

Support Document for
Sulfur Dioxide Designation Recommendations
for the 2010 SO₂ NAAQS



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EXECUTIVE SUMMARY

The Michigan Department of Environmental Quality (MDEQ) is submitting its recommended designations for the 1-hour sulfur dioxide (SO₂) National Ambient Air Quality Standard (NAAQS). These recommendations are based on the dispersion modeling of the eight large SO₂ sources identified by the United States Environmental Protection Agency (USEPA) in a letter dated March 20, 2015, from Acting Assistant Administrator Janet McCabe. Specifically, the MDEQ is recommending a sub-county boundary in St. Clair County, Michigan be designated as nonattainment, and that the counties of Bay, Eaton, Ingham, Marquette, Monroe, and Ottawa be designated as attainment.

The recommended geographical boundary of the St. Clair County nonattainment area was determined using dispersion modeling, emissions-related data, meteorology, geography/topography and jurisdictional boundaries as outlined in the USEPA's guidance memorandum dated March 20, 2015. Our recommendations for the county level attainment areas follow the corresponding methodology in this same guidance. A description of the MDEQ's analysis for both the nonattainment area and the attainment areas is provided in this document.

Introduction

The United States Environmental Protection Agency (USEPA) revised the primary National Ambient Air Quality Standard (NAAQS) for sulfur dioxide (SO₂) on June 2, 2010. The new short-term standard is based on the 3-year average of the 99th percentile of the yearly distribution of 1-hour daily maximum concentrations. This level was set at 75 parts per billion (ppb). In July 2013, the USEPA identified areas in 16 states as nonattainment and expressed their intent to address designations for the remainder of the country in future actions.

On March 2, 2015, a consent decree was reached between the USEPA, the Sierra Club and the Natural Resources Defense Council to resolve litigation concerning the deadline for completing these other 1-hour SO₂ designations. In the consent decree, the USEPA agreed to complete the designations in three rounds, with the first round to be completed by July 2, 2016. On March 20, 2015, the USEPA updated guidance to the states on designating areas. Areas will be designated as either attainment, nonattainment, or unclassifiable.

The first round of designations are for two groups of areas: 1) areas that have newly monitored violations of the 2010 SO₂ standard; and 2) areas that contain any stationary source that emitted more than 16,000 tons of SO₂ in 2012 or emitted more than 2,600 tons of SO₂, had a 2012 emission rate of at least 0.45 pounds (lbs) SO₂ per million BTU (mmbtu), and that has not been announced (as of March 2, 2015) for retirement. State designation recommendations to the USEPA for these areas must be submitted by September 18, 2015.

Michigan Impacts

For the first round of designations as described in the consent decree, there are no additional areas in Michigan with newly monitored violations of the 2010 SO₂ standard. The USEPA has identified the following facilities as falling within the emission levels referenced above:

- Dan E. Karn/J.C. Weadock Generating Complex in Bay County (Consumers Energy)
- Erickson Power Plant in Eaton County (Lansing Board of Water and Light)
- Eckert Power Station in Ingham County (Lansing Board of Water and Light)
- Presque Isle Power Plant in Marquette County (We Energies)
- Monroe Power Plant in Monroe County (DTE)
- J.H. Campbell Generating Complex in Ottawa County (Consumers Energy)
- Belle River Power Plant in St. Clair County (DTE)
- St. Clair Power Plant in St. Clair County (DTE)

The USEPA also identified the Michigan City Generating Station in Laporte County, Indiana as potentially impacting areas in Michigan. The facility is located approximately 10 kilometers (km) from the nearest Michigan border. The Indiana Department of Environmental Management (IDEM) was contacted to investigate potential impacts from this source within Michigan and determine if any resulting attainment issues could exist. IDEM responded that their review of the facility, using continuous emission monitoring (CEMS) data and seasonal background concentrations, yielded no violations of the SO₂ NAAQS threshold. As such, no attainment issues are expected in the southwest corner of Michigan as a result of this facility.

The Michigan Department of Environmental Quality (MDEQ) is responsible for developing SO₂ designation recommendations for the areas surrounding these facilities. The companies that

own the eight affected facilities agreed to perform the necessary dispersion modeling to determine their SO₂ impacts and to determine if the 1-hour NAAQS was being violated.

Based on this analysis, the MDEQ is providing recommendations to the USEPA on appropriate SO₂ attainment and nonattainment areas.

Summary of Modeling

The analysis began with the MDEQ requesting each facility to provide a modeling protocol that included the facility description, model selection, emissions characterization, source description, background concentration, meteorology, modeling domain and off-site emissions inventory. The draft modeling protocols were reviewed by the MDEQ and the USEPA. The facilities then finalized the protocols by incorporating the revisions suggested by the MDEQ and the USEPA. These protocols and modeling results can be found in Appendix C.

The MDEQ followed USEPA guidance throughout the modeling and designation process. The USEPA updated designation guidance with a March 20, 2015, document. The USEPA also provided a Draft SO₂ NAAQS Designations Modeling Technical Assistance Document (TAD), dated December 2013, to provide guidance on the use of modeling data when determining if an area is meeting or not meeting the 2010 SO₂ standard.

