INDIANA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
We Protect Hoosiers and Our Environment.
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Eric J. Holcomb
Governor

Brian C. Rockensuess
Commissioner

August 15, 2023

Ms. Debra Shore
Regional Administrator
U.S. EPA, Region 5
77 West Jackson Boulevard
Chicago, IL 60604-3950

Re: Attainment Demonstration and Supporting Documents for Indiana's Portion of the Chicago, Illinois-Indiana-Wisconsin (IL-IN-WI), 2015 8-Hour Ozone Nonattainment Area

Dear Ms. Shore:

Pursuant to Sections 172 and 182 of Clean Air Act (CAA), the Indiana Department of Environmental Management (IDEM) submits amendments to the Indiana State Implementation Plan (SIP). These amendments apply to Indiana's portion (Lake and Porter partial counties) of the Chicago (IL-IN-WI), 2015 8-Hour Ozone Moderate Nonattainment Area.

Indiana hereby requests review and approval of the following submittals that fulfill requirements in Sections 172 and 182 of the CAA.

- **Attainment Demonstration and Technical Support Document (Attachment A)**

  Indiana demonstrates that the Chicago nonattainment area's air quality is progressing towards attainment of the 2015 8-hour ozone standard.

  The Lake Michigan Air Directors Consortium (LADCO), in cooperation with the states of Illinois, Indiana, and Wisconsin developed updated air quality analyses to support the development of ozone attainment demonstrations. LADCO's modeling results demonstrate that existing emission reduction control measures have improved ozone air quality in the region since designation.

  This attainment demonstration and weight of evidence analysis, along with LADCO's modeling analyses, clearly demonstrates that existing permanent and enforceable emission control measures will ensure the area's air quality continues to improve.

- **Volatile Organic Compounds (VOCs) Reasonably Available Control Technology (RACT) (Attachment B)**

  Indiana certifies that existing VOC rules contained in 326 Indiana Administrative Code (IAC) 8 satisfy VOC RACT requirements under Section 182(b)(2) of the CAA. These rules have been approved into Indiana's SIP. No additional measures are reasonably available that will advance the attainment date.

  Indiana certifies that the Negative Declaration for the Control Techniques Guidelines (CTGs) for Fiberglass Boat Manufacturing Materials, submitted June 5, 2009, and approved by United States Environmental Protection Agency (U.S. EPA) on February 24, 2010, is still up to date.

  Indiana also certifies that the Negative Declaration for the Oil and Natural Gas Industry CTGs submitted October 25, 2018, and approved by U.S. EPA on January 13, 2019, is still up to date.

- **2023 Fifteen Percent (15%) Rate of Progress Plan and Three Percent (3%) Contingency Measure Plan (Attachment C)**

  These plans fulfill requirements under Section 182(b)(1) of the CAA. They are based on measures that are already in-place and technology that is already available. The emission reductions that were found were adequate to meet the 15% and 3% requirements and also provide for an ample margin of safety. There are not any additional control measures that were identified that would advance the attainment date.

- **Revised 2017 Base-Year Emissions Inventory (Attachment D)**

  The revised 2017 base-year emissions inventory updates and replaces the 2017 base-year emissions inventory that was included as Enclosure 1 of the "Update and Replacement for the January 21, 2021, Clean Air Section 172 and 182 State Implementation Plan for Indiana's Portion of the Chicago, Illinois-Indiana-Wisconsin 2015 8-Hour Ozone Nonattainment Area" submitted September 10, 2021. As such, Indiana formally withdraws the January 21, 2021, base-year emission inventory submittal.

  This revised 2017 base-year emission inventory satisfies the state's obligation under Section 182(a)(1) of the CAA and represents a comprehensive and accurate inventory of ozone precursor emissions for Indiana's portion of the Chicago nonattainment area.

- **Nonattainment New Source Review (NNSR) (Attachment E)**

  Indiana certifies that existing NNSR rules, found in 326 IAC 2-3 satisfy, and are at least as stringent as, the NNSR SIP plan requirements of 40 Code of Federal Regulations (CFR) 51.165 for the 2015 8-hour ozone NAAQS. These rules were approved into Indiana's SIP on August 25, 1994 (94 FR 24838) and June 28, 2011 (76 FR 40242) and have not been subsequently amended.

- **Enhanced Vehicle Emissions Inspection and Maintenance (I/M) Testing Program (Attachment F)**

  Indiana certifies that the existing Enhanced Vehicle Emissions Inspection and Maintenance (I/M) Testing Program for Lake and Porter counties fulfills motor vehicle inspection and maintenance requirements under Section 182(b)(4) of the CAA. The program is authorized by state statue Indiana Code (IC) 13-17-5, paid through the general funds, and implemented through rules promulgated by the Indiana Environmental Rules Board at 326 IAC 13. The program was approved effective May 20, 1996 (61 FR 11142).

  In addition, an analysis was performed to determine oxides of nitrogen (NO_x) and hydrocarbon (HC) emission rates by vehicle type for Lake and Porter counties. The results verify that NO_x and HC emissions reductions from Indiana's SIP-approved I/M program are within the 0.02 grams per mile buffer of the emission reductions from U.S. EPA's model program under 40 CFR 51.351(i). Therefore, Indiana's current I/M program in Lake and Porter counties meets the applicable enhanced I/M performance requirements in 40 CFR 51.3.

- **Periodic Inventory Emissions Statement (Attachment G)**

  Indiana certifies that the current Emissions Reporting Rule, 326 IAC 2-6 satisfies Indiana's obligation under Section 182(a)(3)(B) of the CAA for Lake and Porter patrial counties classified as moderate under the 2015 8-hour ozone NAAQS. The emissions reporting rule requires sources located in the northern portions of Lake and Porter counties that emit either NO_x and VOCs into the ambient air equal to or greater than twenty-five (25) tons per year to annually report their emission levels to IDEM.

- **Environmental Justice Screen Reporting Results (Attachment H)**

  U.S. EPA's September 2019 environmental and mapping tool (EJScreen) technical documentation indicates that an area with one or more environmental justice (EJ) indexes at or above the 80th percentile nationally should be considered as a potential candidate for consideration, analysis, or outreach. IDEM used EJScreen to identify areas in Indiana's portion of the Chicago 2015 8-hour ozone moderate nonattainment area with potentially overburden communities and to assess whether this attainment plan would add to existing pollution exposure or burdens for those communities.

- **Public Participation Process (Attachment I)**

  IDEM provided opportunity for a 30-day comment period and opportunity for a public hearing concerning the *Attainment Demonstration and Technical Support Document, Revised 2017 Base-Year Emissions Inventory, 2023 Fifteen Percent*

Rate of Progress and Three Percent Contingency Measure Plans, and Certifications of Indiana's VOC RACT, New Source Review, Vehicle Inspection and Maintenance, and Emissions Reporting Programs for Indiana's Portion of the Chicago, Illinois-Indiana-Wisconsin (IL-IN-WI) 2015 8-Hour Ozone National Ambient Air Quality Standards (NAAQS) "Moderate" Nonattainment Area. A public hearing was requested and was held on June 28, 2023, and the public comment period closed on July 5, 2023. Please refer to Attachment I for a summary of all comments received that includes IDEM's responses, as applicable.

All of the regulations in the submittals that Indiana is certifying, the *Volatile Organic Compounds (VOCs) Reasonably Available Control Technology (RACT) Indiana's Nonattainment New Source Review (NNSR) Plan, Enhanced Vehicle Emissions Inspection and Maintenance (I/M) Testing Program, and Periodic Inventory Emissions Statement*, went through the public participation process and were approved by U.S. EPA before being implemented into Indiana's SIP.

This document was submitted to U.S. EPA via the State Planning Electronic Collaboration System (SPeCS). Transmittal letters were distributed to individuals per the distribution list below. If you have any questions or need additional information, please contact Brian Callahan, Chief, Air Quality Standards and Implementation Section, Office of Air Quality, at (317) 232-8244 or bcallaha@idem.IN.gov.

Sincerely,

Matt Stuckey
Assistant Commissioner
Office of Air Quality

MS/sd/bc/gf/mb

Attachment A: Attainment Demonstration and Technical Support Document
Attachment B: VOC Reasonably Available Control Technology (RACT) Certification
Attachment C: 2023 15% Rate of Progress Plan and 3% Contingency Plan
Attachment D: Revised 2017 Base-Year Inventory
Attachment E: Nonattainment New Source Review Plan Certification
Attachment F: Enhanced Vehicle Emissions Inspection and Maintenance Certification
Attachment G: Periodic Inventory Emissions Statement Certification
Attachment H: Environmental Justice Screen Reporting Results
Attachment I: Public Participation Process

cc: Sarah Arra, U.S. EPA Region 5 (no enclosures)
Chris Panos, U.S. EPA Region 5 (no enclosures)
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Attachment A

ATTAINMENT DEMONSTRATION AND TECHNICAL SUPPORT DOCUMENT

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ATTAINMENT DEMONSTRATION AND TECHNICAL SUPPORT DOCUMENT FOR INDIANA'S PORTION OF THE CHICAGO, ILLINOIS-INDIANA-WISCONSIN (IL-IN-WI), 2015 8-HOUR OZONE NONATTAINMENT AREA

Calumet, Hobart, North, Ross, and St. John Townships in Lake County

and

Center, Jackson, Liberty, Pine, Portage, Union, Washington, and Westchester Townships in Porter County

Prepared By:
The Indiana Department of Environmental Management

August 2023

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ATTAINMENT DEMONSTRATION AND TECHNICAL SUPPORT DOCUMENT FOR INDIANA'S PORTION OF THE CHICAGO, ILLINOIS-INDIANA-WISCONSIN (IL-IN-WI), 2015 8-HOUR OZONE NONATTAINMENT AREA

Lake (partial) and Porter (partial) Counties, Indiana

1.0 OVERVIEW

1.1 Introduction

The Chicago, IL-IN-WI, nonattainment area for the 2015 8-hour ozone standard was re-classified from "marginal" to "moderate" on October 7, 2022, (87FR 60897), effective November 11, 2022. United States Environmental Protection Agency's (U.S. EPA's) final ruling was a result of the area not attaining the 2015 8-hour ozone National Ambient Air Quality Standard (NAAQS) by the attainment deadline of August 3, 2021. Sections 172 and 182 of Clean Air Act (CAA) stipulate the requirements nonattainment areas must meet. One of the requirements for nonattainment areas designated as moderate is to develop state implementation plans (SIPs) that expeditiously attain and maintain the standard.

In accordance with U.S. EPA guidance, this document addresses the CAA's moderate nonattainment area requirements found in the final SIP Requirements Rule for the 2015 ozone NAAQS, 40 Code of Federal Register (CFR) 51.1300 *et seq* for a moderate area SIP revision. These requirements are further discussed in Section 2.0. The structure and content of this document address each of the elements required by the CAA and U.S. EPA guidance.

1.2 Ozone Background

Ground level ozone is not emitted directly into the air but is created by chemical reactions with nitrogen oxides (NO_x) and volatile organic compounds (VOCs) in the presence of sunlight. Ozone formation is promoted by strong sunlight, warm temperatures, and light winds; elevated levels predominantly occur during the hot summer months. Since ozone is formed in the ambient air, control of ozone focuses upon the reduction of precursor emissions (i.e., NO_x and VOCs).

NO_x is formed from the high-temperature reaction of nitrogen and oxygen during combustion processes in sources such as electric utility boilers, industrial fuel-burning, and motor vehicles. VOCs include many industrial solvents and coatings, as well as the hydrocarbons (HCs) that are emitted by motor vehicles as evaporative losses from gasoline and tailpipe emissions of unburned HC. Ground level ozone is associated with several adverse health and environmental impacts, including respiratory impairment and damage to crops and vegetation.

1.3 National Ambient Air Quality Standards (NAAQS)

Ozone is one of the six criteria air pollutants that scientists have identified as being particularly harmful to humans and the environment. NAAQS have been developed for these six pollutants and are used as measurements of air quality. The CAA requires U.S. EPA to set primary standards at a level judged to be "requisite to protect the public health" with an adequate margin of safety and set secondary standards at a level "requisite to protect public welfare from "any known or anticipated adverse effects" associated with the pollutant in the ambient air, including effects on crops, vegetation, wildlife, buildings and national monuments, and visibility.

In 1997, U.S. EPA revised the air quality standards for ozone, replacing the 1979 1-hour standard with an 8-hour ozone standard set at 0.08 parts per million (ppm). The standard was challenged legally and upheld by the U.S. Supreme Court in February of 2001. On March 12, 2008, U.S. EPA strengthened the 8-hour ozone standard to a level of 0.075 ppm. On October 1, 2015, U.S. EPA further strengthened the 8-hour ozone standard to a level of 0.070 ppm. The chronicle of strengthening the 8-hour ozone standard is shown in Table 1.1.

Table 1.1: National Ambient Air Quality Standards for Ozone

	Primary Standards		**Secondary Standards**	
	Level	**Averaging Time**	**Level**	**Averaging Time**
1997 Ozone Standards	0.08 ppm	Three-year average of the fourth highest 8-hour ozone value recorded each year.	Same as primary	
2008 Ozone Standards	0.075 ppm	Three-year average of the fourth highest 8-hour ozone value recorded each year.	Same as primary	
2015 Ozone Standard	0.070 ppm	Three-year average of the fourth highest 8-hour ozone value recorded each year.	Same as primary	

1.4 Nonattainment Area Background

The Chicago-Gary-Lake County, Illinois-Indiana area was subjected to nonattainment area rulemakings under the 1979 1-hour ozone standard and the 1997 8-hour ozone standard. The 1-hour ozone standard was revoked on June 15, 2005. U.S. EPA approved Indiana's redesignation request for attainment under the 1997 8-hour ozone standard on May 11, 2010 (75 FR 26113). This area remains classified as maintenance. Illinois' portion was also redesignated to attainment and classified as maintenance under the 1997 8-hour ozone standard on August 13, 2012 (77 FR 48062).

The Chicago-Naperville IL-IN-WI area within which Lake and Porter counties, Indiana, reside, was subjected to nonattainment area rulemakings under the 2008 8-hour ozone standard. U.S. EPA approved Indiana's redesignation for attainment on May 20, 2022 (87 FR 30821). Illinois' and Wisconsin's portions were also redesignated to attainment and classified as maintenance under the 2008 8-hour ozone standard on May 20, 2022 (87 FR 30828) and April 11, 2022 (87 FR 21027), respectively.

On June 4, 2018, effective August 3, 2018, U.S. EPA designated the Chicago, IL-IN-WI area (Chicago nonattainment area), including Calumet, Hobart, North, Ross, and St. John townships in Lake County, Indiana, as nonattainment in 40 CFR 81.315 and classified it as "marginal" under Subpart 2 of Part D, Title I of the CAA (83 FR 25776). On June 14, 2021, effective July 14, 2021, U.S. EPA revised the Chicago nonattainment area boundary to include Center, Jackson, Liberty, Pine, Portage, Union, Washington, and Westchester townships in Porter County, Indiana (86 FR 31438). This classification provided three years for the area to attain the standard (i.e., August 3, 2021).

On October 7, 2022, effective November 7, 2022, due to failing to meet the attainment date, the Chicago nonattainment area was re-classified from "marginal" to "moderate" (87 FR 60897). This final rule established a new attainment date of August 3, 2024. Therefore, Indiana is submitting this attainment plan for the moderate classification as required by Sections 172(c) and 182(c)(2) of the CAA.

1.5 Nonattainment Area Geography

The specific counties and partial counties that comprise the Chicago, Illinois-Indiana-Wisconsin, nonattainment area as defined in 40 CFR 81.314, 40 CFR 81.315, and 40 CFR 81.350 include: Cook, DuPage, Grundy (partial), Kane, Kendall (partial), Lake, McHenry, and Will counties, Illinois; Kenosha County (partial), Wisconsin; and Lake (partial) and Porter (partial) counties, Indiana. The Chicago nonattainment area is depicted in Figure 4.1.

Lake and Porter counties are located in Northwest Indiana and contain such cities as East Chicago, Gary, Hammond, Portage, and Valparaiso. Lake and Porter counties are bordered by Lake Michigan to the north, the Indiana counties of Jasper and Newton to the south, and LaPorte to the east. The Illinois counties of Cook, Kankakee, and Will border Lake and Porter counties to the west. In Illinois and Wisconsin, the nonattainment area contains such cities as Aurora, Chicago, and Joliet in Illinois, and the City of Kenosha and Village of Pleasant Prairie in Wisconsin.

The Indiana Department of Environmental Management (IDEM), the Illinois Environmental Protection Agency (IEPA), and the Wisconsin Department of Natural Resources (WDNR) are responsible for assuring the nonattainment area for the 2015 8-hour ozone standard complies with the CAA requirements. These state agencies have worked cooperatively with U.S. EPA Region V to address attainment planning issues. Although the agencies have worked together on a comprehensive plan for the multi-state nonattainment area, each state is required to make a separate submittal for its portion of the planning components to U.S. EPA. Attainment demonstrations are SIP submittals and U.S. EPA action on them is taken separately.

2.0 CLEAN AIR ACT REQUIREMENTS

Sections 172 and 182 of the CAA specify the various planning requirements that apply to moderate ozone nonattainment areas. Also, because the Chicago, IL-IN-WI, Ozone Nonattainment Area includes portions of at least two (2) states, Section 182(j) of the CAA adds additional plan provisions concerning the coordination of the states involved. The CAA specifies the following requirements:

- Reasonably Available Control Measures (RACM) / Reasonably Available Control Technology (RACT);
- Reasonable Further Progress (RFP), NO_x Control, and Milestones;
- Base-Year Emissions Inventory;
- Periodic Inventory and Emissions Statements;
- Identification and Quantification of Emissions;
- Permit Program for New and Modified Sources;
- Other Control Measures, Means, or Techniques;
- Compliance with Section 110(a)(2);
- Equivalent Techniques;
- Contingency Measures;
- Demonstration of Attainment;
- Mobile Source Emissions Budgets;
- NO_x Requirements; and,
- Vehicle Inspection and Maintenance Testing Program.

2.1 Reasonably Available Control Measures (RACM) / Reasonably Available Control Technology (RACT)

Sections 172(c)(1) and 182(b)(2) of the CAA require a demonstration that the state has adopted all reasonable and available control measures to demonstrate attainment as expeditiously as practicable and that no additional measures that are reasonably available will advance the attainment date.

As required by Sections 172 and 182 of the 1990 CAA, in the mid-1990s Indiana promulgated rules requiring RACT for emissions of VOCs. There were no specific rules required by the CAA such as RACT for existing sources beyond statewide rules. Statewide RACT rules have applied to all new sources locating in Indiana since that time. The Indiana rules are found in 326 Indiana Administrative Code (IAC) 8. The moderate major threshold of 100 tons per year (tpy) is addressed for non-CTG sources in 326 IAC 8-7. Local control measures, including RACT rules specific to Lake and Porter counties, have helped reduce VOC emissions and other types of emissions in Northwest Indiana. These measures include:

326 IAC 8-7	Specific VOC Reduction Requirements
326 IAC 8-8	Municipal Solid Waste Landfills
326 IAC 8-9	Volatile Organic Liquid Storage Vessels
326 IAC 8-11	Wood Furniture Coatings
326 IAC 8-12	Shipbuilding or Ship Repair Operations
326 IAC 8-13	Sinter Plants
326 IAC 8-16	Offset Lithographic Printing and Letterpress Printing
326 IAC 8-17	Industrial Solvent Cleaning Operations
326 IAC 8-18	Synthetic Organic Chemical Manufacturing Industry Air Oxidation, Distillation, and Reactor Processes
326 IAC 8-19	Control of Volatile Organic Compound Emissions from Process Vents in Batch Operations
326 IAC 8-20	Industrial Wastewater
326 IAC 8-21	Aerospace Manufacturing and Rework Operations
326 IAC 8-22	Miscellaneous Industrial Adhesives
326 IAC 13	Motor Vehicle Emission and Fuel Standards (including a motor vehicle inspection and maintenance program for Lake and Porter counties)
326 IAC 4-1-4.1(c)	Ban on residential burning in Lake and Porter counties
40 CFR 80.70(f)(3)	Federal requirement for the use of federal reformulated gasoline (RFG) in Lake and Porter counties

Indiana's fully approved and effective rules are found in 326 IAC 8. The following is a list of the applicable rules:

326 IAC 8-1-6	New facilities; general reduction requirements (Best Available Control Technology for Non-Specific Sources)
326 IAC 8-2	Surface Coating Emission Limitations
326 IAC 8-3	Organic Solvent Degreasing Operations
326 IAC 8-4	Petroleum Sources
326 IAC 8-5	Miscellaneous Operations
326 IAC 8-6	Organic Solvent Emission Limitations
326 IAC 8-10	Automobile Refinishing
326 IAC 8-14	Architectural and Industrial Maintenance Coatings
326 IAC 8-15	Standards for Consumer and Commercial Products

Indiana certifies that existing VOC rules found in 326 IAC 8 fulfill VOC RACT CAA requirements. Indiana is seeking U.S. EPA approval of this certification request.

Indiana along with other Lake Michigan Air Directors Consortium (LADCO) states worked on two projects to identify and evaluate candidate NO_x and VOC emission controls for reducing emissions in the region, with emphasis on ozone nonattainment areas, including the Chicago 2015 ozone nonattainment area. Under contract to LADCO, Ramboll, Inc. investigated potential NO_x and VOC control measures in all inventory sectors and NO_x control options for non-EGU sources.[1]

An analysis of over 300 candidate point, nonpoint, and mobile emission control measures was conducted. Existing regional NO_x and VOC emission control measures were identified in order to develop a comprehensive list of potential control measures. These measures were then screened based on potential emission reductions, cost effectiveness, and other factors to develop a list of candidate emission controls. A detailed evaluation was then conducted for five source categories.

A comprehensive list of NO_x emission controls was also developed and evaluated for potential emission reductions and costs under a number of scenarios for ten stationary source categories. A combination of high, medium, and low levels of control stringency and applicability to sources based on assumed potential-to-emit levels of 100, 50, 25, and 10 tons per year were evaluated.

Indiana considers the comprehensive assessment of candidate control options for the five selected source categories developed under the first analysis to serve as the primary basis for the RACM evaluation, while the detailed evaluation of select control measures in both of these analyses provide additional support to this assessment. This list was developed using U.S. EPA's Menu of Control Measures in order to identify a broad list of control options and supplemented from various other resources. As shown

[1] https://www.ladco.org/technical/projects/ramboll-o3- precursors-contract-2020/

in Appendix A5, Ramboll, Inc. estimated the available emissions reductions in Indiana's portion of the Chicago nonattainment area for each of the potential control measures.

Additional control measures are required for RACM if they can advance the attainment date by a year or more. Any measure(s) advancing the attainment date by a year would have had to be in place by January 1, 2022. Even though some of the identified measures may provide NO_x or VOC emissions reductions beyond what is currently required, they cannot advance the attainment date, as it has already passed. Therefore, no additional emissions control measures or reduction requirements are applicable for RACM for Indiana's portion of the Chicago nonattainment area under the 2015 ozone standard.

2.2 Reasonable Further Progress (RFP), NO_x Control, and Milestones

Sections 172(c)(2) and 182(b)(1) of the CAA require states with ozone nonattainment areas classified as moderate or higher to submit plans to show RFP towards attaining the standard.

Lake and Porter counties were previously designated nonattainment under the 1-hour ozone standard. The area met all of its 1-hour ozone SIP obligations. The control measures outlined, post Indiana's approved 1999 9% ROP plan, in the 2002, 2005, and 2007 Rate of Progress plans have been fully implemented. The area was also designated nonattainment for ozone under the 1997 8-hour standard in 2004. Since that time, the area has attained the 1997 8-hour ozone standard and was redesignated to attainment.

Once again, the area was designated nonattainment for ozone under the 2008 8-hour standard in 2012 (marginal), reclassified to moderate in 2016, and subsequently bumped-up to serious in 2019. Indiana's 2017 Fifteen Percent (15%) ROP and Three Percent (3%) Contingency Plans for the moderate classification were approved by U.S. EPA on February 13, 2019, effective March 15, 2019 (84 FR 3711). Indiana also submitted a 2020 Nine Percent (9%) and a Three Percent (3%) Contingency Plan for the serious classification on December 29, 2020. Since that time, the area has attained the 2008 8-hour ozone standard and was redesignated to attainment.

For the 2015 8-hour standard, Indiana's 2023 Fifteen Percent (15%) ROP and Three Percent (3%) Contingency Plans demonstrate RFP in measurable reductions of VOCs and NO_x over a 6-year period from 2017-2023. The ROP plan has been calculated using existing emission control measures and technology. Indiana is seeking U.S. EPA approval of the 2023 Fifteen Percent (9%) and Three Percent (3%) Contingency Plans.

2.2.1 2023 Fifteen Percent (15%) ROP Plan and Three Percent (3%) Contingency Plan

Pursuant to Section 182(b)(1) of the CAA, Indiana developed a 2023 Fifteen Percent (15%) ROP Plan and Three Percent (3%) Contingency Plan. The plans demonstrate VOC and NO_x emissions are projected to decline by approximately 10% and 14% from 2017 to 2023, respectively. In order to demonstrate a 15% emissions reduction and 3% contingency, only detailed emission reductions from existing control regulations have been used. Both VOC and NO_x reductions are needed to meet the RFP reduction targets. NO_x substitution is used on a percentage basis to cover any percentage shortfall in VOC emission reductions.

U.S. EPA guidance is to factor the 3% contingency through one year beyond the attainment year, i.e., 2024. However, demonstrating the 3% contingency through the year 2023 is a more conservative analysis. Thus, this analysis demonstrates a 18% rate of progress reduction by the end of 2023.

In combination with the existing ROP plans, the new ROP plan will fulfill the requirements for a 15 percent emission’s reduction within six (6) years (2017-2023) after the baseline year (2017) and the three (3) percent contingency plan.

2.2.2 Existing ROP Plans

Several control measures have been implemented in Lake and Porter counties as part of previous SIP submittals. These ROP plans outline the measures implemented in association with previous SIP submittals that have resulted in permanent and enforceable emission reductions in Lake and Porter counties.

1997 Fifteen Percent (15%) ROP Plan

Indiana’s final 15% ROP plan was approved by U.S. EPA on July 18, 1997. The measures include a mix of point, area, and mobile source control measures:

1. Enhanced Vehicle Inspection and Maintenance Program

   Regulatory Basis: 326 IAC 13-1.1
   Implementation Status: Equivalent controls remain in place.

2. Stage II Vapor Recovery

   Regulatory Basis: 326 IAC 8-4-6
   Implementation Status: Controls remains in place due to gasoline dispensers being allowed to decommission Stage II controls because of wide-spread use of on-board vehicle controls.

3. Reformulated Gasoline Program

   Regulatory Basis: CAA-Federal Control Program
   Implementation Status: Control remains in place.

4. National Volatile Organic Compound Emission Standards for Architectural Coatings Rule

   Regulatory Basis: 40 CFR Part 59, Subpart D
   Implementation Status: Control remains in place.

5. Residential Opening Burning Ban

   Regulatory Basis: 326 IAC 4-1
   Implementation Status: Control remains in place for all incorporated areas.

6. Non-Category Technology Guidelines (CTG) RACT

   Regulatory Basis: 326 IAC 8-7
   Implementation Status: Control remains in place.

1999 Nine Percent (9%) ROP Plan

Indiana's final 1999 9% ROP plan was approved by U.S. EPA on January 26, 2000. The reductions included a variety of state and federal measures that affected various industrial and area sources, such as steel mills, small engines (e.g., lawnmowers), gasoline reformulation, and personal solvent usage. The measures included the following:

1. Emission Limits for Benzene from Coke Oven By-Product Recovery Plants

   Regulatory Basis: 326 IAC 14-9
   Implementation Status: Control remains in place.

2. National Emission Standards for Hazardous Air Pollutants (NESHAP) for Coke Oven Batteries

   Regulatory Basis: 326 IAC 20-3-1
   Implementation Status: Control remains in place.

3. Federal Phase I Reformulated Gasoline (RFG) on Small Non-Road Engines

   Regulatory Basis: Clean Air Act Amendments of 1990; Section 211 of the Clean Air Act
   Implementation Status: Control remains in place.

4. Federal Controls on Small Spark-Ignited Engines (July 3, 1995, 60 FR 34581)

   Regulatory Basis: Court-ordered standards for small spark-ignited engines; 40 CFR Part 90
   Implementation Status: Control remains in place.

5. Commercial/Consumer Solvent Reformulation Rule

   Regulatory Basis: 40 CFR 59, Subpart C
   Implementation Status: Control remains in place.

6. Volatile Organic Liquid Storage RACT

   Regulatory Basis: 326 IAC 8-9
   Implementation Status: Control remains in place.

2002 Nine Percent (9%) ROP Plan

Indiana's 2002 9% ROP plan consists of several federal regulations and some measures specific to Indiana, including state rules and negotiated agreements. The reductions included measures that control VOC emissions from steel mill sinter plants, non-road mobile sources, and municipal solid waste landfills. The measures included the following:

1. Additional Reductions from Federal Controls on Small Spark-Ignited Engines (64 FR 15207, March 30, 1999)

   Regulatory Basis: Court-ordered standards for small spark-ignited engines; 40 CFR Part 90
   Implementation Status: Control remains in place.

2. Sinter Plant Rule

   Regulatory Basis: 326 IAC 8-13
   Implementation Status: Control remains in place.

3. Municipal Solid Waste Landfill

   Regulatory Basis: 326 IAC 8-8
   Implementation Status: Control remains in place.

2005 Nine Percent (9%) ROP Plan

Since there were surplus emission reductions from previous plans, no emission reductions were necessary to meet the additional 9% reduction in VOC emissions for the 2005 ROP. However, the plan includes a federal regulation that further reduces VOCs emitted by non-road small engine sources. The measure includes the following:

1. Further Reductions from Federal Controls on Small Spark-Ignited Engines (65 FR 24268, April 25, 2000)

   Regulatory Basis: Federal Standards for small spark-ignited engines; 40 CFR Part 90
   Implementation Status: Control remains in place.

2007 Six Percent (6%) ROP Plan

Indiana's 2007 6% ROP plan consists of several federal regulations and some measures specific to Indiana, including state rules and negotiated agreements. The reductions included measures that control VOC emissions from petroleum refineries, non-road mobile sources, volatile organic liquid storage operations, cold cleaning degreasing operations, and the reformulation of commercial and consumer products. The measures included the following:

1. Further Reductions from Federal Controls on Small Spark-Ignited Engines (69 FR 1823, January 12, 2004)

   Regulatory Basis: Court-ordered standards for small spark-ignited engines; 40 CFR Part 90
   Implementation Status: Control remains in place.

2. Commercial/Consumer Solvent Reformulation Rule

   Regulatory Basis: 40 CFR 59, Subpart C
   Implementation Status: Control remains in place.

3. Petroleum Refineries NESHAP

   Regulatory Basis: 326 IAC 20-16
   Implementation Status: Control remains in place.

4. United States Steel-Gary Works Agreed Order with IDEM (March 22, 1996)

   Control Method: Halts the use of untreated water for quenching (326 IAC 6.8-9-3(7))
   Implementation Status: Control remains in place.

5. Volatile Organic Liquid Storage RACT

   Regulatory Basis: 326 IAC 8-9
   Implementation Status: Control remains in place.

6. Cold Cleaner Degreasers

   Regulatory Basis: 326 IAC 8-3-8
   Implementation Status: Control remains in place.

2017 Fifteen Percent (15%) ROP Plan and Three Percent (3%) Contingency Plan

Pursuant to Section 182(b)(1) of the CAA, Indiana developed a 2017 Fifteen Percent (15%) ROP Plan and a Three Percent (3%) Contingency Plan. The plans demonstrated a 17% decline in VOCs and a 28% decline in NO_x from 2011-2017. After accounting for creditable VOC emission reductions, additional reductions were needed to fulfill the total 18% reduction requirement. NO_x emissions were substituted (with an applied offset ratio) and the need was found to be 5.75 tons. The projected creditable-decrease in NO_x from 2011-2017 in the on-road and nonroad sectors was 13.82 tons, leaving an overage of 8.07 tons in NO_x reduction.

In combination with the existing ROP plans, this ROP and Contingency plan fulfilled the requirements for a 15 percent emissions reduction within six (6) years (2012-2017) after the baseline year (2011) and the 3% contingency plan through the previous attainment year (2018).

2020 Nine Percent (9%) ROP Plan and Three Percent (3%) Contingency Plan

In accordance with 172(c)(2), 182(c)(2)(B), and 182(g), Indiana developed a 2020 Nine Percent (9%) ROP and a Three (3%) Contingency Plan. The plans demonstrated Lake and Porter counties would achieve an average emission reduction of 3% per year after the first six years (2011-2017) of the attainment planning period through the attainment date (2018-2020), plus an additional 3% contingency reduction through one year beyond the attainment year, i.e., 2021.

Pursuant to 182(c)(2)(C) of the CAA, Indiana substituted NO_x emissions for VOC emissions to fully satisfy the VOC-specific requirements of 182(c)(2)(B). To meet the 9% RFP reduction, 6% of the required reductions were allocated to NO_x emissions, and 3% of the required reductions were allocated to VOC emissions. For the 3% contingency reduction, 1% came from VOC and 2% came from NO_x reductions through 2020. In total, the plans demonstrated Lake and Porter counties would achieve a reduction of at least 12% in NO_x and VOC emissions from 2018 to 2021.

2.3 Base-Year Emissions Inventory

Section 182(a)(1) of the CAA requires states to submit a base-year emissions inventory for the nonattainment area within two (2) years of the nonattainment designation. The base-year emissions inventory must be a comprehensive, accurate, and current inventory of actual emissions from all sources within the boundaries of the nonattainment area, including periodic revisions as the Administrator may determine necessary to assure that the requirements for this part are met. U.S. EPA guidance requires the submittal of a comprehensive SIP quality emissions inventory of ozone precursor emissions (i.e., NO_x and VOCs) representative of the base-year (i.e., 2017).

On September 10, 2021, Indiana submitted a revised 2017 base-year emissions inventory for Indiana's portion of the Chicago marginal 2015 8-hour ozone nonattainment area to update and replace the January 21, 2021, submittal to include emissions data for Porter County (partial). Upon review of this documentation, Indiana has determined that the onroad emissions inventory should be updated to the latest version of U.S. EPA's mobile emissions modeling system (MOVES3.1).

