488023.1	4608208.7	16.43	13.6	7.65	0.465817359	3-yr ave annual
248	AMBH	PFE105		488024.3	4608231.3	16.43	13.6	7.65	0.465817359	3-yr ave annual
249	AMBH	PFE201		488012.9	4608305.6	16.43	13.6	7.65	0.465817359	3-yr ave annual
250	AMBH	PFE202		488013.2	4608327.3	16.43	13.6	7.65	0.465817359	3-yr ave annual
251	AMBH	PFE203		488012.7	4608349.1	16.43	13.6	7.65	0.465817359	3-yr ave annual
252	AMBH	PFE204		488013.1	4608375.5	16.43	13.6	7.65	0.465817359	3-yr ave annual
253	AMBH	PFE205		488013.9	4608397.5	16.43	13.6	7.65	0.465817359	3-yr ave annual
258	AMBH	BFDCHFUG		488240	4609560	24.7	21.4	3.5	14.53072061	3-yr ave annual
259	AMBH	BFCCHFUG		488242	4609426	24.7	21.4	3.5	14.53072061	3-yr ave annual

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ENCLOSURE 3

Carmeuse Commissioner's Order

Indiana Department of Environmental Management
We Protect Hoosiers and Our Environment.
100 N. Senate Avenue • Indianapolis, IN 46204
(800) 451-6027 • (317) 232-8603 • www.idem.IN.gov

Michael R. Pence
Governor

Carol S. Comer
Commissioner

STATE OF INDIANA	)	SS:	BEFORE THE INDIANA DEPARTMENT
COUNTY OF MARION	)		OF ENVIRONMENTAL MANAGEMENT
	)		

IN THE MATTER OF:)
ORDER OF THE COMMISSIONER)
PURSUANT TO IC 13-14-2-1)
FOR CARMEUSE LIME INC.)

NOTICE AND ORDER OF THE COMMISSIONER OF THE DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

This Notice and Order of the Commissioner of the Department of Environmental Management ("Order") is issued pursuant to Indiana Code ("IC") 13-14-1-9, IC 13-14-2-1, and IC 13-14-2-7. During the Commissioner's review, it was determined that the Petition should be granted according to the terms specified below:

PETITION

Petitioner is Carmeuse Lime, Inc. ("Carmeuse" or "Petitioner"), a stationary lime manufacturing plant with Source I.D. Number 089-00112, located at 1 North Carmeuse Drive in Gary, Lake County, Indiana, and permitted under the Part 70 air operating permit program.

The United States Environmental Protection Agency (U.S. EPA) published the final Data Requirements Rule (DRR) for the 2010 1-hour SO_2 Primary National Ambient Air Quality Standard (NAAQS), in the *Federal Register* on August 21, 2015 (80 FR 51052). The DRR was promulgated in order to establish minimum requirements for air agencies to characterize 1-hour SO_2 air quality concentrations across the country, with an emphasis on doing so in the vicinity of sources that have the largest annual SO_2 emissions to aid in the implementation of the 2010 primary 1-hour SO_2 standard. Implementation of the new 1-hour SO_2 standard began in 2013 when U.S. EPA established nonattainment areas based on monitoring data. On March 2, 2015, U.S. EPA entered into a federal Consent Decree with the Sierra Club and Natural Resources Defense Council (NRDC) that established a timeline for the completion of air quality characterizations and designations in all remaining areas of the country. The Consent Decree required U.S. EPA to complete the designations in three additional rounds: Round 2 by July 2, 2016, Round 3 by December 31, 2017, and Round 4 by December 31, 2020.

On January 7, 2016, Indiana submitted to U.S. EPA a list of 11 stationary sources for air quality characterization pursuant to the DRR requirements as part of the Round 3 designation process. The DRR considers air dispersion modeling and ambient air monitoring appropriate ways to assess local SO_2 concentrations and the DRR also provides states with a third option to establish a permanent and federally enforceable facility-wide limit on SO_2 emissions from a listed source to below 2,000 tons per year. A source that limits its SO_2 emissions under the third option is not subject to the requirements for air quality characterization. Though the Petitioner is not one of the 11 stationary sources listed by IDEM and its SO_2 emissions are less than 2,000 tons per year, it has been identified by IDEM as a source that could impact overall SO_2 air quality in the area surrounding it.

On November 16, 2016, the Petitioner submitted a request to the Commissioner to impose permanent and enforceable SO_2 requirements on the Petitioner in order to ensure continued attainment of the 2010 1-hour SO_2 NAAQS in the area surrounding Carmeuse.

By January 13, 2017, the Indiana Department of Environmental Management ("IDEM") intends to recommend that Lake County be designated as attainment for the 2010 1-hour SO_2 NAAQS. The recommendation will be based on modeling that includes, among other requirements, permanent and enforceable SO_2 requirements at Carmeuse.

The Petitioner proposed that it be required to comply with emission rates for Rotary Kilns EU-1, EU-2, EU-3, EU-4, and EU-5 that would provide for modeled attainment of the 2010 1-hour SO_2 NAAQS.

FINDINGS

Pursuant to IC 13-14-2-1(b) and IC 13-14-2-7(1), the Commissioner may issue Orders to secure compliance with Indiana's environmental statutes and rules, and to impose emission limitations or other restrictions to demonstrate attainment of the ambient air quality standards, including the ambient air quality standard for SO_2 at 326 Indiana Administrative Code ("IAC") 1-3-4(b)(1)(A).

Petitioner's proposal and this Order are intended to support IDEM's intended recommendation that Lake County be designated as attainment for the 2010 1-hour SO_2 NAAQS.

Based on the foregoing information, IDEM finds the following:

1. Permanent and enforceable SO_2 emission requirements for Carmeuse are required in order to model continued attainment of the 2010 1-hour SO_2 NAAQS in areas surrounding the Petitioner.

2. Adding SO_2 emission requirements to the Petitioner's Part 70 Operating Permit is not adequately permanent to assure continued attainment of the 2010 1-hour SO_2 NAAQS. An Order of the Commissioner of IDEM is required to ensure SO_2 emission requirements remain permanent and enforceable, as required by 42 U.S.C. § 7407(d)(3)(E)(iii).

3. Approval by U.S. EPA of the Commissioner's Order into the Indiana State Implementation Plan ("SIP") is required to make the Order requirements federally enforceable. Upon approval into the Indiana SIP, the Order requirements become applicable requirements as defined in 326 IAC 2-7-1(6).

4. Based on modeling conducted by IDEM, the SO_2 emission rates in Order paragraph 2 are adequate to assure continued attainment of the 2010 1-hour SO_2 NAAQS.

ORDER

1. This Order approves the Petition submitted by the Petitioner according to the terms specified below. This Order imposes on Petitioner the SO_2 emission requirements described below.

2. Requirements:

   a. The SO_2 emissions from Rotary Kilns EU-1, EU-2, EU-3, EU-4, and EU-5 shall not exceed nine and forty-eight hundredths (9.48) pounds per hour, each, calculated as a rolling seven hundred and twenty (720) operating hour average, per kiln.

3. The Petitioner shall comply with the requirements in Order paragraph 2, beginning seven (7) calendar days from the issuance of the permit modification required to allow the use of natural gas within the affected kilns, but no earlier than January 31, 2017.

4. As required by 326 IAC 2-7-2(d)(1) and 326 IAC 2-7-5, the Petitioner shall apply to incorporate these Order requirements as set for forth in Order paragraphs 2 and 5 into its Part 70 Operating Permit within thirty (30) days of the effective date of U.S. EPA's approval of the requirements contained within this Commissioner's Order into the State Implementation Plan.

5. The Petitioner shall comply with the reporting, stack testing, compliance determination and recordkeeping requirements specified in this paragraph beginning seven (7) calendar days from the issuance of the permit modification required to allow the use of natural gas within the affected kilns, but no earlier than January 31, 2017.

   a. Reporting: The Petitioner shall submit to IDEM, on a quarterly basis, a report of the SO_2 emissions in pounds per hour from each of Rotary Kilns #1 through #5 (EU-1 through EU-5) on a rolling seven hundred and twenty (720) operating hour average calculated for each kiln. Each report will be submitted not later than thirty (30) days after the end of the calendar quarter being reported.
   b. Stack Testing: The Petitioner shall perform SO_2 testing of Rotary Kilns #1 through #5 (EU-1 through EU-5) utilizing methods approved by the Commissioner at least once every thirty (30) months from the date of the most recent valid stack test. The testing is required in order to develop the SO_2 scrubbing factors used to demonstrate compliance with the SO_2 emission rates in Order paragraph 2. Testing shall be conducted in accordance with the provisions of 326 IAC 3-6 (Source Sampling Procedures). Permit Condition C.8, Performance Testing, in Title V Permit No. T089-34191-00112 contains Petitioner's obligation with regard to the performance testing required herein. Representative sampling of the as-fed limestone, coal, engineered fuel (EF), and glycerin shall be conducted during each stack test run and the sulfur content analysis of the collected samples shall be included in the stack test report for development of the SO_2 scrubbing factor. Material sampling (as-fed during test) and analysis methods shall be included in the test protocol submitted to OAQ. Stack testing shall be conducted with limestone representative of the material processed in the kiln (dolomitic limestone or high calcium limestone). Testing shall be conducted for both dolomitic limestone and high calcium limestone if the kiln is used or is anticipated to be used to process both. The initial SO_2 stack test for each kiln shall occur no later than 180 days from the effective date as determined in Order paragraph 3. For kilns that process both dolomitic limestone and high calcium

limestone, the stack test for the second product processed in the kiln shall occur by the later of 180 days from the effective date as determined in Order paragraph 3 or 90 days after the second product is first processed, whichever occurs last.

c. Compliance determination: Petitioner shall demonstrate compliance with the SO_2 emission rates in Order paragraph 2 above as follows:

<u>Sampling, Analysis and Calculations:</u>

(i) Sampling: Each shipment of limestone, glycerin, engineered fuel (EF), and coal is sampled and analyzed by an independent laboratory, utilizing American Society for Testing and Materials (ASTM) standards for sampling and chemical analysis. The certified analyses that accompany each shipment shall be the source of the data of the sulfur content in both the limestone and coal calculation of the hourly SO_2 emissions for reporting. Either a certificate of analysis or certification that the EF complies with Carmeuse's specifications will be the source of the data of the sulfur content in the EF for calculation of the hourly SO_2 emissions for reporting. Information concerning the sulfur content of pipeline quality natural gas shall be the source of the data of the sulfur content in the natural gas. Pursuant to 326 IAC 7-4.1-2(c), the current sampling and analysis protocol to be used in lieu of certified analyses, certificates of analysis, or certification of compliance with Carmeuse's specifications for limestone, coal, glycerin, and/or EF is as follows:

(a) The sample acquisition points shall be at locations where representative samples of the respective material shipments may be obtained.

