

Missouri State Implementation Plan Revision

Interstate Transport Provisions for the 2010 Sulfur Dioxide National Ambient Air Quality Standard

APPENDIX 13

AECI-New Madrid Power Plant

**Prepared for the
Missouri Air Conservation Commission**



**Missouri Department of Natural Resources
Division of Environmental Quality
Air Pollution Control Program
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1. AECI-New Madrid Power Plant Facility Description and Sulfur Dioxide Emission Trends

AECI-New Madrid Power Plant (New Madrid Power Plant, FIPS-Plant ID: 143-0004) is a power plant that converts the energy from coal and other fuels to produce steam that powers electrical generating equipment. The facility conducts coal unloading, conveying, stockpiles, and pulverizing activities to supply coal to the boilers. The boilers combust the coal to create steam. The steam is sent to a steam turbine, which spins a generator to create electricity. The steam is then cooled, condensed back into water, and returned to the boiler to repeat the process. The majority of SO₂ emissions at this facility come from two boilers that combust coal.

New Madrid Power Plant is located within 50 km of Missouri's border in New Madrid County, Missouri. New Madrid Power Plant is located in the portion of New Madrid County designated as nonattainment for the 2010 SO₂ standard. The facility is approximately one km west of Kentucky, three km northwest of Tennessee, and approximately 25 km south-southwest of Illinois. The nearest border-state nonattainment area is Henderson-Webster Counties, Kentucky, which is approximately 206 km northeast.

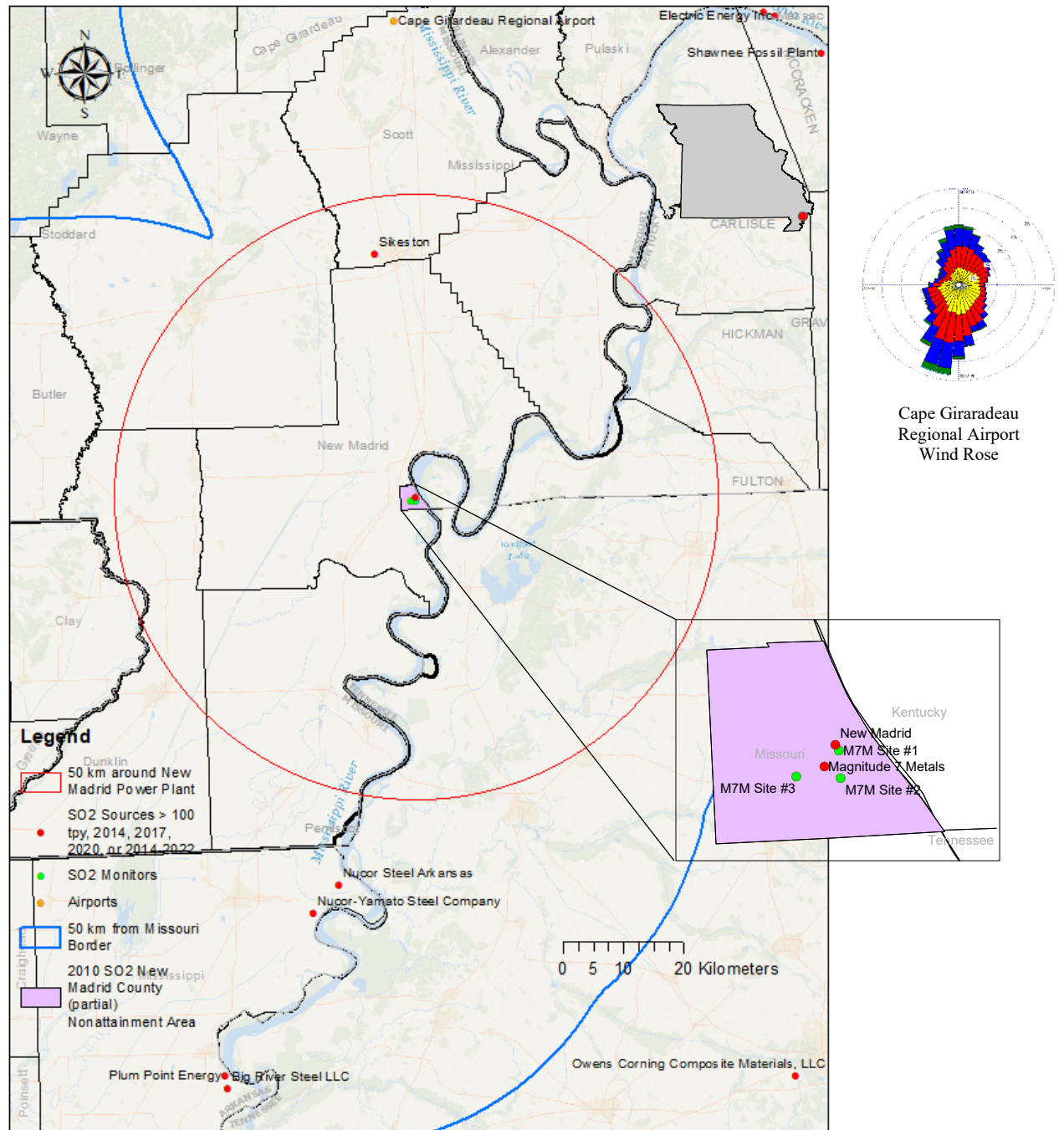
New Madrid Power Plant submits reports of plantwide emissions to the air program. The emissions reports account for all emissions during the calendar year. Table 1 shows the reported SO₂ emission trends from 2014 to 2022. Figure 1 shows the locations of facilities and monitors within 50 km of the New Madrid Power Plant.