This current up-to-date base-year emissions inventory satisfies Indiana's obligation under Section 182(b)(1)(B) of the CAA for the 2015 8-hour ozone standard for Lake (partial) and Porter (partial) counties classified as moderate, as amended by the final ruled titled Implementation of the 2015 National Ambient Air Quality Standards for Ozone: Nonattainment Area State Implementation Plan Requirements (83 FR 62998), December 6, 2018). Indiana is seeking U.S. EPA approval of this updated base-year inventory.

2.4 Periodic Inventory and Emissions Statements

Sections 172(c)(3), 182(a)(1), and 182(a)(3) of the CAA requires states to submit a comprehensive, accurate, and current inventory of actual emissions from all sources in the nonattainment area, including periodic revisions as the Administrator may determine necessary to assure that the requirements for this part are met.

In December 2008, U.S. EPA's Air Emissions Reporting Requirements (AERR) rule consolidated and streamlined previous requirements of several older rules for states and local air pollution control agencies to submit emissions inventories for criteria pollutants to EPA's Emissions Inventory System (EIS). In 2015, U.S. EPA finalized further improvements to these reporting requirements.[2]

IDEM's Office of Air Quality (OAQ) collects data, calculates, and stores emissions for point sources on an annual basis in the Emission Inventory Tracking System (EMITS). These point source emissions are uploaded to the National Emissions Inventory (NEI)

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[2] https://www.epa.gov/air-emissions-inventories/air-emissions-reporting-requirements-aerr

each year. Airport, nonroad, and area emissions data is collected and available through U.S. EPA's Emission Modeling Clearinghouse.

Section 182(a)(3)(B)(ii) of the CAA requires states to submit certification documentation for this Emissions Statement requirement. Indiana is seeking U.S. EPA approval of this certification request.

2.5 Identification and Quantification of Emissions

Section 172(c)(4) of the CAA requires the SIP to identify and quantify the emissions of pollutants (in this case NO_x and VOCs) that sources will be allowed from the construction and operation of major new and modified sources in accordance with Section 173(a)(1)(B). These emissions must not interfere with attainment of the ozone standard by the attainment date. Indiana's permitting rules for nonattainment areas that meet this requirement are in rule 326 IAC 2-3 as further described in Section 7.3 of this document.

2.6 Permit Program for New and Modified Sources

Section 172(c)(5) of the CAA requires the state to implement a permit program consistent with the requirements of Section 173. Indiana has a long standing and fully implemented New Source Review (NSR) permitting program that is outlined in 326 IAC 2-2 and 326 IAC 2-3, as further described in Section 7.3 of this document. Indiana's NSR program was approved by U.S. EPA, as published in the Federal Register (FR) on October 7, 1994 (94 FR 24837), as part of the SIP.

Any facility that is not listed in the emissions inventory, or for the closing of which credit was taken in demonstrating attainment, will not be allowed to construct, reopen, modify, or reconstruct without meeting all applicable permit rule requirements, including an air quality analysis to evaluate whether the new source will threaten the NAAQS.

Section 182(b)(5) of the CAA requires an NSR offset ratio of 1.15:1 for major stationary sources of VOC or NO_x (unless a NO_x waiver is in place) for moderate nonattainment areas. Indiana's minimum NSR offset ratio requirements are established in 326 IAC 2-3-3(a)(5).

2.7 Other Control Measures, Means, or Techniques

Section 172(c)(6) of the CAA requires plan provisions to include enforceable emission limitations, and such other control measures, means, or techniques, as well as schedules and timetables for compliance, as may be necessary or appropriate to provide for attainment by the applicable attainment date.

Existing and future national and regional control measures will ensure that attainment in each county will be maintained with an increasing margin of safety over time. These measures are discussed in greater detail in Section 7.0.

A detailed discussion of the photochemical grid modeling, model selection, methodologies, meteorology, model input, and analysis methods are included in Section 3.0. This section presents details of the technical work done to analyze air quality data to demonstrate attainment of the ozone standard. The results of the computer modeling and an analysis of air quality and emission inventory trends presents strong evidence that existing control measures will improve air quality.

2.8 Compliance with Section 110(a)(2) of the CAA

Section 172(c)(7) of the CAA requires nonattainment SIPs to meet the applicable provisions of Section 110(a)(2). IDEM has reviewed the requirements of Section 110(a)(2) and has concluded that prior rule submittals, along with this attainment demonstration, have addressed the relevant requirements associated with rule development, SIP submissions, and implementation and enforcement of required control measures.

On November 2, 2022, U.S. EPA approved Indiana's Infrastructure SIP Requirements for the 2015 Ozone NAAQS, effective December 2, 2022.[3] U.S. EPA did not act on the interstate transport requirements of Section 110(a)(2)(D)(i)(I) and visibility impairment requirements of Section 110(a)(2)(D)(i)(II). On February 13, 2023, U.S. EPA disapproved the "Good Neighbor" provisions of the SIP pertaining to the interstate transport requirements of Section 110(a)(2)(D)(i)(I) with respect to the 2015 ozone NAAQS (88 FR 9336).

2.9 Equivalent Techniques

IDEM has followed U.S. EPA guidance on procedures for modeling, preparing emission inventories, and plan submittals. Therefore, IDEM is not requesting approval for equivalent techniques, as allowed under Section 172(c)(8) of the CAA.

2.10 Contingency Measures

Section 172(c)(9) of the CAA requires states to provide for specific measures to be implemented should a nonattainment area fail to meet RFP requirements or attain the applicable NAAQS by the attainment date. These contingency measures are required to be implemented without further action by the state or U.S. EPA. U.S. EPA interprets the contingency requirement to mean additional emission reductions that are enough to equal up to 3% of the emissions in the RFP adjusted base-year inventory. Reductions should be achieved as soon as possible but should generally occur within one year of

[3] https://www.govinfo.gov/content/pkg/FR-2022-11-02/pdf/2022-23335.pdf

the triggering event. Per U.S. EPA guidance, an additional year is permissible if states elect to adopt CMs measures that will require more than one year from the triggering event to provide the full amount of necessary reductions.

Contingency measures must be in excess of what is needed to meet any other nonattainment plan requirement in the CAA, such as RACT/RACM, RFP, and attainment modeling. Indiana will consider contingency measures from a comprehensive list of measures deemed appropriate and effective at the time the selection is made. The Implementation Rule states contingency measures be approximately equivalent to one year's worth of emissions reductions, or approximately 3% of the baseline emissions inventory.

Refer to Section 10.0 for further discussion of contingency measures.

2.11 Demonstration of Attainment

Section 182 of the CAA requires a demonstration that will provide for attainment of the ozone standard by the applicable attainment date based on photochemical modeling or any other analytical method determined by the Administrator to be at least as effective.

The attainment modeling analysis for the Chicago nonattainment area was performed by LADCO using 2023 as the projection year to determine whether identified emission reduction measures are sufficient to reduce projected pollutant concentrations to a level that meets the 2015 ozone NAAQS by the statutory deadline established by U.S. EPA. This analysis is supported by technical demonstrations that include rate of progress and contingency plans, air quality trends, emission trends, and a weight of evidence analysis.

2.11.1 Rate of Progress Plans

Section 182(b)(1) of the CAA, and the final implementation rule titled *Implementation of the 2015 National Ambient Air Quality Standard for Ozone, Nonattainment Area State Implementation Plan Requirements* (83 FR 62998, December 6, 2018), require areas classified moderate or above to develop a plan to demonstrate emission reductions of VOCs in the amount of fifteen percent from the baseline year of 2017, as well as a plan for an additional three percent reduction as a contingency in the event that the area fails to meet the standard by the revised attainment date. These plans, which Indiana has prepared only for Indiana's portion of the Chicago nonattainment area, are referred to as the 2023 Fifteen Percent (15%) Rate of Progress (ROP) and Three Percent (3%) Contingency Plans. In combination with previous existing ROP plans, as further detailed in Section 2.2, fulfills the requirement for a 15 percent reduction in VOC emissions within six (6) years (2017-2023) after the baseline year (2017) and a three (3) percent contingency plan.

2.11.2 Photochemical Grid Modeling

Section 182(j) of the CAA requires that photochemical grid modeling be used to demonstrate attainment in multi-state ozone nonattainment areas. A discussion of the modeling results that LADCO performed is included in Section 3.0. This Technical Supporting Document (TSD) in its entirety can be referenced in Appendix A1.

2.11.3 Air Quality Trends Analysis

Section 110(a)(2)(B) of the CAA requires a monitoring strategy for measuring, characterizing, and reporting ozone concentrations in ambient air. IDEM maintains a comprehensive network of air quality monitors throughout the state with the primary objective of being able to determine compliance with the NAAQS.

Implementation of control strategies has resulted in a significant improvement in air quality in the Chicago nonattainment area. Monitoring data shows that overall area design values are decreasing, air quality peak values are declining, and the number of exceedances is falling. This analysis is further discussed in Section 4.0.

2.11.4 Emission Trends Analysis

In Indiana, control measures have been implemented requiring substantial emission reductions from mobile, point, and area sources. Since the attainment deadline occurs during the 2024 ozone season, the effective attainment deadline is the end of the 2023 ozone season. Thus, a projection of emissions in 2023 is required. Indiana's emission trends analysis is discussed in Section 5.0. An analysis of this inventory shows an overall drop in both VOC and NO_x emissions from 2017 and 2023.

2.11.5 Mobile Source Emissions Budgets

Transportation conformity is required under Section 176(c) of the CAA to ensure that federally supported highway and transit project activities are consistent with (i.e., "conform to") the purpose of the SIP. Transportation conformity applies to areas that are designated nonattainment, and those areas redesignated attainment after 1990 ("maintenance" areas with plans developed under Section 175A of the CAA) for transportation-related criteria pollutants.

U.S. EPA requirements outlined in 40 CFR 93.118(e)(4) stipulate that a mobile source emissions budget (for both NO_x and VOCs) be established as part of the attainment demonstration. The mobile source emissions budget is necessary to demonstrate conformity of transportation plans with the SIP. The motor vehicle emission budgets are included in Section 6.0.

The purpose of transportation conformity is to ensure that federal transportation actions occurring in the nonattainment area do not hinder the area from attaining and maintaining the 2015 8-hour ozone standard. This means that the level of emissions estimated by the metropolitan planning organization (MPO) must not exceed the motor vehicle emission budgets as defined in this attainment demonstration.

2.12 NO_x Requirements

Sections 172(c)(1) and 182(f) of the CAA require a demonstration that the state has adopted all reasonable and available control measures to demonstrate attainment for areas classified as "moderate" (and higher) as expeditiously as practicable and that no additional measures that are reasonably available will advance the attainment date. Specifically, Section 182(f) of the CAA requires states to adopt RACT for all major stationary sources of NO_x. Section 302 of the CAA defines major stationary source as any facility which has the potential to emit of 100 tons per year of any air pollutant.

On October 7, 2022, effective November 7, 2022, U.S. EPA reclassified the Chicago nonattainment area from "marginal" to "moderate" nonattainment. As such, NO_x RACT is required to implemented and will continue to be required as part of the anticipated bump-up to "serious" nonattainment. Therefore, IDEM is in the process of initiating a rulemaking to require major stationary sources of NO_x in Indiana's portion of the nonattainment area (i.e., the northern portions of Lake and Porter counties), as defined in Section 302 and Subsections 182(c) and (d), of the CAA, to install and operate NO_x RACT as provided under Section 182(f) of the CAA. Indiana anticipates it will take approximately two years to complete the rulemaking process. In the future, IDEM will revise this element of the SIP submittal to incorporate these requirements and certify compliance.

2.13 Vehicle Inspection and Maintenance (I/M) Testing Program

Section 182(b)(4) of the CAA requires states to provide for a basic I/M testing program to reduce HC and NO_x emissions from in-use motor vehicles registered in each urbanized area (in the nonattainment area). Indiana has a fully implemented and approved basic/enhanced vehicle testing program in Lake and Porter counties previously required under the 1-hour ozone standard. The program was approved by U.S. EPA and became effective on May 20, 1996 (61 FR 11142) and can be found at 326 IAC 13-1. The Northwestern Indiana Regional Planning Commission (NIRPC) conducted a mobile source emissions modeling demonstration on behalf of IDEM comparing HC and NO_x emission reductions from U.S. EPA's model program specified in 40 CFR 51.351(i) and the actual enhanced I/M testing program in Lake and Porter counties, as it is approved into Indiana's SIP for the year 2023 using MOVES3.1. The differences between the two scenarios are: 0.00020 grams per mile (gpm) for HC and 0.0023 gpm for NO_x as shown in Appendix A3. Therefore, Indiana's current I/M testing program in Lake and Porter counties meets the applicable enhanced I/M performance requirements in 40 CFR 51.351.

3.0 MODELING

3.1 Photochemical Modeling

Section 182(j) of the CAA requires that photochemical grid modeling be used to demonstrate attainment in multi-state ozone nonattainment areas. The attainment modeling analysis for the Chicago, IL-IN-WI 2015 ozone nonattainment area was performed by LADCO. This complete analysis, the LADCO Attainment Demonstration Modeling for the 2015 Ozone National Ambient Air Quality Standard, September 21, 2022, is referenced in Appendix A1. The following paragraphs briefly describe the methods, inputs, and major components of this analysis.

3.1.1 Attainment Test

An attainment demonstration based on air quality modeling is used to determine whether identified emission reduction measures are enough to reduce projected pollutant concentrations to a level that meets the NAAQS by the statutory deadline established by U.S. EPA. This modeling analysis uses 2023 and 2026 as the projection years to demonstrate attainment of the 2015 ozone NAAQS. LADCO estimated 2023 emissions for most of the anthropogenic inventory sectors by interpolating between the 2016 and 2023 Inventory Collaborative 2016v1 inventories. Linear interpolation for the emissions was used because 2020 inventories were not readily available for all the emission sectors at the time that this SIP was initiated. These scenarios are evaluated using the Comprehensive Air Quality Model with Extensions version 7.10 (CAMx) model to determine the likelihood that the 2015 ozone NAAQS will be achieved in the Lake Michigan region in 2023. It should be noted the emissions platform LADCO used was LADCO 2016v1-based which differs from U.S. EPA's 2016v2-based platform, therefore the resulting modeled design values are slightly different than U.S. EPA's results. LADCO has conducted additional modeling with a more current version of emissions. LADCO's modeling results were similar to U.S. EPA's.

U.S. EPA has recently developed a 2016v3-based emission platform that has not been made fully available to states and multi-jurisdictional organizations for use in states' modeling efforts. U.S. EPA's modeling results from the 2016v3 emission platform indicate lower modeled ozone concentrations, as evident in U.S. EPA's SIP Disapproval Final Action for the 2015 Ozone NAAQS modeling.

The model attainment test uses modeled estimates in a relative sense to estimate future year design values. U.S. EPA's Air Quality Modeling Group has developed the Software for Modeled Attainment Test Community Edition (SMAT-CE) for this purpose.[4] The SMAT-CE software computes the fractional changes, or relative response factors (RRFs), of ozone concentrations at each monitor location using results of the modeled base year and the future year projections. Meteorological conditions are assumed to be

[4] https://www.epa.gov/scram/photochemical-modeling-tools

unchanged for the base and projection years. The resulting estimates of future ozone design values are then compared to the NAAQS. If the future year ozone design values are less than or equal to the NAAQS, then the analysis suggests that attainment will be reached.

LADCO relied on SMAT-CE version 1.6 to estimate the future year design values while U.S. EPA, conducting more recent modeling, used SMAT-CE version 2.1 software according to U.S. EPA's recommended approach (U.S. EPA, 2018).[5] All modeling results are time shifted to local time to be consistent with monitoring measurements. Baseline 2016 design values were calculated by averaging three successive three-year (3-year) design values centered on 2016 (2014-2016, 2015-2017, and 2016-2018). The baseline 2016 design values are therefore weighted averages using ambient data from 2014-2018 at each location.

3.1.2 Modeling Results

Table 3.1 summarizes LADCO's photochemical modeling including the results of the model attainment test for the 2023 and 2026 future-year projections. Baseline 2016 design values for monitoring sites in the Chicago nonattainment area are compared to the 2023 and 2026 design values. All monitoring locations in the Chicago nonattainment area are projected to meet the 2015 ozone NAAQS of 70 parts per billion by 2023 and maintain attainment of the standard in 2026 with the exception of the Chiwaukee monitor (550590019) in Kenosha County in southeastern Wisconsin. Significant decreases in ozone are projected to occur in the Lake Michigan area, with future year design values 5 to 6 ppb lower than the base year observed design values. LADCO conducted the 2026 modeling using updated emissions information.

[5] https://www.epa.gov/sites/default/files/2020-10/documents/o3-pm-rh-modeling_guidance-2018.pdf

Table 3.1: LADCO Attainment Test Results in 2023 and 2026 for the Chicago, IL-IN-WI, 2015 8-Hour Ozone Nonattainment Area

Air Quality System (AQS) ID	State/ County	2016 Centered Design Value (ppb)	LADCO 2023 Modeled Future Year (ppb)	LADCO 2026 Modeled Future Year (ppb)
170310001	IL - Cook	73.0	67.7	67.3
170310032	IL - Cook	72.3	67.0	67.6
170310076	IL - Cook	72.0	66.9	67.6
170314007	IL - Cook	72.0	66.4	68.1
170314201	IL - Cook	73.3	67.6	69.4
170317002	IL - Cook	74.0	68.2	69.9
170971007	IL – Lake	73.7	67.8	68.9
180890022	IN - Lake	68.3	62.4	63.9
180892008	IN – Lake	66.0	60.5	61.2
181270024	IN – Porter	69.7	63.8	65.2
181270026	IN – Porter	69.3	63.0	63.4
550590019	WI - Kenosha	78.0	71.5	72.7
550590025	WI - Kenosha	73.7	67.5	68.1

In summary, the technical support for U.S. EPA's "Good Neighbor" Plan[6] shows all monitors in the Chicago nonattainment area are projected to demonstrate compliance with the 2015 8-hour ozone NAAQS of 70 ppb by 2023 with the exception of the Chiwaukee monitor in Kenosha County, Wisconsin. The sustained ozone concentration decreases are evident as the modeled results are even lower for 2026 and 2032 in the modeling analysis depicted in Table 3.2.

[6] https://www.regulations.gov/document/EPA-HQ-OAR-2021-0668-0099

Table 3.2: U.S. EPA Proposed Transport Rule Modeling Results for the Chicago, IL-IN-WI, 2015 8-Hour Ozone Nonattainment Area

Site ID	State/ County	2016 Centered Design Value (ppb)	U.S. EPA 2023 Modeled Future Year (ppb)	U.S. EPA 2026 Modeled Future Year (ppb)	U.S. EPA 2032 Modeled Future Year (ppb)
170310001	IL-Cook	73.0	69.6	68.7	67.6
170310032	IL-Cook	72.3	70.1	69.4	68.4
170310076	IL-Cook	72.0	69.3	68.5	67.4
170314007	IL-Cook	72.0	68.8	67.8	66.7
170314201	IL-Cook	73.3	70.0	69.1	67.9
170317002	IL-Cook	74.0	71.1	70.1	69.0
170971007	IL-Lake	73.7	70.0	69.0	67.8
180890022	IN-Lake	68.3	65.2	64.5	63.7
180892008	IN-Lake	66.0	63.3	62.6	61.6
180910010	IN-LaPorte	65.0	60.5	59.6	58.4
181270024	IN-Porter	69.7	65.5	64.7	63.6
181270026	IN-Porter	69.3	64.5	63.6	62.5
550590019	WI-Kenosha	78.0	73.6	72.5	71.2
550590025	WI-Kenosha	73.7	69.2	68.1	66.9

It should be noted that the 2019–2021 design value at Chiwaukee monitor is 74 ppb, 4 ppb lower than the modeled base-year design value of 78 ppb. While the modeled design value results incorporate both the base-year and future year projected emissions from which the modeling was based, the approach does not account for actual emissions and emission reductions that have occurred in the years since the 2016 base-year, including the previous three years from which design values have been calculated. The lower, more current design value only reinforces the trend of decreasing ozone in the area.

U.S. EPA released additional modeling to support its disapproval of states' SIPs for the 2015 ozone NAAQS as well as its recently released final Transport Rule.[7] The modeling results for future year 2023 demonstrates a significant decrease in modeled future year ozone impacts ranging from 1.5 to nearly 3 ppb at monitors in the Chicago 2015 ozone nonattainment area. This includes the modeled impacts at the Chiwaukee monitor; previously modeled as nonattainment, now modeled below the 2015 ozone

[7] https://www.epa.gov/interstate-air-pollution-transport/final-disapproval-good-neighbor-state-implementation-plans

standard. The results are summarized in Table 3.3, comparing the latest two U.S. EPA ozone modeling results.

U.S. EPA's modeling for calculating RRFs relied on both the 3 x 3 grid matrix and the "no water" approaches along coastal areas. The "no water" approach eliminates modeled grid cells over water, thereby giving different modeled results than the standard 3 x 3 grid matrix approach. While U.S. EPA committed to the "no water" approach for this final action, U.S. EPA determined that modeled ozone impacts using the 3 x 3 grid matrix for Chiwaukee, Kenosha County, Wisconsin (Monitor ID 550590019) produced a future year design value of 72 ppb which is above the ozone standard while the "no water" approach yielded a modeled impact of 70.8 ppb at the monitor. U.S. EPA concluded that based on the higher modeled impact, which was above the standard, the Chiwaukee monitor would be classified as a nonattainment receptor using results from the 3 x 3 approach. This approach was not used to determine the future year design values at all other monitors throughout the entire modeling domain, with the exception of one ozone monitor in Connecticut.

Table 3.3: U.S. EPA SIP Disapproval Final Action/Final Transport Rule –Modeling Results for the Chicago, IL-IN-WI, 2015 8-Hour Ozone Nonattainment Area

Site ID	State/ County	2016 Centered Design Value (ppb)	U.S. EPA - SIP Disapproval and Final Transport Rule 2023 Modeled Future Year Avg DV (ppb)	U.S. EPA - Proposed Transport Rule 2023 Modeled Future Year Avg DV (ppb)
170310001	IL-Cook	73.0	68.2	69.6
170310032	IL-Cook	72.3	67.3	70.1
170310076	IL-Cook	72.0	67.6	69.3
170314007	IL-Cook	72.0	66.8	68.8
170314201	IL-Cook	73.3	68.0	70.0
170317002	IL-Cook	74.0	68.5	71.1
170971007	IL-Lake	73.7	67.1	70.0
180890022	IN-Lake	68.3	63.3	65.2
180892008	IN-Lake	66.0	61.5	63.3
180910010	IN-LaPorte	65.0	58.9	60.5
181270024	IN-Porter	69.7	63.4	65.5
181270026	IN-Porter	69.3	63.1	64.5
550590019	WI-Kenosha	78.0	70.8	73.6
550590025	WI-Kenosha	73.7	67.6	69.2

Ozone trends show that ozone design values at select monitors along the western Lake Michigan shoreline have steadily declined over the past two decades even as maximum temperatures in the upper Midwest have increased over the same period. This would indicate emission reductions have been effective in lowering ozone concentrations. Over the past decade or more, the highest ozone design values for the western Lake Michigan lakeshore have shifted northward from the Zion monitor in northeast Illinois to the Chiwaukee site in Kenosha County, WI to the Kohler Andrae site in Sheboygan County, located in southeast WI. The Sheboygan monitor is located outside of the Chicago nonattainment area and isn't evaluated in this analysis. As emission reductions have been realized over the past 15-20 years as the result of permanent and enforceable state and federal emission control measures, the atmospheric chemistry has changed over this time due to the decrease in NO_x and VOC emissions. Ozone development has been altered as lake breezes and synoptic winds from the south continue to push ozone and precursor emissions over Lake Michigan and subsequent lake breezes bring those emissions onshore.

3.1.3 Source Apportionment Modeling Results

LADCO conducted source apportionment modeling for the 2016 base-year to determine the modeled culpability from a regional perspective. As shown in Table 3.4, the percentage of ozone impacts from the states of Indiana, Illinois, and Wisconsin were modeled for their respective impacts on the Chiwaukee ozone monitor. Illinois, including Chicago area emissions, had the largest contribution to ozone concentrations, while Indiana's ozone impacts, including Lake and Porter County emissions were found to be more than four times less than Illinois' impacts.

Table 3.4: LADCO's Source Apportionment Modeling for Base-year 2016

Monitor ID	Site Name	County Name	Ozone Value (ppb)	IN contribution of Total Ozone	IL Contribution of Total Ozone	WI contribution of Total Ozone
550590019	Chiwaukee	Kenosha	71.51	8%	37%	2%

U.S. EPA's state contribution modeling for the final Transport Rule "Good Neighbor" Plan[8] shows similar impacts at the Chiwaukee monitor as the LADCO modeling. Results showed modeled impacts from Indiana estimated at 11%, Illinois' estimated impacts at 27%, and Wisconsin's modeled impacts estimated at 8%. These results continue to show the overwhelming contribution of Illinois to the violating monitor. While these results do not account for modeled impacts from more current or future-year projected emissions, it is indicative of the overwhelming impact from the large metropolitan area. The disparity in apportioned modeled impacts makes an attainment demonstration challenging for states without national mandates reducing emissions at the larger contributing emission sectors.

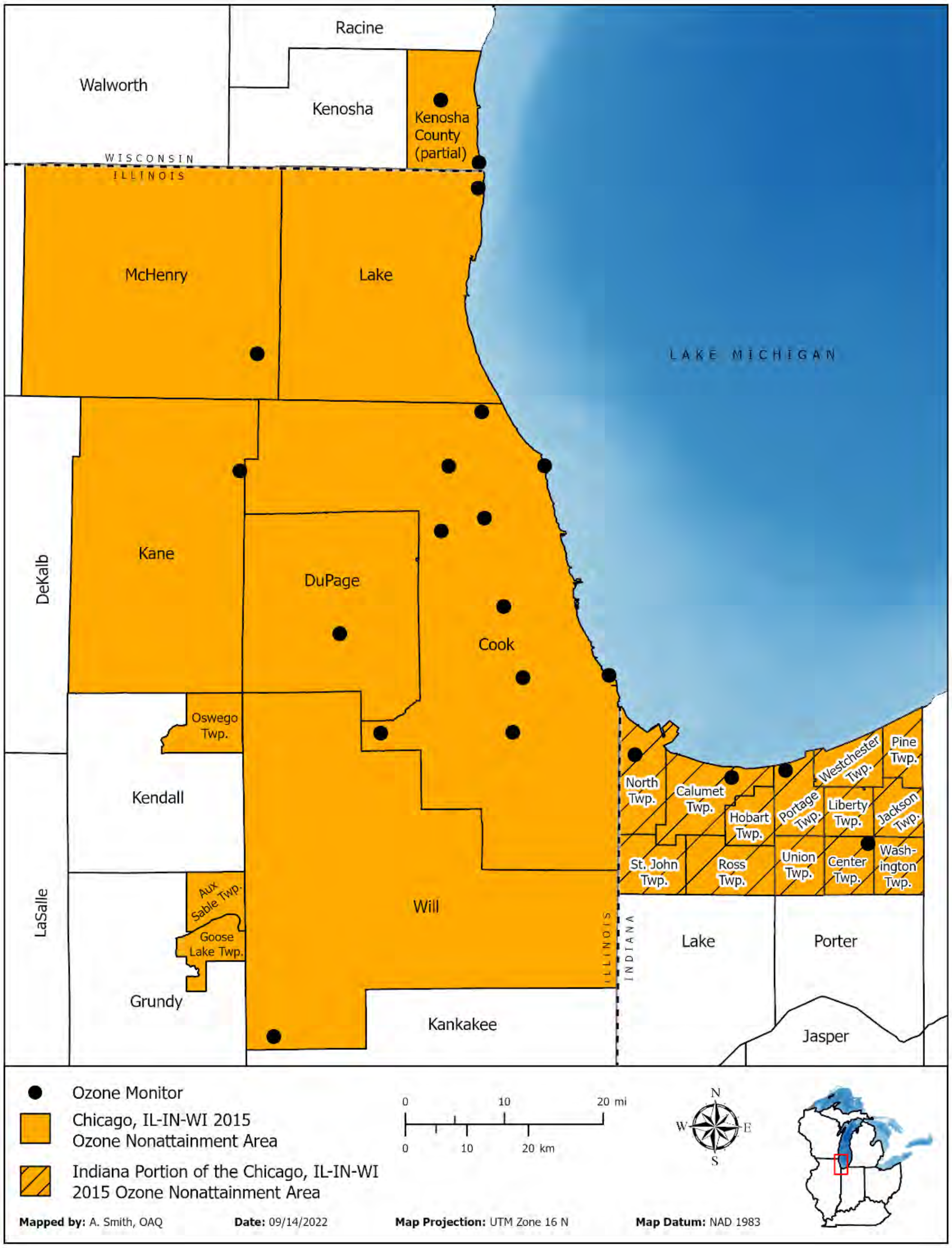
4.0 AIR QUALITY

Section 110(a)(2)(B) of the CAA requires a monitoring strategy for measuring, characterizing, and reporting ozone concentrations in the ambient air. IDEM maintains a comprehensive network of air quality monitors throughout the state with the primary objective of being able to determine compliance with NAAQS. In accordance with Table D-3 of Appendix D of 40 Code of Federal Regulations (CFR) Part 58, starting with the 2017 ozone monitoring season, U.S. EPA mandates seasonal monitoring of ambient ozone concentrations in Indiana and Illinois from March 1st through October 31st and in Wisconsin from March 1st through October 15th.

The current operating ozone network in the Chicago nonattainment area is depicted in Figure 4.1. There are currently twenty (21) Federal Reference Method monitors measuring ozone concentrations in the Chicago, IL-IN-WI, nonattainment area. Four monitors are located in Indiana's portion of the nonattainment area and are operated by IDEM's Office of Air Quality (OAQ). Fifteen monitors are located in Illinois' portion of the nonattainment area and are operated by the IEPA. Two monitors are located in Wisconsin's portion of the nonattainment area and are operated by the WDNR.

[8] https://www.epa.gov/csapr/good-neighbor-plan-2015-ozone-naaqs

Figure 4.1: Chicago, IL-IN-WI, 2015 8-Hour Ozone Nonattainment Area & Monitors



As explained in 40 CFR Part 50, Appendix P, three (3) consecutive, complete years of ozone monitoring data are required to assess attainment at a monitoring site. The 2015 8-hour primary and secondary ozone ambient air quality standards are met at an ambient air quality monitoring site when the three-year average of the annual fourth-highest daily maximum 8-hour average ozone concentration is less than or equal to 0.070 ppm. When this occurs, the site is deemed to be in attainment.

An exceedance of an 8-hour ozone NAAQS occurs when a monitor measures ozone concentrations above the standard. A violation occurs when the three-year average of the annual fourth highest 8-hour averaged daily ozone level is greater than a standard. This three-year average is termed the "design value" for the monitor. The design value for a nonattainment area is derived from the monitor with the highest specific design value.

Table 4.1 provides historical ozone ambient air quality monitoring data for monitors that are currently active as well as any that have been active since 2015.[9] [10] Exceedances of the 2015 8-hour standard of 0.070 ppm are highlighted. Controlling design values from 2017-2022 for each state are represented in Chart 4.1. Each monitor's design value in 2020-2022 is compared in Chart 4.2.