(b) Minimum sample size shall be in accordance with ASTM specifications for representative samples in the size fraction and quantity delivered.

(c) Samples shall be composited and analyzed in accordance with ASTM specifications.

(1) For limestone, a sample shall be taken for each boat/barge load received and analyzed.

(2) For glycerin, a sample shall be taken for each truck load received and analyzed.

(3) For EF, analysis of a composite sample consisting of each truck load received per month.

(4) For coal, a sample shall be taken for each rail load received and analyzed.

(d) Preparation of the sample and sulfur content analysis, where applicable, shall be determined pursuant to 326 IAC 3-7-2(c), (d), and (e).

(ii) For each kiln, the Petitioner shall calculate the SO_2 scrubbing factor for each product type as follows:

Scrubbing Factor (SF) $_{Kiln(i) / Product(i)}$ = 1- [$SO_{2, stack\ test(i)}$ / ($S_{input\ STest(i)}$ *2 * 2000)]

Where, for purposes of this paragraph 5.c.(ii), $S_{input\ STest(i)}$ =
[(%$S_{limestone\ STest(i)}$ x $Usage_{limestone\ STest(i)}$) / 100] +
[(%$S_{coal\ STest(i)}$ x $Usage_{coal\ STest(i)}$) / 100]+
[(%$S_{glycerin\ STest(i)}$ x $Usage_{glycerin\ STest(i)}$) / 100]+
[(%$S_{EF\ STest(i)}$ x $Usage_{EF\ STest(i)}$) / 100] +
[($S_{natural\ gas\ STest(i)}$ x $Usage_{natural\ gas\ STest(i)}$) / (7000 x 2000)]

%$S_{STest(i)}$ = weight percent sulfur in limestone, coal, glycerin or EF inputs, as applicable, as determined by sampling and analysis for the respective material input during the most recent valid stack test for Kiln(i) for the applicable product type (Product(i)).

$S_{natural\ gas\ STest(i)}$= sulfur content of natural gas (grains/dscf) during the most recent valid stack test for Kiln(i) for the applicable product type (Product(i)).

$Usage_{STest(i)}$ = average limestone, coal, glycerin, EF or natural gas input to the kiln during the most recent valid stack test for Kiln(i) for the applicable product type (Product(i)) in tons/hr or dscf/hr as applicable.

The Petitioner shall recalculate the scrubbing factor within thirty (30) days after receiving the results of the most recent valid stack test for SO_2 for Kiln(i) for the applicable product type (Product(i)).

(iii) The Petitioner shall calculate hourly SO_2 emissions (lb/hr) for each of Rotary Kilns #1 through #5 (EU-1 through EU-5) by the following calculations using the input values determined in Order paragraphs 5.c.(i) and 5.c.(ii) above:

$$SO_2\ Emissions_{Kiln\ (i)}\ (lb/hr)\ =\ (1 - SF_{Kiln(i)/Product(i)})\ x\ S_{Input}\ x\ 2\ x\ 2000$$

Where

$SF_{Kiln(i)/Product(i)}$ = Scrubbing Factor value determined in Order paragraph 5.c.(ii) from most recent valid stack test for Kiln(i) for the applicable product type (Product(i)) for which the total sulfur input during the test was the same as or greater than the total sulfur input for the hour. If the total sulfur input for the hour is greater than the total sulfur input during the most recent valid stack test for Kiln(i) for the applicable product type (Product(i)), then the Scrubbing Factor value used shall be the value determined based on the results of the most recent prior valid stack test for Kiln(i) for the applicable product type (Product(i)) for which the total sulfur input during the test was the same as or greater than the total sulfur input for the hour.

Hour of operation is defined as any hour that fuel is being combusted within the affected kiln(s).

For the time period beginning seven (7) calendar days from the issuance of the permit modification required to allow the use of natural gas within the affected kilns, but no earlier than January 31, 2017 and the completion of the initial stack testing discussed in Order paragraph 5.b for each kiln and product type, Petitioner shall continue to use the existing scrubbing factors to calculate SO_2 emissions. However, following the development of new scrubbing factors based on the results of the initial stack tests for each kiln and product type, Petitioner shall recalculate the SO_2 emissions for the period beginning seven (7) calendar days from the issuance of the permit modification required to allow the use of natural gas within the affected kilns, but no earlier than January 31, 2017 to the date the new scrubbing factors were determined using the new scrubbing factors. If Petitioner has filed reports as required by Order paragraph 5.a based on the existing scrubbing factors, Petitioner shall submit revised reports based on the use of the new scrubbing factors.

When limestone or product is NOT present in a kiln, the SF shall be equal to zero (0).

For purposes of this paragraph 5.c.(iii), S_{input} = [(%$S_{limestone}$ x Hourly Input $_{limestone}$) / 100] +
[(%S_{coal} x Hourly Input $_{coal}$) / 100]+
[(%$S_{glycerin}$ x Hourly Input $_{glycerin}$) / 100]+
[(%S_{EF} x Hourly Input $_{EF}$) / 100] +
[($S_{natural\ gas}$ x Hourly Input $_{natural\ gas}$) / (7000 x 2000)]

%S = weight percent sulfur in limestone, coal, glycerin or EF inputs, as applicable, as determined by the most recent vendor analysis or sampling, in accordance with 5.c.(i) - Sampling above.

$S_{natural\ gas}$ = sulfur content of natural gas (grains/dscf).

Hourly Input = limestone, coal, glycerin, EF or natural gas input to the kiln in tons/hr or dscf/hr as applicable.

(iv) The Petitioner shall calculate the rolling seven hundred and twenty (720) operating hour average SO_2 emissions (lbs/hr) for each Rotary Kiln #1 through #5 (EU-1 through EU-5) by adding the hourly SO_2 emissions calculated in Order paragraph 5.c.(iii) for each Rotary Kiln to the preceding seven hundred and nineteen (719) hours of operation for each rotary kiln, then divide by seven hundred and twenty (720) to derive the rolling average emissions per kiln per averaging period.

d. Recordkeeping: The Petitioner shall maintain records of the sampling and analysis of raw material and fuels, certifications, other documentation, and the equations used to demonstrate compliance with the emission requirements in Order paragraph 2. These records shall be retained for a period of at least five (5) calendar years.

This Order shall apply to and be binding upon the Petitioner, its successors and assigns. No change in ownership, corporate, or partnership status of the Petitioner shall in any way alter its status or responsibilities under this Order.

Nothing in this Order shall prohibit future revisions to the emission rates in Order paragraph 2, including increases in such emission rates, provided such future revisions demonstrate continued attainment of the 1-hour SO_2 NAAQS, satisfy the requirements in Section 110(l) of the Clean Air Act (42 U.S.C. §7410(l)), and any necessary revisions to the applicable regulations and SIP are obtained.

EFFECTIVE DATE OF ORDER

Pursuant to IC 13-14-2-1(d), IC 4-21.5-3-1, IC 4-21.5-3-5(a)(6), and 40 CFR 51.102, IDEM will give notice of this Order to each entity to whom the Order is directed and affected neighbors by mailing and to the general public by publication.

Pursuant to IC 4-21.5-3-7(a)(3), IC 4-21.5-3-2(e), and IC 4-21.5-3-5, this Order may be appealed by a Petition for review within eighteen (18) days after the date affected persons were given notice of the Order by U.S. mail. Information on petitions for review of this Order can be found at IC 4-21.5-3-7 and 315 IAC 1-3-2.

Pursuant to IC 4-21.5-3-5(f) and IC 4-21.5-3-2(e), this Order is effective eighteen (18) days from mailing of the notice unless a Petition for review has been filed before or on the eighteenth (18^{th}) day. However, the compliance date for the SO_2 emission requirements in Order paragraph 2 begins seven (7) calendar days from the issuance of the permit modification required to allow the use of natural gas within the affected kilns, but no earlier than January 31, 2017.

Pursuant to 40 CFR 51.103, IDEM will submit this Order to U.S. EPA as a revision to the Indiana SIP. Upon approval by the U.S. EPA, this Order will be part of the Indiana SIP.

Persons seeking judicial review of this Order may do so in accordance with IC 4-21.5-5.

If you have procedural or scheduling questions regarding your request for review, you may contact the Office of Environmental Adjudication at (317) 232-8591. If you have questions regarding this Order, please contact Betsy Zlatos, Office of Legal Counsel, by telephone at (317)233-5645 or email at bzlatos@idem.IN.gov.

Dated at Indianapolis, Indiana this 16th day of November, 2016.

Carol S. Comer
Commissioner
Indiana Department of Environmental Management

ENCLOSURE 4

SABIC Commissioner's Order

Indiana Department of Environmental Management
We Protect Hoosiers and Our Environment.
100 N. Senate Avenue • Indianapolis, IN 46204
(800) 451-6027 • (317) 232-8603 • www.idem.IN.gov
Michael R. Pence, *Governor*
Carol S. Comer, *Commissioner*

STATE OF INDIANA COUNTY OF MARION	) SS:	BEFORE THE INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

IN THE MATTER OF:)
ORDER OF THE COMMISSIONER)
PURSUANT TO IC 13-14-2-1)
FOR SABIC INNOVATIVE PLASTICS)
MT. VERNON, LLC)

NOTICE AND ORDER OF THE COMMISSIONER OF THE INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

On September 9, 2016, SABIC Innovative Plastics Mt. Vernon, LLC (SABIC) submitted a Petition to the Commissioner of the Indiana Department of Environmental Management (IDEM) that requested that the Commissioner limit the emissions of Sulfur Dioxide (SO_2) from SABIC's Mt. Vernon plant. The purpose of the petition request was to allow SABIC to limit its SO_2 emissions below the applicability threshold of the federal SO_2 Data Requirements Rule at 40 CFR 51 Subpart BB and concurrently ensure compliance with the 2010 1-hour SO_2 National Ambient Air Quality Standard (NAAQS). The Commissioner has determined that the Petition should be granted according to the terms specified below:

LEGAL BACKGROUND

SABIC Innovative Plastics Mt. Vernon, LLC owns a stationary integrated plastics and engineering resin manufacturing facility with Source I.D. Number 129-00002, located at 1 Lexan Lane in Mount Vernon, Posey County, Indiana, and permitted under the Part 70 air operating permit program.