Modeling of the facilities was carried out on an individual basis, except for the Eckert Power Station in Ingham County and the Erickson Power Station in Eaton County, which are less than 10 km apart, and the Belle River Power Plant and the St. Clair Power Plant, both in St. Clair County, which are just over 2 km apart. Because of their close proximity to one another, the two sets of facilities were modeled together.

Table 1 summarizes the results from the modeling runs and the background SO₂ concentration for each area. The final column represents the expected highest impacts by adding the modeled high value and background value for each modeled source or group of sources. A narrative describing the individual facility modeling follows.

- Dan E. Karn/J.C. Weadock Generating Complex: The modeling for this facility was carried out by Horizon Environmental on behalf of Consumers Energy using the AERMOD model with 2012-2014 hourly meteorological data from the National Weather Service station at the MBS International Airport in Freeland, Michigan. The facility was modeled by itself because no other SO₂ sources were found in the immediate area. The maximum 3-year average of the 99th percentile of the maximum daily 1-hour concentrations for the off-site receptors was found to be 28.9 ppb. Adding an ambient background concentration of 17.9 ppb derived from the MDEQ's Lansing monitoring station gives a total predicted impact of 46.8 ppb, which is well below the NAAQS of 75 ppb.
- Erickson/Eckert Power Stations: The MDEQ carries out SO₂ monitoring in Lansing. The 2012-2014 design value at this station is 17.9 ppb, indicating that the area is meeting the 1-hour SO₂ NAAQS. Still, modeling was conducted for the Erickson/Eckert power plants by NTH Consultants for the Lansing Board of Water and Light. This modeling was carried out using AERMOD coupled with 2012-2014 meteorological data from Lansing Capital Region International Airport. Off-site sources included in the modeling were Michigan State University, Thompson-McCully Asphalt and Superior Asphalt. Using the Lansing SO₂ design value of 17.9 ppb as the background to be added to the predicted

facility impact of 35.4 ppb, the resulting total impact is 53.3 ppb. This is much less than the NAAQS of 75 ppb.

- J.H. Campbell Generating Complex: Horizon Environmental carried out modeling of the J.H. Campbell Generating Complex for Consumers Energy with AERMOD using 2012-2014 meteorological data from Muskegon County Airport located in Norton Shores, Michigan. No other sources of SO₂ were found to exist near the J.H. Campbell plant. While MDEQ operates an SO₂ monitoring station in West Olive where the J.H. Campbell plant is located, that station began operating in January 2015, so data from that station is not yet available to compute an ambient background. As such, the 10.3 ppb design value recorded at the MDEQ's Grand Rapids air monitoring station was considered as the ambient background. Adding the 10.3 ppb to the predicted facility impact of 42.8 ppb yields a total impact of 53.1 ppb. This level of impact is well below the NAAQS of 75 ppb.
- Presque Isle Power Plant: AERMOD modeling for the Presque Isle Power Plant was conducted for We Energies by Trinity Consultants. Meteorological data from Munising, Michigan for the years 2012-2014 was used. Marquette Board of Light & Power and Northern Michigan University were both identified as SO₂ sources to be included in the modeling analysis. The predicted impact from the Presque Isle Power Plant and the other sources was found to be 33.1 ppb. Adding this impact to the 6.8 ppb ambient background derived from the Forest County, Wisconsin monitoring station yields a total impact of 39.9 ppb. The 39.9 impact meets the 1-hour SO₂ NAAQS.
- Monroe Power Plant: DTE conducted modeling using AERMOD for the Monroe Power Plant. Meteorological data for the years 2012-2014 from Monroe Custer Airport was used by DTE in this modeling. The MDEQ operates an SO₂ air monitoring station at Sterling State Park in Monroe, which is located just to the north of the Monroe Power Plant. While only two years of SO₂ data exist for this site, a background of 18.2 ppb was derived from this data as a conservative estimate. Sources in addition to the Monroe Power Plant used in the analysis include IKO Monroe, Guardian Industries and Gerdau MacSteel-Monroe. Monroe Power Plant emission rates for the modeling were the allowable rates in the current air permit, reflecting the operation of wet flue gas desulfurization systems on all four units. DTE's modeling predicted a maximum facility and other source impact of 42.8 ppb. Adding the 18.2 ppb background estimate to this impact gives a total impact of 61 ppb. This is below the 75 ppb NAAQS.
- Belle River/St. Clair Power Plants: Because of their close proximity, DTE modeled the Belle River and St. Clair Power Plants in the same AERMOD analysis. Two sets of meteorological data from 2012-2014 were used in these runs: Pontiac and Port Huron. While both data sets were collected by the National Weather Service at airports, the Pontiac data was based on 1-minute averaging times. The Port Huron data was based on 1-hour averaging times. The Pontiac data was preferred by the USEPA because, even though Pontiac was farther away, it had a lower incidence of calms. A review of 2013 emission inventory information identified E.B Eddy and Cargill Salt as having SO₂ emissions that could potentially impact the modeling of the Belle River/St. Clair Power Plants. However, the 2013 inventory data did not account for the fact both of these sources have shut down their coal-fired boilers. Therefore, there were no other significant sources of SO₂ emissions in St. Clair County. Using ambient air monitoring data from the Port Huron monitor, the MDEQ determined an ambient background of 15 ppb SO₂ was appropriate for St. Clair County. This background was derived