[9] http://www.in.gov/idem/airquality/2489.htm
[10] https://www.epa.gov/outdoor-air-quality-data/monitor-values-report

Table 4.1: Design Values for the 2015 8-Hour Chicago Ozone Nonattainment Area from 2017-2022

State	County	Site #	Monitor	2015-2017	2016-2018	2017-2019	2018-2020	2019-2021	2020-2022
INDIANA	Lake	180890022	Gary IITRI	0.068	0.070	0.068	0.070	0.069	0.071
	Lake	180892008	Hammond- 141st St.		0.066	0.065	0.066	0.068	0.069
	Porter	181270024	Ogden Dunes	0.069	0.071	0.070	0.071	0.072	0.073
	Porter	181270026	Valparaiso	0.069	0.073	0.073	0.069	0.068	0.066
ILLINOIS	Cook	170310001	Alsip	0.073	0.077	0.075	0.075	0.071	0.072
	Cook	170310032	SWFP	0.072	0.075	0.073	0.074	0.075	0.075
	Cook	170310076	Com Ed	0.072	0.075	0.072	0.069		0.070
	Cook	170311003	Taft	0.067	0.069	0.067	0.073	0.071	0.071
	Cook	170311601	Lemont	0.069	0.070	0.068	0.071	0.072	0.073
	Cook	170313103	Schiller Park	0.062	0.064	0.063	0.065	0.064	0.063
	Cook	170314002	Cicero	0.068	0.072	0.068	0.071	0.070	0.071
	Cook	170314007	Des Plaines	0.071	0.074	0.070	0.071	0.069	0.070
	Cook	170314201	Northbrook	0.072	0.077	0.074	0.077	0.074	0.074
	Cook	170317002	Evanston	0.073	0.077	0.075	0.075	0.073	0.074
	DuPage	170436001	Lisle	0.070	0.071	0.070	0.071	0.070	0.070
	Kane	170890005	Elgin	0.069	0.071	0.070	0.072	0.070	0.070
	Lake	170971007	Zion	0.073	0.075	0.071	0.072	0.073	0.074
	McHenry	171110001	Cary	0.069	0.072	0.071	0.073	0.071	0.071
	Will	171971011	Braidwood	0.065	0.067	0.066	0.066	0.064	0.065
WI	Kenosha	550590019	Chiwaukee	0.078	0.079	0.075	0.074	0.074	0.075
	Kenosha	550590025	Water Tower	0.073	0.077	0.074	0.074	0.072	0.073

> 0.070 ppm

Chart 4.1: Highest Design Values by State in the 2015 8-Hour Chicago Ozone Nonattainment Area from 2017-2022

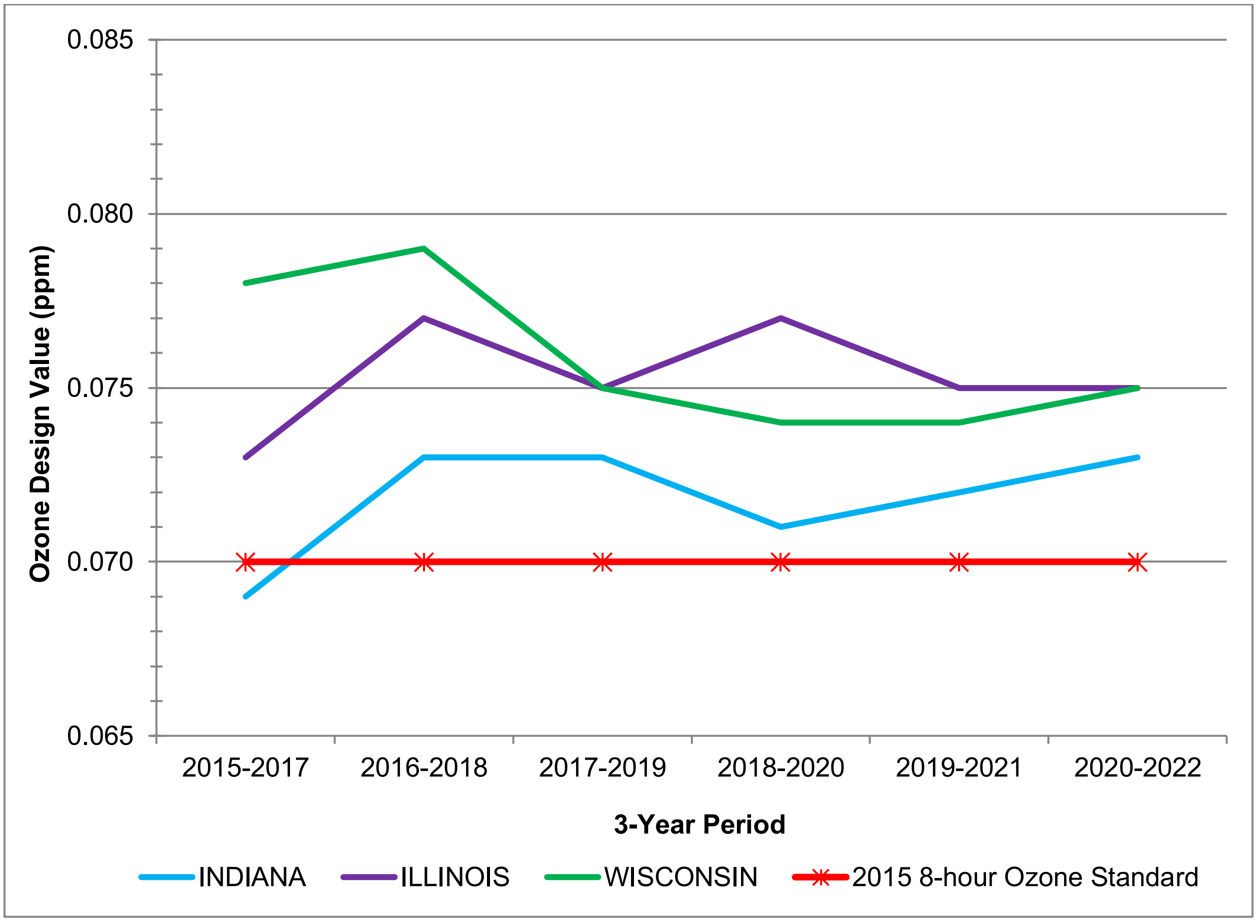
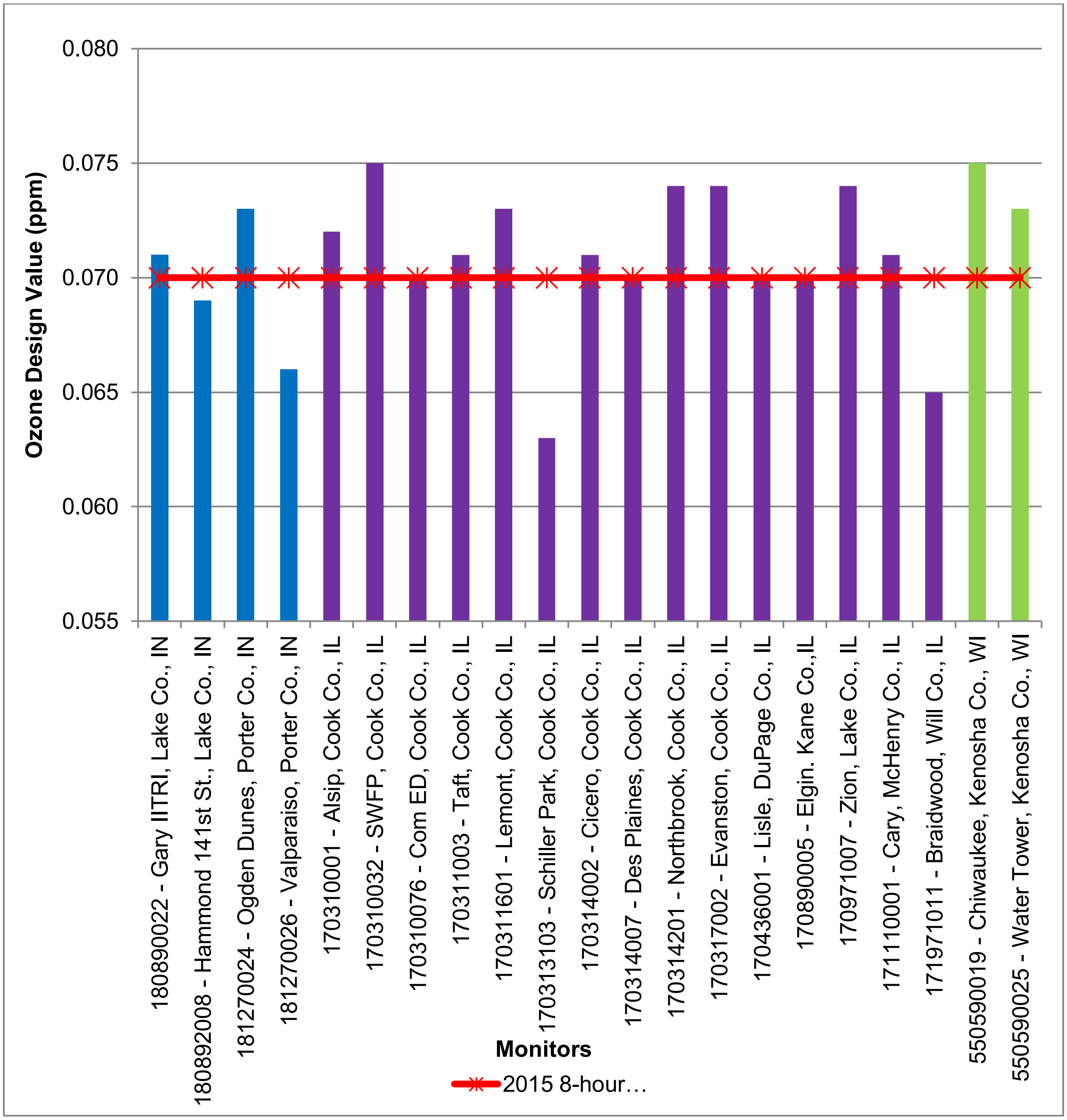


Chart 4.2: Design Values for All Monitors in the 2015 8-Hour Chicago Ozone Nonattainment Area for 2020-2022



4.1 LADCO Conceptual Model for Ozone Formation in Chicago, Illinois

In July 2022, LADCO published the Conceptual Model for Ozone Formation in Chicago, IL (Appendix A4). This model showed that historical ozone data exhibits a downward trend over the past twenty (20) years, likely due to federal and state emission control programs. Concentrations declined sharply from 2002 through 2010, and again from 2012 through 2015. Ozone concentrations at the “controlling” monitors in the Chicago nonattainment area have been on the rise since 2015. Ozone concentrations are strongly influenced by meteorological conditions, with more high ozone days and higher ozone levels occurring during summers with above normal temperatures. Nevertheless, meteorologically adjusted trends at the controlling monitors show that concentrations have declined even on hot days, providing strong evidence that emission reductions of ozone precursors have been effective. Inter- and intra-regional transport of ozone and ozone precursors affects many portions of the LADCO states and is the principal cause of nonattainment in some areas far from population or industrial centers.

The presence of Lake Michigan influences the formation, transport, and duration of elevated concentrations along its shoreline. Depending on large-scale synoptic winds and local-scale lake breezes, different parts of the area experience high ozone concentrations. For example, under southerly flow, high surface ozone concentrations can occur in eastern Wisconsin, and under southwesterly flow, high surface ozone can occur in western Michigan. A natural lake-land breeze circulation pattern is a major cause of the high ozone concentrations observed along the lakeshore. This pattern is driven by surface temperature gradients between the lake and the land. At night and in the early morning a land breeze forms when the lake surface is warmer than the land surface. The land breeze transports ozone precursors from industrial and mobile sources on land out over the lake. When the sun rises, the ozone precursors over the lake begin to rapidly react to form ozone, and high over-lake concentrations are often observed during the summer. A lake breeze forms when the land surface becomes warmer than the lake, typically in the early afternoon during the summer. The lake breeze transports the concentrated ozone and precursors from the lake, inland to a narrow band along the lakeshore. The ozone concentrations observed along the lakeshore that violate the 2015 ozone standard are often associated with lake-land breeze patterns. Areas in closer proximity to the lake shoreline display the most frequent and most elevated ozone concentrations.

5.0 EMISSION TRENDS ANALYSIS

5.1 Inventory

In consultation with U.S. EPA, Illinois, and Wisconsin, Indiana has developed an emissions inventory that represents a comprehensive, accurate, and current inventory of actual emissions from all sources of NO_x and VOCs in Lake (partial) and Porter (partial) counties for the projected-year of 2023 that is compared to the base-year of 2017. Point source (EGU and non-EGU), non-point, and non-road emissions were compiled from the data available on U.S. EPA's Emissions Modeling Clearinghouse website for the Chicago nonattainment area.[11] Indiana used the 2017 emissions modeling platform from the National Emissions Inventory Collaborative as the base year and applied growth factors derived from the 2016v2 Platform[12] that includes a full suite of base year (2016) and projection year (2023) inventories, ancillary emission data, and scripts and software for preparing the emissions for air quality modeling. The Wisconsin emission inventory for Wisconsin was calculated by applying the rate of change found in the 2016v3 Modeling Platform[13] to the 2017 NEI countywide emissions and were grown to 2023 for Kenosha County. In consultation with Wisconsin, the countywide inventory was used to represent the most conservative estimate for the nonattainment area. Illinois's 2017 and 2023 NO_x and VOC emission inventories were provided by the Illinois Environmental Protection Agency.

On-road values for Lake (partial) and Porter (partial) counties in 2017 and 2023 were produced by the NIRPC using U.S. EPA's MOVES3.1 software program (Appendix A3).

5.2 Trends Analysis

Overall emissions of VOCs and NO_x within the Chicago nonattainment area are projected to decrease significantly from 2017 to 2023. Chart 5.1 shows the total projected change for both pollutants over this period. Table 5.1 displays VOC and NO_x emissions by state, emission source sectors (EGU, point, non-point, on-road, and non-road), and totals for the entire nonattainment area. Charts 5.2 and 5.3 are graphical representations of the projected change in emissions by sector for each pollutant. The overall decreases in VOC and NO_x emissions should result in continued decreases in ozone concentrations within the area.

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[11] https://www.epa.gov/air-emissions-modeling/2017-emissions-modeling-platform
[12] https://www.epa.gov/air-emissions-modeling/2016v2-platform
[13] https://www.epa.gov/air-emissions-modeling/2014-2016-version-7-air-emissions-modeling-platforms

Chart 5.1: VOC and NO_x Emissions in 2017 (Base-Year) and 2023 (Projected-Year) for the 2015 8-Hour Chicago Ozone Nonattainment Area

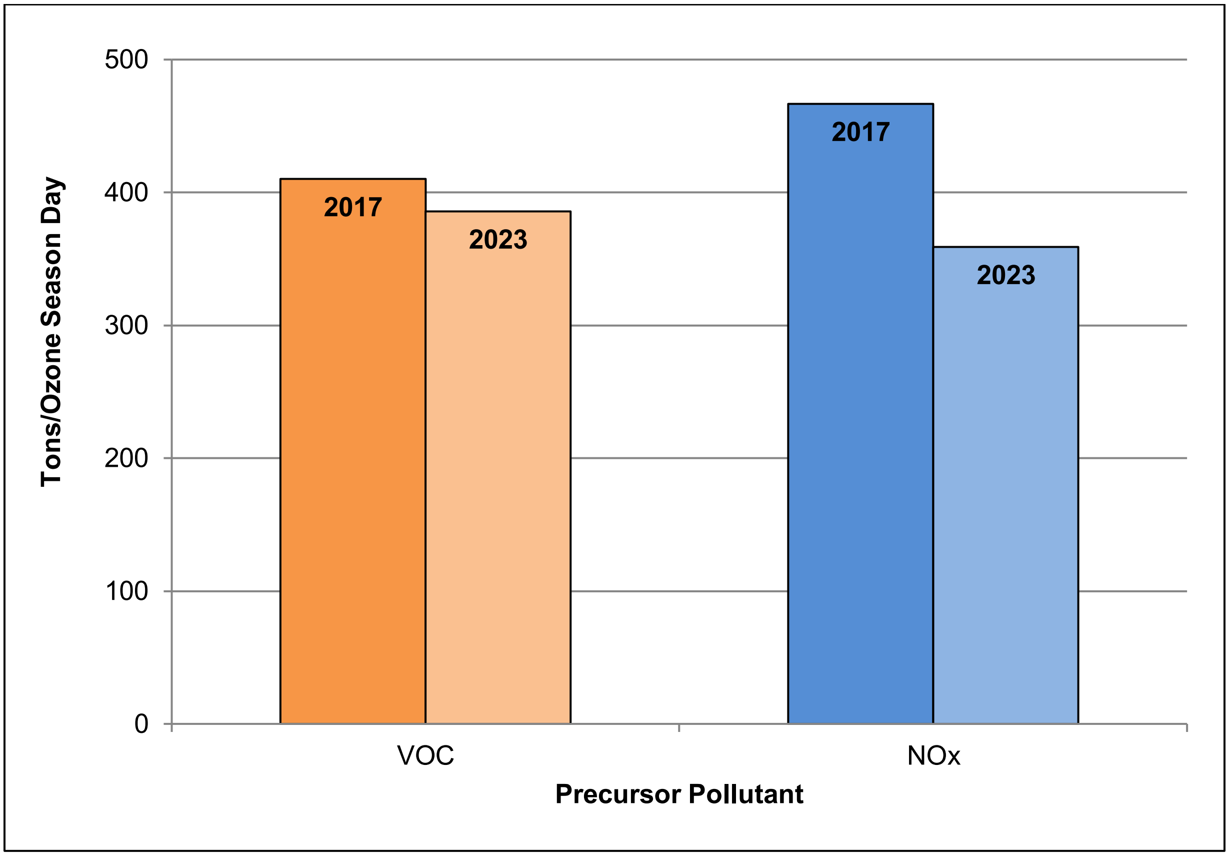


Table 5.1: VOC and NO_x Emissions from 2017 (Base-Year) – 2023 (Projected-Year) and Percent Change in Indiana's, Illinois', and Wisconsin's Portions of the 2015 8-Hour Chicago Ozone Nonattainment Area

Tons/Ozone Season Day		VOCs			NO_x		
		2017 Base-Year	2023 Projected-Year	Change %	2017 Base-Year	2023 Projected-Year	Change %
Indiana	EGU	0.24	0.13	-46	3.79	0.58	-85
	Point	9.99	10.16	2	55.08	56.44	2
	Non-Point	16.55	16.65	1	8.58	6.94	-19
	On-Road	2.86	2.53	-12	9.92	6.71	-32
	Non-Road	3.32	0.20	-94	5.02	0.22	-96
	TOTAL	**32.97**	**29.68**	**-10**	**82.39**	**70.88**	**-14**
Illinois	Point	45.74	45.80	0	66.39	66.59	0
	Non-Point	207.57	211.45	2	101.36	93.11	-8
	On-Road	66.49	46.92	-29	150.77	80.74	-46
	Non-Road	49.99	44.61	-11	53.34	35.32	-34
	TOTAL	**369.79**	**348.78**	**-6**	**371.86**	**275.76**	**-26**
Wisconsin	EGU	0.26	0.26	0	5.72	5.70	0
	Point	0.12	0.12	0	0.50	0.49	0
	Non-Point	4.30	4.28	0	2.13	2.11	0
	On-Road	1.69	1.68	0	2.96	2.95	0
	Non-Road	0.92	0.91	0	1.09	1.08	0
	TOTAL	**7.29**	**7.26**	**0**	**12.40**	**12.34**	**0**
Chicago Nonattainment Area Totals	EGU	0.51	0.39	-22	9.52	6.28	-34
	Point	55.86	56.09	0	121.97	123.52	1
	Non-Point	228.42	232.38	2	112.06	102.16	-9
	On-Road	71.04	51.13	-28	163.65	90.40	-45
	Non-Road	54.23	45.72	-16	59.45	36.62	-38
	TOTAL	**410.06**	**385.72**	**-6**	**466.65**	**358.98**	**-23**

Chart 5.2: VOC Emissions for 2017 (Base-Year) and 2023 (Projected-Year) by Source Sector for the 2015 8-Hour Chicago Ozone Nonattainment Area

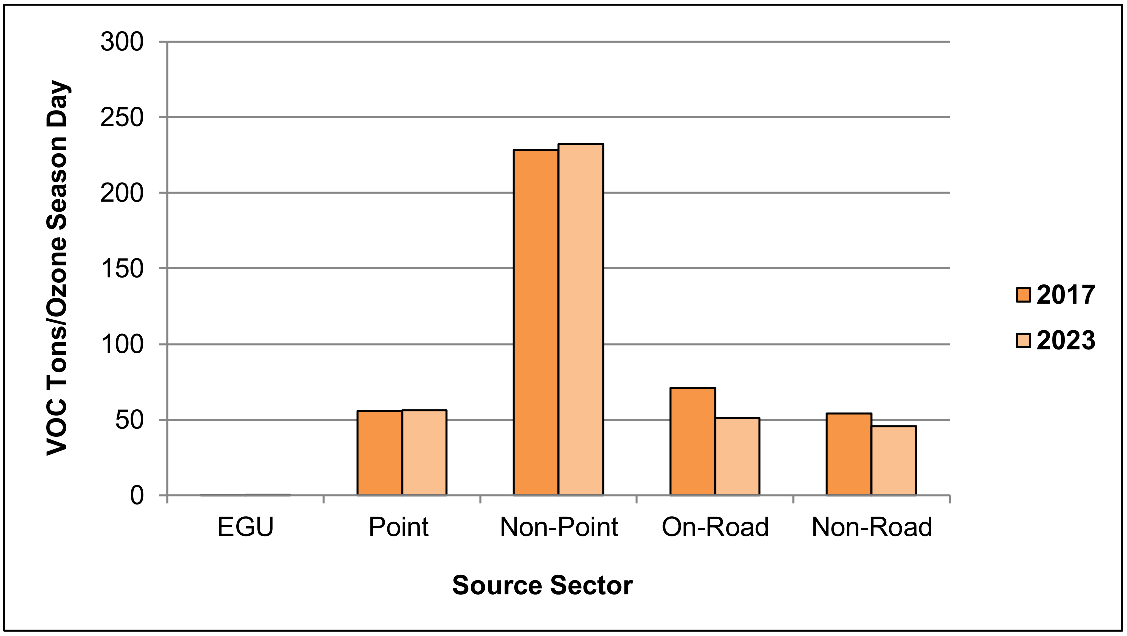
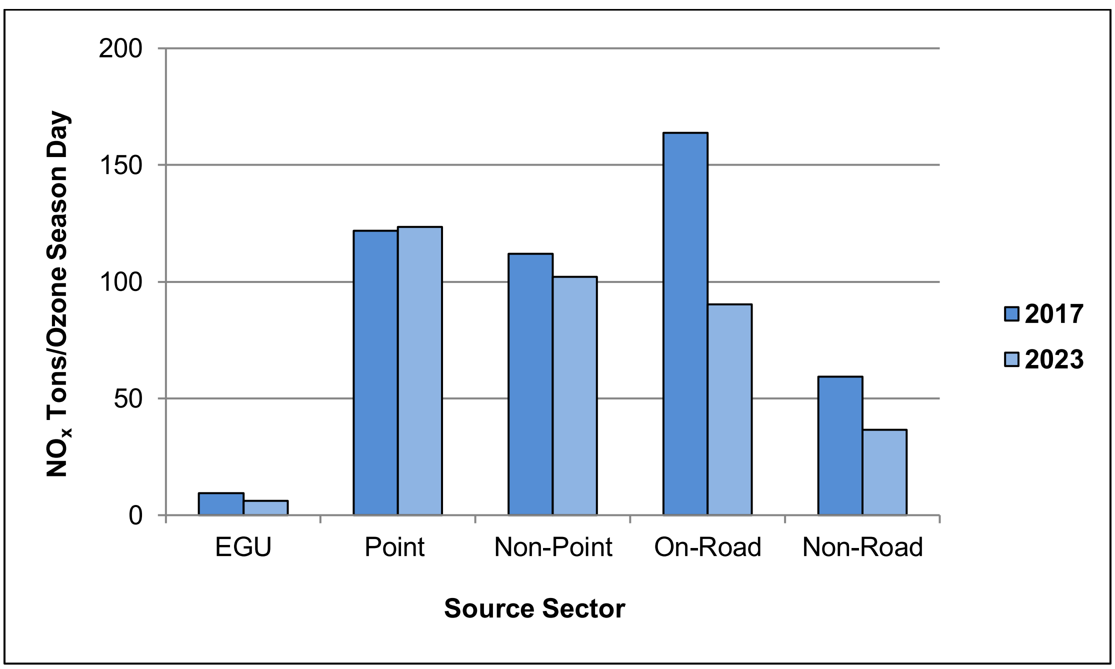


Chart 5.3: NO_x Emissions for 2017 (Base-Year) and 2023 (Projected-Year) by Source Sector for the 2015 8-Hour Chicago Ozone Nonattainment Area



5.2.1 Electric Generating Unit (EGU) Sources

Chart 5.4 shows the trend in regional NO_x emissions (tons per ozone season) from EGUs for the Chicago nonattainment area. Chart 5.5 depicts the trends of NO_x emissions (tons per ozone season) from EGUs in Lake (partial) and Porter (partial) counties. While ozone and its precursors are also transported into this region from outside areas, this information does provide indication that emissions are decreasing substantially. This is in part a result of national programs affecting all EGUs such as the Acid Rain program, the Clean Air Interstate Rule (CAIR), and now CSAPR. Other sectors of the inventory also impact ozone formation, but large regional sources, such as EGUs, have a substantial impact on the formation of ozone.

These data were taken from U.S. EPA's Clean Air Markets Program Data (AMPD).[14] Data are available sooner for these units than other point sources in the inventory because of the NO_x budgets and trading requirements. As part of the NO_x SIP Call, states were required to adopt into their rules a budget for all large EGUs. Indiana's budget, which represents a statewide cap on NO_x emissions, is now found in the federal transport rule for NO_x ozone season trading rules at 40 CFR 97, Subpart BBBBB. Although each unit is allocated emissions based upon historic heat input, utilities can meet this budget by over-controlling certain units or purchasing credits from the market to account for overages at other units. To summarize, NO_x emissions have dramatically decreased over the years as represented on these graphs. These emissions, capped by the state rule, should remain at least this low through the maintenance period covered by this request.

[14] http://www.epa.gov/airmarkets/

Chart 5.4: NO_x Emissions, Electric Generating Units – 2015 8-Hour Chicago Nonattainment Area, 2005-2022

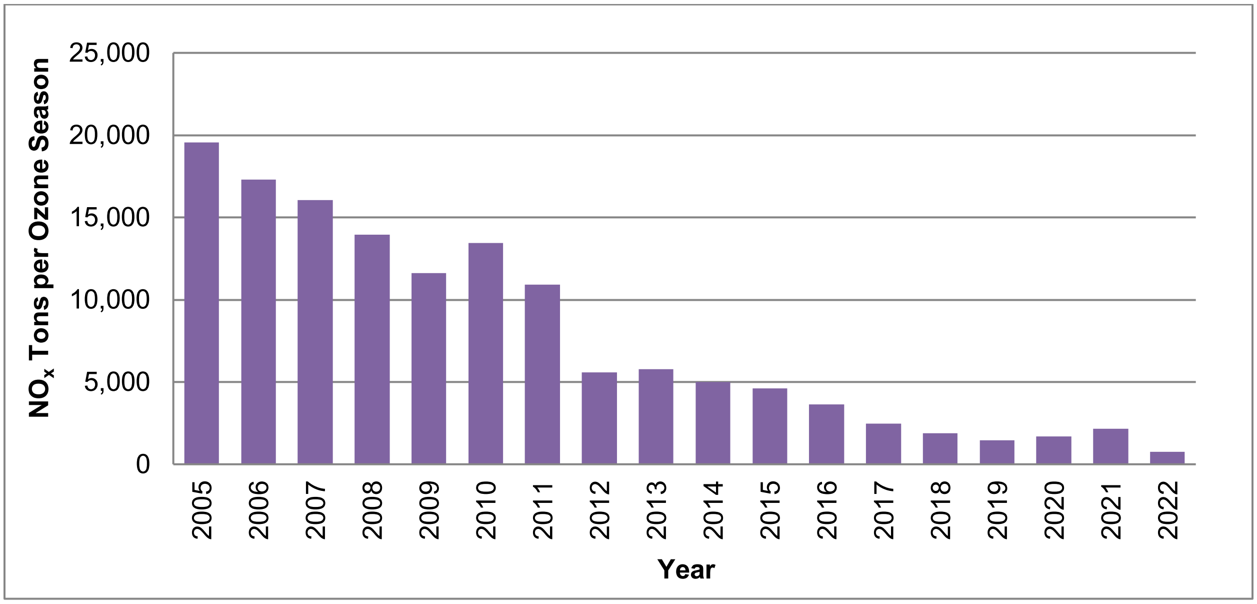
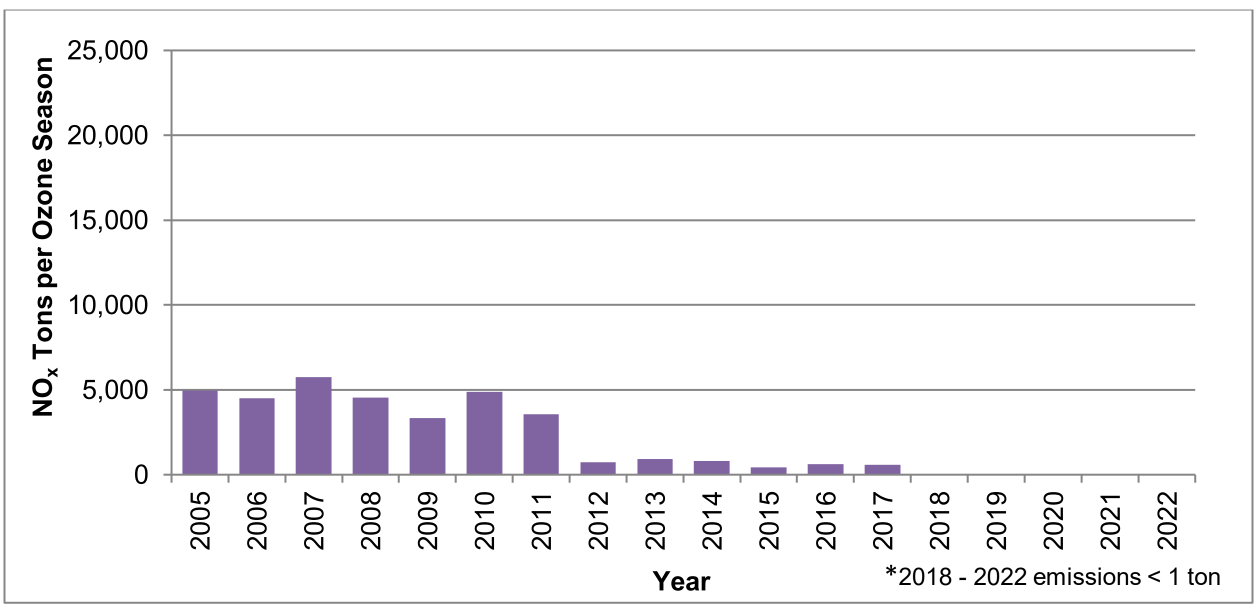


Chart 5.5: NO_x Emissions, Electric Generating Units – Lake (partial) and Porter (partial) Counties, Indiana, 2005-2022



6.0 MOBILE SOURCE EMISSIONS BUDGETS

U.S. EPA requirements outlined in 40 CFR 93.118(e)(4) stipulate that MVEBs for NO_x and VOC be established as part of a SIP. The MVEBs are necessary to demonstrate conformance of transportation plans and improvement programs with the SIP. A summary of the MVEB calculations and the MOVES methodology used in this area can be found in Appendix A3. In addition, due to the size of the MOVES input and output files, they will be provided electronically to appropriate staff with this submittal.

6.1 Overview

NIRPC is the MPO for the area that includes Lake, Porter, and LaPorte counties. This organization maintains a travel demand forecast model that is used to simulate traffic in the area and is used to predict what that traffic will be like in future years given growth expectations. The model is used mostly to identify where travel capacity will be needed and to determine the infrastructure requirements necessary to meet that need. It is also used to support the calculation of mobile source emissions estimates. The travel demand forecast model is used to predict the total daily Vehicle Miles Traveled (VMT) and U.S. EPA's MOVES software program is used to calculate the emissions per mile. MOVES3 is the latest version of the MOVES software program and was used for all emission factor estimates in this submittal. The product of these two outputs, once combined, is the total amount of pollution emitted by on-road vehicles for the particular analyzed area.

6.2 On-Road Emission Estimates

Broadly described, MOVES is used to generate "emission factors," which are the average emissions per mile (grams/mile) for the ozone precursors: NO_x and VOC. There are numerous variables that can affect the emission factors. The vehicle fleet (vehicles on the road) age and the vehicle types (fleet mix) have a major effect on the emission factors. The facility type the vehicles are traveling on (MOVES facility types are Freeway and Arterial and distinguish between urban and rural areas) and the vehicle speeds also affect the emission factor values.

Meteorological factors, such as hourly air temperature and humidity, and the area's Vehicle Inspection/Maintenance program affect the emission factors as well. These data are estimated using the *best available data* to generate emission factors for appropriate ozone precursors, NO_x and VOC. VMT data is generated by the region's travel demand model. Once emission factors are determined, the emission factor(s) is multiplied by the VMT to ultimately determine the quantity of vehicle emissions. It should be noted that each year analyzed will have different emission factors, volumes, speeds, and likely some additional roadway links.

Table 6.1 outlines the on-road emission estimations in tons per summer day (tpsd) for Lake (partial) and Porter (partial) counties for the 2017 base-year and the 2023 projected-year. The 2017 and 2023 emission estimates are based on the actual travel demand model network runs for those specific years.

Table 6.1: Emission Estimations and Projections for On-Road Mobile Sources - Lake (Partial) and Porter (Partial) Counties, Indiana, 2017 (Base-Year), 2023 (Projected-Year)

Lake and Porter	2017 (Base-Year)	2023 (Projected-Year)
NO_x tpsd	9.92	6.71
VOC tpsd	2.86	2.53

6.3 Motor Vehicle Emission Budgets

Table 6.2 contains the projected motor vehicle emissions budgets (tpsd) for Lake (partial) and Porter (partial) counties. As discussed in Section 2.2, this document contains reductions associated with a demonstrated rate of progress as well as contingency measures for NO_x and VOC emissions between 2017 and 2023. This budget includes the emission estimates for 2023 with a 20% margin of safety that is less than the available surplus emissions after the rate of progress and contingency measures are applied. Since assumptions change over time, IDEM determined a 20% margin of safety to be reasonable to account for such changes within the conformity process and the total decrease in emissions from all sources is sufficient to accommodate this twenty (20) percent allocation of safety margin to mobile sources while still continuing to maintain total emissions in the area well below the 2017 attainment level of emissions. This twenty (20) percent safety margin was calculated by adding a straight-line twenty (20) percent to the mobile source emission estimates for the year 2023. A safety margin, as defined by the conformity rule, looks at the total emissions from all sources in the nonattainment area. The emission estimates derive from the NIRPC travel demand model and MOVES as described above under the NIRPC 2050 Comprehensive Regional Plan. The emissions calculation methodology, latest planning assumptions, and margin of safety were approved through the interagency consultation process described in the Transportation Conformity Memorandum of Understanding (MOU) for NIRPC.

Table 6.2: 2023 (Projected-Year) Motor Vehicle Emission Budgets - Lake (Partial) and Porter (Partial) Counties, Indiana

Lake and Porter	2023 (Projected-Year)
NO_x tpsd	8.05
VOC tpsd	3.04

7.0 CONTROL STRATEGY

Several control measures already in place or being implemented over the next few years will reduce point, on-road mobile, and non-road mobile source emissions. The federal and state control measures in place are discussed below.

7.1 Nitrogen Oxides (NO_x) Rule[15]

On October 27, 1998, U.S. EPA established the NO_x SIP Call which required twenty-two (22) states to adopt rules that would result in significant emission reductions from large EGUs, industrial boilers, and cement kilns in the eastern United States. Indiana adopted this rule in 2001. Beginning in 2004, this rule accounts for a reduction of approximately thirty-one percent (31%) of all NO_x emissions statewide compared to previous uncontrolled years.

These rules were also adopted by twenty-one (21) other states. The resulting effect is that significant reductions have occurred within Indiana and regionally due to the number of affected units. The EGU portion of the NO_x SIP Call was replaced by the CAIR and has since been replaced by the CSAPR which continues to result in NO_x controls for EGUs.

On April 21, 2004, U.S. EPA published Phase II of the NO_x SIP Call that established a budget for large (emissions of greater than one ton per day) stationary internal combustion engines. In Indiana, the rule decreased NO_x emissions statewide from natural gas compressor stations by 4,263 tons during the ozone season of May through September. The Indiana Phase II NO_x SIP Call rule became effective in 2006, and implementation began in 2007 (326 IAC 10-5).

7.2 Measures Beyond Clean Air Act (CAA) Requirements

Reductions in ozone precursor emissions have occurred and are anticipated to continue, as a result of state and federal control programs. These additional control measures are summarized below.