The United States Environmental Protection Agency (U.S. EPA) published the final Data Requirements Rule (DRR) for the 2010 1-hour SO_2 Primary National Ambient Air Quality Standard (NAAQS), in the *Federal Register* on August 21, 2015 (80 FR 51052). The DRR was promulgated in order to establish minimum requirements for air agencies to characterize 1-hour SO_2 air quality concentrations across the country, with an emphasis on doing so in the vicinity of sources that have the largest annual SO_2 emissions to aid in the implementation of the 2010 primary 1-hour SO_2 standard. Implementation of the new 1-hour SO_2 standard began in 2013 when U.S. EPA established nonattainment areas based on monitoring data. On March 2, 2015, U.S. EPA entered into a federal Consent Decree with the Sierra Club and Natural Resources Defense Council (NRDC) that established a timeline for the completion of air quality characterizations and designations in all remaining areas of the country. The Consent Decree required U.S. EPA to complete the designations in three additional rounds: Round 2 by July 2, 2016, Round 3 by December 31, 2017, and Round 4 by December 31, 2020.

On January 7, 2016, Indiana submitted to U.S. EPA a list of 11 stationary sources, including SABIC, for air quality characterization pursuant to the DRR requirements as part of the Round 3 designation process. The DRR considers air dispersion modeling and ambient air monitoring appropriate ways to assess local SO_2 concentrations and the DRR also provides states with a third option to establish a permanent and federally enforceable facility-wide limit on SO_2 emissions from a listed source to below 2,000 tons per year. A source that limits its SO_2 emissions under the third option is not subject to the requirements for air quality characterization.

Indiana informed U.S. EPA on June 30, 2016 that SABIC had selected the DRR modeling option to characterize the ambient air quality in the area. Subsequently, Indiana has learned that modifications made at the SABIC facility due to a Co-Gen project that was permitted as PSD/Significant Source Modification No.: 129-33998-00002 and issued on November 20, 2014 have resulted in the reduction of potential SO_2 emissions at the facility.

On September 9, 2016, SABIC submitted a request to the Commissioner to impose permanent and federally enforceable SO_2 emission limitations and emission rates on SABIC in order to ensure continued attainment of the SO_2 NAAQS in the area surrounding SABIC. SABIC proposed SO_2 emission limitations, applicable to specific emissions units and source-wide, as follows:

a. Limitation on source-wide SO_2 emissions of 2,000 tons per year;

b. Limitation on SO_2 emissions from 08-706 COS Vent Oxidizer and 08-708 COS Flare;

c. Limitation on sulfur content of diesel fuel used in diesel-powered engines; and

d. Limitation requiring coal-fired boilers (01-001 BW1-BOILER, 01-001 BW2-BOILER and 09-002 E-BOILER) at the facility to permanently cease operation prior to January 13, 2017.

Pursuant to IC 13-14-2-1(b) and IC 13-14-2-7(1), the Commissioner may issue Orders to secure compliance with Indiana's environmental statutes and rules, including the ambient air quality standard for SO_2 at 326 Indiana Administrative Code ("IAC") 1-3-4(b)(1)(A).

FINDINGS

Based on the foregoing information, IDEM, through its Commissioner, finds the following:

1. Permanent and enforceable SO_2 emission limitations and emission rates for SABIC are required that limit SO_2 emissions in order to provide assurance of attainment of the 2010 1-hour SO_2 NAAQS in the area surrounding SABIC's facility without continued assessment of the SO_2 concentrations through air dispersion modeling or ambient air monitoring.

2. Adding SO_2 emission limitations and emission rates to SABIC's Part 70 Operating Permit, while federally enforceable, is not permanent and, therefore, is not adequate to assure continued attainment of the SO_2 NAAQS. An Order of the Commissioner of IDEM (Order) is

required to ensure SO_2 emission limitations and emission rates remain permanent and enforceable, as required by 42 U.S.C. § 7407(d)(3)(E)(iii).

3. In addition, the approval by U.S. EPA of the Order into the Indiana State Implementation Plan ("SIP") is required to make the Order requirements permanent and federally enforceable. Upon approval into the Indiana SIP, the Order requirements become applicable requirements as defined in 326 IAC 2-7-1(6).

4. Based on modeling conducted by IDEM, the SO_2 emission limitations and emission rates proposed by SABIC were clarified and adjusted in order to assure continued attainment of the 1-hour SO_2 NAAQS. The annual source-wide SO_2 limitation of 2,000 tons was not necessary in order to demonstrate compliance with the DRR.

This Notice and Order of the Commissioner of the Indiana Department of Environmental Management (Order) is issued pursuant to Indiana Code (IC) 13-14-1-9, IC 13-14-2-1, and IC 13-14-2-7.

ORDER

1. SO_2 emission limitations and emission rates are set forth below for the following emission units: 01-101 NE BOILER, 01-014 BW GAS, 08-706 COS Vent Oxidizer, 08-707 COS Flare, 12-701 H-790, 03-007 H-520, 03-008 H-530A, 03-008 H-530B, 12-169 H-390, 13-049 H-900, 13-321 H-900B, 13-155 SC-1/2, 04-063 H-7090, 04-050 H-6060, 08-001 F-972, 19-001 COGEN, 19-002 AUX BOILER, 19-003 AUX2 BOILER, 19-004 CG1 BOILER, 09-106 R BOILER.

2. The COS Vent Oxidizer and the COS Flare shall not exceed the following SO_2 emission rates:

   a. 415 lb/hr, one (1) hour average; and

   b. 269.21 lb/hr, twenty-four (24) hour rolling average, based on daily coke usage and daily sulfur input.

3. The NE BOILER (01-101) shall not exceed an SO_2 emission rate of 0.15 lb/hr, one (1) hour average.

4. The BW GAS (01-014) shall not exceed an SO_2 emission rate of 0.15 lb/hr, one (1) hour average.

5. The H-790 (12-701) shall not exceed an SO_2 emission rate of 0.02 lb/hr, one (1) hour average.

6. The H-520 (03-007) shall not exceed an SO_2 emission rate of 0.0045 lb/hr, one (1) hour average.

7. The H-530A (03-008) shall not exceed an SO_2 emission rate of 27.8 lb/hr, one (1) hour average.

8. The H-530B (03-008) shall not exceed an SO_2 emission rate of 27.8 lb/hr, one (1) hour average.

9. The H-390 (12-169) shall not exceed an SO_2 emission rate of 0.0102 lb/hr, one (1) hour average.

10. The H-900 (13-049) shall not exceed an SO_2 emission rate of 1.86 lb/hr, one (1) hour average.

11. The H-900B (13-321) shall not exceed an SO_2 emission rate of 0.0188 lb/hr, one (1) hour average.

12. The SC 1/2 (13-155) shall not exceed an SO_2 emission rate of 0.0008 lb/hr, one (1) hour average.

13. The H-7090 (04-063) shall not exceed an SO_2 emission rate of 0.00235 lb/hr, one (1) hour average.

14. The H-6060 (04-050) shall not exceed an SO_2 emission rate of 0.00153 lb/hr, one (1) hour average.

15. The F-972 (08-001) shall not exceed an SO_2 emission rate of 0.518 lb/hr, one (1) hour average.

16. The COGEN (19-001) shall not exceed an SO_2 emission rate of 1.17 lb/hr, one (1) hour average.

17. The AUX BOILER (19-002) shall not exceed an SO_2 emission rate of 0.15 lb/hr, one (1) hour average.

18. The AUX2 BOILER (19-003) shall not exceed an SO_2 emission rate of 0.15 lb/hr, one (1) hour average.

19. The CG1 BOILER (19-004), if constructed, shall not exceed an SO_2 emission rate of 0.15 lb/hr, one (1) hour average.

20. The R BOILER (09-106) shall not exceed an SO_2 emission rate of 0.11 lb/hr, one (1) hour average.

21. To achieve the SO_2 emission rate and emission limitation in Paragraph 2.a, daily sulfur input to the carbon monoxide generators, identified as COG1, COG2, COG3, COG4, COG5, COG6, COG7, COG8, COG9, COG10, COG11, COG12, COG13, COG14, COG15, and COG16, shall be limited to no more than 2.49 tons per day.

22. All site emergency generators and pumps, standby energy curtailment diesel generators and mobile diesel units, temporary and portable emergency generators shall operate on No. 2 diesel fuel containing 15 parts per million (ppm) by weight or less of sulfur.

23. SABIC shall comply with the SO_2 emission limitations and emission rates, and the No. 2 diesel fuel sulfur content limit, beginning January 13, 2017.

24. As required by 326 IAC 2-7-2(d)(1) and 326 IAC 2-7-5, SABIC shall apply to incorporate Order requirements, including reporting and recordkeeping requirements and methods to determine compliance, into its Part 70 Operating Permit within ninety (90) days of U.S. EPA approval of the Commissioner's Order into the Indiana SIP.

25. From January 13, 2017 until IDEM issues a Permit incorporating Order requirements, SABIC shall comply with the reporting and recordkeeping requirements and methods to determine compliance specified in this paragraph.

a. Reporting: SABIC shall submit to IDEM, on a quarterly basis, a report of the daily coke input and corresponding sulfur content for the COS Vent Oxidizer and COS Flare.

b. Recordkeeping: SABIC shall maintain records of daily coke input and corresponding sulfur content, and sulfur content of No. 2 diesel fuel.

c. Method to determine compliance: Compliance shall be determined on a daily basis, based on 326 IAC 3-5.

i. Daily sulfur input for the group of carbon monoxide generators (COG1-16), calculated by taking the daily coke usage and multiplying by the percent weight of corresponding sulfur content.

ii. The sulfur content of the coke used in the carbon monoxide generators shall be analyzed daily as received (vendor delivery analysis may be used, approved by IDEM on 08/01/2005) for each day the carbon monoxide generators operate.

iii. Actual fuel usage for natural gas, diesel and fuel oil and liquid waste fuel-fired emission units or, in the alternative, the maximum design fuel usage.