considering only monitor concentrations when the wind was blowing from directions other than from the Belle River/St. Clair facilities or from sources located in Sarnia, Ontario. Avoiding these sectors was crucial so the final predicted impact would not “double count” facility impacts. A background of 15 ppb is also consistent with the Allen Park-derived background that was used in the Wayne County SO₂ State Implementation Plan (SIP) analysis. The MDEQ found using the Pontiac meteorological data resulted in a hotspot impact that was approximately 12 ppb higher than the Port Huron data. This impact of 116.7 ppb, when added to the 15 ppb ambient background produced a total impact of 131.7 ppb. This value exceeds the NAAQS for the 3-year average of the 99th percentile of daily maximum concentrations.

Table 1. Source Modeling Impacts

County	Facility Name	3-year average of the 99% daily max. 1-hour (ppb)	Background Concentration ¹ (ppb)	Combined SO ₂ Impact (ppb)
Bay	Dan E. Karn/J.C. Weadock Generating Complex	28.9	17.9	46.8
Ingham/Eaton	Eckert Power Station/Erickson Power Plant	35.4	17.9	53.3
Ottawa	J.H. Campbell Generating Complex	42.8	10.3	53.1
Marquette	We Energies Presque Isle Power Plant	33.1	6.8	39.9
Monroe	Monroe Power Plant	42.8	18.2	61.0
St. Clair	Belle River Power Plant/St. Clair Power Plant	116.7	15.0	131.7

¹ One-hour SO₂ backgrounds for the Dan E. Karn/J.C. Weadock Complex and Eckert/Erickson Power Plants are from the Lansing monitor; background for the J.H. Campbell Plant is from the Grand Rapids monitor; background for the Presque Isle Plant is from Forest County, WI; background for the Monroe Power Plant is from the Sterling State Park monitor in Monroe; and the background for Belle River/St. Clair Plants is from the Port Huron monitor. The design values for these monitoring stations are included in Appendix A.

Based on the modeling results displayed in Table 1, five of the six facilities/groups have combined impacts (facility, additional sources if applicable, and background) that meet the 1-hour SO₂ standard. The combined modeling analysis for the Belle River Power Plant and the St. Clair Power Plant resulted in impacts above the 1-hour SO₂ standard. Figures 1 through 6 show concentration isopleth plots and the maximum impact area for each of the six modeling demonstrations. Figures 1 through 5 demonstrate areas in attainment and Figure 6 illustrates predicted areas of nonattainment. Note: The isopleths do not include background concentrations of SO₂.