[15] http://www.gpo.gov/fdsys/pkg/FR-1998-10-27/pdf/98-26773.pdf

7.2.1 Tier II Emission Standards for Vehicles and Gasoline Sulfur Standards[16]

On February 10, 2000, U.S. EPA finalized a federal rule to significantly reduce emissions from cars and light duty trucks including sport utility vehicles (SUVs). This rule required automakers to produce cleaner cars and refineries to make cleaner lower-sulfur gasoline. This rule was phased in between 2004 and 2009 and resulted in a 77% decrease in NO_x emissions from passenger cars, an 86% decrease from smaller SUVs, light duty trucks, and minivans, and a 65% decrease from 8-larger SUVs, vans, and heavier duty truck classes. This rule also resulted in a 12% decrease in VOC emissions from passenger cars, an 18% decrease from smaller SUVs, light duty trucks, and minivans, and a 15% decrease from larger SUVs, vans, and heavier duty trucks.

7.2.2 Tier III Emission Standards for Vehicles and Gasoline Sulfur Standards[17]

On April 28, 2014, U.S. EPA finalized a federal rule to further strengthen Tier II vehicle emission and fuel standards. This rule will require automakers to produce cleaner vehicles and refineries to make cleaner lower-sulfur gasoline. This rule will be phased in between 2017 and 2025. Tier III requires all passenger vehicles to meet an average standard of 0.03 gram/mile of NO_x. When compared to Tier II, the Tier III tailpipe standards for light-duty vehicles are expected to reduce NO_x and VOC emissions by approximately 80%. Tier III vehicle standards also include evaporative standards using onboard diagnostics that will result in a 50% reduction in VOC emissions compared to Tier II reductions. In January 2017, the rule reduced the sulfur content of gasoline to 10 ppm.

7.2.3 Heavy-Duty Diesel Engines[18]

On January 18, 2001, U.S. EPA issued a final rule for Highway Heavy-Duty Engines, a program that includes low-sulfur diesel fuel standards. This rule applies to heavy-duty gasoline and diesel trucks and buses. This rule was phased in from 2004 through 2007 and resulted in a 40% decrease in NO_x emissions from diesel trucks and buses.

7.2.4 Clean Air Non-road Diesel Rule[19]

On June 29, 2004, U.S. EPA issued the Clean Air Non-road Diesel Rule. This rule applies to diesel engines used in industries such as construction, agriculture, and mining. It also contains a cleaner fuel standard similar to the highway diesel program. The engine standards for non-road engines took effect in 2008 and resulted in a 90% decrease in sulfur dioxide (SO_2) emissions from non-road diesel engines. Sulfur levels were also reduced in non-road diesel fuel by 99.5% from approximately 3,000 ppm to 15 ppm.

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[16] http://www.gpo.gov/fdsys/pkg/FR-2000-02-10/pdf/00-19.pdf
[17] http://www.gpo.gov/fdsys/pkg/FR-2014-04-28/pdf/2014-06954.pdf
[18] http://www.gpo.gov/fdsys/pkg/FR-2001-01-18/pdf/01-2.pdf
[19] http://www.gpo.gov/fdsys/pkg/FR-2004-06-29/pdf/04-11293.pdf

7.2.5 Non-road Spark-Ignition Engines and Recreational Engine Standards [20]

This standard was effective on January 7, 2003, and regulates NO_x, VOCs, and carbon monoxide (CO) for groups of previously unregulated non-road engines. This standard applies to all new engines sold in the United States and imported after the standards went into effect. The standard applies to large spark-ignition engines (forklifts and airport ground service equipment), recreational vehicles (off-highway motorcycles and all-terrain vehicles), and recreational marine diesel engines. According to U.S. EPA estimates, this rule has resulted in an overall 80% reduction in NO_x, 72% reduction in VOC, and 56% reduction in CO emissions.

7.2.6 Reciprocating Internal Combustion Engine Standards[21]

This standard was effective May 3, 2010, and regulates emissions of air toxics from existing diesel-powered stationary reciprocating internal combustion engines that meet specific site rating, age, and size criteria. These engines are typically used at industrial facilities (e.g., power, chemical, and manufacturing plants) to generate electricity for compressors and pumps and to produce electricity to pump water for flood and fire control during emergencies. The standard applies to stationary diesel engines: (1) used at area sources of air toxics and constructed or reconstructed before June 12, 2006; (2) used at major sources of air toxics, having a site rating of less than or equal to 500 horsepower, and constructed or reconstructed before June 12, 2006; and, (3) used at major sources of air toxics for non-emergency purposes, having a site rating of greater than 500 horsepower, and constructed or reconstructed before December 19, 2002.

Operators of existing engines were required to: (1) install emissions control equipment that would limit air toxics up to 70% for stationary non-emergency engines with a site rating greater than 300 horsepower; (2) perform emission tests to demonstrate engine performance and compliance with rule requirements; and, (3) burn ultra-low sulfur fuel in stationary non-emergency engines with a site rating greater than 300 horsepower. These engine standards took effect in 2013. According to U.S. EPA estimates, this rule has resulted in emission reductions from existing diesel-powered stationary reciprocating internal combustion engines of approximately 1,000, 2,800, and 27,000 tons per year (tpy) of air toxics, $PM_{2.5}$, and CO, respectively.

7.2.7 Category 3 Marine Diesel Engine Standards[22]

This standard was effective on June 29, 2010, and promulgated more stringent exhaust emission standards for new large marine diesel engines with per-cylinder displacement at or above 30 liters (commonly referred to as Category 3 compression-ignition marine engines) as part of a coordinated strategy to address emissions from all ships that affect

[20] http://www.gpo.gov/fdsys/pkg/FR-2002-11-08/pdf/02-23801.pdf
[21] http://www.gpo.gov/fdsys/pkg/FR-2010-03-03/pdf/2010-3508.pdf
[22] http://www.gpo.gov/fdsys/pkg/FR-2010-04-30/pdf/2010-2534.pdf

U.S. air quality. These emission standards are equivalent to those adopted in the amendments to Annex VI to the International Convention for the Prevention of Pollution from Ships (MARPOL Annex VI). The emission standards apply in two stages: near-term standards for newly built engines, which took effect in 2011, and long-term standards requiring an 80% reduction in NO_x emissions that began in 2016.

U.S. EPA is adopting changes to the diesel fuel program to allow for the production and sale of diesel fuel with up to 1,000 ppm sulfur for use in Category 3 marine vessels. The regulations generally forbid production and sale of fuels with more than 1,000 ppm sulfur for use in most U.S. waters unless operators achieve equivalent emission reductions in other ways.

U.S. EPA is also adopting provisions to apply some emission and fuel standards to foreign-flagged and in-use vessels that are covered by MARPOL Annex VI. When this strategy is fully implemented in 2030, U.S. EPA estimates that NO_x and $PM_{2.5}$ emissions in the U.S. will be reduced by approximately 1.2 million tpy and 143,000 tpy, respectively.

7.2.8 Clean Air Interstate Rule (CAIR)/Cross State Air Pollution Rule (CSAPR)[23]

On May 12, 2005, U.S. EPA published the following regulation: "Rule to Reduce Interstate Transport of Fine Particulate Matter and Ozone (CAIR); Revisions to Acid Rain Program; Revisions to the NO_x budget; Final Rule". This rule established the requirement for states to adopt rules limiting the emissions of NO_x and SO_2 and provided a model rule for the states to use in developing their rules in order to meet federal requirements. The purpose of CAIR was to reduce interstate transport of $PM_{2.5}$, SO_2, and ozone precursors (NO_x).

CAIR applied to any stationary fossil fuel-fired boiler, stationary fossil fuel-fired combustion turbine, or a generator with a nameplate capacity of more than 25 megawatt electrical (MWe) producing electricity for sale. This rule provided annual state caps for NO_x and SO_2 in two phases with Phase I caps for NO_x and SO_2 starting in 2009 and 2010, respectively. Phase II caps were to become effective in 2015. U.S. EPA allowed limits to be met through a cap-and-trade program if a state chose to participate in the program. SO_2 emissions from power plants in the 28 eastern states and the District of Columbia (D.C.) covered by CAIR were to be cut by 4.3 million tons from 2003 levels by 2010 and 5.4 million tons from 2003 levels by 2015. NO_x emissions were to be cut by 1.7 million tons by 2009 and reduced by an additional 1.3 million tons by 2015. In response to U.S. EPA's rulemaking, Indiana adopted a state rule in 2006 based on the model federal rule (326 IAC 24-1, 326 IAC 24-2, and 326 IAC 24-3). Indiana's rule included annual and seasonal NO_x trading programs, and an annual SO_2 trading program. This rule required compliance effective January 1, 2009.

[23] https://www.epa.gov/csapr

In July 2008, the D.C. Circuit court vacated CAIR and issued a subsequent remand without vacatur of CAIR in December 2008. The court then directed U.S. EPA to revise or replace CAIR in order to address the deficiencies identified by the court. On July 6, 2011, U.S. EPA finalized the CSAPR as a replacement for CAIR. On August 21, 2012, the U.S. Court of Appeals for the D.C. Circuit vacated CSAPR and directed U.S. EPA to continue administering CAIR "pending the promulgation of a valid replacement." In a subsequent decision on the merits, the Court vacated CSAPR based on a subset of petitioners' claims. On April 29, 2014, the U.S. Supreme Court reversed that decision and remanded the case to the D.C. Circuit court for further proceedings. Throughout the initial round of D.C. Circuit proceedings, and the ensuing U.S. Supreme Court proceedings, the stay remained in place and U.S. EPA had continued to implement CAIR.

In order to allow CSAPR to replace CAIR in an equitable and orderly manner, while further D.C. Circuit Court proceedings were held to resolve petitioner's remaining claims, U.S. EPA filed a motion asking the D.C. Circuit Court to lift the stay. U.S EPA also asked the court to toll all CSAPR compliance deadlines that had not passed as of the date of the stay order by three years. On October 23, 2014, the Court granted U.S. EPA's motion. CSAPR became effective on January 1, 2015, for SO_2 and annual NO_x, and then on May 1, 2015, for ozone season NO_x.

On September 7, 2016, U.S. EPA finalized an update to the Cross-State Air Pollution Rule (CSAPR) for 2008 ozone standard. This is a FIP that sets forth new EGU emission budgets for NO_x via allowance trading modifications in 22 eastern states. These affected states failed to submit fully approvable Infrastructure SIPs that address interstate transport of emissions. Compliance with these emissions reductions began January 2017 for the annual program and May 2017 for the ozone season program. This final rule became effective on December 27, 2016.

On December 6, 2018, U.S. EPA signed a final action determining that the existing CSAPR Update fully addresses and provides complete remedy for the CAA's good neighbor provision requirements for the remaining CSAPR Update states, including Indiana (83 FR 65878). The final rule went into effect on February 19, 2019. According to U.S. EPA, the final Determination Rule satisfied U.S. EPA's obligation to fully address the good neighbor provision requirements for the 2008 8-hour ozone standard. As such, U.S. EPA required no further action be taken by Indiana to address the good neighbor provision requirements and the supplemental information submitted on March 29, 2018, was unnecessary. Therefore, Indiana withdrew the March 29, 2018, submittal on July 9, 2019.

Downwind states, that have undertaken court challenges to force U.S. EPA to bring the upwind states, including Indiana, into compliance with the CAA's good neighbor provision requirements in the past, challenged U.S. EPA's decision to require no further action in a court filling in the D.C. Circuit on January 30, 2019. On October 1, 2019, the

D.C. Circuit struck down the rule, on the basis that future action is required to meet a statutory 2021 deadline.

On September 13, 2019, D.C. Circuit decision on Wisconsin v. U.S. EPA held that U.S. EPA was required to fully address upwind states' Good Neighbor obligations by the downwind states' statutory attainment dates. The court remanded the CSAPR Update without vacatur. The Southern District of New York issued a July 28, 2020, decision in NJ v. Wheeler, ruling that U.S. EPA must issue a final federal plan rule by March 15, 2021.

On March 15, 2021, U.S. EPA finalized the Revised CSAPR Update in order to resolve 21 states' outstanding interstate pollution transport obligations for the 2008 ozone NAAQS. Starting in the 2021 ozone season, this final rule reduced emissions of NO_x from power plants in 12 states, including Indiana, improving air quality for millions of Americans. This rulemaking responds to a September 2019 ruling by the United States Court of Appeals for the D.C. Circuit, Wisconsin v. EPA, which remanded the 2016 CSAPR Update to U.S. EPA for failing to fully eliminate significant contribution to nonattainment and interference with maintenance of the 2008 ozone NAAQS from these states by downwind areas' attainment dates.

On August 19, 2022, U.S. EPA finalized the Good Neighbor Plan Allowance Recordation Rule to revise certain administrative deadlines under seven allowance trading programs for NO_x and SO_2, including all CSAPR trading programs.

On January 31, 2023, U.S. EPA disapproved 19 states' SIP submissions addressing interstate transport for the 2015 ozone NAAQS, including Indiana. In addition, U.S. EPA partially approved and partially disapproved 2 states' SIP submissions. Disapproving these "good neighbor" or "interstate transport" SIP submissions established a 2-year deadline for U.S. EPA to promulgate a Federal Implementation Plan (FIP) for the affected states to address interstate transport of ozone, unless a state subsequently submitted, and U.S. EPA approved a good neighbor SIP.

On March 15, 2023, U.S. EPA issued its final Good Neighbor Plan, to assure that states identified in the proposal, including Indiana, do not significantly contribute to problems attaining and maintaining the 2015 ozone NAAQS in downwind states.[24] Beginning in the 2023 ozone season, power plants in 22 states are required to participate in a revised and strengthened CASPR ozone season trading program. To achieve emission reductions as soon as possible, U.S. EPA based the initial control stringency on the level of reductions achievable through immediately available measures, including consistently operating emissions controls already installed at power plants. Further reductions will be phased in over several years starting in 2024 and reflect emissions levels that could be achieved through installation of new emissions controls. Beginning in the 2026 ozone season, U.S. EPA is setting enforceable NO_X emission control

[24] https://www.epa.gov/csapr/good-neighbor-plan-2015-ozone-naaqs

requirements for certain sources at existing and new industrial facilities that have significant impacts on downwind air quality and the ability to install cost-effective pollution controls. U.S. EPA estimates that this action will reduce ozone season NO_X pollution by approximately 70,000 tons in 2026. By 2027, the emissions budget for power plants will reflect a 50% reduction from 2021 ozone season NO_X emissions levels.

7.2.9 Oil and Natural Gas Industry Standards[25]

This standard was issued on August 16, 2012, and regulates VOC and air toxic emissions from hydraulically fractured natural gas wells and also includes requirements for several other sources of pollution in the oil and natural gas industry that were previously unregulated in the United States. U.S. EPA estimated that these standards will apply to approximately 11,400 new natural gas wells hydraulically fractured each year and an additional 1,400 existing natural gas wells refractured annually. These standards took effect in 2015. According to U.S. EPA estimates, this rule has resulted in emission reductions of VOC and air toxics of approximately 190,000-290,000 tpy and 12,000-20,000 tpy, respectively.

7.2.10 Mercury and Air Toxic Standards (MATS)[26]

This standard was effective on April 16, 2012, and regulates emissions of mercury, acid gases, and non-mercury metallic toxic pollutants from new and existing coal and oil-fired EGUs. U.S. EPA estimates that this rule will apply to approximately 1,100 coal-fired and 300 oil-fired EGUs at 600 power plants in the United States. According to U.S. EPA, most facilities will comply with these standards through a range of strategies including the use of existing emission controls, upgrades to existing emission controls, installation of new pollution controls, and fuel switching.

Following promulgation of the rule, U.S. EPA received petitions for reconsideration of various provisions of the rule including requests to reconsider the work practice standards applicable during startup and shutdown periods. U.S. EPA granted reconsideration of the startup and shutdown provisions as no opportunity to comment was provided to the public regarding the work practice requirements contained in the final rule. On November 30, 2012, U.S. EPA published a proposed rule reconsidering certain new source standards and startup and shutdown provisions in MATS. U.S. EPA proposed certain minor changes to the startup and shutdown provisions contained in the 2012 final rule based on information obtained in the petitions for reconsideration. On April 24, 2013, U.S. EPA took final action on the new source standards that were reconsidered and also the technical corrections contained in the November 30, 2012, proposed action. U.S. EPA did not take final action on the startup and shutdown provisions. On June 25, 2013, U.S. EPA added new information and analysis to the docket and reopened the public comment period for the proposed revisions. U.S. EPA

[25] http://www.gpo.gov/fdsys/pkg/FR-2012-08-16/pdf/2012-16806.pdf
[26] https://www.epa.gov/stationary-sources-air-pollution/mercury-and-air-toxics-standards

took final action on the remaining topics open for reconsideration on November 19, 2014. The compliance date for existing sources was April 16, 2015, while the compliance date for new sources was April 16, 2012.

On November 25, 2014, the U.S. Supreme Court accepted several challenges to the rules brought by the utility industry and a coalition of nearly two dozen states. On June 29, 2015, the U.S. Supreme Court ruled that U.S. EPA did not properly account for compliance costs when crafting the MATS rule and remanded the decision to the D.C. Circuit Court for reconsideration. As a response, on November 20, 2015, U.S. EPA proposed to find that regulating emissions of toxic air pollution from power plants is applicable and that considering the possible associated costs of compliance does not change that conclusion. On March 17, 2016, U.S. EPA finalized a number of clarifying changes and corrections to the MATS rule. On April 14, 2016, U.S. EPA confirmed that it is appropriate and necessary to regulate emissions of toxic air pollution after including a consideration of costs. On August 8, 2016, U.S. EPA denied two petitions for reconsideration of the startup and shutdown provisions in MATS. On March 29, 2017, U.S. EPA finalized portions of its proposal to streamline "e-reporting" in MATS. On June 26, 2018, U.S. EPA extended the period during which certain electronic reports can by submitted as PDFs. On April 15, 2020, after evaluating information on the acid gas hazardous air pollutant emissions from EGUs that burn eastern bituminous coal refuse, U.S. EPA established a new subcategory for these units. On May 22, 2020, U.S. EPA completed a reconsideration of the appropriate and necessary finding for MATS, correcting flaws in the approach to considering costs and benefits while ensuring that hazardous air pollutant emissions from power plants continue to be appropriately controlled. On July 17, 2020, U.S. EPA finalized revisions to the electronic reporting requirements to increase data transparency, provide enhanced access to data, and extend the current deadline for alternative electronic data submission via PDF files through December 31, 2023.

On February 15, 2023, U.S. EPA reaffirmed that it remains appropriate and necessary to regulate hazardous air pollutants, including mercury, from power plants after considering cost. This action also revoked a May 22, 2020, finding that it was not appropriate and necessary to regulate coal- and oil-fired power plants under Section 112 of the CAA which covers toxic air pollutants.

On April 3, 2023, U.S. EPA proposed to strengthen and update MATS for coal-fired power plants which will result in important hazardous air pollutant emission reductions and ensure the standards reflect the latest advancements in pollution control technologies. This proposed rule, the most significant update since MATS was first issued in February 2012, fulfills U.S. EPA's responsibility under the CAA to periodically review emission standards.

7.3 New Source Review (NSR) Provisions[27]

Indiana has a long standing and fully implemented NNSR permitting program that is outlined in 326 IAC 2-3. U.S. EPA approved the initial rules on October 7, 1994 (94 FR 24837).[28] U.S. EPA approved amendments affecting 326 IAC 2-3-1, 326 IAC 2-3-2, and 326 IAC 2-3-3, to comply with federal rules for NSR Reform on December 31, 2002 (67 FR 80186) and July 8, 2011 [76 FR 40242][29], which have not been subsequently amended.

Any facility for which emission reduction credit through closing was taken will not be allowed to construct, reopen, modify, or reconstruct without meeting all applicable permit rule requirements. The review process will be identical to that used for new sources. This program requires an air quality analysis to evaluate whether the new source will threaten the NAAQS.

Indiana commits to maintain the control measures listed above or submit to U.S. EPA as a SIP revision, any changes to its rules or emission limits applicable to NO_x or VOC sources as required for maintenance of the 2015 8-hour ozone standard in Lake (partial) and Porter (partial) counties, Indiana. Indiana, through IDEM's OAQ and its Compliance and Enforcement Branch, has the legal authority and necessary resources to actively enforce any violations of its rules or permit provisions. IDEM intends to continue enforcing all rules that relate to the emission of ozone precursors in Lake (partial) and Porter (partial) counties, Indiana.

8.0 WEIGHT OF EVIDENCE

A weight of evidence demonstration relies on the use of supplemental information to support the modeling analysis (Section 3.0 and Appendix A1), demonstrating that a vast majority of the Chicago nonattainment area will comply with the ozone standard by the prescribed attainment date with the exception of one ozone monitor in southeastern Wisconsin. In Sections 4.0, 5.0, and 6.0, this demonstration includes analyses of air quality trends, emission trends, current air quality data, and a summary of projected emission reductions. This section exemplifies three modeling analyses that conclude attainment of the 2015 8-hour standard in 2026 at all ozone monitors in the Chicago nonattainment area except for the Chiwaukee, Kenosha County, Wisconsin. These are U.S. EPA Modeling Analyses for the proposed Transport "Good Neighbor" Provision and the Disapproval of the State Implementation Plan Addressing Regional Ozone Transport for the 2015 Ozone National Ambient Air Quality Standards final action as well as the Lake Michigan Air Directors Consortium (LADCO) future year 2026 modeling results based on an earlier version of the 2016 emission platform that U.S. EPA used for its photochemical modeling.

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27 https://www.govinfo.gov/content/pkg/FR-2004-05-20/pdf/04-11337.pdf
28 https://www.gpo.gov/fdsys/pkg/FR-1994-10-07/html/94-24837.htm
29 https://www.gpo.gov/fdsys/pkg/FR-2011-07-08/pdf/2011-17036.pdf

8.1 Trends in U.S. EPA Modeling Results

Review of U.S. EPA's previous regulatory modeling to address the 8-hour ozone standard over the past two decades has shown a wide range of results; undoubtedly the disparity between results is due to different emission platforms, meteorology, projected emissions inventories, and different versions of photochemical models. These disparities can lead to inconsistencies in assumed ozone reductions based on emission control options that are factored into the model. This is seen when reviewing model performance matrices. If the modeled results show outliers from the vast majority of monitoring sites which were shown to be in attainment of the 2015 ozone standard, that shows that either the photochemical model does not process well or the monitoring location and associated meteorology within the model or emissions estimates and meteorological data were flawed or did not correspond well to observations.

A comparison of past U.S. EPA photochemical modeling to support national rulemakings was conducted. Several aspects of the analyses were evaluated to determine the validity of the projected modeled results with observed readings for the modeled future years. Among the results compared were the base future year design values with the modeled future year design value with controls. Modeled future year design values were also compared to observed design values to evaluate model performance. These comparisons point out that modeling results can be misleading and may only represent the projection of the base-year modeled design values which are not reflective of more current ozone values. In addition, modeling the future year projected emission estimates account for larger modeled decreases in ozone than proposed emission control rulemakings. This is evident in ozone decreases ranging from 5% to 15% lower for base future year modeled design values to future year projected base modeling runs. When incorporating national emission reduction measures (CSAPR and Transport/"Good Neighbor" emission control mandates) to the future year projected design values, the additional benefit of those controls in modeled future year ozone impacts tend to show very minor ozone concentration reductions.

8.1.1 Clean Air Interstate Rule (CAIR)

CAIR modeling was conducted by U.S. EPA. Inventories were prepared from a 2001 base-year, for 2010 and 2015 future baseline scenarios, and for 2010 and 2015 regional control scenarios. As noted in Table 8.1, the observed design value at the Chiwaukee, Kenosha County, Wisconsin monitor was 98.7 ppb. The decreases in the modeled ozone concentrations from the 2001 base-year to future year 2010 were approximately 7.5% less for the 2010 base future inventory and approximately 7.8% less for the 2010 regional control strategy. For 2015, modeled results showed an estimated 9.7% decrease for the future base inventory and 10% decrease for the regional control strategy from the base-year design values. These results are consistent for both future years as emissions reductions from the implementation of CAIR controls were predicted to have an additional 0.3 ppb or 0.3% decrease in ozone concentrations at the Kenosha County monitor as a result of the emission reductions due to implementation of CAIR.

Table 8.1. Clean Air Interstate Rule Ozone Modeling Results

Area	County	Design Value Ave 1999-2003 (ppb)	2010 Base (ppb)	2010 CAIR (ppb)	2015 Base (ppb)	2015 CAIR (ppb)
Chicago, IL-IN	Kenosha	98.7	91.3	91	89.1	88.8

Variability in the design values occurs with each passing year. Weather conditions played a very important role in determining the 4th high value used in the design value calculation, as warmer than normal summer temperatures impacted ozone development and transport during this period. Review of the 2008 – 2012 design values for the 2010 CAIR modeling showed a 3 to 10 ppb range over the 5-year period, as shown below:

2008-2010 – 74 ppb

2009-2011 – 77 ppb

2010-2012 – 84 ppb => average 2008 – 2012 design value of 78.3 ppb.

Weather conditions from 2013 through 2017 had fewer extreme temperatures and ozone conducive conditions. This led to more stable monitored design values for the future year projections for the 2015 CAIR modeling which showed a 2 to 3 ppb range over the 5-year period.

2013-2015 – 75 ppb

2014-2016 – 77 ppb

2015-2017 – 78 ppb => average 2012 – 2017 design value of 76.7 ppb.

Additional emission reductions throughout the country led to lower observed ozone concentrations that far exceeded what was modeled through the CAIR analysis.

8.1.2 Cross-State Air Pollution Rule (CSAPR)

The CSAPR rule modeling included 2005 base-year emissions, a 2012 future year base case, a 2014 future year base case, and 2014 remedy case with CSAPR emission reductions factored in. Emission reductions from EGUs were targeted with this rule in order to address transport.

Modeling results show decreases from the modeled 2003-2007 design value at the Chiwaukee monitor. As noted in Table 8.2, the observed design value at the Chiwaukee monitor was 84.7 ppb. This design value is approximately 15% less than the observed design value for CAIR. Percent decreases in the modeled ozone concentrations for the CSAPR modeling for 2012 and 2014 base case scenarios were approximately 5.8% and 7.0% less. U.S. EPA modeled the impacts from NO_x reductions from additional EGU controls. This resulted in an additional 0.2 ppb decrease in ozone concentrations for the 2014 remedy modeling run at the Chiwaukee monitor. Modeled NO_x emission reductions from CSAPR in Indiana and nationally were estimated to be 7,092 and 198,000 tons, respectively.

Table 8.2. Cross State Air Pollution Rule Ozone Modeling Results

State	County	2003-2007 Average Ambient Values (ppb)	2012 Base Case Average Values (ppb)	2014 Base Case Average Values (ppb)	2014 Remedy Average Values (ppb)
Wisconsin	Kenosha	84.7	79.8	78.8	78.6

Variations in design values were less evident in the CSAPR modeling as the observed design values centered around 2012 ranged from 1 to 3 ppb.

2010-2012 – 84 ppb

2011-2013 – 82 ppb

2012-2014 – 81 ppb => average 2010-2014 design value of 82.3 ppb.

The average of the three design values centered around 2014 ranged from 4 to 6 ppb as warmer summer temperatures impacted ozone values for the beginning and end of this period.

2012-2014 – 81 ppb

2013-2015 - 75 ppb

2014-2016 – 77 ppb => average 2012-2016 design value of 77.7 ppb.

Model predictions agreed more with the observed design values as the lower base-year design values were reflective of emissions reductions made nationally at that time as elevated summer temperatures observed for 2012 and 2016 impacted the ozone design values.

8.1.3 Update to the Cross-State Air Pollution Rule

On September 7, 2016, U.S. EPA finalized an update to the CSAPR for the 2008 ozone standard. The purpose of this rule was to reduce summertime (May - September) NO_x emissions from power plants. The CSAPR update modeling included 2011 base-year and 2017 projected future year base case scenarios.

Modeling results show decreases from the modeled 2009-2013 design value at the Chiwaukee monitor. As noted in Table 8.3, the observed design value at Chiwaukee was 81.0 ppb. This design value is approximately 15% less than the observed design value used in the CSAPR modeling. The modeled ozone concentrations for the 2017 base case scenario decreased by approximately 18%. For Indiana, the proposed NO_x budgets resulted in emission reductions of 16,920 tons. Modeled future year design values for this rule were underestimated as shown below.

Table 8.3. Update to the Cross-State Air Pollution Rule Ozone Modeling Results

State	County	2009-2013 Base Period Average Design Value (ppb)	2017 Base Case Average Design Value (ppb)
Wisconsin	Kenosha	81.0	66.3

Review of the three design values for the future year projections for the CSAPR update modeling show varying monitored design values ranging from 1 to 4 ppb over the 5-year period used for the 2017 future year projections.

2015-2017 – 78 ppb

2016-2018 - 79 ppb

2017-2019 – 75 ppb => average 2015-2019 design value of 77.3 ppb.

Model performance and emission estimates were in question with this modeling demonstration and the results were brought under scrutiny. This underscores the unpredictability of the model and how modeling results should only be a part of an attainment demonstration where monitoring and emission trends should be held in higher regard. Lowering trends in monitored ozone data and anthropogenic NO_x and VOC emissions indicate states are making advances in improving air quality.

8.1.4 Final Revised Cross-State Air Pollution Rule Update

In 2021, U.S. EPA took action to address the 2008 ozone standard and completed the final revised CSAPR update, under the ‘‘good neighbor provision’’ of the CAA. Again, EGUs were the focus of NO_x emission reductions.

Modeling results show decreases from the modeled 2014-2018 design value at the Chiwaukee monitor. As noted in Table 8.4, the observed design value at Chiwaukee was 78 ppb. Modeled ozone concentrations for the final revised CSAPR update for the 2021, 2023, and 2028 base case scenarios were approximately 6.3%, 8.7%, and 11.7% less than the 2016 centered design value at Chiwaukee, respectively.

Table 8.4. Final Revised Cross-State Air Pollution Rule Ozone Modeling Results

State	County	2016-Centered Average DV (ppb)	2021 Average DV (ppb)	2023 Average DV (ppb)	2028 Average DV (ppb)
Wisconsin	Kenosha	78	73.1	71.2	68.9

Review of the two current design values for the future year projections for the final revised CSAPR modeling show slight variation in design values and modeled future year design values lower than the observed ozone values:

2019-2021 – 74 ppb

2020-2022 – 75 ppb => 2 design value periods (2019-2022) average of 74.5 ppb.

Weather conditions play a very important role in determining the 4th high value used in the design value calculation as 2020 and 2021 had higher spring and summer temperatures and ozone conducive conditions which led to increased ozone design values for the future year projections for 2021, 2023, and 2028. As data becomes available and quality assured, it is believed these modeling results will be consistent with the observed monitoring data and design values and attainment will be achieved at this monitor.

8.1.5 Proposed Transport Rule “Good Neighbor” Rule

In 2022, U.S. EPA proposed action to address the 2015 ozone standard and finalized the transport rule, under the ‘‘good neighbor provision’’ of the CAA. This rule focused more on EGUs and non-EGUs for NO_x emission reductions.

Modeling results show decreases from the modeled 2016 centered design value at the Chiwaukee monitor. As noted in Table 8.5, the observed design value at the Chiwaukee monitor was 78 ppb. Modeled ozone design values for the 2023, 2026, and 2032 fj emissions platform base case scenarios were approximately 6.7%, 8.1%, and 9.7% less than the 2016 centered design value at Chiwaukee, respectively.

Table 8.5. Proposed Transport Rule “Good Neighbor” Ozone Modeling Results

State	County	2016-Centered Avg DV (ppb)	2023fj Avg No Water (ppb)	2026fj Avg No Water (ppb)	2032fj Avg No Water (ppb)
Wisconsin	Kenosha	78.0	72.8	71.7	70.4

Review of the two current design values for the future year projections for the final revised CSAPR modeling show modeled future year design values slightly lower than the observed ozone values:

2019-2021 – 74 ppb

2020-2022 – 75 ppb => 2 design value periods (2019-2022) average of 74.5 ppb.

8.1.6 SIP Disapproval Final Action – 2015 Ozone NAAQS Modeling

In 2023, U.S. EPA performed photochemical modeling to support final disapproval of the “good neighbor” SIPs addressing transport for the 2015 ozone NAAQS. The modeling results are based on version 3 of the 2016 emission platform (2016v3).

Modeling results show a decrease from the modeled proposed transport rule “good neighbor” design value at the Chiwaukee monitor. As noted in Table 8.6, the observed design value at the Chiwaukee monitor was 78 ppb. Modeled ozone concentrations decreased approximately 9.7% from the 2016 centered design value.

Table 8.6. SIP Disapproval Final Action – 2015 Ozone NAAQS Modeling Results

State	County	2016-Centered Avg DV (ppb)	2023 Avg No Water (ppb)	2023 Max No Water (ppb)	2023 Avg 3 x 3 (ppb)	2023 Max 3 x 3 (ppb)
Wisconsin	Kenosha	78.0	70.8	71.7	72.0	73.0

It should be noted that U.S. EPA’s photochemical modeling shows a 2023 average design value with “no water” cells at 70.8 ppb, which is approximately 2.0 ppb less than the modeled results presented for the proposed transport rule. The 2016 emissions platform version 3 (scenario 2016gf) revised anthropogenic and biogenic emissions which improved model performance (see Section 8.2) and lowered future year modeled design values significantly.

8.1.7 Summary of U.S. EPA Modeling Analyses

Determination of future year projected design values depends on several important factors, some of which states have no control. Based on the analysis above, early U.S. EPA modeling showed vast overpredictions of future year base and controlled impacts. This is most evident in the CAIR modeling analyses with projected modeled design values overestimated by 12 to 13 ppb. The subsequent CSAPR rule modeling brought modeled future-year projections and design values based on observed data closer together. The update to CSAPR modeling produced an underprediction in future-year projected design values when compared to the observed design values.

Also of note is the lack of substantial ozone concentration decreases in the photochemical modeling results due to projected NO_x and VOC emission reductions from federal mandates. The future year projections, when modeled as the future base-year, represent the majority of the ozone concentration decreases. The 2016 emissions platform version 3 reduced anthropogenic and biogenic emissions from the 2016 version 2 (scenario 2016fj) emissions, which improved overall model performance and lowered future year modeled design values significantly. As evident in the summaries of modeled results, when controls from CAIR, CSAPR, transport rule, etc., are factored into the future year modeled projections, the difference between future year base-year and controlled modeled concentrations are considered minimal. Once again, this highlights the sensitivity of photochemical models to emission changes within inventories and how platforms are characterized within the model itself.