26. This Order shall apply to and be binding upon SABIC, its successors and assigns. No change in ownership, corporate, or partnership status of SABIC shall in any way alter its status or responsibilities under this Order.

27. The requirements of this Order supersede any less stringent requirements applicable to SABIC.

EFFECTIVE DATE OF ORDER

Pursuant to IC 13-14-2-1(d), IC 4-21.5-3-1, IC 4-21.5-3-5(a)(6), and 40 Code of Federal Regulations ("CFR") 51.102, IDEM will give notice of this Order to each entity to whom the Order is directed and affected neighbors by mailing and to the general public by web publication.

Pursuant to IC 4-21.5-3-7(a)(3), IC 4-21.5-3-2(e), and IC 4-21.5-3-5, this Order may be appealed by filing a Petition for review within eighteen (18) days after the date affected persons were given notice of the Order by U.S. mail. Information on petitions for review of this Order can be found at IC 4-21.5-3-7.

Pursuant to IC 4-21.5-3-5(f) and IC 4-21.5-3-2(e), the Order is effective eighteen (18) days from mailing of notice unless a Petition for review has been filed before or on the eighteenth (18^{th}) day. However, the compliance date for the emission limitations in this Order is January 13, 2017.

Pursuant to 40 CFR 51.103, IDEM will submit this Order to U.S. EPA as a revision to the Indiana SIP. Upon approval by the U.S. EPA, this Order will be part of the Indiana SIP.

Persons seeking judicial review of this Order may do so in accordance with IC 4-21.5-5.

If you have procedural or scheduling questions regarding your request for review, you may contact the Office of Environmental Adjudication at (317) 232-8591. If you have questions regarding this Order, please contact Mark Derf, Office of Air Quality, by telephone at (317) 233-5682 or email at MDERF@idem.IN.gov.

Dated at Indianapolis, Indiana this 20th day of October, 2016.

Carol S. Comer
Commissioner
Indiana Department of Environmental Management

Attachment 3

U.S. Mineral Products (Isolatek) Discussion

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U.S. Mineral Products (Isolatek - Source ID: 069-00021)

The Indiana Department of Environmental Management (IDEM) excluded U.S. Mineral Products (USM) d/b/a Isolatek International, a mineral wool manufacturer near Huntington, Indiana in Huntington County, from its January 7, 2016 list of affected sources to be characterized under the Data Requirements Rule (DRR). Per the thresholds established within the DRR, USM's most current reported sulfur dioxide (SO_2) emissions were well below levels required for the rule to be applicable. However, United States Environmental Protection Agency (U.S. EPA) identified USM as an additional source to be characterized in its March 25, 2016 response to IDEM.

Indiana strongly objects to the inclusion of USM as an affected source under the DRR. The DRR defines applicable sources as stationary sources that had actual SO_2 emissions in 2014 of 2,000 tons or more, or have been identified by IDEM or U.S. EPA "as requiring further air quality characterization." (40 CFR § 51.1202). Indiana did not include USM on its list of sources subject to the DRR because its reported actual SO_2 emissions in 2014 were 164 tons, less than one tenth of the DRR threshold of 2,000 tons or more. According to U.S. EPA's calculations (based on an informal in-house 2007 stack test), USM's actual annual emissions would have been "approximately 444 tons of SO_2" in 2014. U.S. EPA also determined that 2014 was an abnormally low year for production and estimated 800 tons of SO_2 per year during normal production years, which is still less than half the DRR emission threshold. USM has seen a downturn since 2013 in its wool production (approximately 40,000 tons/year could be considered a prior normal), with a slight bounce back to 28,000 to 30,000 tons per year production over the last few years. This is still much lower than historic production, but should be considered the current normal production at the facility based upon current economic factors with the economy.

USM has operated the same equipment at its Huntington facility since 1982. In its March 25, 2016, letter, U.S. EPA indicated an emission factor of 21.6 lb SO_2 per ton of melt was appropriate for the USM cupola emissions. USM has historically used an emission factor of 8 lbs/ton based upon U.S. EPA's Compilation of Air Pollutant Emission Factors, AP-42.[1] As a result of a Clean Air Act (CAA) §114 information request, USM submitted to U.S. EPA, a summary sheet from stack tests previously conducted which included some engineering studies from 2007 and several pages from the 2007 study report for in-house testing of particulate matter (PM), nitrogen oxides (NO_x) and SO_2 at the facility. That study included an informational emission test for SO_2 for the cupola that was only performed in the downdraft ducts. The results were reported in the summary sheet and in the study report. USM does not consider 21.6 lbs/ton

[1] An emission factor of 0.2 lbs/hr was used from 2000 through 2005 as a result of an error in the data used for the annual emission calculation. When the correction was made in 2005, IDEM advised USM that it was not necessary to correct the prior emission statements.

to be a valid SO_2 emission factor due to problems with the cupola operation at the time of the informal test. It should be noted that IDEM did not review or approve of an SO_2 stack test protocol in 2007 for USM and had no compliance inspector present at the informal SO_2 test. According to production records available for the time period on and around the stack testing days in December 2007, the following may be concluded as summarized by USM:

On Dec 17th, the first day of the testing, both cupolas were idled in the morning for a period exceeding 2 hours each due to an electrical problem with a charge hoist. In addition, #1 cupola idled for 3 hours directly preceding the hoist issue due to a spinner motor failure. Typically, following an idle period of time, the cupola operating conditions take some time (could easily be several hours) to stabilize. Thus, the testing period started with less than normal conditions.

On Dec 18th, during the period of the testing for SO_2 data collection, #1 cupola went through a period of increased coke consumption and reduced melt rate. Both indicators were showing a variation from standard coke consumption and melt rate in the 10% - 20% order of magnitude. USM standard coke consumption is expected to be at ~320 – 340 lbs / ton of charge and the avg. melt rate at ~4.2 tons / hr. At the time of the stack test USM recorded an avg. of 360 – 380 lbs of coke / charge and a melt rate of ~3.9 tons / hr respectively. These variations are considered significant and clearly not normal operations. Those conditions are related and indicate that the operator was attempting to overcome the slower melt rate by adding additional coke to the charge. Based upon the increased coke consumption and slower melt rate, general operating conditions at the time of testing are best described as poor. The raw material receivers from that period of time indicate a higher than normal moisture content in received coke (10%-15% vs. standard of <7%) explaining the need for additional BTUs with every charge to evaporate the excess moisture. The low moisture content of coke is a critical factor to the cupola performance. During the period of time in 2007 around when the testing was performed, the USM coke supplier was struggling to provide a product with acceptable quality. The coke quality issues were caused by operational issues at the source. USM had no viable, alternative supply options at the time.

In order to resolve the emission factor issue, in 2016, USM conducted an engineering study of the cupola emissions. This consisted of an informational emission test that included SO_2 measured in the baghouse. That test indicated an SO_2 emission factor range of 9.22 to 9.36 lbs/ton. The results of the 2016 test confirm that the emission factor from AP-42 is appropriate to use for the USM mineral wool cupola operation. Additionally, the 164 tons of SO_2 reported as actual emissions for USM should be considered valid for DRR purposes. This is significantly lower than what U.S. EPA is attempting to rely upon in its analysis.

U.S. EPA identified the 2,000 ton threshold as an important indicator of the need for prioritized air quality characterization under the DRR. U.S. EPA set the threshold at a level "that prioritizes the resources that will be devoted to characterizing air quality near SO_2 sources nationally." (80

FR 51061). That threshold is already on "the lower end of the range of thresholds" of sources that have the potential to contribute to violations of the National Ambient Air Quality Standard (NAAQS) (80 FR 51061). Furthermore, that threshold "strikes a reasonable balance between the need to characterize air quality near sources that have a higher likelihood of contributing to a NAAQS violation and the analytical burden on air agencies." (80 FR 51061). U.S. EPA did not characterize the 2,000 ton threshold as an arbitrary number, but rather as an indicator of sources warranting prioritization of state and federal resources.

Because USM's actual SO_2 emissions and total potential-to-emit SO_2 emissions remain well below the 2,000 ton applicability threshold, it is unreasonable to place it among the sources that should be prioritized to determine if it contributes to violations of the NAAQS. Including sources with actual SO_2 emissions of less than one-tenth the 2,000 ton threshold represents a misapplication of the intent of the DRR to prioritize sources and resources. Indiana believes that this reinterpretation of the DRR inappropriately broadens the scope and purpose of this phase of the DRR. There are numerous sources across the United States that fall into a similar category as USM. In Indiana alone, there are thirty five (35) sources with reported actual emissions between that of USM and the 2,000 ton threshold. Among these is a manufacturer of mineral wool, with very similar operational characteristics, with reported actual emissions greater than that of USM, and sources located in densely populated areas with as much as ten times the reported emissions of USM, which happens to be located in a sparsely populated rural area. Based on familiarity with how the dispersion model handles certain operations, it is safe to assume that some of these sources would clearly pose a greater threat to the NAAQS and human health than USM. Therefore, U.S. EPA's identification of USM is clearly arbitrary and capricious.

Due to the time constraints that U.S. EPA has placed on states to implement the DRR, broadening the applicability of the DRR's phased approach thwarts the rule's intent to prioritize state and federal resources. IDEM does not question whether the DRR provides states or U.S. EPA the authority to identify sources with actual emissions below the 2,000 ton threshold as requiring further air quality characterization. However, if this is done, it should be done consistently and not arbitrarily. U.S. EPA did not use a systematic approach to identify sources below 2,000 tons that have the greatest probability to pose a risk to exceeding the NAAQS and threaten human health. Therefore, IDEM disagrees that USM should be arbitrarily subjected to further characterization under the DRR.