Figure 1. Isopleth and Max. Impact (ppb) for the Dan E. Karn Generating Complex

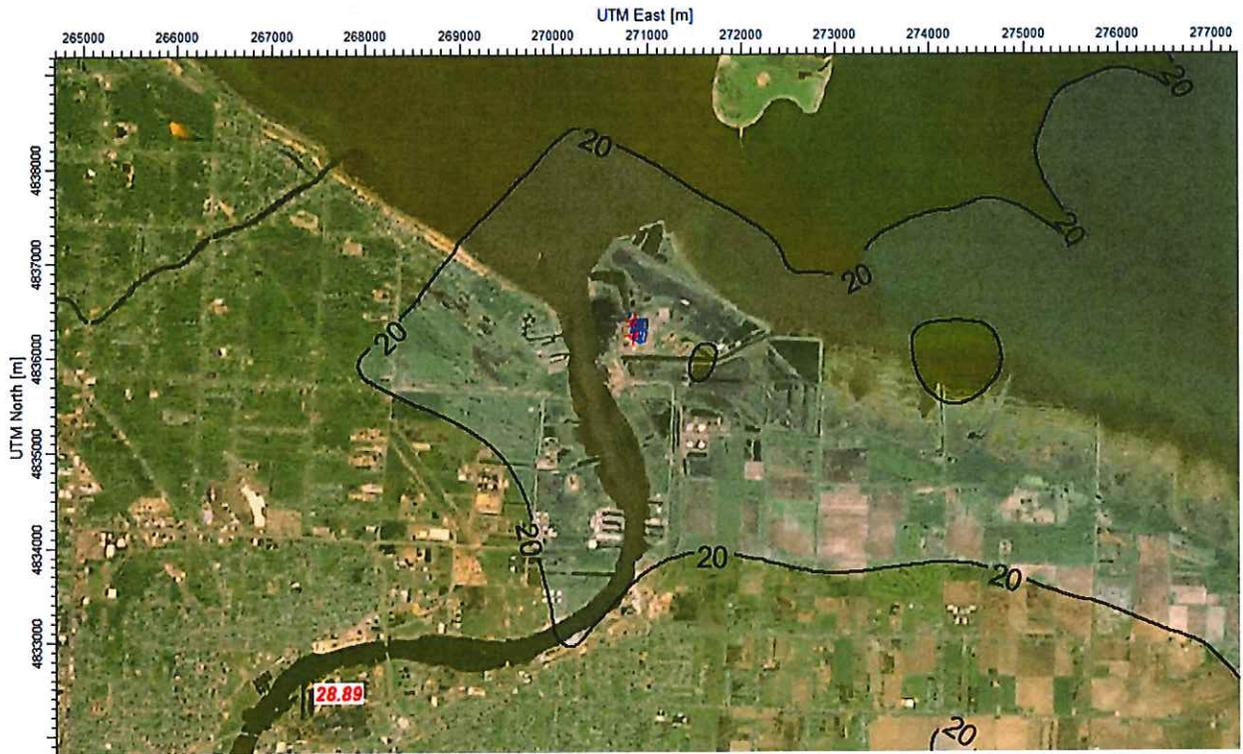


Figure 2. Isopleth and Max. Impact (ppb) for the Eckert Power Station/Erickson Power Plant

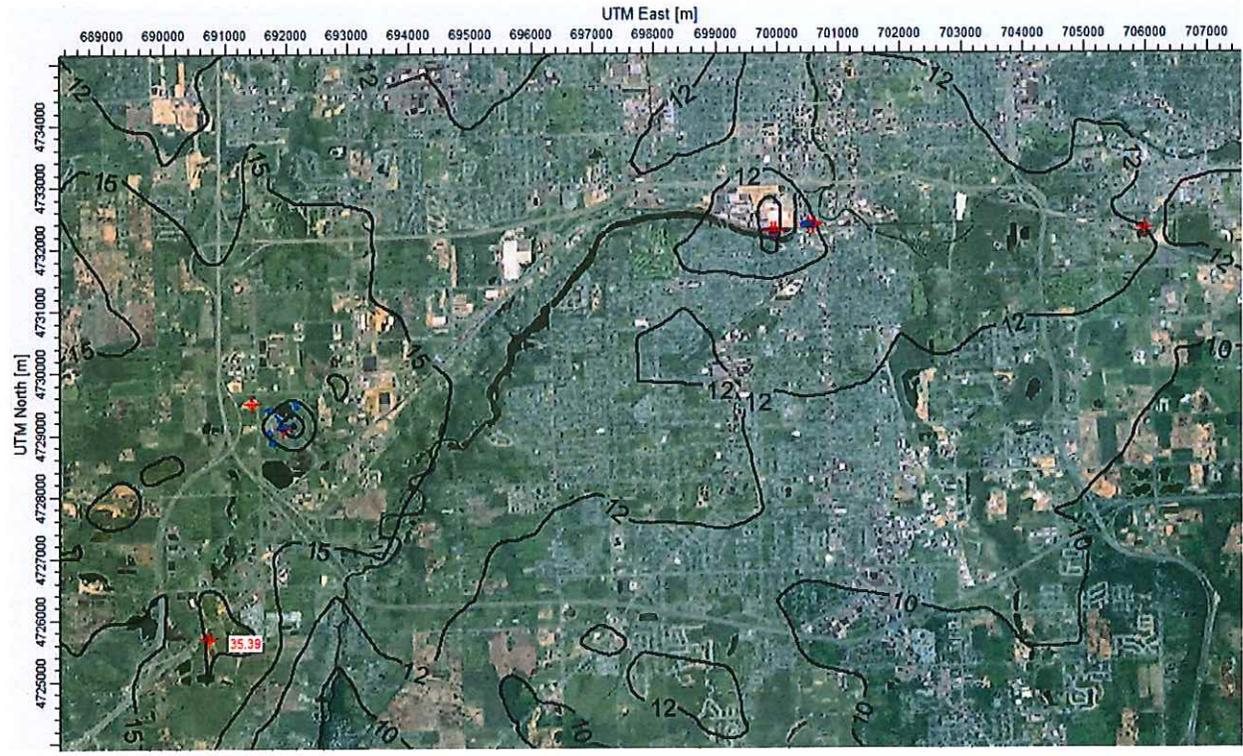


Figure 3. Isopleth and Max. Impact (ppb) for the J.H. Campbell Generating Complex