8.2 U.S. EPA Proposed Transport Rule - Good Neighbor Model Performance

Model performance is also a concern for accurately evaluating photochemical model results. U.S. EPA has provided model performance evaluation analysis for the proposed transport rule "Good Neighbor" SIP modeling. Table A-1 of the "Air Quality Modeling Technical Support Document for the Federal Implementation Plan Addressing Regional Ozone Transport for the 2015 Ozone National Ambient Air Quality Standards Proposed Rulemaking" (Transport Modeling TSD) details the model performance at each of the monitoring sites throughout the country. Model performance statistics were created for the period May through September (i.e., seasonal) and for individual months during this time period. Statistics were created using data on all days with valid observed data during this period as well as for the subset of days with observed maximum daily average 8-hour concentrations greater than 60 ppb. Modeling performance statistics were calculated for individual monitoring sites and in aggregate for monitoring sites within each of nine climate regions of the 12-kilometer U.S. modeling domain. Of concern for the Chicago nonattainment area, the Ohio Valley includes Illinois, Indiana, Kentucky, Missouri, Ohio, Tennessee, and West Virginia while the Midwest climate region includes Iowa, Michigan, Minnesota, and Wisconsin. The Chiwaukee model performance statistics for U.S. EPA's model run are poorer than the model performance statistics for the Ohio Valley and Midwest climate regions, as shown below in Table 8.7.

Table 8.7 Proposed Transport Rule model performance at Ohio Valley and Midwest Climate Regions

Climate Region/ Monitor	Number of Site-Days	MB (ppb)	ME (ppb)	NMB (%)	NME (%)
Midwest	16,279	-2.9	6.3	-6.9	15.2
Ohio Valley	33,784	0.4	6.3	1.0	14.1
Chiwaukee	31	-17.14	17.79	-24.36	25.29
Kohler Andrae	19	-17.78	17.78	-24.56	24.56
Zion	22	-9.57	11.10	-14.12	16.37

While the overall correlation between observed and modeled ozone values is within acceptable levels, there are still bias and error concerns with individual monitoring sites that cannot be ignored. The regulatory significance of mean bias/mean error and normalized mean bias/normalized mean error can impact the final projected modeled concentrations. The two monitoring sites with modeled design values above the 2015 ozone standard in the Chicago, IL-IN-WI nonattainment area show larger bias and error than the averaged performance statistics calculated by U.S. EPA in its technical support documentation for its modeling. While IDEM is not questioning the results, based on U.S. EPA's statement in its Transport Modeling TSD that "predictions from the 2016v2 modeling platform correspond closely to observed concentrations in terms of the magnitude, temporal fluctuations, and geographic differences for maximum daily average 8-hour ozone. Thus, the model performance results demonstrate the scientific credibility of our 2016v2 modeling platform. These results provide confidence in the ability of the modeling platform to provide a reasonable projection of expected future year ozone concentrations and contributions.", it should be noted that the performance at each monitor differs. These differences should be considered when determining future year modeled impacts for regulatory purposes.

U.S. EPA has recently released modeling to support its disapproval of states' SIPs for the 2015 ozone NAAQS as well as its final Transport Rule "Good Neighbor" modeling results. The model performance for these modeling results shows improved performance as U.S. EPA used an updated emissions platform 2016 version 3 (2016v3). Table 8.8 shows overall performance results for the Midwest and Ohio Valley regions in addition to monitoring sites along Lake Michigan that have historically high ozone values.

Table 8.8 SIP Disapproval/Final Transport Rule Model Performance at Ohio Valley and Midwest Climate Regions

Climate Region/ Monitor	Number of Site-Days	MB (ppb)	ME (ppb)	NMB (%)	NME (%)
Midwest	16,279	1.9	6.0	4.5	14.6
Ohio Valley	33,762	6.4	8.2	14.3	18.4
Chiwaukee	31	-9.06	11.9	-12.88	16.91
Kohler Andrae	19	-8.37	9.53	-11.57	13.16
Zion	22	0.14	9.71	0.2	14.31

To demonstrate the improvement in model performance, Table 8.9 compares certain statistical analyses of the model performance from each of the emissions platforms modeled. 2016v2 was the emissions platform modeled for the proposed Transport Rule, while 2016v3 was used for the Disapproval of state ozone transport SIPs and the final Transport Rule. Modeling using 2016v3 clearly performs better as the mean bias and error results are much improved.

Table 8.9 SIP Disapproval/Final Transport Rule Performance Statistics - Comparison of 2016v2 and 2016v3 Emission Platforms

		Mean Bias (ppb)		Mean Error (ppb)		Normalized Mean Bias (%)		Normalized Mean Error (%)	
Climate Region/ Monitor	**Number of Site-Days ≥ 60 ppb**	**2016 v2**	**2016 v3**	**2016 v2**	**2016 v3**	**2016 v2**	**2016 v3**	**2016 v2**	**2016 v3**
Midwest	1,134	-12.7	-4.6	13.0	6.8	-19.1	-7.0	19.5	10.2
Ohio Valley	3,211	-7.1	1.5	8.7	6.4	-10.9	2.3	13.3	9.8
Chiwaukee	31	-17.1	-9.1	17.79	11.9	-24.36	-12.9	25.29	16.9
Kohler Andrae	19	-17.8	-8.41	17.78	9.5	-24.56	-11.6	24.56	13.2
Zion	26	-9.84	0.1	10.31	9.7	-14.50	0.2	15.2	14.3

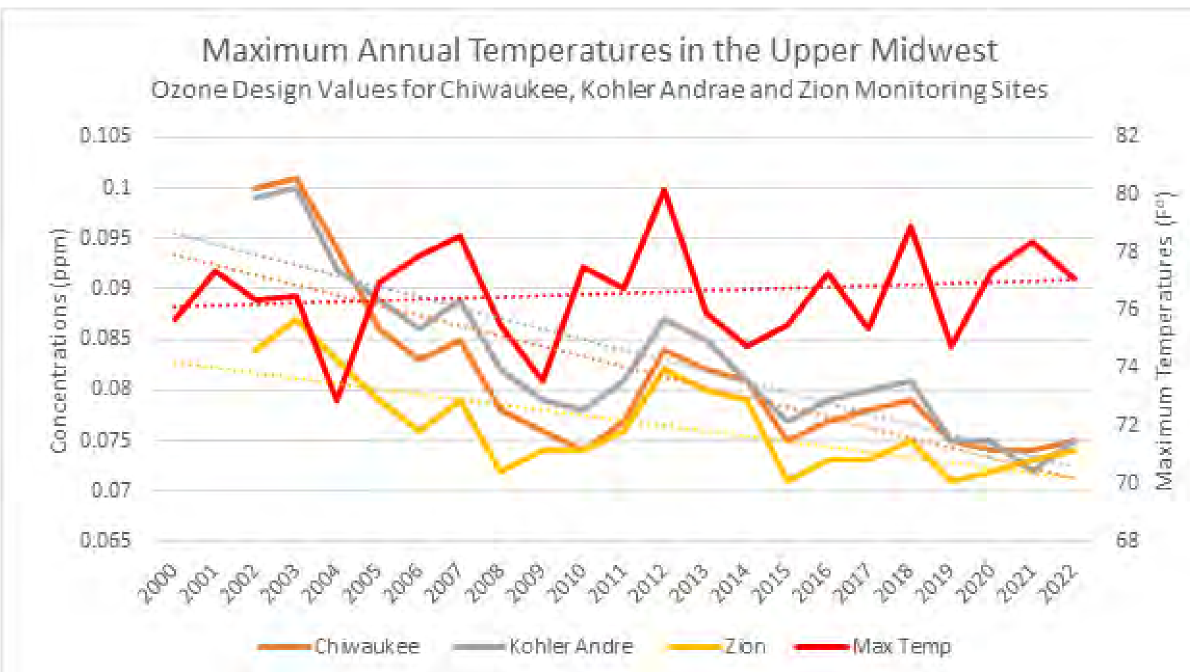
There was vast improvement in model performance at several key performance statistics at the lakeshore monitors with the use of the 2016v3 emission platform. As model performance improved from 2016v2 to 2016v3 emission platforms, the modeled design values decreased to be more in line with observations.

While the overall modeling performance for the Ohio Valley/Midwest region does provide some confidence in U.S. EPA's emissions and modeling platforms and the resulting projected modeled concentrations, replicating meteorological conditions along the lakeshore of Lake Michigan is far more difficult in the photochemical model. Complexities of lake breezes, temperature fluctuations, and other meteorological parameters due to influences from the large body of water cannot be ignored and brings into question the accuracy of the modeled projected ozone concentrations.

8.3 Meteorology

Weather has been and continues to be the biggest driver of ozone concentrations. Despite a trend in of increased summertime temperatures, ozone has trended downward with spikes in ozone occurring with summer temperatures hotter than normal. To highlight this trend, Chart 8.1 shows the maximum annual temperatures from 2000 to 2022 and design values of select ozone monitors near the Chicago area. These monitors, located in southeast Wisconsin and northeast Illinois show downward trends in ozone levels despite the increased trend in average maximum temperature from Chicago's O'Hare International Airport. Monitors included in this analysis are the Chiwaukee (Kenosha County, WI), Kohler Andrae (Sheboygan County, WI), and Zion (Lake County, IL) monitors. Linear regression of ozone design values over time show distinct overall ozone design values decreases with spikes in certain years. These fluctuations in yearly data should not distract from the continued trend of lower ozone concentrations.

Chart 8.1 Maximum Annual Temperature Trends and Ozone Design Values Comparisons



8.4 Classification and Regression Tree Analysis

Ozone concentrations are greatly influenced by meteorological factors. Qualitatively, ozone episodes in the region are associated with hot weather, clear skies (sometimes hazy), low wind speeds, high solar radiation, and winds with a southerly component. These conditions are often a result of a slow-moving high-pressure system to the east of the region.

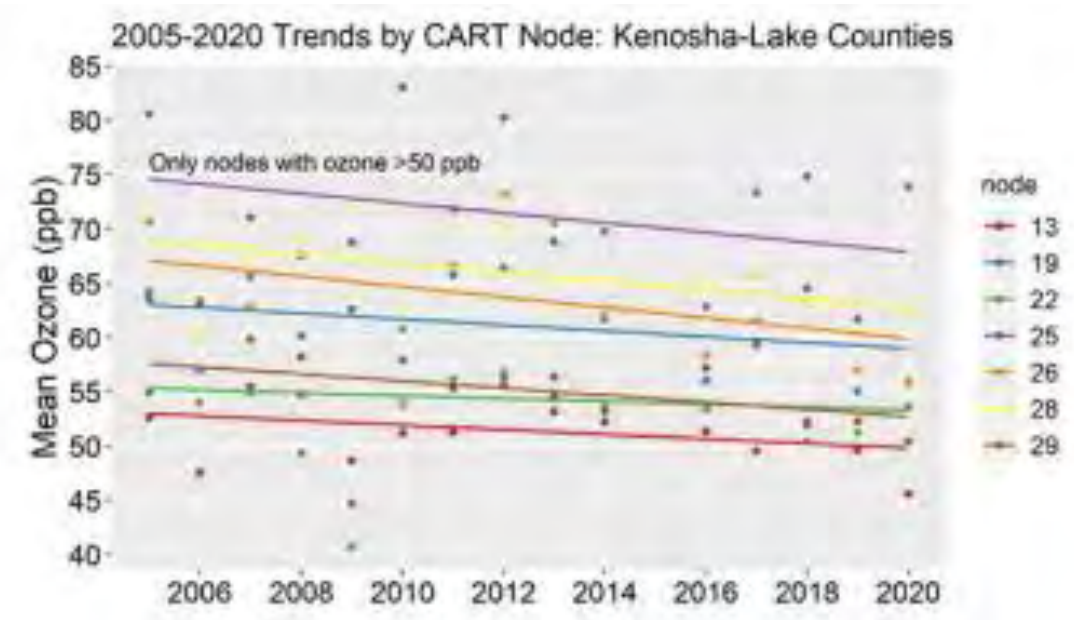
LADCO used the CAMx Anthropogenic Precursor Culpability Assessment (APCA) tool to calculate emission tracers for identifying upwind sources of ozone precursors at downwind monitoring sites. IDEM used APCA to quantify the impacts of inventory sectors or geographic source regions on ozone concentrations at receptors. LADCO simulated 2016 meteorology and emissions on the 12-km modeling domain for the APCA simulations used for this application.

Lake Michigan and Lake Erie influence the formation and transport of ozone in the region, particularly at sites within a few kilometers of the shoreline. Depending on large-scale synoptic winds and local-scale lake breezes, different parts of the area experience high ozone concentrations. For example, during southerly flow, high ozone can be transported from Chicago to the Wisconsin lakeshore, whereas during southwesterly flow, high ozone from Chicago can be transported to western Michigan.

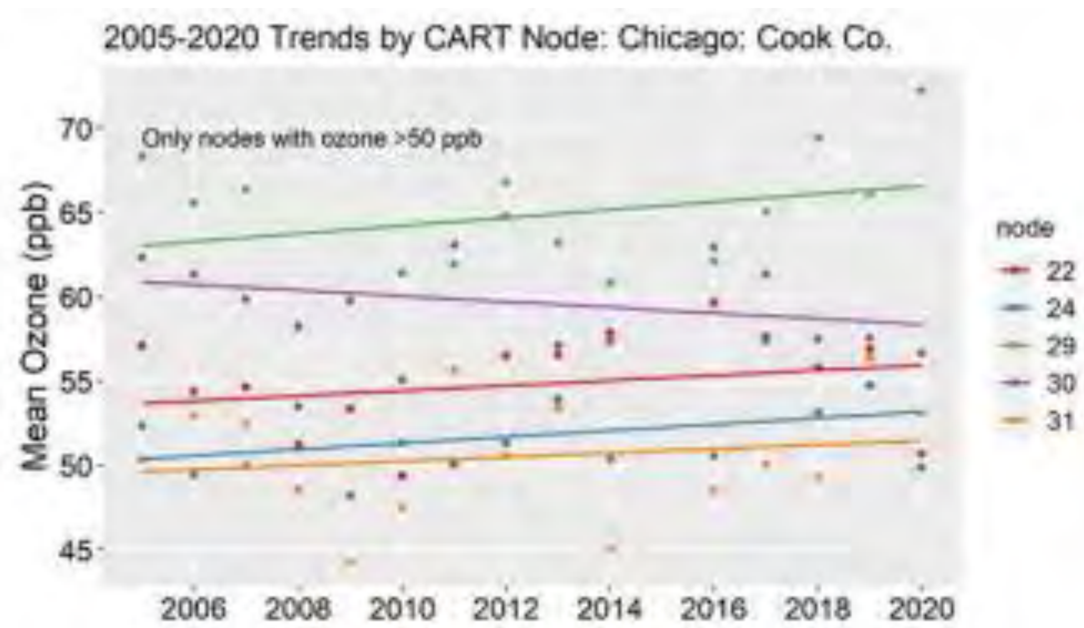
One approach to adjust the trends in ozone concentrations for meteorological influences uses Classification and Regression Trees (CART). CART is a statistical tool to classify data (Breiman et al., 1984). LADCO applied CART to maximum daily average ozone and meteorological data to determine the meteorological conditions most commonly associated with high ozone days in nonattainment and maintenance areas in the LADCO region. Once days are classified by their unique, shared meteorological characteristics, ozone concentration trends among days with similar meteorological conditions can be examined. The CART analysis removes the influence of year-to-year meteorological variability on ozone concentrations, and any remaining trend is assumed to be the result of non-meteorological factors, such as reductions in emissions of ozone precursors.

CART analyses were performed for three portions of the Chicago nonattainment area: the far north (Kenosha and Lake counties, WI-IL), central (Cook County, IL), and the far east (Lake and Porter counties, IN). The high-ozone nodes from all three CART analyses generally have hot temperatures and low relative humidity (Supplement Table S11). Some of the nodes in all three of the analyses are also influenced by southerly transport, although southerly transport is most important for the northern Kenosha and Lake County monitors. Several nodes in the Indiana monitor analysis are also influenced by wind speeds. For the far north and eastern parts of the Chicago nonattainment area, mean ozone concentrations in all the high-ozone nodes have decreased from 2005 to 2020 (Graph 8.1 and 8.3). In contrast, mean ozone concentrations in most of the high-concentration nodes in central Chicago have increased from 2005 to 2020 (Graph 8.2).

Graph 8.1 Kenosha and Lake Counties, WI-IL CART Analysis



Graph 8.2 Cook County, IL CART Analysis



Graph 8.3 Lake and Porter Counties, IN CART Analysis

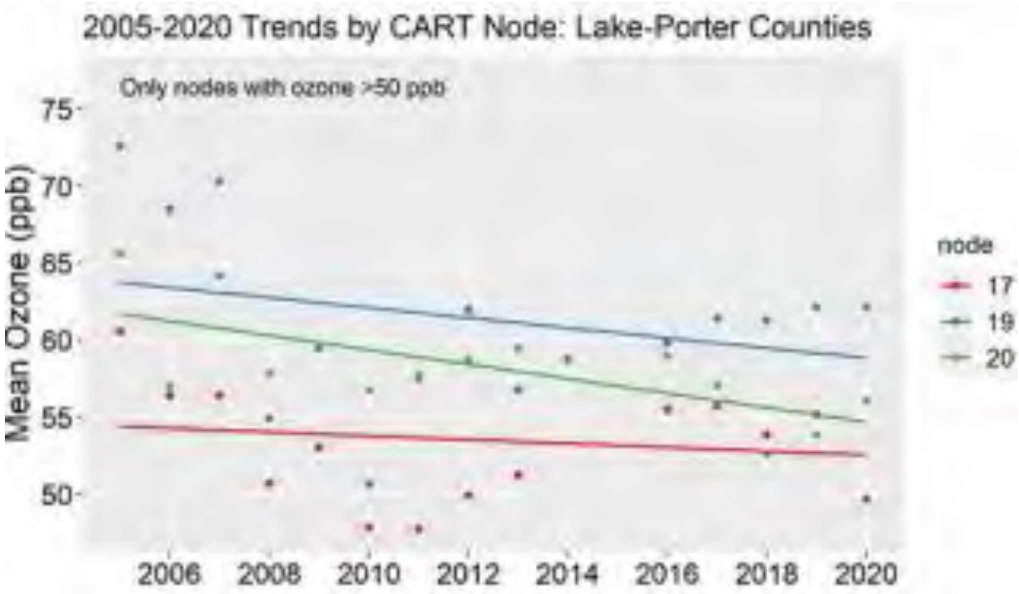


Table 8.10 shows the meteorological parameters that were most influential to ozone development and transport at the different monitoring sites. Winds, maximum afternoon temperatures, relative humidity, and transport of ozone and ozone precursors each play roles to varying degrees for elevated ozone concentrations.

Table 8.10 Influential CART Nodes for the Chicago, IL-IN-WI Nonattainment Area

Chicago: Kenosha and Lake Counties, WI-IL						
Node 25	**Node 28**	**Node 26**	**Node 19**	**Node 29**	**Node 22**	**Node 13**
74 ppb O_3	65 ppb O_3	66 ppb O_3	62 ppb O_3	55 ppb O_3	54 ppb O_3	51 ppb O_3
PM Temp >86 °F	PM Temp >86 °F	PM Temp >86 °F	PM Temp >82 & <86 °F	PM Temp >86 °F	PM Temp >82 & <86 °F	PM Temp <82 °F
RH <58%	RH >58%	RH <58%	Minimum apparent Temp <65 °F	RH >58%	Minimum apparent Temp >65 °F	Southerly winds
Little westerly transport	2-day winds <3.4 m/s	More westerly transport[1]		2-day winds >3.4 m/s	PM southerly winds	RH <75% PM T >76 °F

Chicago: Cook County, IN				
Node 29	**Node 30**	**Node 22**	**Node 24**	**Node 31**
66 ppb O_3	60 ppb O_3	55 ppb O_3	52 ppb O_3	51 ppb O_3
PM Temp >85 °F	PM Temp >85 °F	PM Temp >77 & <85 °F	PM Temp >77 & <85 °F	PM Temp >85 °F
Midday RH <53%	Midday RH <53%	Average RH <55%	Average RH >59% & <75%	Midday RH >53%
Average RH <54%	Average RH >54%	AM southerly winds (>-1.8 m/s)	AM southerly winds (>-1.8 m/s)	
			Easterly winds (wind direction <167°)	

Chicago: Lake and Porter Counties, IN		
Node 19	**Node 20**	**Node 17**
63 ppb O_3	59 ppb O_3	54 ppb O_3
PM Temp >85 °F	PM Temp >85 °F	PM Temp >77 & <85 °F
Average RH <61%	Average RH <61%	Average RH <61%
3-day wind speed <3.3 m/s	3-day wind speed >3.3 m/s	24-hour southerly transport (>-200 km)

Overall, the LADCO CART analysis shows that ozone design values have decreased considerably since 2005, reaching levels where all nonattainment and maintenance areas attained the 2008 ozone NAAQS, and many areas attained the 2015 ozone NAAQS in 2021. Ozone concentrations in the different areas are impacted by different meteorological factors, with all areas impacted by high temperatures and many areas impacted by southerly transport and low relative humidity. When adjusted for meteorology using CART, ozone concentrations on high-ozone days in select NAAs (those that did not attain the 2015 ozone NAAQS in 2021) decreased for almost all types of days in almost all NAAs. The notable exception is central Chicago, where meteorologically adjusted ozone concentrations appear to have increased since 2005. The CART trends indicate that ongoing reductions of ozone precursor emissions are continuing to reduce ozone concentrations in most areas of the LADCO region.

9.0 ENVIRONMENTAL JUSTICE

IDEM used U.S. EPA's environmental screening and mapping tool (EJScreen) to identify areas in Indiana's portion of the Chicago 2015 8-hour ozone moderate nonattainment area with potentially overburden communities and assess whether this attainment plan would add to existing pollution exposure or burdens for those communities.

IDEM screened Indiana's portion of the nonattainment area at two different scales. IDEM first screened and reviewed data for the combined portions of Lake and Porter counties in the nonattainment area. Then, localized data for a 5-kilometer radius around the Gary – IITRI monitor (18-089-0022) in Lake County and Ogden Dunes monitor (18-127-0024) in Porter County were then screened individually and reviewed in order to identify any potentially overburdened communities in areas known to have the highest monitored ozone concentrations.

U.S. EPA's September 2019 EJScreen Technical Documentation[30] indicates that an area with one or more environmental justice (EJ) indexes at or above the 80th percentile nationally should be considered as a potential candidate for consideration, analysis, or outreach. IDEM utilized EJScreen to generate reports for the combined area of Lake (partial) and Porter (partial) counties and the areas of interest around the Gary- IITRI and Ogden Dunes monitors. These reports identify three types of variables for the screened areas: EJ Indexes, Environmental Indicators, and Demographic Indicators. EJ indexes are a summarized combination of demographic and environmental factors allowing them to be compared across regions. Environmental indicators are a quantification of the proximity, concentration, and/or exposure potential to certain types of environmental pollutants. Demographic indicators are demographic statistics gathered from a screened area and used to calculate the EJ indexes. Examples of each of these categories are:

- EJ Indexes: ozone, fine particles ($PM_{2.5}$), and diesel particulate matter.

- Environmental Indicators: ozone (parts per billion), $PM_{2.5}$ (micrograms per cubic meter), and traffic proximity (daily traffic count/distance to road).

- Demographic Indicators: low income, unemployment rate, and over age of 64.

The combined area of Lake (partial) and Porter (partial) counties, and the 5-kilometer area around the highest reading monitors were screened separately. Separate reports were generated for each of these areas for all available variables in the EJScreen tool as depicted in Table 9.1. All variables that were above the 80th percentiles and those above the national average (50th percentile) are identified and highlighted.

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[30] https://www.epa.gov/sites/default/files/2017-09/documents/2017_ejscreen_technical_document.pdf

The screening of the combined area of Lake (partial) and Porter (partial) counties showed the area to have no EJ Index above the 80^{th} percentile. The screening also showed the area to be above the national average percentile (50%) for all Environmental and Demographic indicators, as well as two Environmental Indicators above the 80% percentile.

The results of the targeted analysis aided in identifying potential local scale areas of concern. The EJ screening of the 5-kilometer area around the Gary – IITRI monitor showed the area to be above the 80^{th} percentile for the majority of EJ Indexes and above the 50% percentile for the majority of Environmental and Demographic indicators.

The EJ screening of the 5-kilometer area around the Ogden Dunes monitor showed the majority of EJ Indexes, and Environmental and Demographic Indicators above the national average percentile of 50%, and two Environmental Indicators above the 80^{th} percentile.

Because ground-level ozone is a regional pollutant and is the result of secondary urban scale atmospheric formation, efforts to address ozone throughout the region will benefit the general population as well as potentially overburdened communities. IDEM has worked to identify potentially overburdened communities in Indiana's portion of the Chicago, IL-IN-WI nonattainment area and will conduct outreach, as appropriate, in order to assure they are aware of the revised ozone classification as well as efforts to address ozone in the area.

Table 9.1: EJScreen Reporting Results

	Lake/Porter Partial	Lake – IITRI (5 km)	Porter – Ogden Dunes (5 km)
EJ Indexes:			
EJ Index for Particulate Matter 2.5	78	94	74
EJ Index for Ozone	75	93	77
EJ Index for Diesel Particulate Matter	74	92	69
EJ Index for Air Toxics Cancer Risk	61	88	67
EJ Index for Air Toxics Respiratory HI	57	78	52
EJ Index for Traffic Proximity	68	86	57
EJ Index for Lead Paint	76	96	74
EJ Index for Superfund Proximity	79	95	68
EJ Index for RMP Facility Proximity	71	91	62
EJ Index for Hazardous Waste Proximity	71	77	61
EJ Index for Underground Storage Tanks	73	88	68
EJ Index for Wastewater Discharge	65	93	66
Environmental Indicators:			
Particulate Matter 2.5 (µg/m^3)	78	78	70
Ozone (ppb)	65	67	69
Diesel Particulate Matter* (µg/m3)	70-80th	70-80th	60-70th
Air Toxics Cancer Risk (lifetime risk per million)	60-70th	70-80th	80-90th
Air Toxics Respiratory HI*	50-60th	50-60th	<50th
Traffic Proximity (daily traffic count/distance to road)	75	76	64
Lead Paint (% Pre-1960 Housing)	66	82	64
Superfund Proximity (site count/km distance)	92	81	53
RMP Facility Proximity (facility count/km distance)	78	81	55
Hazardous Waste Proximity (facility count/km distance)	74	43	65
Underground Storage Tanks (county/km 2)	79	80	72
Wastewater Discharge (toxicity-weighted concentration/m distance	85	81	81
Demographic Indicators:			
Demographic Index	62	92	61
People of Color	62	87	60
Low Income	57	89	60
Unemployment Rate	70	87	80
Limited English Speaking Households	63	0	0
Less Than High School Education	58	71	52
Under Age 5	58	69	55
Over Age 64	54	63	56

Yellow highlighted cells indicate criteria above national average (>50th percentile)

Red Highlighted cells indicate criteria above EJ Screen Screening Criteria (>80th percentile)

10.0 CONTINGENCY MEASURES

Section 172(c)(9) of the CAA requires that an attainment demonstration contain specific measures that would take effect upon a failure to attain the ozone standard in a given area, without further action by the state or U.S. EPA. On March 17, 2023, U.S. EPA released draft guidance to assist states in implementing Contingency measures (CMs) that will take effect if an area fails to attain a NAAQS by an applicable attainment date or fails to make reasonable further progress toward attainment. In the draft guidance, U.S. EPA is proposing to retain the 60-day time period before CM implementation and extends the amount of time in which emission reductions from CMs must occur from one year to up to two years. This timing scheme remains highly problematic as most states cannot hold CMs in reserve, ready to be "taken off the shelf" and implemented within 60 days. In many cases, once CMs are triggered, sources need considerable lead time to prepare before any emission reductions will begin. This may include time required for permitting, equipment installation, and start up. IDEM cannot meet this guidance considering the expeditious manner in which new regulatory requirements must be implemented as it will take IDEM approximately two years to complete the rulemaking process. In the future, if new regulatory requirements are triggered for this area, IDEM will revise this element of the SIP to incorporate these requirements and certify compliance.

In lieu of these requirements, contingency measures to be considered will be selected from a comprehensive list of measures deemed appropriate and effective at the time the selection is made. Listed below are example measures that may be considered. All of the listed contingency measures are potentially effective or proven methods of obtaining significant reductions of ozone precursor emissions. Because it is not possible at this time to determine what control measure will be appropriate at an unspecified time in the future, the list of contingency measures outlined below is not comprehensive. Indiana anticipates that if contingency measures should ever be necessary, it is unlikely that a significant number (i.e., all those listed below) will be required.

1. Enhancements to the vehicle emissions testing program (increased weight limit, addition of diesel vehicles, etc.)
2. Asphalt paving (lower VOC formulation)
3. Diesel exhaust retrofits
4. Traffic flow improvements
5. Idle reduction programs
6. Portable fuel container regulation (statewide)
7. Park and ride facilities
8. Rideshare/carpool program
9. VOC cap/trade program for major stationary sources

The selection of measures will be based upon cost-effectiveness, emission reduction potential, economic and social considerations, or other factors that IDEM deems appropriate. IDEM will solicit input from all interested and affected persons in the maintenance area prior to selecting appropriate contingency measures. There will not be any contingency measure implemented without providing the opportunity for full public participation during which the relative costs and benefits of individual measures, at the time they are under consideration, can be fully evaluated.

11.0 PUBLIC PARTICIPATION

In accordance with 40 CFR 51.102, public participation in this request was provided as follows:

Notice of availability of this complete document and a request for the opportunity for a public hearing was made available on IDEM's website on May 25, 2023 at: IDEM: Public Notices: Northwest Indiana.

A public hearing was conducted on June 28, 2023, and several comments were received. The public comment period closed on July 5, 2023. Attachment I includes a copy of the public notice, certification of publication, the transcript from the public hearing, public hearing attendance record, copies of all written comments received, and a summary of all comments received that includes IDEM's responses, as applicable.

12.0 CONCLUSION

Indiana has performed an analysis that shows air quality improvements in the Chicago nonattainment area are due to permanent and enforceable emission control measures which have resulted in significant regional VOC and NO_x emission reductions. Additionally, Indiana has ensured that all CAA requirements necessary to support this attainment demonstration have been met.

Monitored air quality in the Chicago ozone nonattainment area has shown improvement in ozone concentration levels as a result of national and local control strategies implemented since designation. This demonstration shows that NO_x and VOC emission reductions since designation have had a positive effect on regional ozone levels. Along with the sustained national, regional, and local control measures, and any future measures that will be phased-in or implemented, air quality in the area will meet photochemical model predictions.

Under the previous 1-hour standard, and under the current 8-hour standard for ozone, emission control measures that are more stringent than in any other portion of Indiana have been implemented in Lake and Porter counties. These controls are comparable to measures implemented elsewhere within the nonattainment area. These controls shall remain in effect to ensure continued compliance with the standard.

This plan satisfies Indiana's obligation under Sections 172 and 182 of the CAA to demonstrate how the area will attain the air quality standard for ozone, and, as a result, realize cleaner air. These include modeling, air quality, emissions, on-road, weight of evidence, and environmental justice screening analyses and a 2023 Fifteen (15%) Rate of Progress Plan and Three Percent (3%) Contingency Plan.

The development of this plan, along with the plans from Illinois and Wisconsin, will bring this region into compliance with state and federal ozone quality standards, and provide real progress in the state's journey toward cleaner air.

APPENDIX A1

Modeling for the 2015 Ozone National Ambient Air Quality Standard, Lake Michigan Air Directors Consortium (LADCO) Technical Support Document

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Attainment Demonstration Modeling for the 2015 Ozone National Ambient Air Quality Standard

Technical Support Document

Lake Michigan Air Directors Consortium
4415 W Harrison Ave, Suite 548
Hillside, IL 60162

Please direct question/comments to adelman@ladco.org

September 21, 2022

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Contents

Document Change Log

Version	Date	Comments/Changes
1	May 24, 2022	First draft to LADCO members
2	July 27, 2022	Assimilated comments from LADCO members and US EPA
3	September 21, 2022	Final TSD: assimilated comments from IL EPA and US EPA

Errata/Known Issues

#	Description

Figures

Tables

Executive Summary

LADCO prepared this Technical Support Document (TSD) to support the development of 2015 ozone (O_3) national ambient air quality standard (NAAQS) nonattainment area (NAA) state implementation plans (SIPs). LADCO used the Comprehensive Air Quality Model with Extensions (CAMx) v7.10 photochemical model to support these analyses. The LADCO CAMx modeling results are used here to identify O_3 monitoring sites that may have nonattainment or maintenance problems for the 2015 O_3 NAAQS by the August 3, 2024 attainment date for moderate NAAs. Because the attainment date occurs during the 2024 O_3 season, the effective attainment deadline is the end of the 2023 O_3 season and thus resulted in the selection of 2023 as the projection year for this modeling application. LADCO used 2016 as the base modeling year from which we projected air quality in 2023.

LADCO based our 2023 O_3 air quality and NAA attainment forecasts on meteorology modeling that was optimized for conditions in the Great Lakes Basin. We used U.S. EPA 2016fh emissions modeling platform data, and other CAMx modeling platform inputs released by the U.S. EPA in September 2019 for this application. LADCO replaced the Electricity Generating Unit (EGU) emissions in the 2016fh platform with 2023 EGU forecasts estimated with the ERTAC EGU Tool version 16.2 beta. ERTAC EGU 16.2 beta integrated state-reported information on EGU operations and forecasts as of September 2021. Overall the CO, NOx, and VOC ozone season emissions are projected to decrease in 2023 relative to 2016 in all LADCO states.

The LADCO 2023 CAMx simulation predicts that the Chiwaukee Prairie, WI and Sheboygan Kohler Andrae, WI monitors are the only two receptors in the region that will have an average future year design value (DV_{2023}) that exceeds the 2015 O_3 NAAQS.

We justify the use of the LADCO 2016 modeling platform by comparing O_3 modeling performance benchmarks against recent U.S. EPA 2016 modeling and demonstrating that the LADCO model is a superior model of ground level O_3 in the Great Lakes Basin.