Table 1: U.S. Mineral Products (Isolatek) 2016 Stack Test Data

Table 1. Measured & Calculated Data-Melters' Process Line EU#1 & EU#2 CE#1 Baghouse

Summary of Stack Gas Parameters and Test Results
50668.0003
Isolatek
Baghouse
Page 1 of 2

	RUN NUMBER	1-O2	2-O2	O2
	RUN DATE	4/26/2016	4/26/2016	Average
	RUN START	11:30	12:50	
	RUN STOP	12:18	13:48	
	MEASURED DATA			
P_{static}	Stack Static Pressure, Inches H_2O	0.00	0.00	0.00
y	Meter Box Correction Factor	0.976	0.976	0.976
P_{bar}	Barometric Pressure, Inches Hg	29.95	29.95	29.95
V_m	Sample Volume, ft^3	48.165	49.453	48.809
$Dp^{1/2}$	Average Square Root Dp, (In. $H_2O)^{1/2}$	1.0948	1.1172	1.106
DH	Avg Meter Orifice Pressure, In. H_2O	3.271	3.402	3.336
T_m	Average Meter Temperature, °F	86.3	86.5	86.4
T_s	Average Stack Temperature, °F	230.3	231.3	230.8
V_{lc}	Condensate Collected, ml	16.0	13.0	14.50
CO_2	Carbon Dioxide content, % by volume	0.0	0.0	0.00
O_2	Oxygen content, % by volume	20.8	20.8	20.8
N_2	Nitrogen content, % by volume	79.2	79.2	79.2
C_p	Pitot Tube Coefficient	0.84	0.84	0.84
	Circular Stack? 1=Y,0=N:	1	1	
As	Diameter or Dimensions, Inches:	37.00	37.00	37.00
Q	Sample Run Duration, minutes	48	48	48
D_n	Nozzle Diameter, Inches	0.238	0.238	0.238
	CALCULATED DATA			
A_n	Nozzle Area, ft^2	0.000309	0.000309	0.000309
$V_{m(std)}$	Standard Meter Volume, ft^3	45.82	47.05	46.44
$V_{m(std)}$	Standard Meter Volume, m^3	1.298	1.332	1.315
Q_m	Average Sampling Rate, dscfm	0.955	0.980	0.967
P_s	Stack Pressure, Inches Hg	29.95	29.95	29.95
B_{ws}	Moisture, % by volume	1.6	1.3	1.5
$B_{ws(sat)}$	Moisture (at saturation), % by volume	142.1	145.0	143.6
V_{wstd}	Standard Water Vapor Volume, ft^3	0.753	0.612	0.683
$1-B_{ws}$	Dry Mole Fraction	0.984	0.987	0.985
M_d	Molecular Weight (d.b.), lb/lb•mole	28.83	28.83	28.83
M_s	Molecular Weight (w.b.), lb/lb•mole	28.66	28.69	28.67
V_s	Stack Gas Velocity, ft/s	70.5	72.0	71.2
A	Stack Area, ft^2	7.5	7.5	7.5
Q_a	Stack Gas Volumetric flow, acfm	31,587	32,238	31,912
Q_s	Stack Gas Volumetric flow, dscfm	23,786	24,320	24,053
Q_s	Stack Gas Volumetric flow, dscmm	674	689	681
I	Isokinetic Sampling Ratio, %	97.0	97.4	97.2

Table 2. PM, NO_x, CO, & SO_2 Emissions Test Results- Melters' Process Line EU#1 & EU#2 CE#1 Baghouse

Summary of Stack Gas Parameters and Test Results
50668.0003
Isolatek
US EPA Test Method 5 (PM), 6C (SO2), 7E(Nox), 10 (CO), 15/16 (H2S/COS), & 26A (HCL/HF)
Baghouse
Page 2 of 2

	RUN NUMBER	*1-O2*	*2-O2*	*O2*
	RUN DATE	*4/26/2016*	*4/26/2016*	*Average*
	RUN START	*11:30*	*12:50*	
	RUN STOP	*12:18*	*13:48*	
	EMISSIONS DATA			
	Throughput (tons/hr)	10.135	9.564	9.85
	Sulfur Dioxide			
SO_2	Concentration PPM Dry	393.67	368.85	381.26
E SO_2	Emission Rate, lb/hr	93.40	89.48	91.44
E SO_2	Emission Rate, lb/ton	9.22	9.36	9.29

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Attachment 4

Alcoa Warrick Attainment Discussion

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ALCOA Warrick Power Plant (Source ID: 173-00007) and Warrick Operations (Source ID: 173-00002)

Aluminum Manufacturing Company of America (ALCOA) operates an aluminum manufacturing facility and power plant in Newburgh, Indiana, along the northern bank of the Ohio River in Anderson Township, Warrick County. The Indiana Department of Environmental Management (IDEM) believes Warrick Power Plant and Warrick Operations and the surrounding area should be designated attainment based on historical sulfur dioxide (SO_2) ambient monitoring data showing attainment of the SO_2 standard.

Warrick Power and Warrick Operations were determined to be sources subject to United States Environmental Protection Agency's Data Requirements Rule (DRR) based on actual 2014 SO_2 emissions of 4,993 tons and 3,500 tons, respectively. However, Warrick Operations shut down its smelter operations as of March 31, 2016, and has therefore ceased to generate potline point SO_2 emissions, potline smelter line source SO_2 emissions, or SO_2 emissions from the anode baking ring furnace. Warrick Operations currently operates a rolling mill that uses natural gas and will generate SO_2 emissions of less than one ton per year.

Historical SO_2 data from monitors operated by ALCOA prior to the shut-down of the smelter show attainment of the 2010 primary SO_2 1-hour National Ambient Air Quality Standard (NAAQS). Tables 1 and 2 provide data from SO_2 monitors operated by ALCOA for several years prior to the smelting operation's shutdown. The tables also show data from the SO_2 monitor that IDEM operates in the region near the ALCOA Warrick facility.

As shown in the tables, all 99th percentile values since 2009 are below the 1-hour standard. In addition, the most recently available design value (2008 – 2010), and all recent partial-year design values, are also below the 1-hour standard. These low monitor values occurred during the time when the operations plant and the power plant were in full operation. As such, it is reasonable to conclude that the area surrounding the ALCOA Warrick facilities is in attainment of the 1-hour SO_2 NAAQS. As such, Indiana is recommending Anderson Township, Warrick County, Indiana as attainment.

Table 1: Warrick County SO_2 Monitor Data - 99th Percentile Values
(parts per billion) (2005 – 2016)

Site ID	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
IDEM Operated												
181630021	66	67	69	41	17	18.8	19.4	16.5	18.6	32.3	18	11 [a]
ALCOA Operated												
181730002	143	199	103	111	38	18	Not Operational				23	36 [b]
181730004	Not Operational										63	57 [b]
181730005	Not Operational										46	42 [b]
181730012	Not Operational										59	62 [b]

[a] – Data through July 31, 2016.

[b] – Data through June 30, 2016.

Table 2: Warrick County SO_2 Monitor Data – Design Values
(parts per billion) (2007 – 2016)

Site ID	2005 - 2007	2006 - 2008	2007 - 2009	2008 - 2010	2009 - 2011	2010 - 2012	2011 - 2013	2012 - 2014	2013 – 2015	2014 – 2016
IDEM Operated										
181630021	67	59	43	26	18	18	18	22	23	21
ALCOA Operated										
181730002	148	138	84	56	Not Operational				23 [a]	30 [b]
181730004	Not Operational								63 [a]	60 [b]
181730005	Not Operational								46 [a]	44 [b]
181730012	Not Operational								59 [a]	61 [b]

[a] – Based on one year of data.

[b] – Based on two years of data.

Attachment 5

ArcelorMittal – Burns Harbor SO_2 Air Quality Monitor System Documentation

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U.S. EPA Confirmation Letter for Siting Methodologies of ArcelorMittal Burns Harbor SO_2 Monitor

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

AUG 5 2018

REPLY TO THE ATTENTION OF

AT-18J

Mr. Mark Derf
Office of Air Quality
Indiana Department of Environmental Quality
Indiana Government Center North
100 North Senate Avenue
Indianapolis, Indiana 46204

Dear Mr. Derf:

The purpose of this letter is to respond to your request for concurrence with the siting recommendation for a sulfur dioxide (SO_2) air quality monitor near the ArcelorMittal-Burns Harbor facility, located in Porter County, Indiana. The monitor is being sited in response to the designation process detailed in EPA's Data Requirements Rule for SO_2. This new monitor will supplement an existing monitor.

We have reviewed your June 2016 Monitoring Protocol document and, based on the air quality modeling conducted by the facility and IDEM, agree that the western boundary of the ArcelorMittal facility is the best location for a monitor. Additionally, based on information provided to Region 5 by IDEM, the availability of land on the western border that would be considered ambient air and available for lease is extremely limited. This resulted in your recommendation that the existing lead monitor site is the best available location. This site is represented by the green dot in Figure 13.3 of the IDEM protocol document. Region 5 agrees that the placement of a monitor at the location of the existing lead site is acceptable. This will augment the existing SO_2 monitor located on the eastern edge of the facility.

While this letter confirms our agreement that the addition of a single monitor located at the existing lead monitor site is acceptable based on air quality modeling conducted in accordance with EPA's Monitoring Technical Assistance Document and site specific accessibility information, this letter does not confirm that the proposed site will meet each of the monitor siting requirements specified in 40 CFR part 58 Appendix E. Prior to beginning installation, IDEM should evaluate and ensure this site will meet those criteria and provide Region 5 with the results of your monitor siting assessment showing that all criteria will be able to be met at this proposed location.

Thank you for the advanced coordination on this issue. If you have any questions or need additional information, please contact Randy Robinson at 312 353-6713 or Jesse McGrath at 312 886-1532.