Table 1—New Madrid Power Plant Sulfur Dioxide Emission Trends in Tons (2014-2022)

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	Percent Change from 2014
SO ₂ Emissions *	16,672	12,375	12,467	13,548	14,865	13,253	12,036	10,486	13,764	-17.44

* Data retrieved from the Missouri Emissions Inventory System (MoEIS).

Figure 1—Map Showing 50 km Radius Around the New Madrid Power Plant, including Potentially Affected Border-State Facilities, Sulfur Dioxide Ambient Air Monitors, Airports, and Wind Rose



2. Missouri Facility Analysis

New Madrid Power Plant is subject to the Data Requirements Rule and chose the monitoring compliance option. The two coal-fired boilers are subject to major trading programs such as the Acid Rain Program, the Clean Air Interstate Rule, the Cross-State Air Pollution Rule, and the Mercury and Air Toxics Standards (MATS) rule.¹

2.1 *Modeling*

2.1.1 New Madrid Power Plant

The air program submitted a nonattainment area plan for the New Madrid County SO₂ nonattainment area to the EPA on May 3, 2023. This plan includes Consent Agreements with the two contributing sources of SO₂ emissions in the nonattainment area, Magnitude 7 and the AECI-New Madrid Power Plant (New Madrid Power Plant). The Magnitude 7 Consent Agreement (APCP-2022-047A)² contains new enforceable hourly SO₂ emission rates for the three contributing emission points at the facility (the Carbon Bake stack, the existing Pot Line stack for lines 1 and 2, and the Pot Line Roof Vents), and also requires the facility to construct a new 65-meter stack and reroute the existing Carbon Bake stack emissions to this new stack. The Consent Agreement (APCP-2022-048A)³ for the New Madrid Power Plant establishes an SO₂ emission limit of 5,523 pounds per hour (lbs/hr) for the combined emissions from Unit 1 and Unit 2 boilers at the facility. The plan and requirements in the Consent Agreements are currently enforceable at the state level but are not yet federally enforceable because the plan is under review by EPA.

The attainment modeling performed in the nonattainment area plan relies on the limits in the Consent Agreements which are necessary to reduce SO₂ concentrations in the New Madrid SO₂ nonattainment area to levels that will comply with the 2010 SO₂ standard. The modeling for this plan included the New Madrid County nonattainment area as the domain, expanding anywhere from three to six km into Kentucky and Tennessee, depending on the location. The air program modeled potential emissions from Magnitude 7, the New Madrid Power Plant, and Alubar (Rod Mill). Other minor sources located outside the nonattainment area were accounted for in the background concentration. The air program used 2019-2021 monitoring data from the Mark Twain State Park monitor to establish a background SO₂ concentration of 5.0 parts per billion (ppb). Results of the modeling show that the maximum 5-year average 99th percentile 1-hour average SO₂ concentration was 75 ppb. The maximum concentration occurred less than one km east-northeast of Magnitude 7, and less than one km southeast of the New Madrid Power Plant. The modeling demonstrates that Magnitude 7 and the New Madrid Power Plant will not

¹ Operating permit #OP2020-012, permit condition 003 requires the facility to meet the MATS rule hydrogen chloride limit, which also reduces SO₂. <https://dnr.mo.gov/air/business-industry/air-permits/associated-electric-new-madrid-op2020-012>.