1. Introduction

The Lake Michigan Air Directors Consortium (LADCO) was established by the states of Illinois, Indiana, Michigan, and Wisconsin in 1989. The four states and EPA signed a Memorandum of Agreement (MOA) that initiated the Lake Michigan Ozone Study and identified LADCO as the organization to oversee the study. Additional MOAs were signed by the states in 1991 (to establish the Lake Michigan Ozone Control Program), January 2000 (to broaden LADCO's responsibilities), and June 2004 (to update LADCO's mission and reaffirm the commitment to regional planning). In March 2004, Ohio joined LADCO. Minnesota joined the Consortium in 2012. LADCO consists of a Board of Directors (i.e., the State Air Directors), a technical staff, and various workgroups. The main purposes of LADCO are to provide technical assessments for and assistance to its member states, to provide a forum for its member states to discuss regional air quality issues, and to facilitate training for staff in the member states.

On October 26, 2015 the U.S. EPA revised the primary and secondary National Ambient Air Quality Standard (NAAQS) for ozone (O_3), strengthening the standard to a level of 0.070 parts per million (ppm) for a maximum daily 8-hour average (80 FR 65291)[1]. The form of the 8-hour O_3 NAAQS remained the same as the previous standard, the annual fourth-highest daily maximum averaged over three consecutive years. When U.S. EPA adopts a new or revises an existing NAAQS, it is required by Section 107(d)(1) of the Clean Air Act (CAA) to designate areas as nonattainment, attainment, or unclassifiable. Accordingly, on November 6, 2017 U.S. EPA considered recommendations from states and tribes and designated as attainment/ unclassifiable 2,646 counties and tribal lands across the U.S. (82 FR 54232). The U.S. EPA followed up this action on June 4, 2018 and initially designated several areas in the Great Lakes region, among other areas in the country, as "marginal" O_3 nonattainment areas (NAA) based on 2014-2016 ambient air quality data (85 FR 25776). Table 1-1 shows the areas in the LADCO region initially designated by U.S. EPA as nonattainment of the 2015 O_3 NAAQS.

[1] The final rule was effective December 8, 2015.

Table 1-1. June 4, 2018 designations of 2015 Ozone NAAQS NAAs in the LADCO region

Area	State	Designation
Allegan County	MI	Marginal
Berrien County	MI	Marginal
Chicago	IL, IN, WI	Marginal
Cincinnati	OH, KY	Marginal
Cleveland	OH	Marginal
Columbus	OH	Marginal
Detroit	MI	Marginal
Door County	WI	Marginal
Louisville	KY, IN	Marginal
Manitowoc County	WI	Marginal
Milwaukee	WI	Marginal
Muskegon County	MI	Marginal
St. Louis	MO, IL	Marginal
Sheboygan County	WI	Marginal

Several follow-up U.S. EPA actions redesignated some of the areas in the LADCO region from nonattainment to maintenance areas or changed the boundaries of the nonattainment areas. Table 1-2 summarizes the subsequent 2015 O_3 NAAQS final actions taken by U.S. EPA on NAAs in the LADCO region.

Table 1-2. U.S. EPA final actions on 2015 Ozone NAAQS NAAs in the LADCO region as of July 27, 2022

Area	State	Action	Date
Columbus	OH	Redesignation to maintenance	8/21/2019
Door County-Revised	WI	Redesignation to maintenance	6/10/2020
Sheboygan County	WI	Boundary change	6/14/2021
Manitowoc County	WI	Boundary change	6/14/2021
Milwaukee	WI	Boundary change	6/14/2021
Door County-Revised	WI	Designation to marginal NAA	6/14/2021
Chicago	IL, IN, WI	Boundary change	6/14/2021
St. Louis	MO, IL	Boundary change	6/14/2021
Manitowoc County	WI	Redesignation to maintenance	3/1/2022
Door County-Revised	WI	Redesignation to maintenance	4/29/2022
Cincinnati	OH	Redesignation to maintenance	6/9/2022
Louisville	IN	Redesignation to maintenence	7/5/2022

On April 13, 2022, U.S. EPA determined that several NAAs in the LADCO region failed to attain the 2015 O_3 NAAQS by the August 3, 2021 attainment date and proposed to reclassify the areas as "moderate" O_3 NAAs. The attainment deadline for moderate NAAs to meet the 2015 O_3 NAAQS is August 3, 2024.

The 2015 O_3 NAAQS nonattainment areas in the LADCO region as of July 27, 2022 are shown in Figure 1-1. The states with NAAs shown in this figure must submit State Implementation Plans (SIPs) to U.S. EPA that meet the requirements applicable to "moderate" O_3 NAAs. The NAA SIPs, or attainment demonstrations, must include a demonstration which identifies emissions reduction strategies that are enough to achieve the NAAQS by August 3, 2024, the attainment date for moderate NAAs. Because the attainment deadline occurs during the 2024 O_3 season, the effective attainment deadline is the end of the 2023 O_3 season.

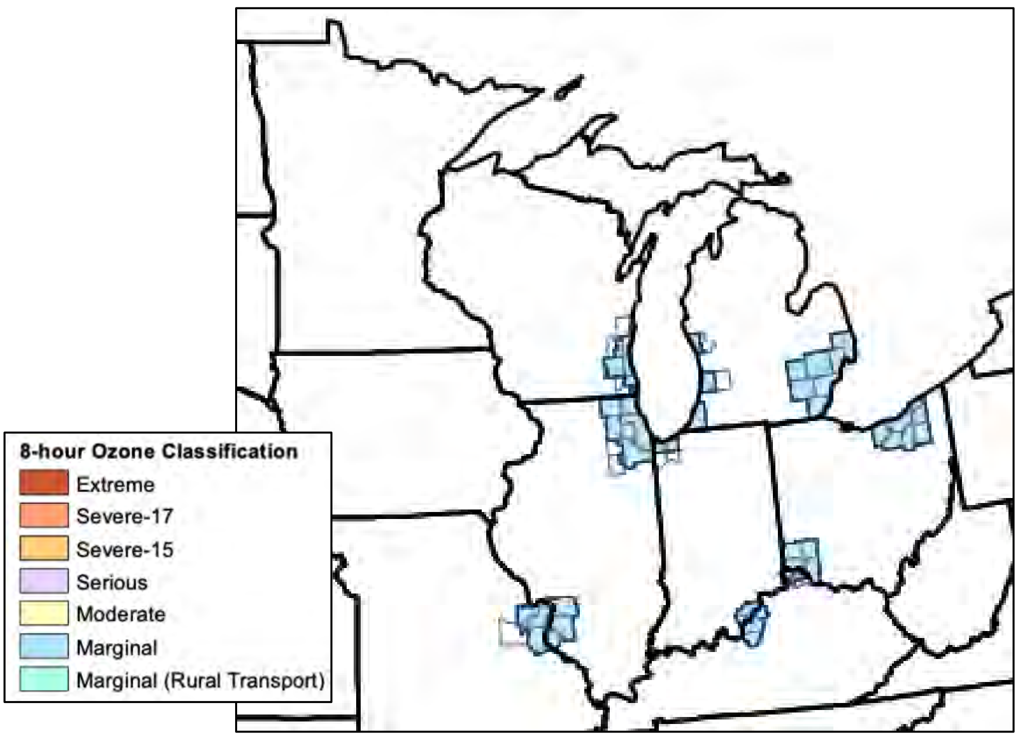

Figure 1-1. Nonattainment areas in the Lake Michigan region for the 2015 O_3 NAAQS (Source: U.S. EPA, June 30, 2022).[2]

[2] For the Cincinnati, OH-KY nonattainment area the Ohio portion was redesignated on June 9, 2022. For the Louisville, KY-IN nonattainment area the Indiana portion was redesignated on July 5, 2022. Neither of the Kentucky portions of these areas have been redesignated. The entire area is not considered in maintenance until all states in a multi-state area are redesignated.

One of LADCO's responsibilities is to provide technical air quality modeling guidance and support to the LADCO member states. LADCO prepared this Technical Support Document (TSD) to support the development of the O_3 NAA SIPs (e.g., attainment plans) for our members pursuant to the 2015 O_3 NAAQS. The analyses prepared by LADCO include preparation of modeling emissions inventories for the base year (2016) and the last completed ozone season (2023) before the attainment year (2024), evaluation and application of meteorological and photochemical grid models, analysis of ambient monitoring data, and a modeled attainment test for surface O_3 monitors in the existing NAAs. In this report LADCO provides technical information on the validity of the model used to forecast future air quality, and our predictions of future O_3 design values for the following 2015 O_3 NAAQS nonattainment areas:

- Chicago, IL/IN/WI
- St. Louis, MO/IL
- Allegan County, MI
- Berrien County, MI
- Muskegon County, MI
- Detroit, MI
- Cleveland, OH
- Milwaukee, WI
- Sheboygan County, WI

1.1. Conceptual Models of Ozone Formation in the LADCO Region

An O_3 conceptual model is a qualitative description of the physical and chemical parameters that drive ground level O_3 formation in a specific area. The purpose of the model is to build understanding of the meteorological and chemical factors contributing to high O_3 concentrations. Ozone conceptual models are a component of attainment plans because a fundamental understanding of the cause of O_3 pollution is needed to enable the development of effective mitigation strategies.

LADCO compiled a library of O_3 conceptual models for the different NAAs in the region on the LADCO website:

Conceptual Models of Ozone Formation in the LADCO Region

The site includes conceptual models for the following areas in the LADCO region,

- Chicago, IL/IN/WI
- Cincinnati, OH/KH
- Cleveland, OH
- Southeast Michigan
- Louisville, KY/IN
- Wisconsin Lakeshore
- St. Louis, MO/IL
- Western Michigan

1.2. LADCO Ozone Synthesis Project

Starting in 2017 with the Lake Michigan Ozone Study, LADCO has been building a library of contemporary, state-of-the-science information on ground level O_3 pollution in the Great Lakes Basin. The purpose of this effort is to synthesize all known, recent information about O_3 in the region into a coherent picture of the drivers of and potential solutions to O_3 air pollution. The goal of the effort is to provide the LADCO member states with comprehensive decision support resources that are based on the best available information on emissions, ambient observations, satellite-based remote sensing, and modeling.

The LADCO O_3 Synthesis Project supplements this TSD with reports on the following areas:

- Ozone chemistry
- Satellite-based remote sensing
- Ozone trends
- Ozone precursor emissions reduction options
- Machine learning applications for understanding ozone

- Insights from recent monitoring and modeling intensives (LMOS and MOOSE)

The LADCO O_3 Synthesis Project reports are available on the O_3 Science page of the LADCO website:

LADCO Ozone Science for the Great Lakes Basin[3]

1.3. Project Overview

LADCO conducted regional air quality modeling to support the statutory obligations of the LADCO member states under Clean Air Section 172**.** These obligations include SIP revisions that are plans describing how states with designated NAAs will bring the areas back into attainment of the NAAQS. LADCO used the Comprehensive Air Quality Model with Extensions (CAMx[4]) to support these analyses. LADCO used CAMx version 7.10 to predict O_3 concentrations in 2023 to determine if current emissions control programs in the region will lead to attainment of the 2015 O_3 NAAQS.

1.4. Organization of the Technical Support Document

This TSD is presented to the LADCO member states for estimating year 2023 O_3 design values (DVF_{2023}). The TSD is organized into the following sections.

- Section 2 describes current surface O_3 conditions in the LADCO region and trends in O_3 concentrations over the past decade
- Section 3 describes the methods and data that LADCO used for air quality modeling, model performance evaluation, and source apportionment modeling.
- Section 4 describes the 2016 and 2023 emissions used for the modeling and attainment testing described in this TSD
- Section 5 summarizes the results of LADCO 2016 air quality model performance evaluation, including a summary and references to details of the WRF meteorology modeling used to support the CAMx simulations

[3] https://www.ladco.org/public-issues/ozone/ozone-science/

[4] www.camx.com

- Section 6 describes LADCO's model attainment testing methods and results
- Section 7 presents source apportionment modeling results that associate O_3 precursors sources to O_3 concentrations at NAA receptors in the region.
- Section 8 provides a justification for using the LADCO 2016 modeling for the 2015 O_3 NAAQS moderate area attainment demonstrations
- The TSD concludes with a summary of significant findings and observations from the LADCO modeling.
- The TSD Supplement is a separate document that includes additional supplementary technical information to support this TSD.

Throughout the TSD, the modeling and analysis results are organized by the 2015 O_3 NAAQS NAAs where appropriate. The TSD presents average ozone season day emissions summaries, CAMx model performance, O_3 attainment test results, and source apportionment results for each 2015 O_3 NAAQS NAA in the LADCO region.

2. 2016 Ambient Air Quality Data Analysis

LADCO retrieves and conducts analyses on surface O_3 data collected at routine and special-purpose ambient monitors throughout the region. The current monitored O_3 design values (DVs), or the three-year average of the 4th highest daily maximum 8-hour average (MDA8) O_3 concentrations, are presented in this section along with a discussion of trends in O_3 DVs and other metrics for tracking the changes in surface O_3 concentrations in the region. Design values are labeled by the last year of the three-year average. For example, the 2021 O_3 DV is the average of the annual 4th highest MDA8 O_3 concentrations for the years 2019-2021.

2.1. Current Conditions

Figure 2-1 shows maps of the 2021 annual fourth high MDA8 values and the 2021 DVs for the LADCO region. Figure 2-2 shows the same DV data for each O_3 NAA and maintenance area. DVs exceeding the level of the 2015 O_3 NAAQS (70 ppb) are shown in orange. These figures also show the locations of the 2015 O_3 NAAQS NAAs and maintenance areas.

Table 2-1 and Table 2-2 show the historical trends in O_3 DVs in O_3 nonattainment and maintenance areas in the region. Table 2-1 shows the annual DVs for each area from 2015 to 2021; these values show the DV from the “controlling” monitor, or the monitor with the highest 3-year DV in the entire area. Table 2-2 shows the annual DVs for all monitors in the NAAs and maintenance areas from 2015 to 2021.

The DV tables and figures show that about half of the areas in the LADCO region were attaining the 2015 O_3 NAAQS in 2021. These attaining areas include the Door County-Revised, WI, Manitowoc County, WI, Detroit, MI, St. Louis, MO-IL, Louisville, KY-IN, and Cincinnati, OH-KY areas. Six areas around Lake Michigan (Sheboygan, WI, Milwaukee, WI, Chicago, IL-IN-WI, and the Berrien, Allegan, and Muskegon county areas in MI) and Cleveland, OH violated the 2015 O_3 NAAQS in 2021; no areas violated the 2008 ozone NAAQS in 2021.

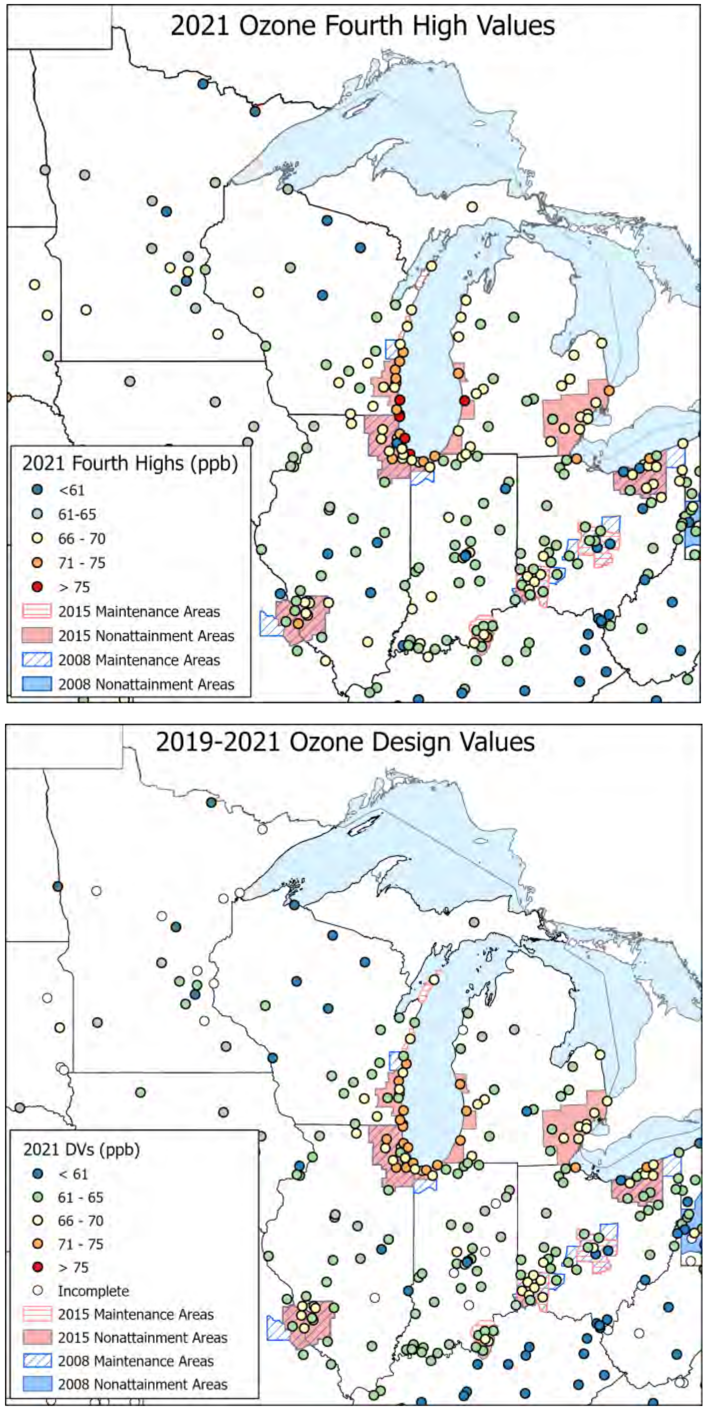

Figure 2-1. 2021 fourth high ozone MDA8 values (top) and draft 2019-2021 ozone design values (bottom) for the LADCO region. Nonattainment and maintenance areas for the 2008 and 2015 ozone NAAQS are shown for comparison. Where the current nonattainment areas overlap, the area appears purple.

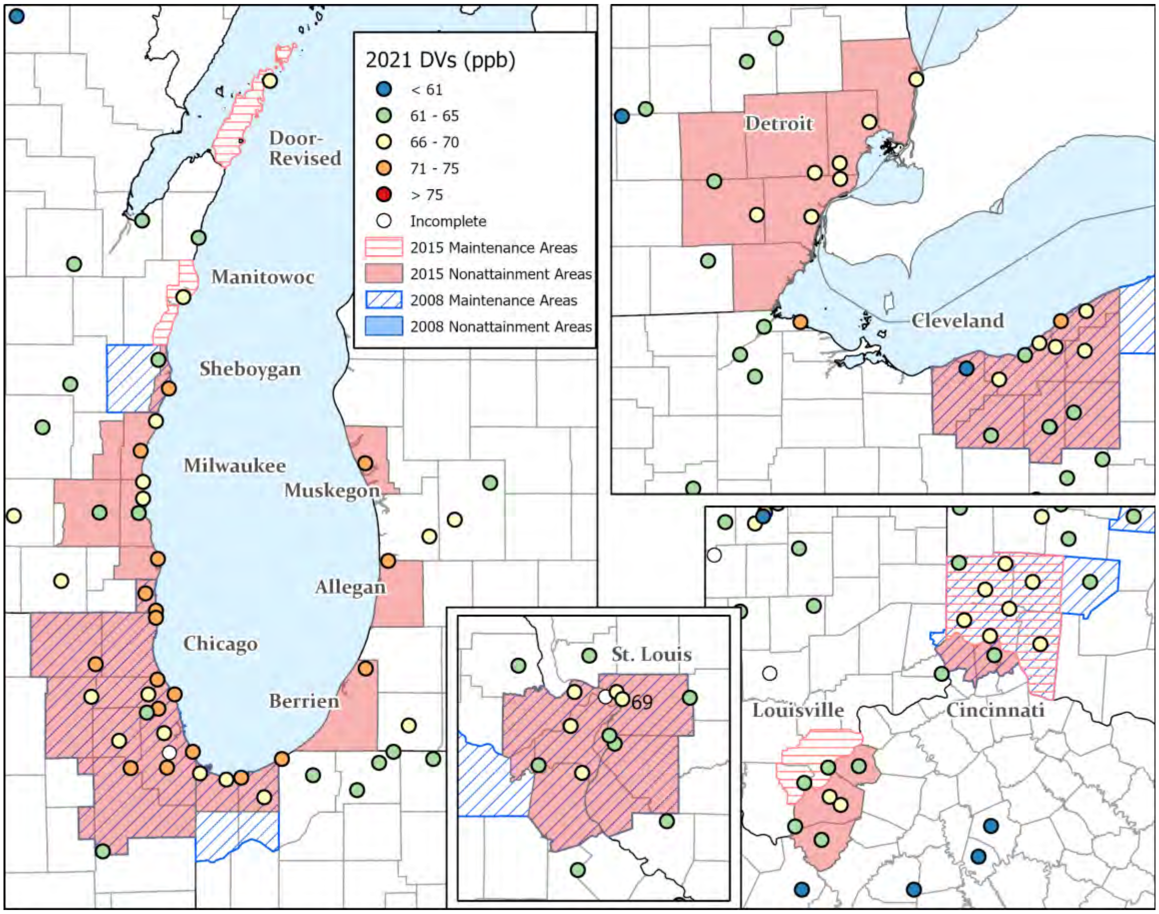

Figure 2-2. 2019-2021 ozone design values for the nonattainment and maintenance areas in the LADCO region. Nonattainment and maintenance areas for the 2008 and 2015 ozone NAAQS are shown for comparison. Where the current nonattainment areas overlap, the area appears purple.

Table 2-1. LADCO nonattainment and maintenance area design values (ppb). Values exceeding the 2015 NAAQS are highlighted in light orange. Values exceeding the 2008 NAAQS are highlighted in medium orange. Design values were downloaded from AQS.

Designated Area	2015	2016	2017	2018	2019	2020	2021
Allegan County, MI	75	75	73	73	72	73	75
Berrien County, MI	73	74	73	73	69	72	71
Muskegon County, MI	74	75	74	76	74	76	74
Door County, WI	69	72	73	73	70	72	70
Manitowoc County, WI	72	72	74	73	71	70	68
Milwaukee, WI	70	73	74	78	74	73	73
Sheboygan County, WI	77	79	80	81	75	75	72
Chicago, IL-IN-WI	75	77	78	79	75	77	75
Cincinnati, OH-KY	71	72	73	75	74	74	70
Cleveland, OH	73	74	73	74	73	74	72
Detroit, MI	71	71	71	69	68	67	66
Louisville, KY-IN	72	73	73	74	72	72	70
St. Louis, MO-IL	69	74	74	75	72	72	69

Table 2-2. LADCO nonattainment and maintenance area monitor design values (ppb). Values exceeding the 2015 NAAQS are highlighted in light orange. Values exceeding the 2008 NAAQS are highlighted in medium orange. Design values were downloaded from AQS

Site	Site Name	2015	2016	2017	2018	2019	2020	2021
Allegan County, MI								
260050003	Holland	75	75	73	73	72	73	75
Berrien County, MI								
260210014	Coloma	73	74	73	73	69	72	71
Muskegon County, MI								
261210039	Muskegon	74	75	74	76	74	76	74
Door County, WI								
550290004	Newport	69	72	73	73	70	72	70
Manitowoc County, WI								
550710007	Manitowoc	72	72	74	73	71	70	68
Milwaukee, WI								
550790010	Milw-16th St	62	64	65	67	64		
550790026/68	SER DNR/UWM Upark	66	68	67	69	65	68	68
550790085	Bayside	68	71	71	73	69	70	70
550890008	Grafton	70	71	71	72	71	71	71
550890009	Harrington Beach	69	73	73	74	70	70	70
551010020	Racine-P&D			74	78	74	73	73
551330027	Waukesha	63	66	65	66	63	64	65

Site	Site Name	2015	2016	2017	2018	2019	2020	2021
Sheboygan County, WI								
551170006	Sheboygan KA	77	79	80	81	75	75	72
Chicago, IL-IN-WI								
170310001	Alsip	65	69	73	77	75	75	71
170310032	Chicago SWFP	68	70	72	75	73	74	75
170310076	Chicago Com Ed	64	69	72	75	72	69	67
170311003	Chicago Taft HS	66	69	67	69	67	73	71
170311601	Lemont	66	69	69	70	68	71	72
170313103	Schiller Park	61	62	62	64	63	65	64
170314002	Cicero	62	66	68	72	68	71	70
170314007	Des Plaines	68	71	71	74	70	71	69
170314201	Northbrook	68	71	72	77	74	77	74
170317002	Evanston	70	72	73	77	75	75	73
170436001	Lisle	64	68	70	71	70	71	70
170890005	Elgin	65	68	69	71	70	72	70
170971007	Zion	71	73	73	75	71	72	73
171110001	Cary	65	68	69	72	71	73	71
171971011	Braidwood	63	64	65	67	66	66	64
180890022	Gary-IITRI	65	67	68	70	68	70	69
180892008	Hammond	63	65		66	65	66	68
181270024	Ogden Dunes	68	69	69	71	70	71	72
181270026	Valparaiso	63	66	69	73	73	69	68
550590019	Chiwaukee	75	77	78	79	75	74	74
550590025	Kenosha WT	69	71	73	77	74	74	72
Cincinnati, OH-KY								
210150003	East Bend	61	63	62	64	63	64	61
210373002	N Kentucky Univ	71	70	69	67	65	63	63
390170018	Middletown	69	70	71	73	71	71	67
390170023	Crawford Woods	69	72	72	73	70	69	66
390179991	Oxford	68	69	69	70	68	66	64
390250022	Batavia	68	70	70	70	69	68	66
390610006	Sycamore	70	72	73	75	74	74	70
390610010	Colerain	69	72	70	72	70	70	67
390610040	Taft	69	71	71	72	71	70	69
391650007	Lebanon	69	72	71	72	71	72	70
Cleveland, OH								
390350034	District 6	69	69	68	70	69	71	70
390350060	GT Craig	62	64	62	62	63	65	63
390350064	Berea BOE	63	64	66	66	64	65	66
390355002	Mayfield	66	67	70	71	71	71	68
390550004	Notre Dame	67	70	72	72	70	68	66

Site	Site Name	2015	2016	2017	2018	2019	2020	2021
390850003	Eastlake	73	74	73	74	73	74	72
390850007	Painesville	66	67	70	70	70	68	66
390930018	Elyria-Sheffield	63	65	65	67	64	62	58
391030004	Chippewa Lake	64	64	64	65	61		61
391331001	Lake Rockwell	61	61	62	63	63	62	62
391530020	Patterson Park	61	61	64	65	67	65	64
Columbus, OH								
390410002	Delaware	68	67	65	64	63	64	62
390490029	New Albany	71	71	71	69	68	67	66
390490037	Franklin Park	67	66	65				
390490081	Columbus-Maple	65	67	66	66	62	62	62
390890005	Heath	66	67	66	64	61	60	59
390890008	Reynoldsburg						61	58
Detroit, MI								
260990009	New Haven	71	72	71	72	68	71	68
260991003	Warren	66	67	66	69	66	68	66
261250001	Oak Park	66	69	70	73	70	72	69
261470005	Port Huron	72	73	71	72	71	71	70
261610008	Ypsilanti	66	67	67	69	66	67	66
261619991	Dexter		68	69	71	66	65	62
261630001	Allen Park	63	65	66	68	66	67	67
261630019	Detroit-E 7 Mile	70	72	73	74	72	71	70
Louisville, KY-IN								
180190008	Charlestown SP	69	70	71	70	67	65	63
180431004	New Albany	67	69	71	73	70	67	64
210290006	Shepherdsville	65	66	65	66	64	65	64
211110051	Watson Ln		69	68	68	66	65	65
211110067	Cannons Lane		74	74	75	72	72	69
211110080	Carrithers MS						67	68
211850004	Buckner	68	70	68	67	66	65	63
St. Louis, MO-IL								
171190120	Alton-HM Sch	71	71	69	70	68	69	68
171191009	Maryville	69	67	68	72	71	68	67
171193007	Wood River	69	71	70	71	69	70	69
171199991	Alhambra	68	67	67	68	66	66	64
171630010	East St. Louis	66	68	68	71	68	67	65
291831002	West Alton	71	72	72	74	71	71	
291831004	Orchard Farm	69	71	70	72	69	68	66
291890005	Pacific	65	65	64	66	65	66	64
291890014	Maryland Heights	70	71	69	70	68	71	69
295100085	Blair Street	65	65	66	71	69	68	65

2.2. Ozone Trends

Figure 2-3 and Figure 2-4 illustrate the 17-year trends in O_3 DVs at surface monitors in the different O_3 NAAs. Ozone DVs in all nonattainment and maintenance areas decreased over this period from high values in the mid-2000s to values in 2021 that were either record lows or near-record lows in many areas. The O_3 DV reductions are particularly notable for the Manitowoc, Sheboygan, and Door County areas along Wisconsin's lakeshore, as well as for Detroit, MI, and the southern areas of Cincinnati, OH, Louisville, KY-IN, and St. Louis, MO-IL. In contrast, while O_3 DVs in the Chicago, IL-IN-WI appear to have been relatively stable since 2010, the area has attained the 2008 ozone NAAQS in two out of the last three design value years.

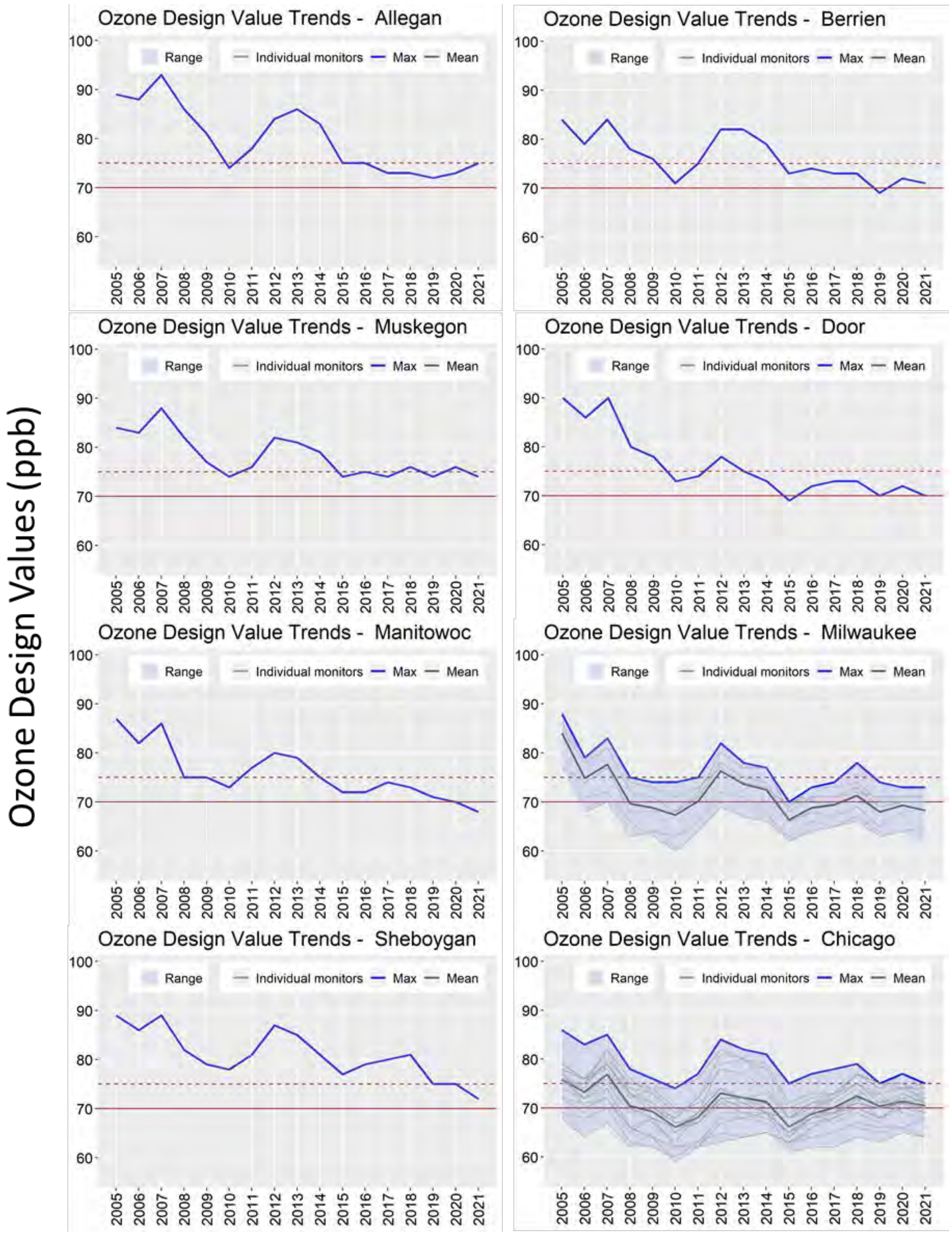

Figure 2-3. 3-year O_3 design value trends from 2005 to 2019 in the LADCO ozone nonattainment and maintenance areas. Area mean and maximum values are shown, along with values for individual monitors. The solid red line shows the level of the 2015 ozone NAAQS, and the dashed line shows the level of the 2015 ozone NAAQS.