Sincerely,

Michael Compher
Chief
Air Monitoring and Analysis Section

Enclosures

U.S. EPA's Approval of IDEM's 2017 Ambient Air Monitoring Network Plan

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
CHICAGO, IL 60604-3590

OCT 3 1 2016

REPLY TO THE ATTENTION OF:
AT-18J

Mr. Keith Baugues
Assistant Commissioner
Office of Air Quality
Indiana Department of Environmental Management
100 North Senate Avenue
Indianapolis, IN 46204-2251

Dear Mr. Baugues:

The U.S. Environmental Protection Agency has reviewed the Indiana Department of Environmental Management's 2017 Ambient Air Monitoring Network Plan and approves the plan and proposed changes to your network of air quality monitors, but for the following:

- Lead emissions from the Crane Division Naval Surface Warfare Center have increased from the time of IDEM's original waiver from 1.2 tons/year to 2.3 tons/year. In light of this increase, EPA requires that IDEM either operate a lead monitor at this facility, or request a waiver which demonstrates that lead values will not exceed 50% of the NAAQS.
- EPA has reviewed the analyses in Appendix B and does not approve exclusion of the $PM_{2.5}$ Federal Equivalent Method data at sites 18-141-0015 or 18-163-0021 from comparison to the NAAQS. Where IDEM determines specific daily values are erroneous and can identify the causes of the error, IDEM should invalidate the specific data, rather than exclude all data from comparison to the NAAQS.

EPA evaluated the plan, as well as information about monitoring sites submitted to the Air Quality System database, and confirmed, with the above exceptions, that IDEM's network meets the siting and operation requirements of 40 CFR Part 58.

Additionally, EPA has reviewed and approves IDEM's lead monitoring waivers in Appendix D for the ALCOA Warrick Power Plant in Warrick County, and Ardagh Glass Inc. in Randolph County, as per 40 CFR Part 58 Appendix D section 4.5(ii).

If you determine that changes to your monitoring network are needed due to unplanned circumstances or revisions to the federal ambient monitoring and quality assurance requirements, the modifications must be reviewed and approved by EPA.

If you have any questions, please contact Michael Compher, Air Monitoring and Analysis Section Chief, at (312) 886-5745.

Sincerely,

Edward Nam

Ed Nam
Acting Director
Air and Radiation Division

Clean Air Engineering Certifications for ArcelorMittal Burns Harbor's SO_2 Monitor

CleanAir

Ambient SO2 Monitoring System
Factory Acceptance Test Protocol and Checklist

1

2 ***Clean Air Project Information***

Project Number:	13075
Project Mananger:	Jack Demkovich
Purchaser:	ArcelorMittal
Installation Location:	Port of Indiana, Burns Harbor

3 ***System Information***

System Type:	SO2 Ambient
System Serial Number:	N/A
System Site ID:	TBD
Date Installed:	12-7-17

4 ***FAT Test Information***

Test Date:	12/8 - 12/13/2016
Test Site:	Final Installation Location
Test Supervisor:	Jack Demkovich
Test Engineer:	Jack Demkovich
Witness & Affiliation:	--

5 ***Instructions:***

6 *Use check boxes ☐ to acknowledge completion of each step.*

7 *Note status of each completed test as follows: PASS/FAIL/SEE COMMENTS.*

8 *A Comments page is included at the end of the document.*

9 *Comments are required for any test marked FAIL and for deviations from this checklist.*

10 *Comments must reference a form line number.*

11 *Test Engineer(s) and Witness(es) to sign this form upon completion.*

System Documentation

Attach the following documents for inspection

- ☑ Major Component Serial ID list
- ☑ Calibration Reference Certifications
- ☑ Project Drawings
- ☑ QAPP *Draft version subject to final approval by IDEM*

System Documentation: PASS ☑ FAIL ☐ SEE COMMENTS ☐

System Physical Inspection

- ☑ Primary system components are available for inspection
- ☑ Shelter dimensions match construction drawings
- ☑ Shelter interior layout matches construction drawings
- ☑ Shelter construction materials correspond to construction specifications
- ☑ Shelter electrical service matches construction specifications

Voltage: 240 Phase: 1 Current: 100A @ 240V

- ☑ Shelter HVAC matches construction specifications:

Heat BTU: ____ Cooling BTU: 2 ton SN: L163362236

- ☑ Site specific labeling (if applicable) is installed & meets specification

☑	Analyzer #1 Mfg:	THERMO	Model:	43i	Gas:	SO2
■	Analyzer #2 Mfg:	N/A	Model:	N/A	Gas:	N/A
■	Analyzer #3 Mfg:	N/A	Model:	N/A	Gas:	N/A
☑	Calibrator Mfg:	THERMO	Model:	146i		
☑	Logger Mfg:	AGILAIRE	Model:	8872		
☑	UPS Mfg:	APC	Model:	SMART UPS 1500		
■	Other Mfg:	N/A	Model:	N/A		
■	Other Mfg:	N/A	Model:	N/A		
■	Other Mfg:	N/A	Model:	N/A		

- ☑ Number of PCs supplied = Server PC (Pittsburgh), Logger PC & Monitor
- ☑ I/O components include:
  - ☑ Ethernet switch
  - ☑ Cellular Modem, Carrier: ATT Number: 2245323513
  - ☑ Cloud Backup, Provider: Wellkeeper Number: 5056972685

Physical Inspection: PASS ☑ FAIL ☐ SEE COMMENTS ☐

Initials: JD / AKA Date: 12/10/16

Component IP Address List

IP Verified	Component	IP Address
☑	MODEM	192.168.13.31:9191
☑	AGILAIRE LOGGER	192.168.13.101
☑	43i	192.168.13.102
☑	146i	192.168.13.103
☐		
☐		
☐		
☐		
☐		
☐		

IP Verification: PASS ☑ FAIL ☐ SEE COMMENTS ☐

HVAC Operation Verification

☑ Set HVAC temperature to 25°C (78°F)
☑ Energize sampling system
☑ Initiate sampling (all shelter-housed components must be operational)
☑ Allow system to operate for at least 3 days
☑ Retrieve hourly data logs at completion of the test period
☑ Verify HVAC operation:

- Start Date & Time: 12-10-16, 09:00
- End Date & Time: 12-13-16, 08:00
- Min cabinet temperature: 24.7
- Max cabinet temperature: 25.1

☑ All data within ±2°C (3.6°F):
☑ All data within 20° to 30°C, (68° to 86°F):

HVAC Operation Verified: PASS ☑ FAIL ☐ SEE COMMENTS ☐

Initials: JD / AKA
Date: 12/10/16

Sampling System Inspection

- [x] Sampling system is complete with:
  - [x] Inverted Funnel Inlet
  - [x] Support System
  - [x] Calibration Tee at Funnel
  - [x] Filter
  - [x] Moisture Trap
  - [x] All components Teflon or glass
  - [x] All components are new and clean
  - [x] Exhaust tubing installed
  - [x] All system interconnecting tubing is installed

☑ Funnel inlet is 3 to 6 m (10-20 ft) above ground:		3.84			
☑ Inlet distance to nearest obstruction:	m:	1.1	DISTANCE TO ROOF TOP		
☑ Sample Flow Rate	L/min:	0.495			
☑ Sample Line Vacuum	inHg:	0.16			
☑ Tubing ID (1/8 inch):	cm:	0.318			
☑ Estimated Length (25 ft):	cm:	520			
☑ Volume of tubing:	cm^3:	41.3			
☑ Volume of Trap/Filter:	cm^3:	50.0	total vol=	91.3	
☑ Calculate residence time:	sec:	11.06			
☑ Residence time < 20 seconds?	☑ YES				

Sampling System Inspection: PASS ☑ FAIL ☐ SEE COMMENTS ☐

System Startup and Communication Verification

- [x] Energize all system components and allow system to fully start up
- [x] Open calibration gas regulator
- [x] Enter Agilaire logger software
- [x] Use a remote PC with Team Viewer to verify connectivity
- [x] Verify logger time and date, reset if necessary
- [x] Verify Environics 7000 operating temperature is 300°C
- [x] Verify Environics 7000 output pressure is set to 25psi
- [x] Verify Environics 7000 dewpoint indicator is BLUE
- [x] Verify no alarms are present on the Thermo 146i
- [x] Verify no alarms are present on the Thermo 43i

Initials: <u>JD / AKA</u> Date: <u>12/10/16</u>

109 ☑ Verify the following parameters are updating and logger and instrument displays agree:

#	Parameter	Logger	Instrument	Units	%Diff	PASS (<1%)
110						
111	☑ SO2 - Thermo 43i - Logger display	2.09	2.08	ppb	0.5%	☑
112	☑ SO2 Internal Temp (SO2INTTP)	35	35	°C	0.0%	☑
113	☑ SO2 Chamber Temp (SO2CHMTP)	45.3	45.3	°C	0.0%	☑
114	☑ SO2 Chamber Press (SO2CHMPR)	730.6	730.6	mmHg	0.0%	☑
115	☑ SO2 Sample Flow (SO2FLOW)	0.494	0.494	l/min	0.0%	☑
116	☑ SO2 PMT Volts (SO2PMTVT)	-721.5	-721.5	V	0.0%	☑
117	☑ SO2 Flash Volts (SO2FLSVT)	1006.2	1006	V	0.0%	☑
118	☑ SO2 Lamp Intensity (SO2FLINT)	92.0	92.0	%	0.0%	☑
119	☑ SO2 Background (SO2BCKGR)	2.11	2.11	ppb	0.0%	☑
120	☑ SO2 Cal Coefficient (SO2COEFF)	1.012	1.012	N/A	0.0%	☑
121	☑ Cal Gas Concentration (CALGAS)	400.0	400	ppb	0.0%	☑
122	☑ Cal Gas Target Flow (CALTARG)	37.7	37.70	scc/min	0.0%	☑
123	☑ Cal Gas Actual Flow (CALACTL)	37.7	37.66	scc/min	0.1%	☑
124	☑ Cal Gas Zero Gas Target Flow (CALZTRG)	2000	2000	scc/min	0.0%	☑
125	☑ Cal Gas Zero Gas Actual Flow (CALZACT)	1996	1996	scc/min	0.0%	☑
126	☑ Cal Gas Total Target Flow (CALTOTTG)	2000	2000	scc/min	0.0%	☑
127	☑ Cal Gas Total Actual Flow (CALTOTAC)	1996	1996	scc/min	0.0%	☑
128	☑ Cal Gas Pressure (CALGSPRS)	1873.9	1862	scc/min	0.6%	☑
129	☑ Sample Line Vacuum (SMPLNVAC)	0.16	N/A	inHg	N/A	☑
130	☑ AC Power Loss (ACPWRLSS)	0.7	N/A	V	N/A	☑
131	☑ Low UPS Battery (LOWBATT)	1	N/A	V	N/A	☑
132	☑ Cal Zero Gas Pressure (ZAGPRESS)	26.5	26.5	psi	0.0%	☑
133	☑ Shelter Temperature (SHLTTEMP)	25.9	N/A	°C	N/A	☑