² The Consent Agreement for Magnitude 7 may be found in Appendix E of the New Madrid County Nonattainment Area Plan for the 2010 Sulfur Dioxide Standard, <https://dnr.mo.gov/document/new-madrid-sulfur-dioxide-nonattainment-plan-appendices-through-g>.

³ The Consent Agreement for the New Madrid Power Plant may be found in Appendix F of the New Madrid County Nonattainment Area Plan for the 2010 Sulfur Dioxide Standard, <https://dnr.mo.gov/document/new-madrid-sulfur-dioxide-nonattainment-plan-appendices-through-g>.

significantly contribute to nonattainment (prong 1) or interfere with maintenance (prong 2) of the 2010 SO₂ standard in any nearby state.

2.2 Monitoring

2.2.1 Ambient Air Monitor Design Values

Table 2 shows the 2015 to 2023 design values for existing SO₂ ambient air quality monitors located within 50 km of the New Madrid Power Plant in Missouri. The SO₂ ambient air quality monitors⁴ have design values greater than the 2010 SO₂ standard. However, the modeling in the New Madrid nonattainment area plan demonstrates concentrations will return to compliance with the 2010 SO₂ standard. In addition, since January 2024, Magnitude 7 has curtailed operations, and as a result, the preliminary maximum-daily hourly SO₂ monitor readings have dropped significantly as shown in Figure 2. The modeling indicates the New Madrid Power Plant will not significantly contribute to nonattainment (prong 1) or interfere with maintenance (prong 2) of the 2010 SO₂ standard. Figure 1 shows locations of monitors within 50 km of the New Madrid Power Plant.

Table 2—Trends in 1-Hour SO₂ Design Values for Air Quality System Monitors Within 50 km of the New Madrid Power Plant in Missouri

State	County Name	Local Monitor Site Name	Distance (km) from New Madrid Power Plant	Design Values (ppb)						
				2015-2017	2016-2018	2017-2019	2018-2020	2019-2021	2020-2022	2021-2023
MO	New Madrid	Site #1 AECL Water Tower *	0.14	ND	ND	202	320	376	417	452
MO	New Madrid	Site #2 East Graveyard *	0.71	ND	ND	268	361	333	291	291
MO	New Madrid	Site #3 West Entrance *	1.05	ND	ND	47	68	83	95	115