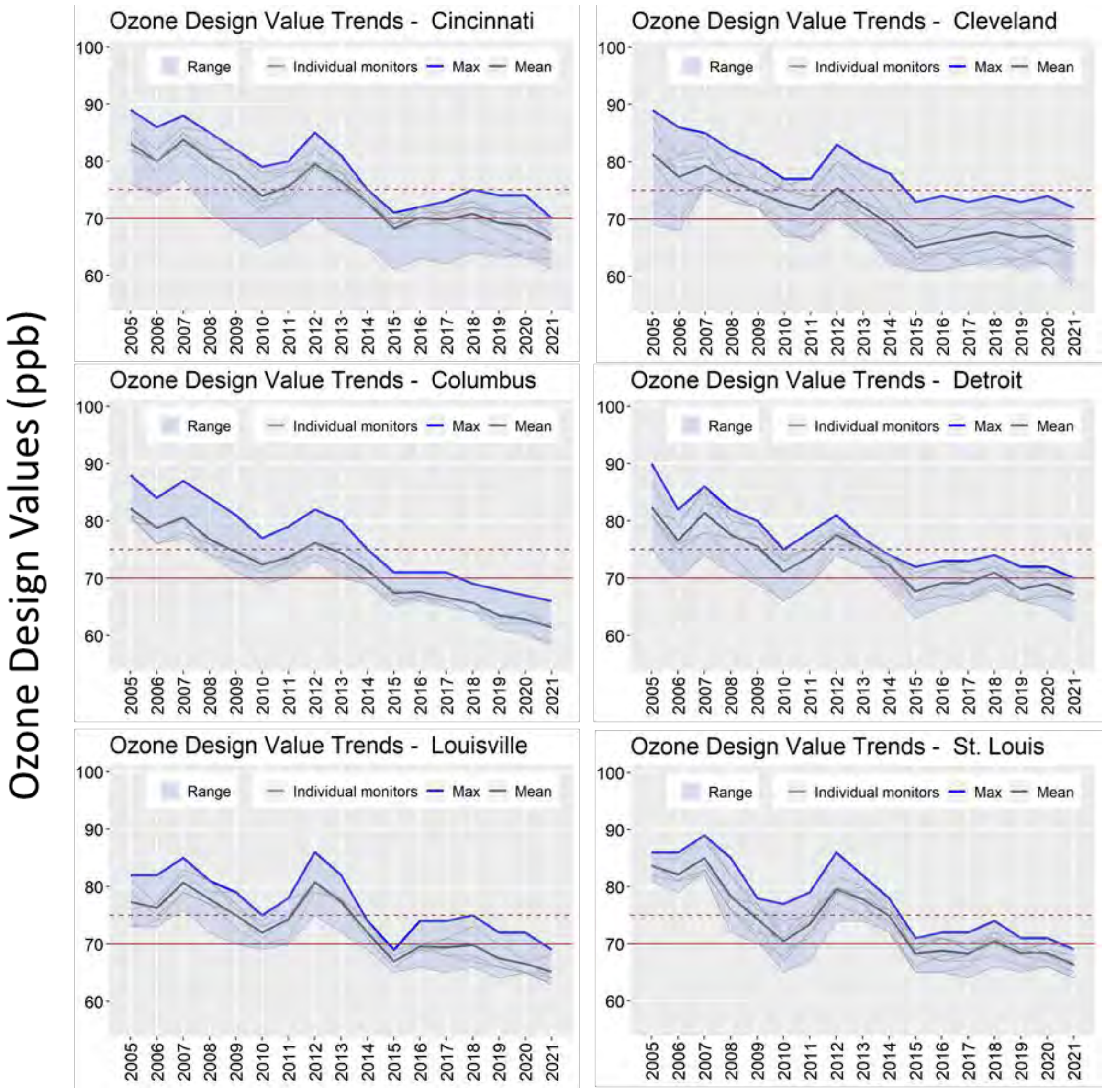

Figure 2-4. 3-year O_3 design value trends from 2005 to 2019 in the LADCO ozone nonattainment and maintenance areas. Area mean and maximum values are shown, along with values for individual monitors. The solid red line shows the level of the 2015 ozone NAAQS, and the dashed line shows the level of the 2008 ozone NAAQS.

2.3. Meteorology and Transport

Ozone concentrations are greatly influenced by meteorological factors. Qualitatively, O_3 episodes in the region are associated with hot weather, clear skies (sometimes hazy), low wind speeds, high solar radiation, and winds with a southerly component. These conditions are often a result of a slow-moving high-pressure system to the east of the region. The relative importance of various meteorological factors in select NAAs is discussed later in this section.

Transport of O_3 and its precursors is a significant factor in the LADCO region and occurs on several spatial scales. Regionally, over a multi-day period, somewhat stagnant summertime conditions can lead to the build-up of O_3 and O_3 precursor concentrations over a large spatial area. This polluted air mass can be transported long distances, resulting in elevated O_3 levels in locations far downwind. Locally, emissions from urban areas add to the regional background leading to O_3 concentration hot spots downwind. Depending on the synoptic wind patterns and presence of local land-lake breezes in some areas, different downwind areas are affected.
The following key findings related to transport can be made:

- Ozone transport is an issue affecting many portions of the eastern U.S. NAAs in the LADCO region receive high concentrations of incoming (transported) O_3 and O_3 precursors from upwind source areas on many hot summer days. Sources in the LADCO region also contribute to the high concentrations of O_3 and O_3 precursors affecting downwind receptor areas.
- Lake Michigan and Lake Erie influence the formation and transport of O_3 in the region, particularly at sites within a few kilometers of the shoreline. Depending on large-scale synoptic winds and local-scale lake breezes, different parts of the area experience high O_3 concentrations. For example, during southerly flow, high O_3 can be transported from Chicago to the Wisconsin lakeshore, whereas during southwesterly flow, high O_3 from Chicago can be transported to western Michigan.

2.4. Adjustment of Ozone Trends for Meteorology

Given the importance of the impacts of meteorology on ambient O_3 concentrations, year-to-year variations in meteorology can make it difficult to assess short term (e.g. less than 10 years) trends in O_3 concentrations. One approach to adjust the trends in O_3 concentrations for meteorological influences uses Classification and Regression Trees (CART). CART is a statistical tool to classify data (Breiman et al., 1984). We applied CART to MDA O_3 and meteorological data to determine the meteorological conditions most commonly associated with high O_3 days in nonattainment and maintenance areas in the LADCO region. Once days are classified by their unique, shared meteorological characteristics, O_3 concentration trends among days with similar meteorological conditions can be examined. The LADCO CART analysis removes the influence of year-to-year meteorological variability on O_3 concentrations, and any remaining trend is assumed to be the result of non-meteorological factors, such as reductions in emissions of O_3 precursors.

LADCO conducted the CART analyses using MDA8 O_3 monitoring data from regulatory monitors in the NAAs and daily meteorological data from airport weather stations. The analysis included data from the years 2005 through 2020 to identify the trends in ambient, surface O_3 concentrations after adjustment for meteorology. LADCO developed regression trees to classify each summer day (May – September) by a common set of meteorology variables. Each branch in a regression tree describes the meteorological conditions associated with different O_3 concentrations. We assigned meteorologically similar days to day-type groups (known in CART as "nodes"), which are equivalent to branches of the regression tree. Grouping days with similar meteorology normalizes the influence of meteorological variability on the underlying trend in O_3 concentrations. The remaining trend in O_3 concentrations can be presumed to be due to trends in non-meteorological predictors, such as precursor emissions. We then plotted the O_3 trends for each of the different CART nodes.

This TSD gives a high-level summary of the CART results for the currently designated ozone NAAs. A brief description of CART analysis is provided in Section S3 of the Supplement to this TSD. A more complete description of the results for all nonattainment and maintenance areas, along with the CART methodology, is available in a LADCO report on CART.[5]

Although the exact selection of predictive variables changes from site to site, the most common predictors of high surface O_3 concentrations during the period we analyzed are temperature, wind direction, and relative humidity. Trends in O_3 concentrations in high-O_3 nodes were found to be declining over the 16-year period for almost all areas studied (Figure 2-5 and Figure 2-6). These plots reflect long term trends and are not meant to depict trends over shorter time periods.

[5] https://www.ladco.org/wp-content/uploads/Projects/Ozone/LADCO_O3_CART-Analysis_27Oct2021-FINAL-with-Appendices.pdf

2.4.1. Western Michigan NAA CART Analyses

LADCO conducted CART analyses for each of the three NAAs along Michigan's Lake Michigan shoreline. This TSD examines the analyses for these three NAAs, all of which are currently designated nonattainment for the 2015 O_3 NAAQS. The high-ozone nodes from the CART analysis for the Muskegon County monitor generally have southerly transport, hot temperatures, and low relative humidity (Supplement Table S11). Similarly, the high-ozone nodes for the Allegan County monitor all had southerly transport and hot temperatures (Supplement Table S11), but relative humidity was not a factor. The most important factors for the high-ozone nodes for the Berrien County monitor were hot temperatures and low relative humidity (Supplement Table S11). Several Berrien County nodes also have southerly winds or transport. Mean O_3 concentrations in all high-ozone nodes in Muskegon and Allegan counties have decreased from 2005 to 2020 (Figure 2-5). In Berrien County, mean O_3 concentrations in all but one of the high-ozone nodes have decreased from 2005 to 2020 (Figure 2-5); the one node with steady O_3 concentrations has a mean concentration of 53 ppb, so these days are unlikely to contribute to O_3 nonattainment.

2.4.2. Wisconsin NAA CART Analyses

LADCO conducted CART analyses for each of the four NAAs along Wisconsin's Lake Michigan shoreline. This TSD examines the analyses for the Sheboygan and Milwaukee NAAs, both of which are currently designated nonattainment for the 2015 O_3 NAAQS. The high-ozone nodes from the CART analysis for the Sheboygan County monitor generally have southerly winds/transport and hot temperatures (Supplement Table S11). Mean O_3 concentrations in all the high-ozone nodes have decreased from 2005 to 2020 (Figure 2-5). Similarly, the high-ozone nodes from the CART analysis for the Milwaukee monitors generally have hot temperatures and southerly winds (Supplement Table S11). The highest O_3 node also has winds that are either weak from the west (<2.0 m/s) or from the east. Mean O_3 concentrations in all the high-ozone nodes have decreased from 2005 to 2020 (Figure 2-5).

2.4.3. Chicago, IL-IN-WI, CART Analyses

LADCO conducted CART analyses for three different parts of the large Chicago NAA: the far north (Kenosha and Lake counties, WI-IL), central (Cook County, IL), and the far east (Lake and Porter counties, IN). The high-ozone nodes from all three CART analyses generally have hot temperatures and low relative humidity (Supplement Table S11). Some of the nodes in all three of the analyses are also influenced by southerly transport, although southerly transport is most important for the northern Kenosha and Lake County monitors. Several nodes in the Indiana monitor analysis are also influenced by wind speeds. For the far north and far eastern parts of Chicago, mean O_3 concentrations in all the high-ozone nodes have decreased from 2005 to 2020 (Figure 2-5). In contrast, mean O_3 concentrations in most of the high-concentration nodes in central Chicago have increased from 2005 to 2020 (Figure 2-5).

2.4.1. Detroit, MI, CART Analyses

LADCO conducted CART analyses for the Detroit nonattainment area. The high-ozone nodes from the CART analysis for the Detroit monitors generally have hot temperatures and low relative humidity (Supplement Table S11). The highest ozone nodes also have winds from the east to south-southwest, and other high-ozone nodes have low wind speeds. Southerly winds and transport appear as important variables. Figure 2-6 shows that the mean O_3 concentrations in all the high-concentration nodes for Detroit have decreased from 2005 to 2020.

2.4.2. St. Louis, MO-IL, CART Analyses

LADCO conducted CART analyses for the St. Louis nonattainment area. The high-ozone nodes from the CART analysis for the St. Louis monitors generally have low relative humidity and hot temperatures (Supplement Table S11). The highest ozone nodes also have gentle winds or shorter transport distances, with easterly winds. These factors also appear as important variables, with relative humidity-related parameters being the most important. Figure 2-6 shows that the mean O_3 concentrations in all the high-concentration nodes for St. Louis have decreased from 2005 to 2020.

2.4.3. Cleveland, OH, CART Analyses

LADCO conducted CART analyses for the Cleveland nonattainment area. The high-ozone nodes from the CART analysis generally have hot temperatures and low relative humidity (Supplement Table S11). The highest ozone nodes for Cleveland have low wind speed, which also appears as an important variable, along with southerly transport. Figure 2-6 shows that the mean O_3 concentrations in all the high-concentration nodes for Cleveland have decreased from 2005 to 2020 (Figure 2-6).

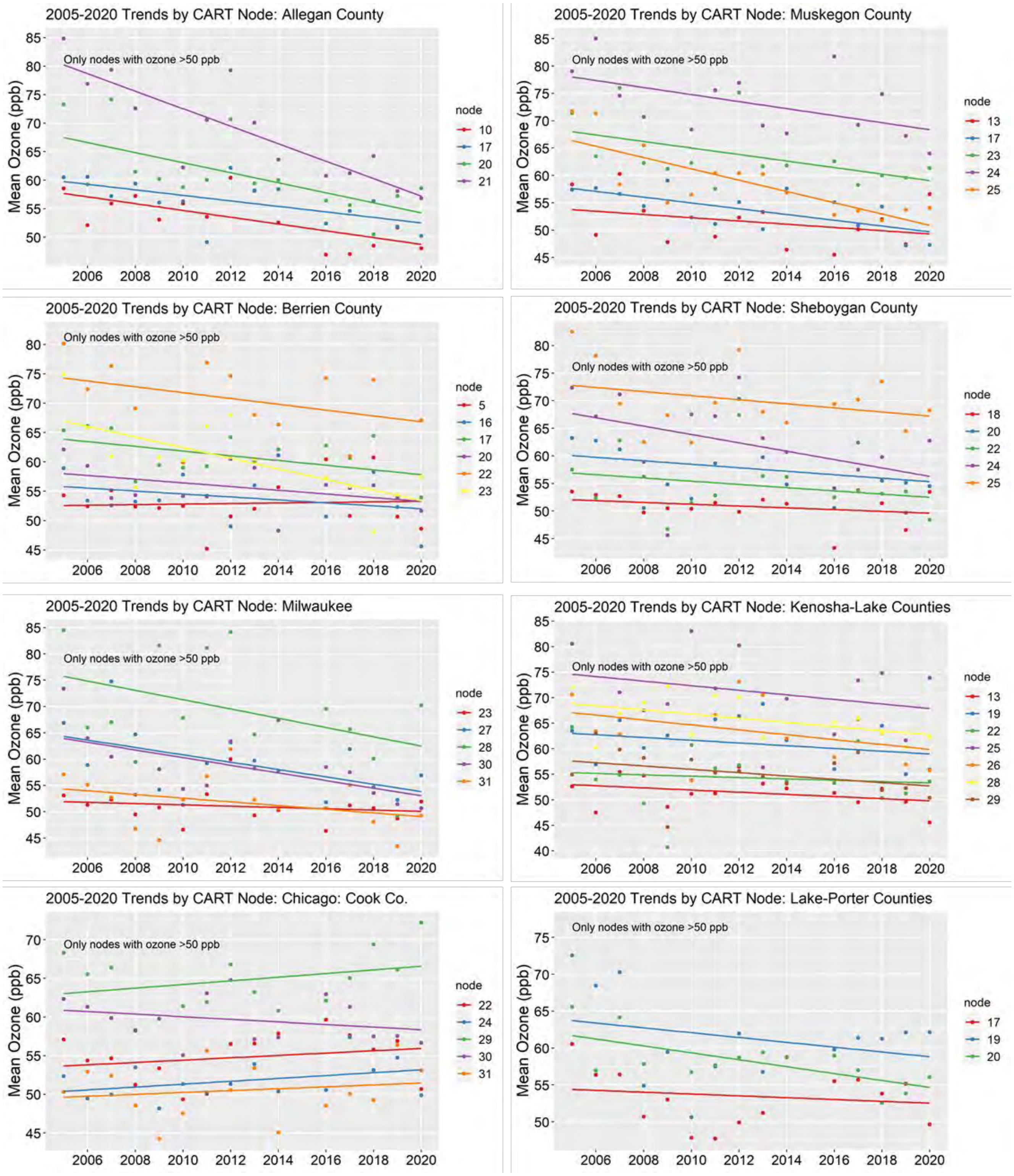

Figure 2-5. Ozone trends in high-ozone nodes in select ozone nonattainment areas in the LADCO region.

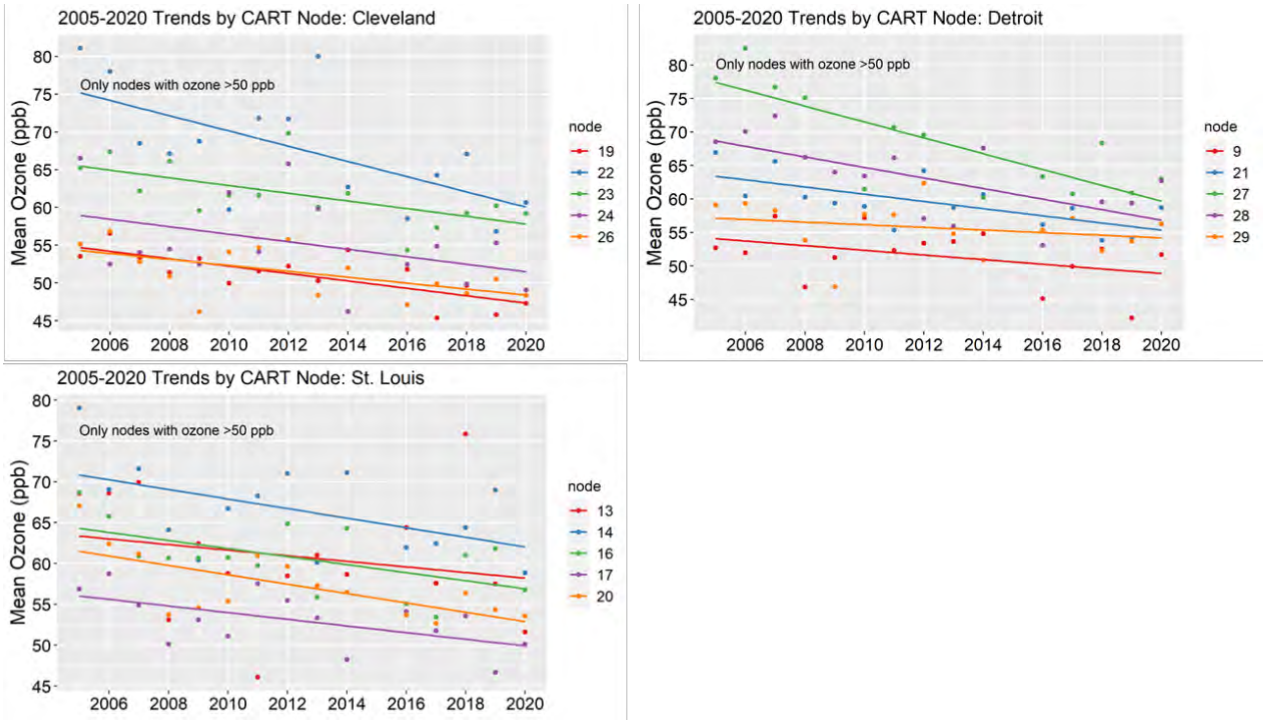

Figure 2-6. Ozone trends in high-ozone nodes in select ozone nonattainment areas in the LADCO region.

2.5. Summary

Overall, the LADCO CART analysis shows that O_3 DVs have decreased considerably since 2005, reaching levels where all nonattainment and maintenance areas attained the 2008 ozone NAAQS and many areas attained the 2015 O_3 NAAQS in 2021. Ozone concentrations in the different areas are impacted by different meteorological factors, with all areas impacted by high temperatures and many areas impacted by southerly transport and low relative humidity. When adjusted for meteorology using CART, O_3 concentrations on high-ozone days in select NAAs (those that did not attain the 2015 ozone NAAQS in 2021) decreased for almost all types of days in almost all NAAs. The notable exception is for central Chicago, where meteorologically-adjusted O_3 concentrations appear to have increased since 2005. The CART trends indicate that ongoing reductions of O_3 precursor emissions are continuing to reduce O_3 concentrations in most areas of the LADCO region.

3. Air Quality Modeling Platform

3.1. 2016 Modeling Platform

LADCO based our 2016 O_3 air quality predictions on the 2016v1 National Emission Inventory Collaborative emissions inventory[7] and the U.S. EPA 2016fh_16j (herein referred to as 2016fh) emissions modeling platform (US EPA, 2021). LADCO generated the Weather Research Forecast (WRF) model meteorology (LADCO, 2022) and used initial and boundary conditions from the U.S. EPA 2016fg CAMx modeling platform (US EPA, 2019). LADCO processed the 2016 emissions using the U.S. EPA Sparse Matrix Operator Kernel Emissions (SMOKE) scripts distributed with the 2016fh emissions modeling platform. The CAMx inputs, including the meteorology data simulated with the Weather Research Forecast (WRF) model, emissions data, and boundary conditions represent year 2016 conditions.

3.2. Modeling Year Justification

LADCO selected 2016 as a modeling year for this study because at the initiation of this project in late 2019 CAMx input data for 2016 were widely available and they represented the state-of-the-science for emissions and meteorology data. In 2017, a group of multi-jurisdictional organizations (MJOs), states, and EPA established 2016 as the new base year for a national air quality modeling platform[8]. The group concluded that if only one recent year could be selected, that 2016 would serve as a good base year because of typical O_3 conditions and average wildfire conditions. Following from the base year recommendations from that group, several modeling centers, including U.S. EPA and LADCO, developed data and capabilities for simulating and evaluating air quality in 2016.

Following from the selection of 2016 as the base year for a national modeling platform, starting in late 2017, the MJOs, states, and EPA formed the National Emissions Inventory Collaborative to develop a 2016 emissions inventory and modeling platform. Over 200

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[7] http://views.cira.colostate.edu/wiki/wiki/10202

[8] Base Year Selection Workgroup Final Report

participants collaborated across 12 workgroups to develop base and future year emissions to support upcoming regulatory modeling applications. This effort was designed to involve a broad group of emissions experts in the development of a new national emissions modeling platform. LADCO used the 2016 and 2023 inventories developed by the Collaborative for the modeling presented here. Section 8 presents LADCO's justification for using the 2016v1 emissions data over the 2016v2 data for the modeling reported in this TSD.

The attainment date for 2015 O_3 NAAQS moderate NAAs is August 3, 2024. LADCO selected 2023 as the future projection year because it aligns with the last complete O_3 season that will be used to determine attainment of these areas.

3.3. Air Quality Model Configuration and Data

LADCO based our CAMx air quality modeling platform for this application on the configuration that we recently used for 2008 O_3 NAAQS attainment demonstration modeling (LADCO, 2020) and regional haze modeling for the Regional Haze Rule 2nd implementation period (LADCO, 2021). LADCO used CAMx 7.10 (Ramboll, 2020) as the photochemical grid model for this application. CAMx is a three-dimensional, Eulerian air quality model that simulates the chemical transformation and physical transport processes of air pollutants in the troposphere. It includes capabilities to estimate the concentrations of primary and secondary gas and particle phase air pollutants, and dry and wet deposition, from urban to continental spatial scales. As CAMx associates source-level air pollution emissions estimates with air pollution concentrations, it can be used to design and assess emissions reduction strategies pursuant to NAAQS attainment goals.

LADCO selected CAMx for this study because it is a component of recent LADCO and U.S. EPA modeling platforms for investigating the drivers of ground level O_3 in the Great Lakes region and across the U.S. As CAMx is a component of U.S. EPA studies with a similar scope to this project, LADCO was able to leverage the data and software elements that are distributed with recent U.S. EPA regulatory air quality modeling platforms. Using these elements saved LADCO significant resources relative to building a modeling platform from scratch.

Figure 3-1 shows the LADCO WRF modeling domains used for this application. A 12-km uniform grid (12US2) covers all the continental U.S. and includes parts of Southern Canada and

Northern Mexico. A 4-km domain covers all the LADCO member states in their entirety. A 1.33-km domain covers Lake Michigan. The vertical modeling domain has 36 layers with a model top at about 17,550 meters (50 mb). LADCO used the same U.S. EPA 12-km domain for this project because it supported the use of initial and boundary conditions data that were readily available from U.S. EPA.

Table 3-1 summarizes the CAMx science configurations and options LADCO used for the 2016 and 2023 CAMx modeling for this application. We used the Piecewise Parabolic Method (PPM) advection solver for horizontal transport along with the spatially varying (Smagorinsky) horizontal diffusion approach. We used K-theory for vertical diffusion using the CMAQ-like vertical diffusivities from WRFCAMx. The CB6r5 gas-phase chemical mechanism was selected because it includes the latest chemical kinetic rates and represents improvements over the other alternative CB05 and SAPRC chemical mechanisms as well as active methane chemistry. Additional CAMx inputs were as follows:

Meteorological Inputs: The LADCO WRF-derived meteorological fields (LADCO, 2022) were processed to generate CAMx meteorological inputs using the WRFCAMx processor, as described in Section 3.3.1.

Initial/Boundary Conditions: LADCO used 2016 initial and boundary conditions for CAMx generated by the U.S. EPA from a northern hemisphere simulation of the Community Multiscale Air Quality (CMAQ) model (US EPA, 2019d). EPA generated hourly, one-way nested boundary conditions (i.e., hemispheric-scale to regional-scale) from a 2016 108-km x 108-km polar stereographic CMAQ simulation of the northern hemisphere. Following the convention of the U.S. EPA 2016 regional haze modeling (U.S. EPA, 2019b), LADCO used year 2016 CMAQ boundary conditions for modeling 2016 and 2023 air quality with CAMx.

Photolysis Rates: LADCO prepared the photolysis rate inputs as well as albedo/haze/ozone/snow inputs for CAMx. Day-specific O_3 column data were based on the Total Ozone Mapping Spectrometer (TOMS) data measured using the satellite-based Ozone Monitoring Instrument (OMI). Albedo were based on land use data. LADCO used the TUV photolysis rate processor to prepare clear-sky photolysis rates for CAMx. If there were periods where daily TOMS data were unavailable in 2016, the TOMS measurements were interpolated between the days with valid data. CAMx was also configured to use the in-line TUV to adjust for cloud cover and account for the effects that modeled aerosol loadings have on photolysis rates; this latter effect on photolysis may be especially important in adjusting the photolysis rates due to the occurrence of PM concentrations associated with emissions from fires.

Landuse: LADCO used landuse/landcover data from the U.S. EPA WRF simulation.

Spin-Up Initialization: A minimum of ten days of model spin up (e.g., December 21-31, 2015) was used for all modeling domains. LADCO ran monthly CAMx simulations, initializing each month with a 10-day spin-up period.

As the focus of this study is on O_3, LADCO used CAMx to simulate the 2016 O_3 season. LADCO simulated April 1 through October 31, 2016 as individual months using 10-day model spin-up periods for each month. LADCO selected a CAMx configuration that was consistent with previous O_3 modeling applications performed by LADCO (2020) and U.S. EPA. U.S. EPA (2019).

Table 3-1. LADCO 2016 CAMx modeling platform configuration

Science Options	Configuration
Model Codes	CAMx v7.10
Simulation Period	March 20-October 31, 2016
Horizontal Grid Mesh	12 km, 396 cols x 246 rows 4 km, 420 cols x 390 rows 1.33 km, 279 cols x 450 rows
Vertical Grid Mesh	36 layers up to 50 mb
Grid Interaction	Two-way nested
Initial Conditions	10-day spin up on all grids
Boundary Conditions	12km from hemispheric CMAQ (U.S. EPA 2016ff)
Emissions	
Baseline Emissions Processing	Sparse Matrix Operator Kernel Emissions (SMOKE), EPA's MOtor Vehicle Emission Simulator (MOVES2014) and Biogenic Emission Inventory System (BEIS)
Emissions Modeling Platform	U.S. EPA 2016fh_16j Platform with ERTAC 16.2 beta EGU Point and hourly CEMs
Chemistry	
Gas Phase Chemistry	CB6r5
Aerosol Chemistry	CF + SOAP
Meteorological Processor	WRFCAMx_v4.9.1
Horizontal Diffusion	Spatially varying
Vertical Diffusion	CMAQ-like in WRF2CAMx
Diffusivity Lower Limit	Kz_min = 0.1 to 1.0 m^2/s or 2.0 m^2/s
Dry Deposition	Zhang dry deposition scheme (CAMx)
Wet Deposition	CAMx-specific formulation
Gas Phase Chemistry Solver	Euler Backward Iterative (EBI) -- Fast Solver

Science Options	Configuration
Vertical Advection Scheme	Implicit scheme w/ vertical velocity update (CAMx)
Horizontal Advection Scheme	Piecewise Parabolic Method (PPM) scheme
Integration Time Step	Wind speed dependent
Source Apportionment	CAMx APCA with region and inventory sector tags

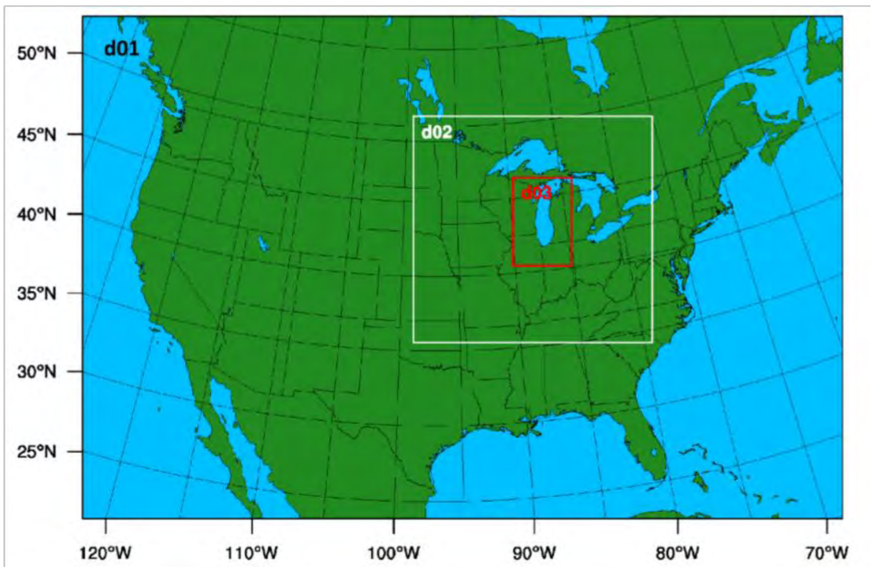

Figure 3-1. LADCO WRF modeling domains

3.3.1. Meteorology Data

LADCO developed 2016 WRF data for this application (LADCO, 2022). We used version 3.9.1 of the WRF model, initialized with the 12-km North American Model (NAM) from the National Climatic Data Center (NCDC) to simulate 2016 meteorology. Complete details of the WRF simulation, including the input data, physics options, and four-dimensional data assimilation (FDDA) configuration are detailed in the LADCO Meteorology Model Performance for Annual 2016 Simulation report (LADCO, 2022). LADCO prepared the WRF data for input to CAMx with version 4.8 of the WRFCAMx software.

3.4. 2016 and 2023 Emissions Data

LADCO collected 2016 and 2023 emissions data for this study primarily from the U.S. EPA 2016fh emissions modeling platform (U.S. EPA, 2021). U.S. EPA and the 2016 Emissions

Inventory Collaborative[9] generated version 1 of the 2016 (2016v1) inventory for use in O_3 NAAQS and Regional Haze SIPs. The first version of the 2016 inventories used 2014 inventory data; the 2016v1 inventory fully integrated 2016 estimates of emissions activities, growth and controls, and the latest emissions factors. Table 3-2 lists the 2016 base year inventory components that LADCO used to simulate 2016 air quality for this application.

LADCO replaced the 2023 EGU emissions in the U.S. EPA 2016fh emissions modeling platform with 2023 EGU forecasts estimated with the August 2021 version of the ERTAC EGU Tool version 16.2 beta (MARAMA, 2012). LADCO also used a version of the 2016fh non-EGU point inventory that is synchronized with the ERTAC EGU inventory in our 2016 modeling platform to ensure consistency with the EGU sector. The ERTAC model defines EGUs as power generating units with Continuous Emissions Monitoring (CEM). The U.S. EPA EGU inventory encompasses all power generating units, including industrial facilities such as paper mills and aluminum foundries. The non-EGU point inventory needed to be modified to work with the ERTAC EGU inventory by including the industrial sources from the U.S EPA EGU point inventory that are not included in the ERTAC model.

Figure 3-2 through Figure 3-7 show 2016 daily total EGU NOx emissions by fuel type for each of the LADCO states. These figures show that in 2016 the NOx emissions from power generation in the LADCO region were primarily emitted by sources that burn coal, that there is significant day to day variation in power plant emissions, and that the summer and winter seasons are the peak periods of EGU NOx emissions. Note that vertical axis of these figures varies from state to state.