134 **System Startup Successful:** PASS ☑ FAIL ☐ SEE COMMENTS ☐

Initials: JD / AKA

Date: 12/10/16

System should be running for at least 24 hours and be calibrated before calibration verification

Multipoint Calibration Verification

- ☑ Trigger the Multipoint Calibration cycle through the logger
- ☑ Allow the calibration cycles to complete
- ☑ Complete a Multipoint Calibration form using logger data
- ☑ Attach completed form to this document

Multipoint Calibration Verified: PASS ☑ FAIL ☐ SEE COMMENTS ☐

One-Point Quality Control (Precision) Check Verification

- ☑ Trigger the One-Point Quality Control Check through the logger
- ☑ Allow the cycle to complete
- ☑ Complete a One-Point QC Check form using logger data
- ☑ Attach completed form to this document

One-Point QC Check Verified: PASS ☑ FAIL ☐ SEE COMMENTS ☐

Data Validation (DV) Check Verification

- ☑ Trigger the Data Validation Check through the logger
- ☑ Allow the cycle to complete
- ☑ Complete a Data Validation check form using logger data
- ☑ Attach completed form to this document

DV Check Verified: PASS ☑ FAIL ☐ SEE COMMENTS ☐

Automated Span Drift Verification

- ☑ Allow the system to operate for at least 24 hours
- ☑ Allow at least one automated cycle to complete
- ☑ Manually poll Calibration Results from logger into AirVision
- ☑ Attach Calibration Report generated through AirVision to this document

Automated Span Verified: PASS ☑ FAIL ☐ SEE COMMENTS ☐

Automated Zero Drift Verification

- ☑ Allow the system to operate for at least 24 hours
- ☑ Allow at least one automated cycle to complete
- ☑ Manually poll Calibration Results from logger into AirVision
- ☑ Attach Calibration Report generated through AirVision to this document

Automated Zero Verified: PASS ☑ FAIL ☐ SEE COMMENTS ☐

Shelter Ambient Temperature Sensor Calibration Verification

- ☑ Perform a shelter temp sensor calibration per the SOP
- ☑ Complete the Shelter TC Calibration form
- ☑ Attach completed form to this document

Shelter Temp Sensor Cal Verified: PASS ☑ FAIL ☐ SEE COMMENTS ☐

Initials: JD / AKA Date: 12/10/16

Data Backup Verification

Allow system to run under normal operation conditions for 3 days

Agilaire 8872 Logger Backup

- ☑ Open folder "C:\SQL_Database_Backups_for_AVTrend" on the Agilaire 8872 Logger
  - ☑ AVData.bak file is present in folder
  - ☑ Date modified of AVData.bak is the current date, time modified is 04:30
- ☑ Open folder "Weekly_Backups"
  - ☑ All files are named "8872_AVBackup_MMDDYY_hhmmss"
  - ☑ Date modified of newest file is the most recent Sunday
  - ☑ No files older than 14 days old
  - ☑ No more than two files in folder
- ☑ Open Z: drive
  - ☑ AVData.bak file is only file present in Z:
  - ☑ Date modified of AVData.bak is the current date, time modified is 04:30

Agilaire 8872 Logger Backup: PASS ☑ FAIL ☐ SEE COMMENTS ☐

AirVision Server Backup

- ☑ Open the folder "C:\SQL_Database_Backups_For_AirVision" on the AirVision Server
  - ☑ AVData.bak file is present in folder
  - ☑ Date modified of AVData.bak is the current date, time modified is 04:30
- ☑ Open folder "Weekly_Backups"
  - ☑ All files are named "Server_AVBackup_MMDDYY_hhmmss"
  - ☑ Date modified of newest file is the most recent Sunday
  - ☑ No files older than 14 days old
  - ☑ No more than two files in folder

AirVision Server Backup: PASS ☑ FAIL ☐ SEE COMMENTS ☐

Dropbox Backup

- ☑ Open the folder "C:\Users\mrclean\Dropbox (CleanAir)\13075_ArcelorMittal_SO2 _Backup_Data_SERVER" on the AirVision Server
  - ☑ AVData.bak file is present in folder
  - ☑ Date modified of AVData.bak is the current date, time modified is 04:30
- ☑ In the Dropbox folder, open "13075_ArcelorMittal_SO2_Backup_Data_TEXT"
  - ☑ *1-Minute_Data* folder is present
  - ☑ *5-Minute_Data* folder is present
  - ☑ *Hourly_Data* folder is present
- ☑ Open "1-Minute_Data" folder
  - ☑ Several .CSV files are present, all with format "RAW_1MIN_Data_Mmddyyyy.csv"
  - ☑ Date modified of most recent file is the current date, time modified is XX:XX
  - ☑ When file is opened, opens Excel, is populated, and is easily readable
- ☑ Open "5-Minute_Data" folder
  - ☑ Several .CSV files are present, all with format "RAW_5MIN_Data_Mmddyyyy.csv"
  - ☑ Date modified of most recent file is the current date, time modified is XX:XX
  - ☑ When file is opened, opens Excel, is populated, and is easily readable
- ☑ Open "Hourly_Data" folder
  - ☑ Several .CSV files are present, all with format "RAW_HOUR_Data_Mmddyyyy.csv"
  - ☑ Date modified of most recent file is the current date, time modified is XX:XX
  - ☑ When file is opened, opens Excel, is populated, and is easily readable

Dropbox Backup Verified: PASS ☑ FAIL ☐ SEE COMMENTS ☐

Initials: JD / AKA

Date: 12/10/16

NOTE REQUIRED CORRECTIVE ACTIONS, DEVIATIONS & COMMENTS:

PAGE/LINE	COMMENTS

System Equipment List

PROJECT: ArcelorMittal USA / Job No: 13075
INSTALLATION LOCATION: Burns Harbor, IN
STATION ID:

ITEM	EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	OPERATIONAL DATE
1	SO2 Analyzer	Thermo Scientific	43iTLE	1162320006	12/10/2016
2	Gas Dilution Calibrator	Thermo Scientific	146i	1162320005	12/10/2016
3	Data Control System	Agilaire	8872	0609	12/10/2016
4	Zero Air Generator (ZAG)	Environics	7000	7223	12/10/2016
5	Temperature Probe	Agilaire	RS-232 Air Temp Sensor	RTD-01	12/10/2016
6	Cylinder Gas Pressure Transmitter	Ashcroft	GC35	6600057 R	12/10/2016
7	Cylinder Gas Regulator	Scott Specialty Gases	51215A660	817334	12/10/2016
8	ZAG Output Pressure Transmitter	Dwyer	628-09-GH-P1-E1-S1	13075PT1	12/10/2016
9	Sample Vacuum Pressure Transmitter	ControllerSensors	860-0.00/30.00-I-12-I-P	B100040	12/10/2016
10	Uninterruptible Power Supply	APC	SUA1500RM2U	AS0733130756	12/10/2016
11					
12					
13					
14					
15					

Transfer Standard Certification Schedule

PROJECT: ArcelorMittal USA / Job No: 13075
INSTALLATION LOCATION: Burns Harbor, IN
STATION ID:

ITEM	EQUIPMENT	MANUFACTURER	MODEL	SERIAL NUMBER	CYLINDER NUMBER	CERTIFICATION DATE	RECERTIFICATION DATE
1	Gas Dilution Calibrator	Thermo Scientific	146i	1162320005	--	11/29/2016	5/29/2017
2	Station SO2 Gas Standard	Airgas	N/A	--	CC7590	11/29/2016	5/29/2017
3	Digital Thermometer	Omega	HH370	160407973	--	12/5/2016	12/5/2017
4	Temperature Probe	Omega	RS-232	RTD-01	--	12/8/2016	6/8/2017
5	Audit Gas Standard	Airgas	N/A	--	--	--	--
6	Audit UHP Zero Air	Airgas	N/A	--	--	--	--
7	Audit Dilution Calibrator	Environics	6100	--	--	--	--
8							
9							
10							
11							
12							
13							
14							
15							

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF AIR QUALITY

CERTIFICATION - AIR MASS FLOW METER

Cert Type	Agency	Cert Date	Recert Date	Performed By
90	CLEAN AIR ENGINEERING	28-NOV-2016	28-MAY-2017	ALDAVIDS

Transfer Standard

Flow Meter SN	Brand	Model	Calibrator SN	Brand	Model
1162320005-A	THERMO	146I	1162320005	THERMO	146I

Previous Flow Meter Certification

Slope	Intercept	Cert Date
1.00000	0.00000	

Primary Flow Standard

Standard SN	Brand	Model	Type
378+ / 790+	FLUKE / AIR MOLBLOC		MASS FLOW

Air/Dil Meter Setting	Std Flow (L/min)	Curve Flow (L/min)	Pct Diff (%)	Pass/Fail	Current Curve Flow (L/min)	Prev Curve Flow (L/min)	Pct Diff (%)
0.538	0.5380	0.5380	0.0	PASS	0.5380	0.5380	0.0
2.009	2.0090	2.0090	0.0	PASS	2.0090	2.0090	0.0
3.427	3.4270	3.4270	0.0	PASS	3.4270	3.4270	0.0
4.838	4.8380	4.8380	0.0	PASS	4.8380	4.8380	0.0
6.245	6.2450	6.2450	0.0	PASS	6.2450	6.2450	0.0
7.685	7.6850	7.6850	0.0	PASS	7.6850	7.6850	0.0
9.199	9.1990	9.1990	0.0	PASS	9.1990	9.1990	0.0

Comments

FLOWS ENTERED INTO MFC TABLE FOR SLOPE INTERCEPT OF 1/0. 4 FLOWS CHECKED AFTERWARDS AND FOUND TO ALL BE WITHIN 1% OF ACTUAL FLOW. CERTIFICATION GOOD TILL 11/28/17 DUE TO THIS BEING A BENCH CALIBRATOR.