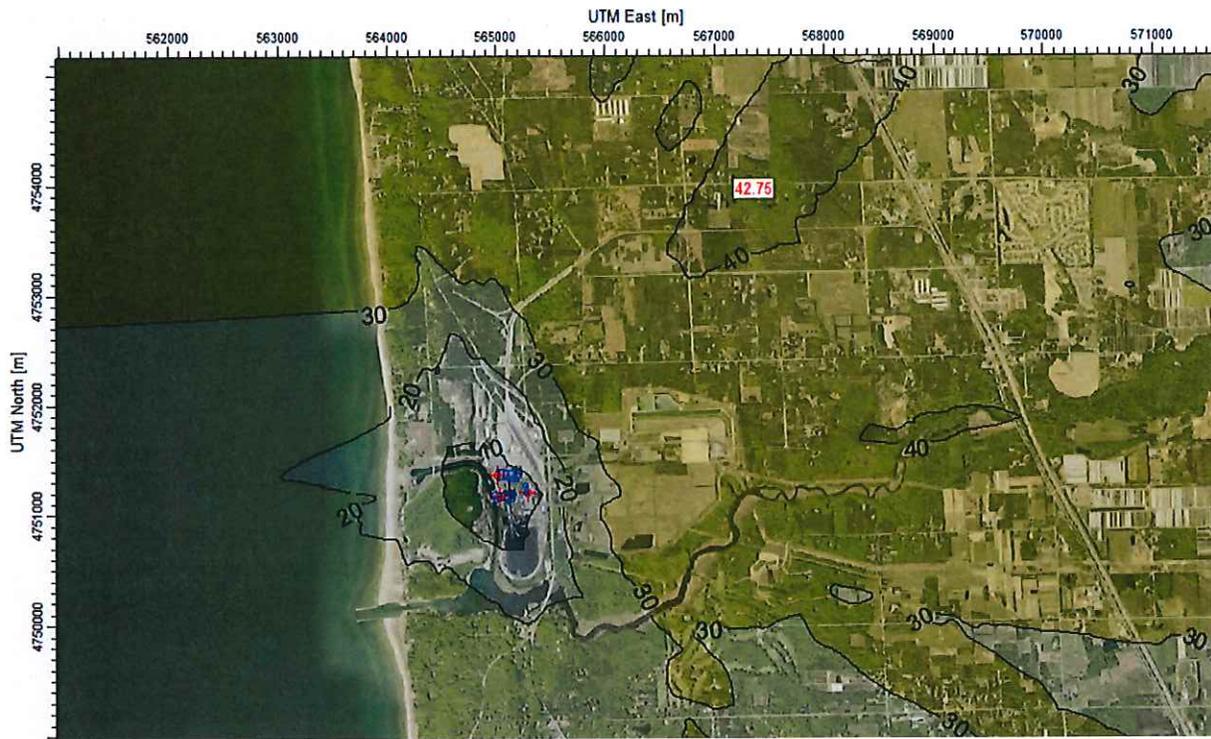


Figure 4. Isopleth and Max. Impact (ppb) for the We Energies Presque Isle Power Plant



Figure 5. Isopleth and Max. Impact (ppb) for the Monroe Power Plant

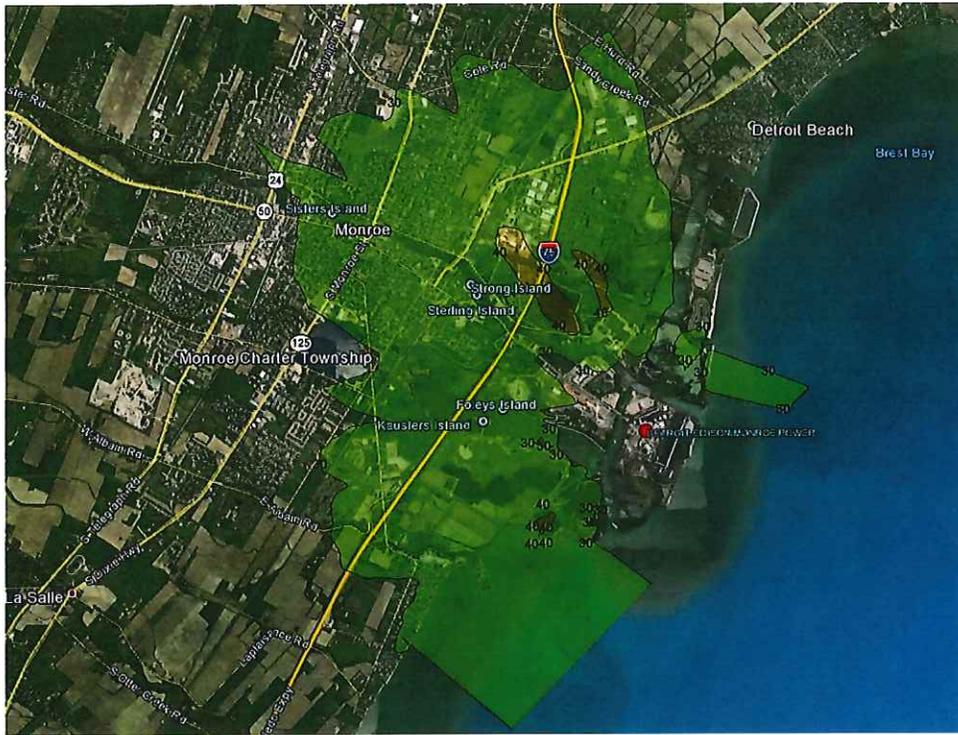
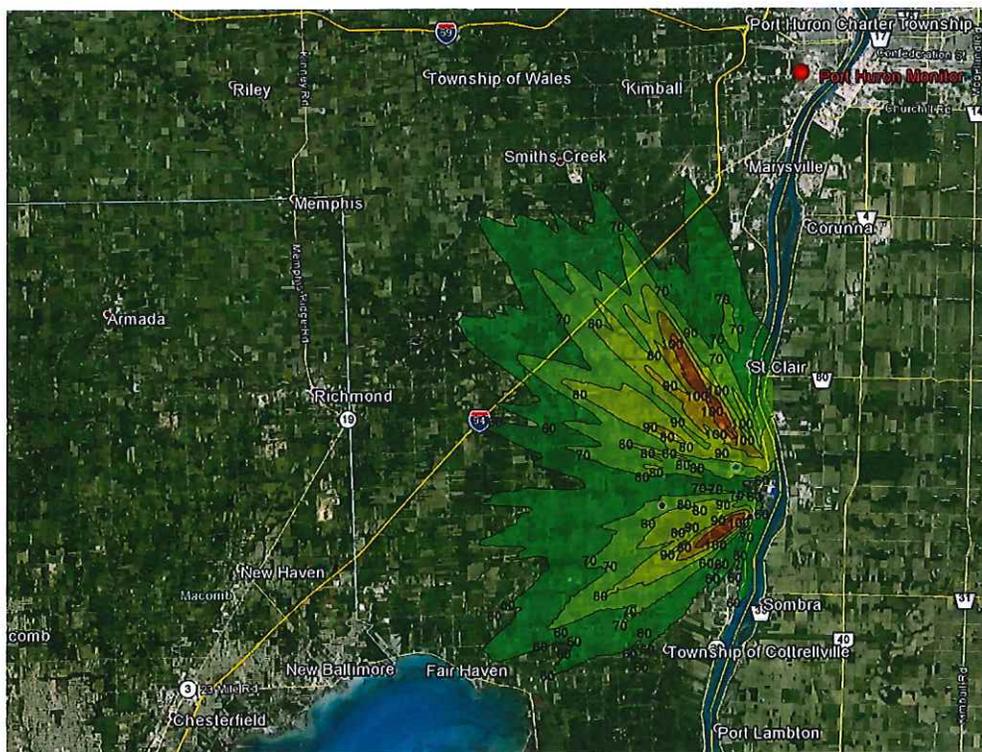