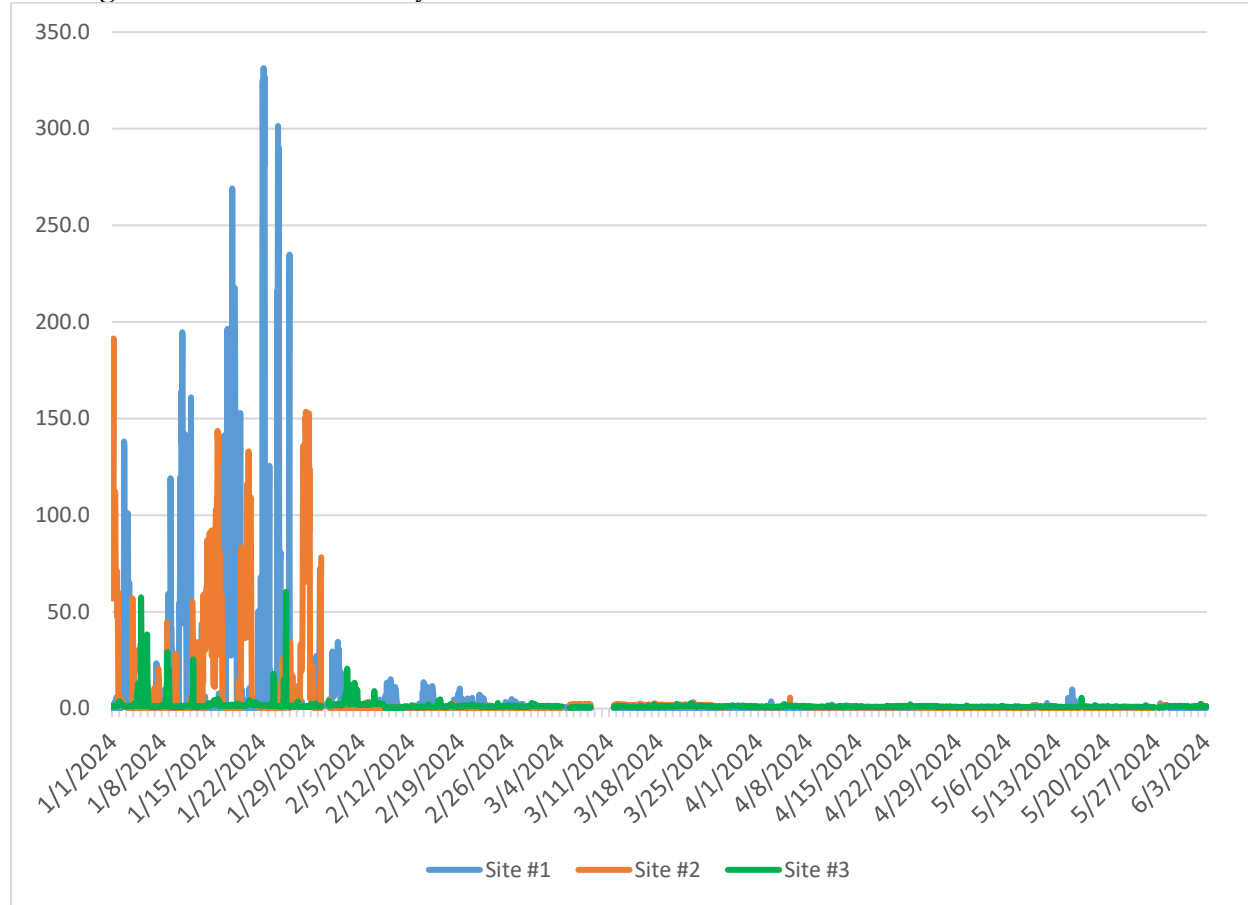
* Data Requirements Rule facility monitor for Magnitude 7 Metals, LLC.

ND indicates "No Data" due to monitor start up or shut down, data quality issues, or incomplete data.

Source: <https://www.epa.gov/air-trends/air-quality-design-values>, 2015 through 2023 Design Value Reports, Sulfur Dioxide.

⁴ States that chose the monitoring option in the Data Requirements Rule (80 FR 51052, August 21, 2015) were required to characterize ambient air quality around or impacted by significant SO₂ emission sources. The Data Requirements Rule monitors established to meet this objective were targeted, source-oriented monitors, with the primary objective of identifying peak SO₂ concentrations in the ambient air that are attributable to an identified emission source or group of sources.

Figure 2—Chart Showing Preliminary 2024 Maximum Daily Hourly SO₂ (ppb) Monitor Readings in New Madrid County



Note: Year to date preliminary data. Do not cite or quote.

2.2.2 Ambient Air Monitor 99th percentiles

Design Values are 3-year averages of the 99th percentile of 1-hour daily maximum SO₂ concentration data. As a conservative approach, the air program also reviewed the 99th percentile values shown in Table 3. The air program reviewed data for the monitors⁵ located in Missouri. The SO₂ monitors around Magnitude 7 are targeted, source-oriented monitors, with the primary purpose of identifying maximum SO₂ emissions from this facility. All values at the Missouri monitors are greater than the 2010 SO₂ standard. However, the modeling in the nonattainment area plan demonstrates concentrations will return to compliance with the 2010 SO₂ standard. In addition, since January 2024, Magnitude 7 has curtailed operations as its current compliance strategy with the SIP. The data indicates the New Madrid Power Plant will not significantly contribute to nonattainment (prong 1) or interfere with maintenance (prong 2) of the 2010 SO₂ standard in Missouri.