Slope	Intercept	Corr Coef
1.00000	0.00000	1.00000

RECERTIFICATION IS DUE: ***28-MAY-2017***

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF AIR QUALITY

CERTIFICATION - GAS MASS FLOW METER

Cert Type	Agency	Cert Date	Recert Date	Performed By
90	CLEAN AIR ENGINEERING	28-NOV-2016	28-MAY-2017	ALDAVIDS

Transfer Standard

Flow Meter SN	Brand	Model	Calibrator SN	Brand	Model
1162320005-G	THERMO	146I	1162320005	THERMO	146I

Previous Flow Meter Certification

Slope	Intercept	Cert Date
1.00000	0.00000	

Primary Flow Standard

Standard SN	Brand	Model	Type
378+ / 788+	FLUKE / GAS MOLBLOC		MASS FLOW

Gas Meter Setting	Std Flow (cc/min)	Curve Flow (cc/min)	Pct Diff (%)	Pass/Fail	Current Curve Flow (cc/min)	Prev Curve Flow (cc/min)	Pct Diff (%)
2.608	2.6080	2.6080	0.0	PASS	2.6080	2.6080	0.0
10.069	10.0690	10.0690	0.0	PASS	10.0690	10.0690	0.0
17.471	17.4710	17.4710	0.0	PASS	17.4710	17.4710	0.0
24.819	24.8190	24.8190	0.0	PASS	24.8190	24.8190	0.0
32.142	32.1420	32.1420	0.0	PASS	32.1420	32.1420	0.0
39.532	39.5320	39.5320	0.0	PASS	39.5320	39.5320	0.0
48.100	48.1000	48.1000	0.0	PASS	48.1000	48.1000	0.0

Comments

FLOWS ENTERED INTO MFC TABLE FOR SLOPE/INTERCEPT OF 1/0. 4 FLOWS CHECKED AFTERWARDS AND FOUND TO BE LESS THAN 0.1% DIFFERENT FROM TRUE FLOW.
CERT GOOD UNTIL 11/28/17 DUE TO THIS BEING A BENCH CALIBRATOR THAT WILL BE AT ONE STATION.

Slope	Intercept	Corr Coef
1.00000	0.00000	1.00000

RECERTIFICATION IS DUE: 28-MAY-2017

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF AIR QUALITY

CERTIFICATION - SO2, DILUTION WITH MASS FLOW

Cert Type	Agency	Cert Date	Recert Date	Performed By
10	CLEAN AIR ENGINEERING	29-NOV-2016	29-MAY-2017	ALDAVIDS

Transfer Standard

Calibrator SN	Brand	Model	Cylinder SN	Brand	Prev Conc	Prev Cert Date
1162320005	THERMO	146I	CLEAN CC7590	AIRGAS		

Transfer Analyzer

SN	Brand	Model	Slope	Intercept	Calibration Date	Verification Date
0524312232	THERMO E.C.	43I	1.00138	-0.00050	29-NOV-2016	13-DEC-2006

Primary Standard

Calibrator SN	Brand	Model	Standard SN	Type	Brand	Concentration
462-S	API	700E	ND47923		AIR LIQUIDE	49.0800

Mass Flow Meter Last Certification

Gas Slope	1.00000	Gas Intercept	0.00000
Air Slope	1.00000	Air Intercept	0.00000

Analyzer Zero Resp (volts)	Avg Calc Conc	Pct Diff Avg vs Prev	**Pass/Fail
-0.0003	10.6100		FAIL

Gas	Air/Dilution	Gas (cc/min)	Total (cc/min)	Analyzer Resp (volts)	Meas Conc (ppm)	Calc Conc (ppm)	Pct Diff for Avg Conc	*Pass/ Fail
45.00	2.00	45.00	2,045.0	0.234	0.234	10.62	0.1	PASS
40.00	3.00	40.00	3,040.0	0.141	0.140	10.66	0.4	PASS
32.00	3.00	32.00	3,032.0	0.112	0.112	10.58	-0.2	PASS
25.00	3.00	25.00	3,025.0	0.088	0.088	10.60	-0.1	PASS
25.00	4.00	25.00	4,025.0	0.066	0.066	10.58	-0.3	PASS

Certified Cylinder Concentration (ppm): **10.6100** ***Recertification is Due:*** **29-MAY-2017**

Comments

* PASS if Pct Diff of Avg vs Calc is less than + - 4.0%. All data points must PASS for a valid certification.
** PASS if Pct Diff of Current vs Previous is less than + - 5.0%. If Fail, see Comment.

INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
OFFICE OF AIR QUALITY

CERTIFICATION - TEMPERATURE PROBE

Cert Type	Agency	Cert Date	Recert Date	Performed By
98	CLEAN AIR ENGINEERING	05-DEC-2016	05-DEC-2017	ALDAVIDS

Transfer Standard

SN	Brand	Model	Prev Cert Date
160407973	OMEGA	HH370	

Primary Std SN	Brand	Type
35060-1	ISOTECH	THERMOMETER

Test Ranges	Transfer Std (C)	Primary Std (C)	Difference (C)	Pass/Fail	Met Use Pass/Fail
LOW (-5.0 to +5.0) C	0.0	0.0	0.0	PASS	PASS
AMBIENT	26.3	26.4	-0.1	PASS	PASS
HIGH (35 to 45) C	46.2	46.4	-0.2	PASS	PASS

Note: All differences must be within +/- 1.0 C or a correction factor is required. For meteorological audits all differences must be +/- 0.2 C or a correction factor is required.

Comments

OMEGA ENGINEERING, INC.
An OMEGA Technologies Company

Certificate of Calibration

Customer:	CLEAN AIR ENGINEERING
Customer P.O.:	01356-44-13075
Instrument:	Omega HH370
Order Number:	WC00274278
Description:	Digital Thermometer
Serial Number:	160407973
Equipment I.D.#:	WC274278
Incident Number:	new

Cal-3

Omega Engineering, Inc. hereby certifies that the above instrumentation has been calibrated and tested to **meet or exceed** the published specifications. This calibration and testing was performed using instrumentation and standards that are traceable to the **National Institute of Standards and Technology**. Omega Engineering, Inc. is in compliance with ISO 10012-1, ISO 9001 and ANSI/NCSL Z540-1-1994. This certificate shall not be reproduced, except in full, without the written consent of Omega Engineering, Inc.

CALIBRATION INFORMATION

Cal Date: 04-Oct-16
Cal Due Date: 04-Oct-17

Temperature: 22°C ± 5°C
Humidity: Below 80%

Absolute Uncertainty: ± 0.19 F
Comments:

Pass: Y **Technician:** DL
Procedure: QAP-2100

Seals OK: N/A
Certificate #: WC274278

STANDARDS USED FOR CALIBRATION

Asset Number	Description	NIST Traceable Number	Cal Date	Due Date
RE-098-14	IET HARS-X-6-0.01 Resistance Simulator	10NNRE09814	8-Apr-16	8-Apr-17

Metrology Technician:

Quality Assurance Inspector:

OMEGA Engineering, Inc., One Omega Circle, P.O. Box 336, Bridgeport, NJ 08014-0336 Telephone: (856) 467-4200 Fax: (856) 467-1212
www.omega.com e-mail: info@omega.com

WC3 - 0635A

An OMEGA Technologies Company

Calibration Results

Customer:	CLEAN AIR ENGINEERING	Result:	PASS
P.O. Number:	01356-44-13075	Cal Date:	04-Oct-16
Order Number:	WC00274278	Cal Due Date:	04-Oct-17
Instrument:	Omega HH370	Technician:	DL
Description:	Digital Thermometer	Temperature:	22 °C ± 5 °C
Serial Number:	160407973	Humidity:	Below 80%
Equipment I.D.#:	WC274278	Condition F/L:	AS-LEFT
Incident Number:	new	Procedure:	QAP-2100
		Certificate #:	WC274278

Standards Used

Asset #	Description	NIST Traceable Number	Cal Date	Due Date
RE-098-14	IET HARS-X-6-0.01 Resistance Simulator	10NNRE09814	8-Apr-16	8-Apr-17

Test Data

Test Description	True Value	Test Result	Lower limit	Upper limit	
Pt100 RTD Temperature Test					
-130.0 DegreeF		-130.0	-130.9	-129.1	Pass
32.0 DegreeF		31.8	31.2	32.8	Pass
212.0 DegreeF		211.8	211.0	213.0	Pass
392.0 DegreeF		391.7	390.8	393.2	Pass
554.0 DegreeF		553.5	552.6	555.4	Pass

End of Test Data

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OMEGA Engineering, Inc., One Omega Circle, P.O. Box 336, Bridgeport, NJ 08014-0336 Telephone: (856) 467-4200 · FAX: (856) 467-1212
www.omega.com e-mail: info@omega.com

WCS-0633A

Airgas.

Airgas USA, LLC
2009 BELLAIRE AVE
ROYAL OAK, MI 48067
248-399-8020
Airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Customer:	CLEAN AIR ENGINEERING		
Part Number:	E02NI99E15A0576	Reference Number:	32-400770445-1
Cylinder Number:	CC7590	Cylinder Volume:	144.3 CF
Laboratory:	112 - Royal Oak-32 (SAP) - MI	Cylinder Pressure:	2015 PSIG
PGVP Number:	B52016	Valve Outlet:	660
Gas Code:	SO2,BALN	Certification Date:	Oct 03, 2016

Expiration Date: Oct 03, 2020

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
SULFUR DIOXIDE	10.00 PPM	10.02 PPM	G1	+/- 1% NIST Traceable	09/15/2016, 10/03/2016
NITROGEN	Balance				

CALIBRATION STANDARDS

Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	130603-28	CC403839	16.82 PPM SULFUR DIOXIDE/NITROGEN	+/-0.9%	May 31, 2019

ANALYTICAL EQUIPMENT

Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
E/N 54 Nicolet 6700 SO2	FTIR	Sep 23, 2016

Triad Data Available Upon Request

Approved for Release

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ON
OFF