Figure 6. Isopleth and Max. Impact (ppb) for the Belle River/St. Clair Power Plants



Recommended Attainment Areas

Based on the source modeling described above, the areas surrounding the following facilities are found in attainment of the 2010 SO₂ 1-hour NAAQS: Dan E. Karn/J.C. Weadock Generating Complex, Erickson Power Plant and Eckert Power Station, We Energies Presque Isle Power Plant, Monroe Power Plant, and J.H. Campbell Generating Complex. For each, the MDEQ recommends attainment boundaries to include the entire county in which the facility resides. This follows the recommended approach for facilities modeling attainment as described in the March 20, 2015, USEPA guidance. Therefore, the MDEQ recommends an attainment designation for the 1-hour SO₂ NAAQS for Bay County, Eaton County, Ingham County, Marquette County, Monroe County and Ottawa County.

Recommended Nonattainment Area

As shown in Table 1, modeling of the Belle River/St. Clair Power Plants revealed impacts exceeding the 1-hour SO₂ NAAQS. As such, the USEPA's guidance requires the MDEQ to consider air quality data, emissions-related data, meteorology, geography/topography and jurisdictional boundaries in determining the nonattainment area boundaries.

Air Quality Data: The MDEQ collects SO₂ data at its Port Huron air quality monitoring station located on Dove Road. The design value for this station is 69 ppb which meets the NAAQS. Given the monitoring data meets the NAAQS and the Belle River/St. Clair Power Plant modeling predicts that the area should remain in attainment, the MDEQ recommends the City of Port Huron not be in the nonattainment area.

Emission-Related Information: As described in the previous section, the only significant sources of SO₂ in St. Clair County are the Belle River and St. Clair Power Plants. As such, the nonattainment area will be Belle River/St. Clair-centric, as there are no additional sources contributing to the nonattainment area.

Meteorology: The Belle River and St. Clair Power Plants were modeled with AERMOD using both Port Huron and Pontiac meteorological data. While Port Huron is closer to the facilities, the data does have a high percentage of calms. Using Pontiac meteorological data does produce a maximum impact that is 12 ppb higher than predicted using Port Huron data, but both data sets predict areas of nonattainment. And, in both cases, the area of nonattainment is confined to St. Clair County.