⁵ Id.

Table 3—Annual 99th Percentile of 1-Hour Daily Maximum Sulfur Dioxide Concentrations for Ambient Air Monitors Within 50 km of the New Madrid Power Plant in Missouri

State	County Name	Local Monitor Site Name	Distance from New Madrid Power Plant (km)	Approximate Distance to Nearest Border (km)	Annual 99 th Percentile Concentrations (ppb)				
					2019	2020	2021	2022	2023
MO	New Madrid	Site #1 AECl Water Tower *	0.14	1 (KY)	356.0	366.9	405.2	479.0	473.0
MO	New Madrid	Site #2 East Graveyard *	0.71	1 (KY)	427.8	285.3	285.3	303.7	183.0
MO	New Madrid	Site #3 West Entrance *	1.05	2 (KY)	90.7	69.4	87.9	128.4	128.0

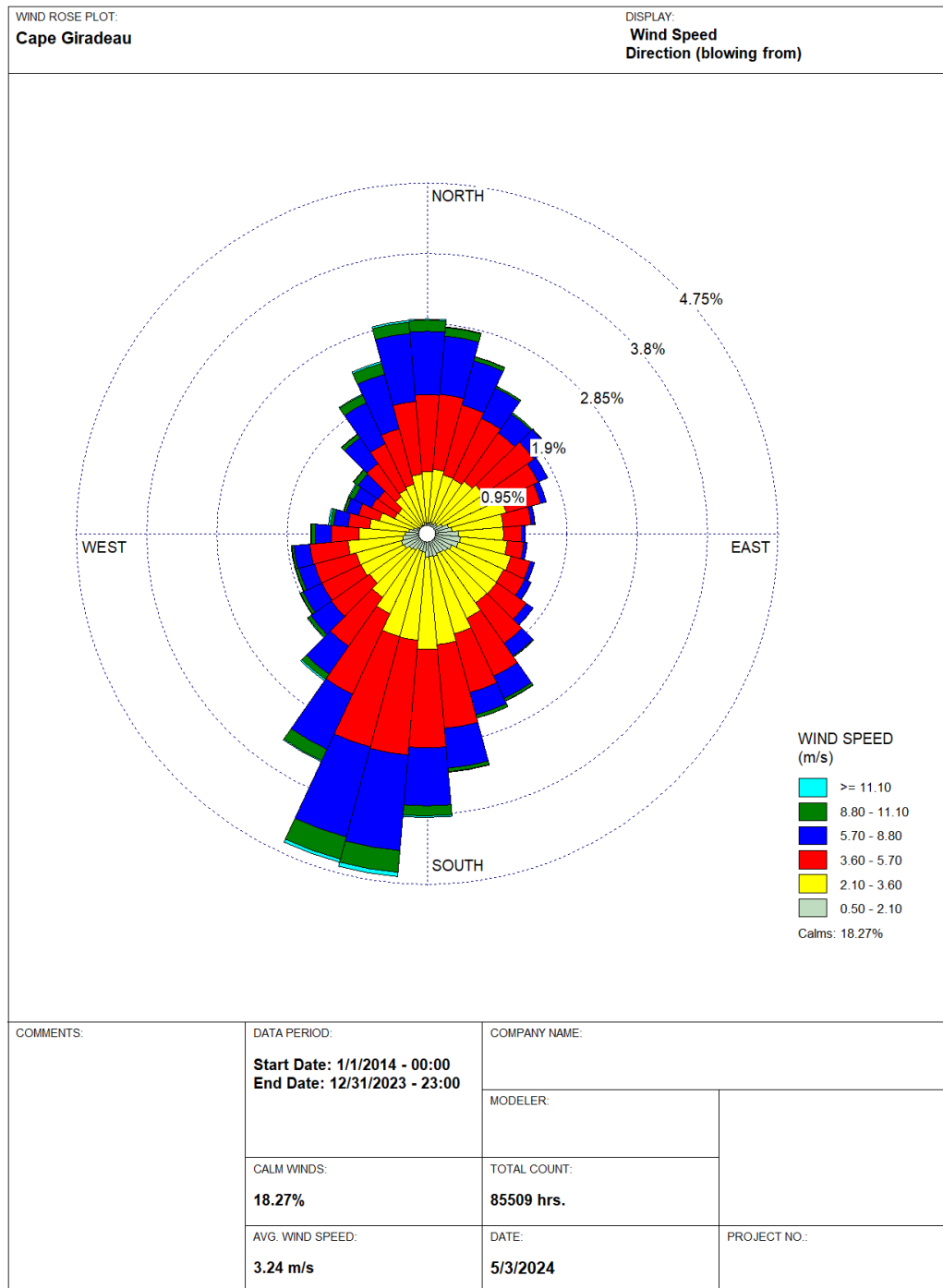
* Data Requirements Rule facility monitor for Magnitude 7 Metals, LLC.