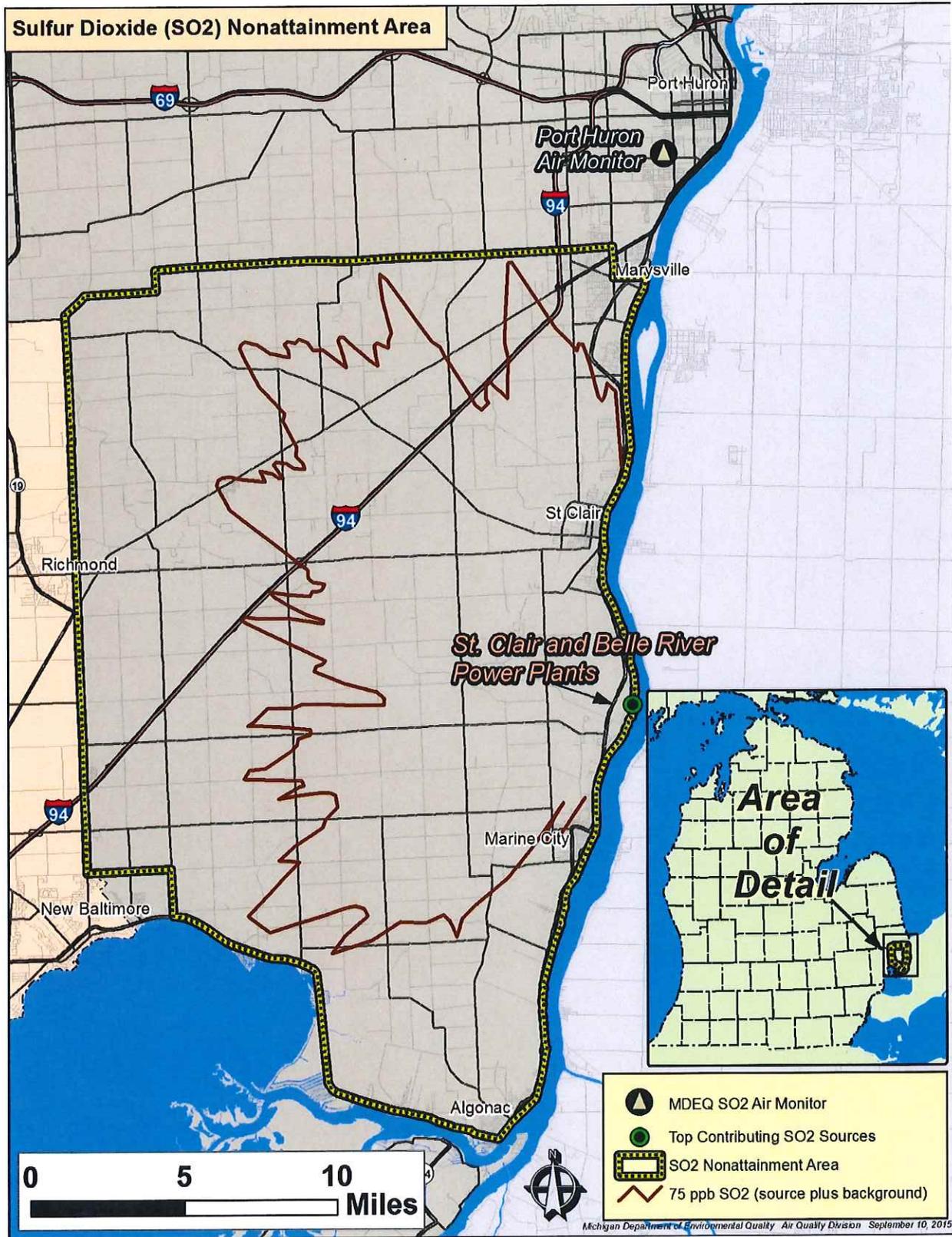
Geography/Topography: There is no elevated terrain in close proximity to the Belle River/St. Clair Power Plants. However, the plants are located on the St. Clair River, which may cause some channelization of the winds, suggesting that perhaps Port Huron meteorological data should be used in future modeling analyses. The St. Clair River also forms the international boundary with Canada. As such, it forms a natural boundary for the recommended nonattainment area to the east.

Jurisdictional Boundaries: As described above, those areas with modeled concentrations above the 1-hour NAAQS and on American soil are all confined to St. Clair County. However, Figure 6 shows that not all of St. Clair County is predicted to be in nonattainment. The 75 ppb modeling isopleth extends only as far north as Smiths Creek Road. Using Smiths Creek Road as the northern boundary of the nonattainment area is substantiated by the 69 ppb design value measured at the MDEQ's Port Huron monitoring station, which is located approximately four miles to the north of Smiths Creek Road.

While 75 ppb is not expected to occur in the far southern or western portions of St. Clair County, the MDEQ does not wish to carve out irregularly shaped areas of attainment surrounded by nonattainment in the same geopolitical area. Therefore, the MDEQ recommends that the nonattainment area extend to the remaining portions of southern and western St. Clair County.

Based upon these considerations, the MDEQ is recommending the USEPA designate the sub-county area of St. Clair County shown in Figure 7 as nonattainment for SO₂. Specifically, the area would include that portion of St. Clair County defined by the St. Clair River on the east; State Highway M-29 to Church Road to Arnold Road to County Line Road on the south; County Line Road and the Macomb County/St. Clair County boundary to Stoddard Road to Wales Ridge Road on the west; and Alpine Road to Fitz Road to Smiths Creek Road to Range Road to Huron Avenue to the St. Clair River on the north.

Figure 7. Proposed SO₂ 1-hour Nonattainment Area



APPENDIX A

2012-2014 Michigan/Wisconsin 1-hour SO₂ Monitor Design Values

2012-2014 Michigan/Wisconsin 1-hour SO₂ Monitor Design Values

Monitor Location	3-year 1-hour SO ₂ Design Value (ppb)
Grand Rapids	10.3
Forest County, WI	6.8
Lansing	17.9
Port Huron	69.4
Sterling State Park, Monroe*	18.2

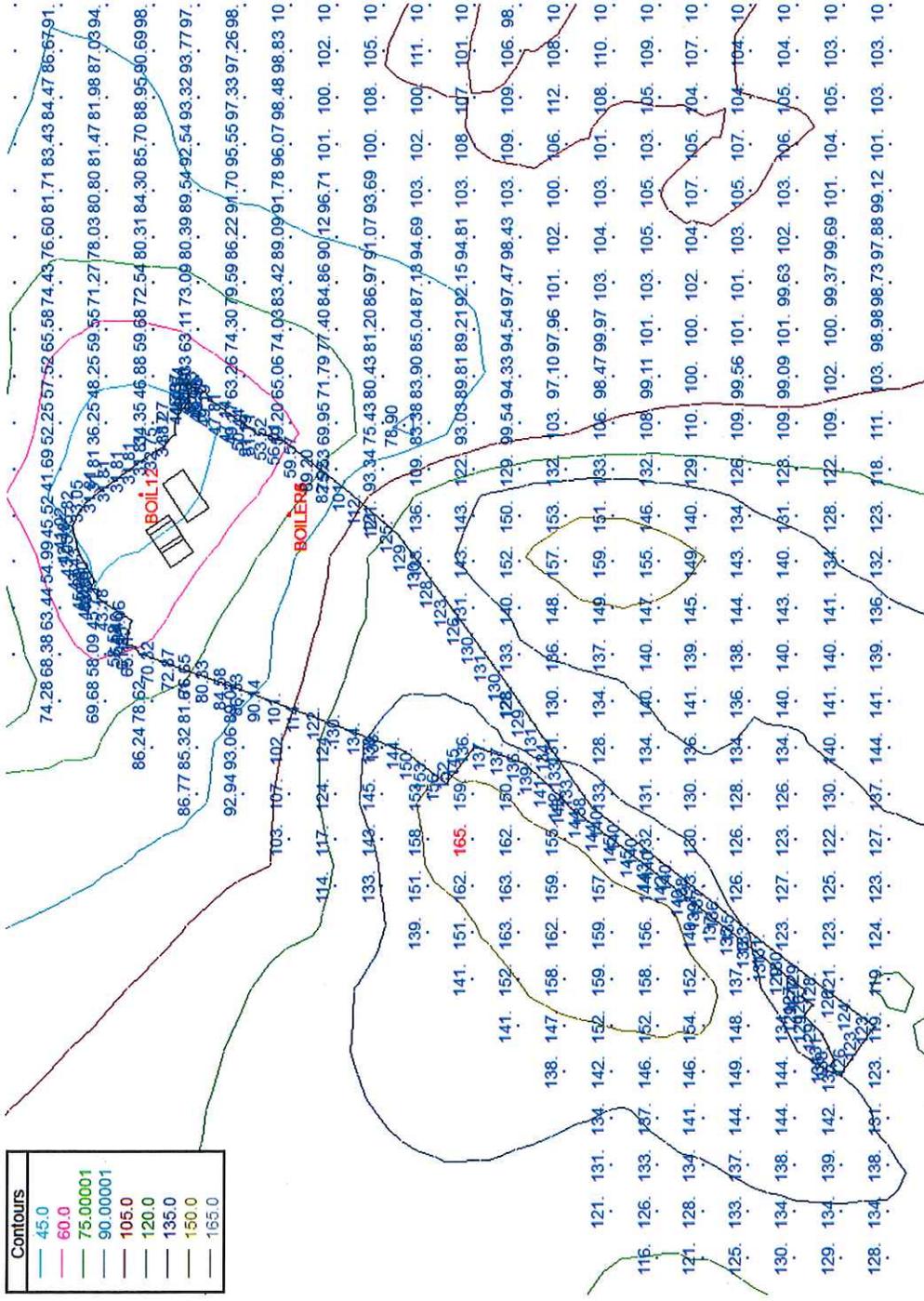
* Two years of data only.

APPENDIX B

IDEM Modeling for Michigan City Generating

NIPSCO Michigan City 2012-2014 CEMS Hourly Emissions Data Boiler 12

1-HOUR SO2 MODELING CONSENT DECREE LAPORTE COUNTY NIPSCO BOILER 12



Scale: 1" = 309.4 Meters
 GROUP NIPSCOMC - 4TH-HIGHEST MAX DAILY 1-HR VALUES AVERAGED OVER 3 YEARS Max = 165.061 (506800, 4618200)
 AERMOD 15181 2012-2014 Gary IITRI Meteorology Hourly Seasonal Background Concentrations

APPENDIX C

Modeling Protocols/Reports