Source: <https://www.epa.gov/outdoor-air-quality-data/monitor-values-report>; 2019 through 2023, Sulfur Dioxide.

2.3 Wind Rose

To evaluate prevalent wind transport patterns near the New Madrid Power Plant, the air program produced a wind rose using 2014-2023 meteorological data from the Cape Girardeau Regional Airport (Cape Girardeau airport). The Cape Girardeau airport is representative of the meteorological conditions at the facility. The wind rose indicates predominantly SSW winds, and a range of northerly winds as shown in Figure 2. Prevailing winds do align to flow into border-states. However, because there are no contributing outstate downwind sources located within 50 km, there are no combined source impacts. Most of the New Madrid Plant's SO₂ emissions are emitted at a stack height of approximately 800 feet contributing to good dispersion. Additionally, the modeling in the nonattainment area plan demonstrates concentrations will return to compliance with the 2010 SO₂ standard. The air program concludes that the New Madrid Power Plant is not significantly contributing to nonattainment (prong 1) or interfering with maintenance (prong 2) of the 2010 SO₂ standard in Kentucky or Tennessee.

Figure 3—Wind Rose Derived from the Cape Girardeau Regional Airport Hourly Wind Speeds and Direction (2014-2023)



WRPLOT View - Lakes Environmental Software

3. Border-State Analysis

To determine whether the New Madrid Power Plant is likely to significantly contribute to or interfere with maintenance in a bordering state, the air program identified sources meeting three criteria. The air program selected these criteria as a conservative approach to identify areas where New Madrid Power Plant could most likely contribute to elevated SO₂ concentrations. There are no facilities that meet all of the following criteria: the facility is located in a bordering state, the facility reported SO₂ emissions greater than 100 tons per year in National Emissions Inventory years 2014, 2017, or 2020, and the facility is located within 50 km of the New Madrid Power Plant. Figure 1 shows the locations of facilities within 50 km of the New Madrid Power Plant. There are no potentially affected border-state facilities to evaluate in the prong 1 and prong 2 analysis.

3.1 *Modeling*

There are no existing border-state SO₂ emission sources located within 50 km of the New Madrid Power Plant.

3.2 *Monitoring*

There are no existing SO₂ air quality monitors in border-states located within 50 km of the New Madrid Power Plant.

4. Conclusion

Emissions from the New Madrid Power Plant do not significantly contribute to nonattainment (prong 1) or interfere with maintenance (prong 2) of the 2010 SO₂ standard based on the following:

4.1 *Prong 1*

- New Madrid County, Missouri, Nonattainment Area Plan modeling results show SO₂ concentrations will be in compliance with the standard in Missouri, Kentucky, and Tennessee based on the conditions of the Consent Agreements.
- Since curtailment of operations at Magnitude 7 Metals in late January 2024, the preliminary maximum daily SO₂ monitor values near the plant in New Madrid County have all remained well below the 2010 SO₂ standard.

4.2 *Prong 2*

- New Madrid Power Plant's two coal-fired boilers are subject to major trading programs such as the Acid Rain Program, the Clean Air Interstate Rule, the Cross-State Air Pollution Rule, and the Mercury and Air Toxics Standards (MATS) rule.
- The Nonattainment Area Consent Agreements include maximum allowable emission rates that demonstrate continuous compliance at all receptors near the facility.
- There are no contributing outstate downwind sources located within 50 km, resulting in no combined source impacts.