[9] http://views.cira.colostate.edu/wiki/wiki/10202

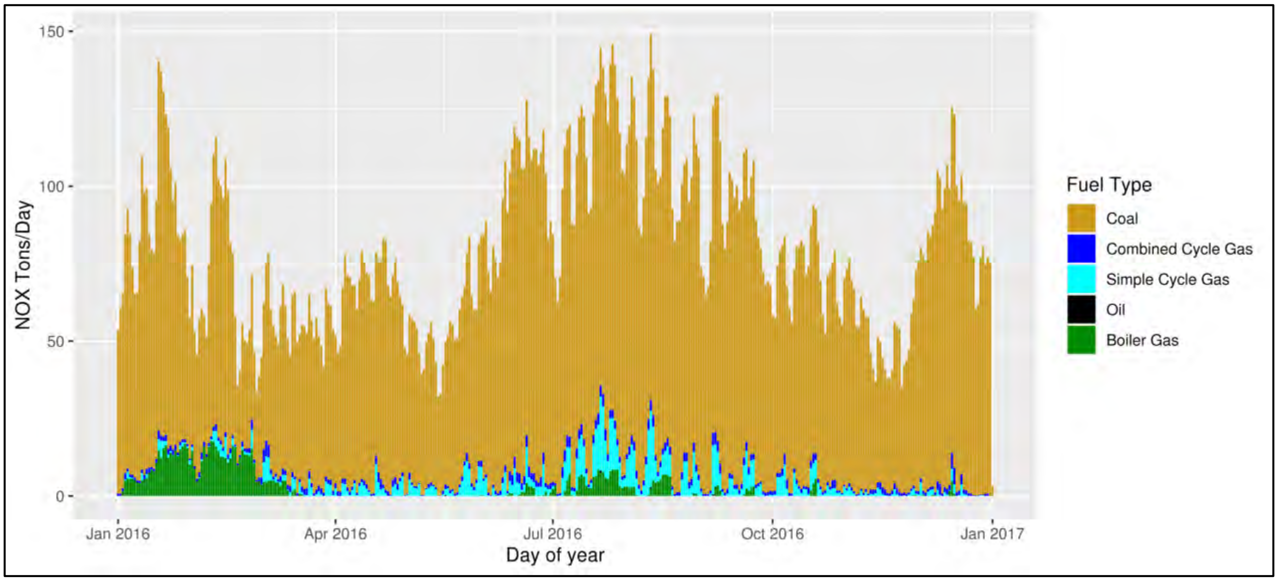

Figure 3-2. Illinois power generation 2016 daily NOx emissions by fuel type

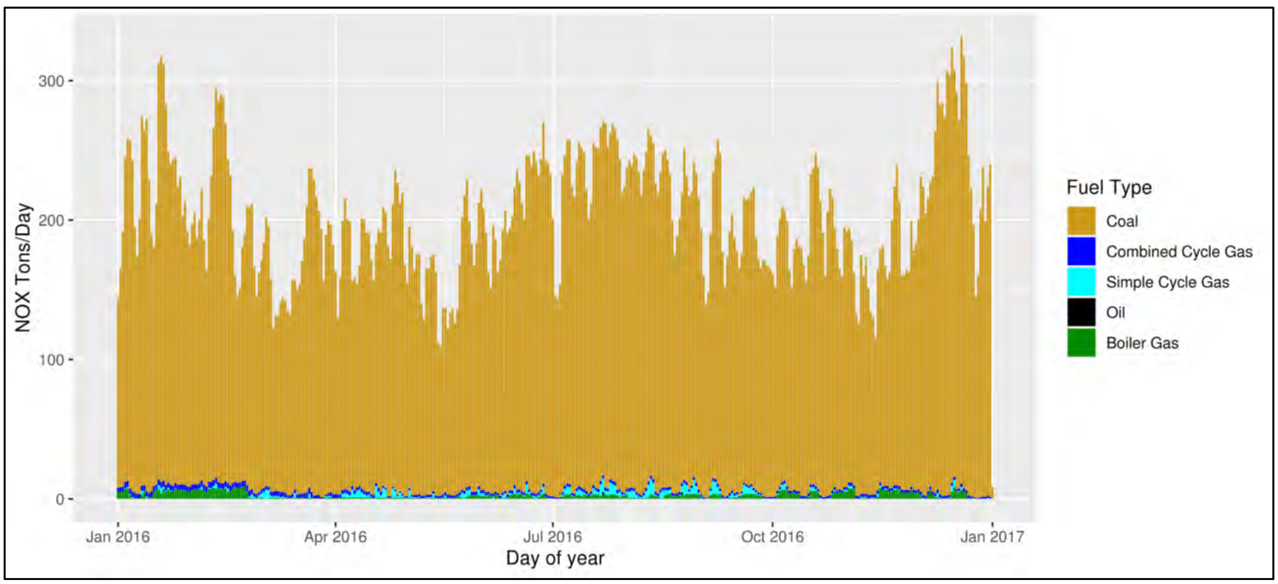

Figure 3-3. Indiana power generation 2016 daily NOx emissions by fuel type

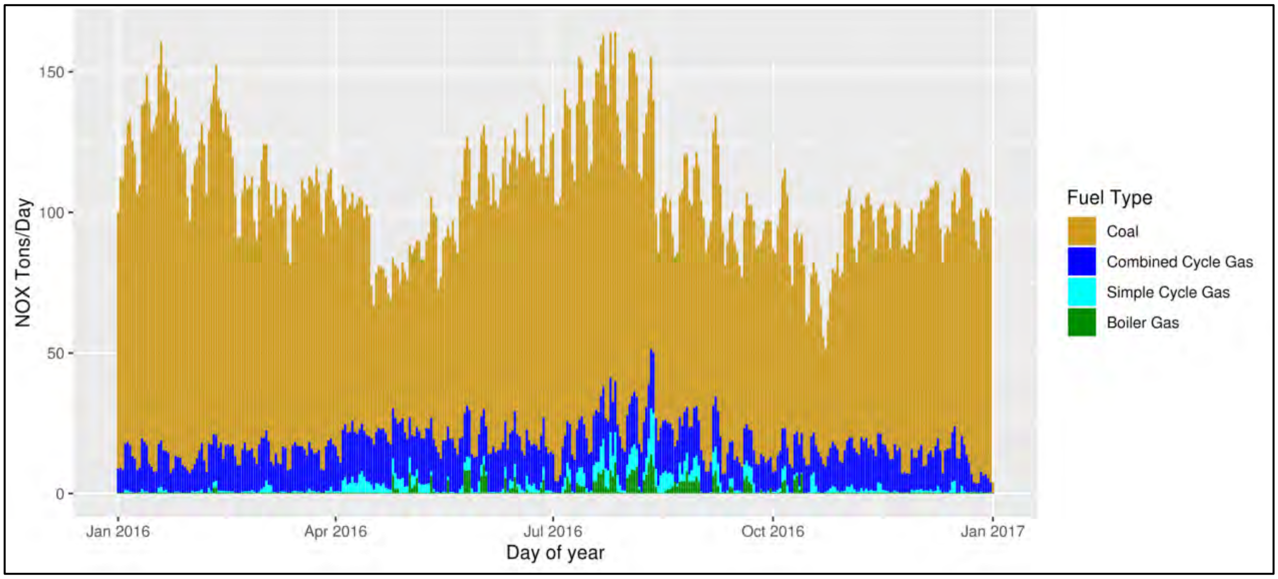

Figure 3-4. Michigan power generation 2016 daily NOx emissions by fuel type

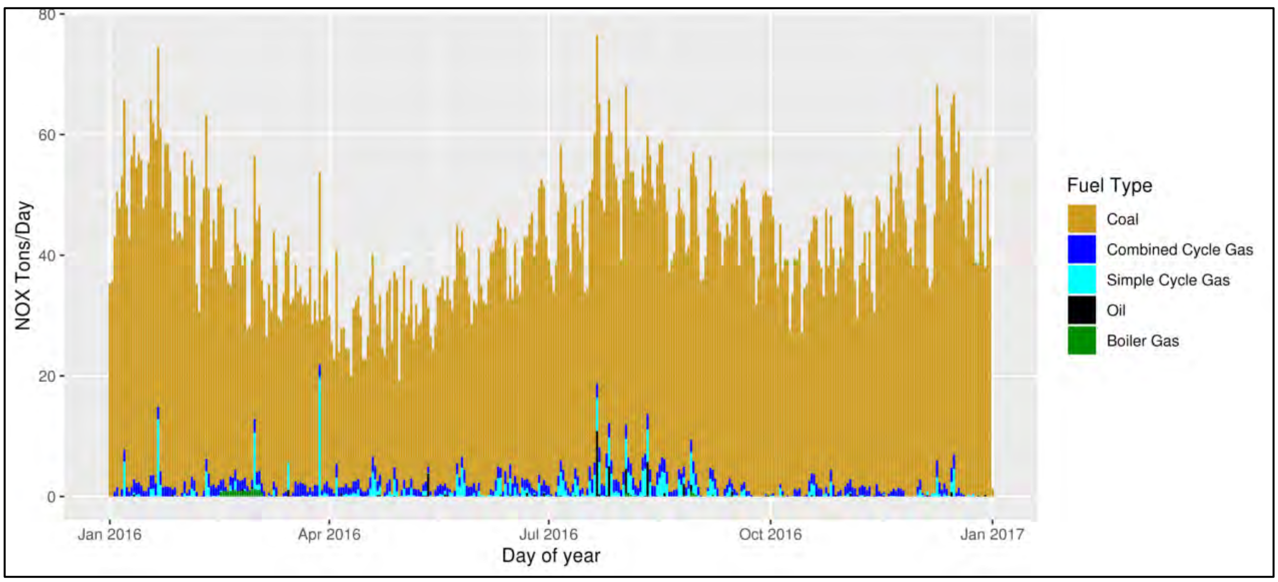

Figure 3-5. Minnesota power generation 2016 daily NOx emissions by fuel type

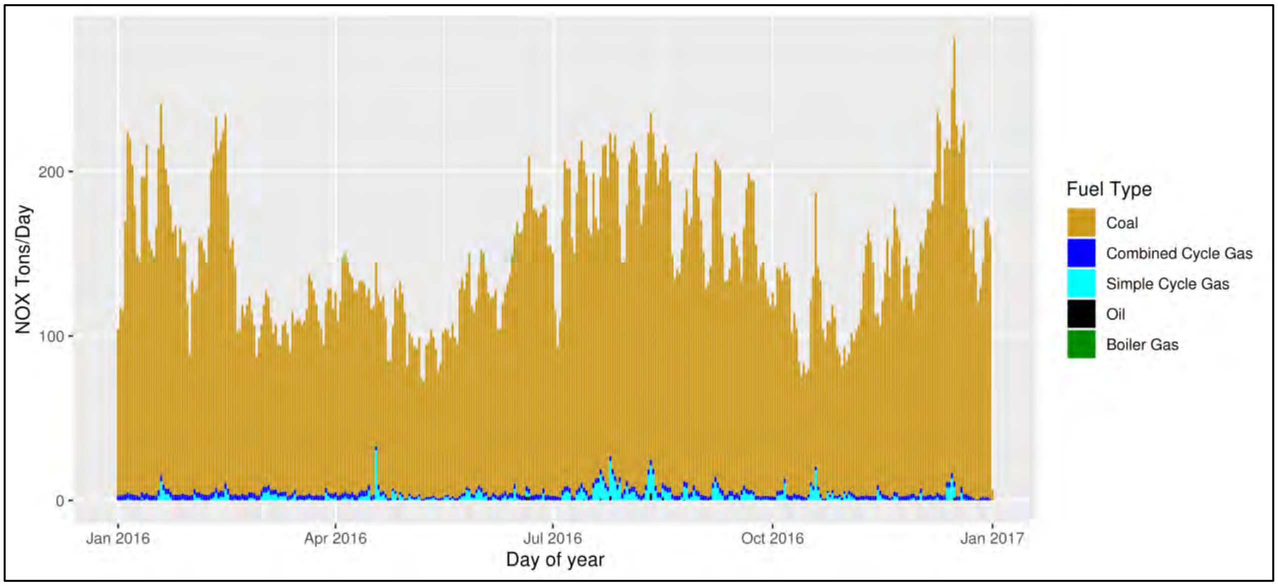

Figure 3-6. Ohio power generation 2016 daily NOx emissions by fuel type

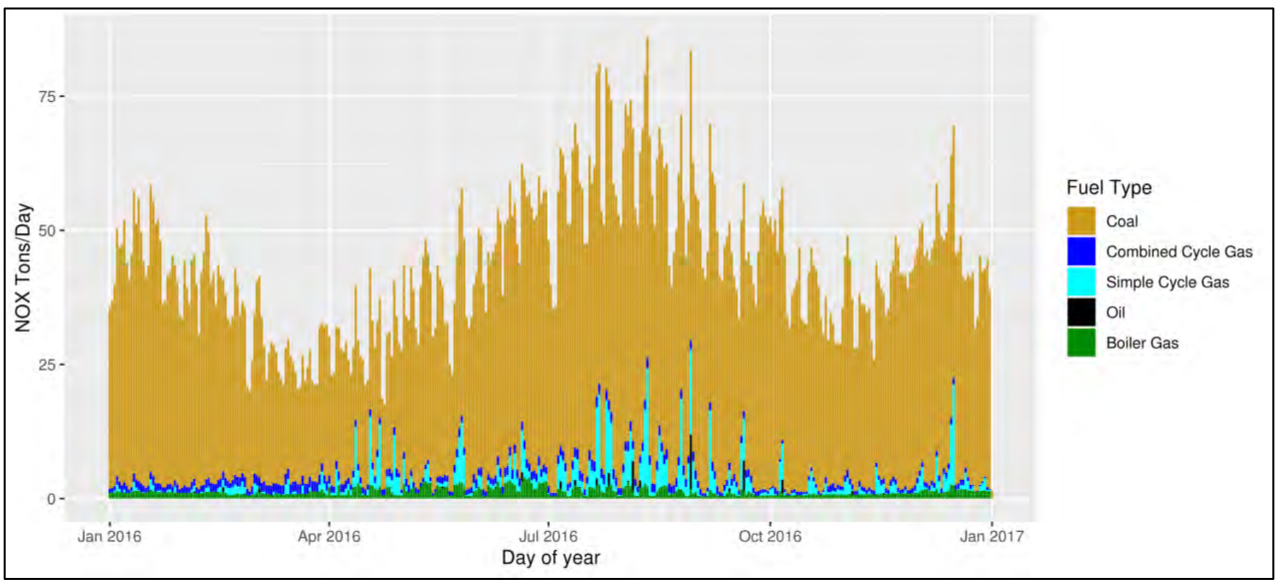

Figure 3-7. Wisconsin power generation 2016 daily NOx emissions by fuel type

LADCO modified the ERTAC EGU 16.2 beta inventory forecasts for 2023 to exclude the emissions from two EGU units that announced shutdowns that will occur before 2023. These announcements came after the ERTAC EGU 16.2 beta emissions were developed. LADCO zeroed out the 2023 emissions from these units in our 2016-based modeling forecasts for 2023. The two units removed from the ERTAC EGU 16.2 beta inventory included:

- ComED Will County, Illinois (ORIS ID: 884)

- WEPCO Rock River, Wisconsin (ORIS ID: 4057).

Supplement Section S4 to this TSD is a table of all of the EGU sources that operated in 2016 but were removed from the 2023 inventory and LADCO CAMx simulation due to retirement dates that occurred before the end of 2023.

Table 3-2 lists the 2016 base year and 2023 future year inventory components that LADCO used to simulate 2016 and 2023 air quality for this application. LADCO processed the inventories into CAMx binary format with SMOKE to estimate hourly emissions on three nested modeling domains (12/4/1.33 km) for March 20, 2016 through October 31, 2016.

Table 3-2. LADCO 2016 emissions modeling platform inventory components

Sector	Abbreviation	Base Year Data Source	Future Year Data Source
Agriculture	ag	U.S. EPA 2016fh	U.S. EPA 2023fh
Fugitive Dust	afdust	U.S. EPA 2016 fh	U.S. EPA 2023fh
Airports	airports	U.S. EPA 2016 fh	U.S. EPA 2023fh
Biogenic	BEIS3	U.S. EPA 2016fh	U.S. EPA 2013fh
C1/C2 Commercial Marine	cmv_c1c2	U.S. EPA 2016fh	U.S. EPA 2023fh
C3 Commercial Marine	cmv_c2	U.S. EPA 2016fh	U.S. EPA 2023fh
Nonpoint	nonpt	U.S. EPA 2016fh	U.S. EPA 2023fh
Offroad Mobile	nonroad	U.S. EPA 2016fh	U.S. EPA 2023fh
Nonpoint Oil & Gas	np_oilgas	U.S. EPA 2016fh	U.S. EPA 2023fh
Onroad Mobile	onroad	U.S. EPA 2016fh	U.S. EPA 2023fh
Point Oil & Gas	pt_oilgas	U.S. EPA 2016fh	U.S. EPA 2023fh
Electricity Generation	ptertac	ERTAC 16.1	ERTAC 16.2 modified
Industrial Point	ptnonertac	U.S. EPA 2016fh	U.S. EPA 2023fh modified
Minnesota Taconite	ptmntaconite	Provided by MPCA	Provided by MPCA
Rail	rail	U.S. EPA 2016fh	U.S. EPA 2023fh
Residential Wood Combustion	rwc	U.S. EPA 2016fh	U.S. EPA 2023fh
Agricultural Fires	ptagfire	U.S. EPA 2016fh	U.S. EPA 2023fh
Wild and Prescribed Fires	ptfire	U.S. EPA 2016fh	U.S. EPA 2023fh
Mexico Anthropogenic	othar/othpt/	U.S. EPA 2016fh	U.S. EPA 2023fh
Canada Anthropogenic	othar/othpt	U.S. EPA 2016fh	U.S. EPA 2023fh

3.4.1. Spatial Surrogates and Emissions Grids

LADCO's 2016 air quality modeling platform uses three nested modeling grids that focus on the Great Lakes region. We processed the 2016fh emissions on the LADCO modeling grids using U.S. EPA 12-km and 4-km spatial surrogates. LADCO used the Spatial Allocator Surrogate Tool with the GIS shapefiles that U.S. EPA used for the 12-km and 4-km spatial surrogates to generate surrogates for the LADCO 1.33 km grid. We processed the point source emissions inventory modeling files for CAMx.

3.5. Source Apportionment Modeling

LADCO used the CAMx Anthropogenic Precursor Culpability Assessment (APCA) tool to calculate emissions tracers for identifying upwind sources of ozone precursors at downwind monitoring sites. We used APCA to quantify the impacts of inventory sectors or geographic source regions on ozone concentrations at receptors. LADCO simulated 2016 meteorology and emissions on the 12-km modeling domain for the APCA simulations used for this application.

3.5.1. 2016 Inventory Sector Source Apportionment Configuration

LADCO used CAMx APCA to track the contributions of emissions sources on modeled O_3 concentrations. We configured the 2016fh emissions modeling platform to track the influence of emissions from key inventory sectors on O_3 concentrations in the region. We split the nonpoint, onroad mobile, and offroad mobile (nonroad) into subsectors to better distinguish the sources of O_3 pollution from these sectors. For example, LADCO split the two mobile sectors into diesel and non-diesel (gasoline, natural gas, and other) to resolve the impacts of diesel and non-diesel engines on O_3 in the region. Table 3-3 lists the APCA tags used for the LADCO 2016 CAMx APCA “sectors” simulation.

Table 3-3. LADCO 2016 CAMx APCA "sector" tags

Tag	Description	Tag	Description
1	Biogenic	12	Offroad Mobile - diesel
2	Agriculture	13	Offroad Mobile – non-diesel
3	Nonpoint – industrial combustion	14	Rail
4	Nonpoint – other combustion, including residential wood combustion	15	Onroad Mobile – California only*
5	Nonpoint – non-combustion	16	Commercial Marine (C2/C3)
6	Nonpoint – solvents	17	Point - agricultural fires
7	Nonpoint – waste	18	Point – electricity generation
8	Oil and gas	19	Point – wildfires
9	Onroad Mobile - diesel	20	Point – non-electricity generation
10	Onroad Mobile – non-diesel	21	Point – airports
11	Canada and Mexico		

* Emissions for this sector are for sources in California only and were generated with the EMFAC model

3.5.2. 2016 Geographic Source Apportionment Configuration

LADCO used CAMx APCA to track the contributions of geographic source regions on modeled O_3 concentrations. For the 2016 APCA simulation LADCO used the CAMx point source override option to tag emissions from geographic source groups. Emissions from all sectors, point and non-point, used the point source override option to better identify the locations of the source emissions. LADCO prepared the emissions through SMOKE by including state/county code-based geographic tags in each inventory sector processing stream to support the point source override option. This option is an improvement over the spatial masks traditionally used to tag emissions by source region because it does not suffer from the border errors in which a model grid cell can only be associated with one geographic region. Table 3-4 lists the APCA geographic tags used for the LADCO 2016 CAMx simulation.

For the states that have both state and county tags (IL, IN, MI, OH, WI) the state tag includes emissions from the areas of the state outside of the explicitly-tagged counties. For example, the tracer for WI sources (Tag = 6) includes the emissions from all areas of the state except for the counties included in Tags 20 and 21.

Table 3-4. LADCO 2016 CAMx APCA "geographic" tags

Tag	Description		Tag	Description
1	Biogenic		14	West: NM, AZ, CO, UT, WY, MT, ID, WA, OR, CA, NV, ND, SD
2	Miscellaneous		15	Northeast: ME, NH, VT, MA, RI, CT, NY, NJ, PA, DE, MD, DC
3	IL		16	Chicago IL Metro Counties: Cook, Du Page, Kane, Lake, Mc Henry, Will,
4	IN		17	Chicago IL Exurb Counties: Boone, De Kalb, Ford, Grundy, Iroquois, Kankakee, Kendall, La Salle, Lee, Livingston, Ogle, Stephenson, Winnebago
5	MI		18	East St. Louis IL Counties: Madison, Monroe, St. Clair
6	WI		19	Northern IN Counties: De Kalb, Elkhart, Fulton, Jasper, Kosciusko, Lagrange, La Porte, Marshall, Newton, Noble, Polaski, St. Joesph, Starke, Steuben, Porter, Lake
7	MN		20	Southeast WI Counties: Kenosha, Racine, Milwaukee, Ozaukee, Washington, Waukesha
8	OH		21	Central Coast WI: Kewaunee, Manitowoc, Sheboygan
9	MO		22	Detroit MI Counties: Livingston, Macomb, Monroe, Oakland, St. Claire, Washtenaw, Wayne
10	KY		23	Berrien County, MI
11	TX		24	Allegan County, MI
12	Southeast: WV, VA, NC, SC, TN, GA, AL, FL, MS		25	Muskegon County, MI
13	Great Plains: AR, KS, IA, NE, OK		26	Cincinnati OH Counties: Butler, Clermont, Hamilton, Warren
			27	Cleveland OH Counties: Cuyahoga, Geauga, Lake, Lorain, Medina, Portage, Summit

3.6. LADCO Modeling Platform Summary

Table 3-5 summarizes the LADCO 2016 air quality modeling platform elements.

Table 3-5. Listing of the LADCO 2016 air quality modeling platform components

Platform Element	Configuration	Reference	Data source
Meteorology Data	WRFv3.9.1	LADCO, 2022	LADCO
Initial and Boundary Conditions	2016 Hemispheric CMAQ	U.S. EPA, 2019c	U.S. EPA
2016 Emissions Data	Inventory Collaborative 2016v1 ERTAC16.1 EGU Point and hourly CEMs		Inventory Collaborative and ERTAC
2023 Emissions Data	Inventory Collaborative 2016v1 ERTAC16.1 EGU Point		LADCO and ERTAC
Emissions Modeling Platform	U.S. EPA 2016fh_16j		U.S. EPA
Photochemical Grid Model	CAMxv7.10	Ramboll, 2020	LADCO

3.7. 2016 CAMx Model Performance Evaluation Methods

LADCO simulated 2016 air quality with CAMx using data derived from the U.S. EPA 2016fh emissions modeling platform. The CAMx model performance evaluation (MPE) presented here focuses on O_3 at surface monitors in the LADCO states with 2015 O_3 NAAQS NAAs, including Illinois (IL), Indiana (IN), Michigan (MI), Ohio (OH), and Wisconsin (WI). These states will use the information in this TSD as weight of evidence in support of the moderate area NAA SIPs. LADCO used the Atmospheric Model Evaluation Tool (AMET) version 1.4 to pair the model results and surface observations in space and time, generate bi-variate statistics of model performance, and to produce MPE plots.

LADCO evaluated the CAMx 2016 modeled O_3 concentrations against concurrent measured surface ambient O_3 concentrations using graphical displays of model performance and statistical model performance measures. We compared the statistical measures against established model performance goals and criteria (Emery et al., 2017) and following the procedures recommended in EPA's photochemical modeling guidance document (US EPA, 2018).

3.7.1. Available Aerometric Data for the Model Evaluation

LADCO used the following routine air quality measurement data networks operating in in 2016 to assess CAMx O_3 model performance:

EPA AQS Surface Air Quality Data: Data files containing hourly-averaged concentration measurements at a wide variety of state and EPA monitoring networks are available in the Air Quality System (AQS) database throughout the U.S. The AQS consists of many sites that tend to be mainly located in and near major cities. There are several types of networks within AQS that measure different species. The standard hourly AQS AIRS monitoring stations typically measure hourly O_3, NO_2, NO_X and CO concentration and there are thousands of sites across the U.S. Figure 3-8 shows the locations of AQS surface monitors in the LADCO region.

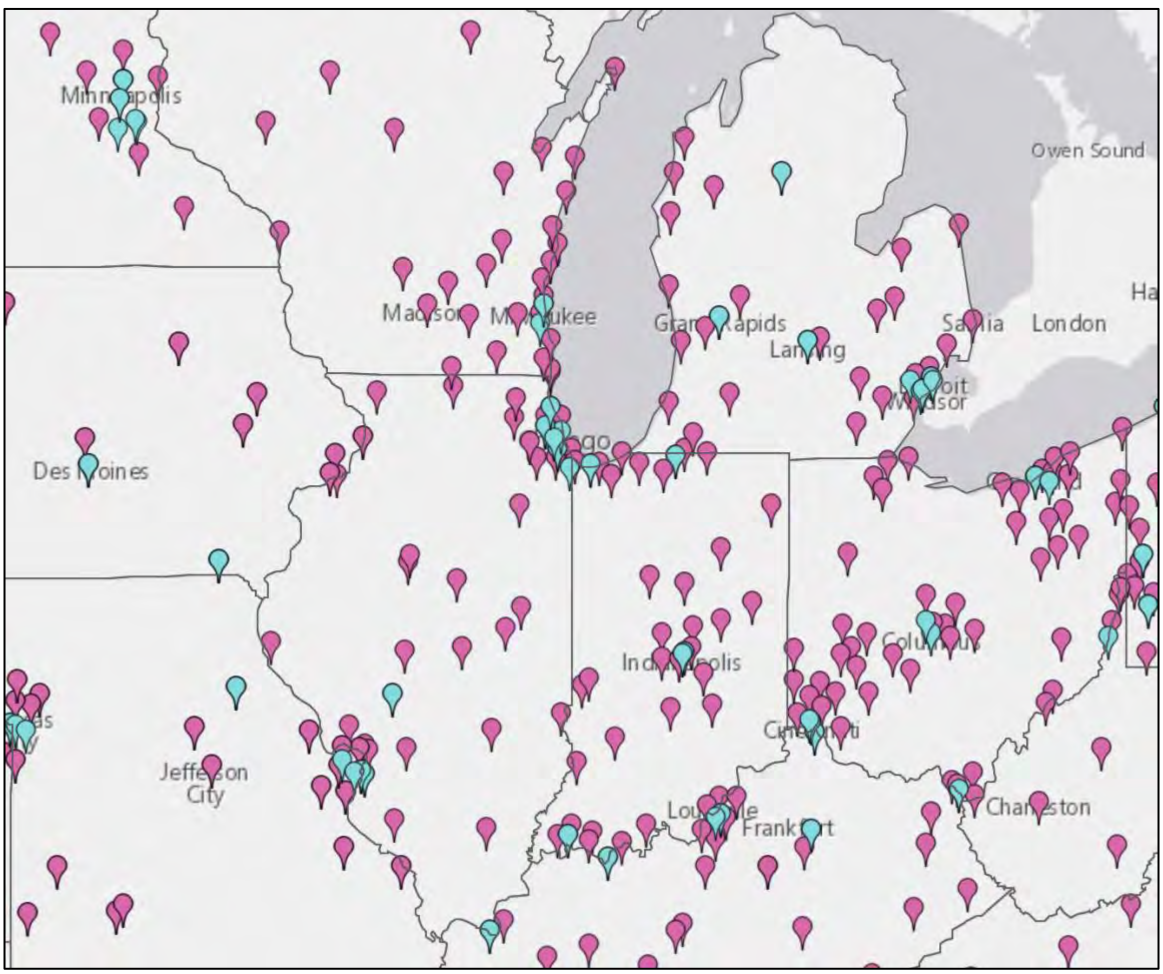

Figure 3-8. Locations of AQS monitors in the LADCO region, O_3 monitors are pink and NO_2 monitors are blue; source: U.S. EPA AirData

CASTNet Monitoring Network: The Clean Air Status and Trends Network (CASTNet) operates approximately 80 monitoring sites in mainly rural areas across the U.S. CASTNet sites typically collect hourly O_3, temperature, wind speed and direction, the standard deviation of the wind direction, solar radiation, relative humidity, precipitation and surface wetness. CASTNet also collects weekly (Tuesday to Tuesday) samples of speciated $PM_{2.5}$ sulfate, nitrate, ammonium and other relevant ions and weekly gaseous SO_2 and nitric acid (HNO_3). Figure 3-9 displays the locations of the approximately 80 CASTNet sites across the U.S.

Figure 3-9. Locations of CASTNet monitoring sites; source: https://www.epa.gov/castnet

3.7.2. Model Performance Statistics, Goals and Criteria

U.S. EPA (2018) recommended a 60 ppb observed O_3 cut-off threshold when calculating O_3 model performance statistics. Emery et al., (2017) conducted a meta-analysis of 38 peer-reviewed articles from 2005 through 2015 on photochemical grid modeling applications to update the MPE benchmarks for O_3 and particulate matter modeling. Table 3-6 lists their recommended MPE goals and criteria, and cutoff concentrations. In addition, Emery et al., recommended that MPE statistics for O_3 should be calculated for time periods of roughly 1 week (episodic) and not to exceed 1 month.

Table 3-6. Ozone model performance benchmarks by Emery, et al. (2017)

Metric	Goal	Criteria	Cutoff
Normalized Mean Bias (NMB)	≤± 5%	≤± 15%	40 ppb for 1-hour O_3, no cutoff for MDA8 O_3
Normalized Mean Error (NME)	< 15%	< 25%	40 ppb for 1-hour O_3, no cutoff for MDA8 O_3
Correlation Coefficient (r)	> 0.75	> 0.5	No cutoff

The model performance goals by U.S. EPA and Emery et al. are not used to assign passing or failing grades to model performance, but rather to help interpret the model performance and intercompare across locations, species, time periods and model applications. The model inputs to CAMx vary hourly, but tend to represent average conditions that do not account for unusual or extreme conditions. For example, an accident or large event could cause significant increases in congestion and motor vehicle emissions that are not accounted for in the average emissions inputs used in the model.

U.S. EPA compiled and interpreted the model performance from 69 air quality modeling studies in the peer-reviewed literature between 2006 and March 2012 and developed recommendations on what should be reported in a model performance evaluation (Simon, et al., 2012). Included in the most recent EPA guidance (U.S. EPA, 2018), they are useful and were used by LADCO in our model performance evaluation:

- Photochemical modeling MPE studies should at a minimum report the Mean Bias (MB) and Error (ME or RMSE), and Normalized Mean Bias (NMB) and Error (NME) and/or Fractional Bias (FB) and Error (FE). The NMB and NME are unbounded on the positive end ($+\infty$) but bounded at -100% for bias and 0% for error, while FE is bounded in 0-200% and FB is bounded in -200% to +200%.
- The model evaluation statistics should be calculated for the highest temporal resolution available and for important regulatory averaging times (e.g., daily maximum 8-hour O_3).
- It is important to report processing steps in the model evaluation and how the predicted and observed data were paired and whether data are spatially/temporally averaged before the statistics are calculated.

- Predicted values should be taken from the grid cell that contains the monitoring site, although bilinear interpolation to the monitoring site point can be used for higher resolution modeling (< 12 km).
- Evaluation should be performed for subsets of the data including, high observed concentrations (e.g., O_3 > 60 ppb), by subregions and by season or month.
- Evaluation should include more than just O_3 and $PM_{2.5}$, such as SO_2, NO_2 and CO.
- Spatial displays should be used in the model evaluation to evaluate model predictions away from the monitoring sites. Time series of predicted and observed concentrations at a monitoring site should also be used.
- It is necessary to understand measurement artifacts to make meaningful interpretation of the model performance evaluation.

We incorporated the recommendations of U.S. EPA (2018) and Emery et al., (2017) into the LADCO CAMx model performance evaluation. The LADCO evaluation products include qualitative and quantitative evaluation for MDA8 O_3 with and without a 60 ppb threshold.

Table 3-7. Definition of model performance evaluation statistical measures used to evaluate CAMx.

Statistical Measure	Mathematical Expression	Notes
Normalized Mean Error (NME)	$\frac{\sum_{i=1}^{N} \lvert P_i - O_i \rvert}{\sum_{i=1}^{N} O_i}$	Reported as %
Normalized Mean Bias (NMB)	$\frac{\sum_{i=1}^{N} (P_i - O_i)}{\sum_{i=1}^{N} O_i}$	Reported as %
Correlation Coefficient (r)	$\frac{\sum \left[(P_j - \bar{P}) \times (O_j - \bar{O}) \right]}{\sqrt{\sum (P_j - \bar{P})^2 \times \sum (O_j - \bar{O})^2}}$	Unitless, -1 ≤ r ≤ +1 r =1 is perfectly correlated r = 0 is totally uncorrelated

3.7.3. Subregional Evaluation of Model Performance

The evaluation of the LADCO 2016 CAMx simulations focuses on monthly and O_3 season model performance at monitors in IL, IN, MI, OH and WI. We also examined summer season high O_3 episodes in the 2015 O_3 NAAQS NAAs in the LADCO region to determine how well the model performs on O_3 exceedance days in policy relevant locations.

4. 2016 and 2023 Emissions Summary

In this section we summarize the base and future year emissions modeling results used to forecast ground-level O_3 concentrations in 2023. The emissions projections from the 2016 base year to 2023 are the foundation of the air quality model forecasts of future year air quality. The emissions plots and tables in this section illustrate and quantify how the U.S. emissions modeling community, including LADCO, U.S. EPA, and state air quality planning agencies forecasted air pollution emissions for the current round of 2015 O_3 NAAQS attainment demonstrations.
As described in Section 3.4, LADCO based the 2016 and 2023 emissions data for this application on the U.S. EPA 2016fh emissions modeling platform (US EPA, 2021). LADCO replaced the EGU emissions in the U.S. EPA 2016fh platform with 2023 EGU forecasts estimated with a modified version of the ERTAC EGU Tool version 16.2 beta (MARAMA, 2012). Table 3-2 lists the 2016 base year and 2023 future year inventory components that LADCO used to simulate 2016 and 2023 air quality for this application.

The following sections summarize the 2016 and 2023 emissions used by LADCO for simulating O_3 and O_3 precursors during these years. Tabulated ozone season total emissions by state, county, and sector for the data used by LADCO for this TSD are include in the supporting materials to this TSD:

2016 and 2023 State, County, and Sector Emissions Summary (XLSX; 41 Mb)

4.1. 2016 Emissions Summary

The tables and figures in this section summarize the emissions used in the LADCO 2016 CAMx simulation. Table 4-1 shows the LADCO state 2016 average O_3 season (March – October) day emissions (OSDE) for CO, NOx, and VOC for all sectors, including natural sources like biogenics and fires. The calculation for average OSDE is shown in Equation 4-1.

$$OSDE_{s,p} = \frac{\sum_{m=mar}^{oct} \sum_{y=1}^{n} E_{m,y,s,p}}{244} \quad \text{(Equation 4-1)}$$

Where *E* = monthly total emissions, *s* = state, *p* = pollutant, *m* = month, *y* = inventory sector, *n* = number of inventory sectors; note that 244 is the number of days in March - October 2016

Figure 4-1 through Figure 4-9 are tile plots of the 12-km, 4-km, and 1.33-km gridded, July 2016 total CO, NOx, and VOC surface layer emissions, respectively. The CO and NOx plots illustrates that the highest emissions occur in proximity to urban areas and roadways. The VOC plot shows high emissions around urban areas and a diffuse emissions signal from biogenic sources. Table 4-2 through Table 4-4 show the 2016 average OSDE for CO, NOx, and VOC, respectively, by LADCO member state and inventory sector.

Table 4-1. 2016 average ozone season day emissions (OSDE) by state (tons/day)

State	CO	NOX	VOC
Illinois	4,421	1,082	2,703
Indiana	3,578	876	1,789
Michigan	4,123	805	3,152
Minnesota	4,355	652	2,838
Ohio	4,776	946	2,371
Wisconsin	2,636	533	2,399

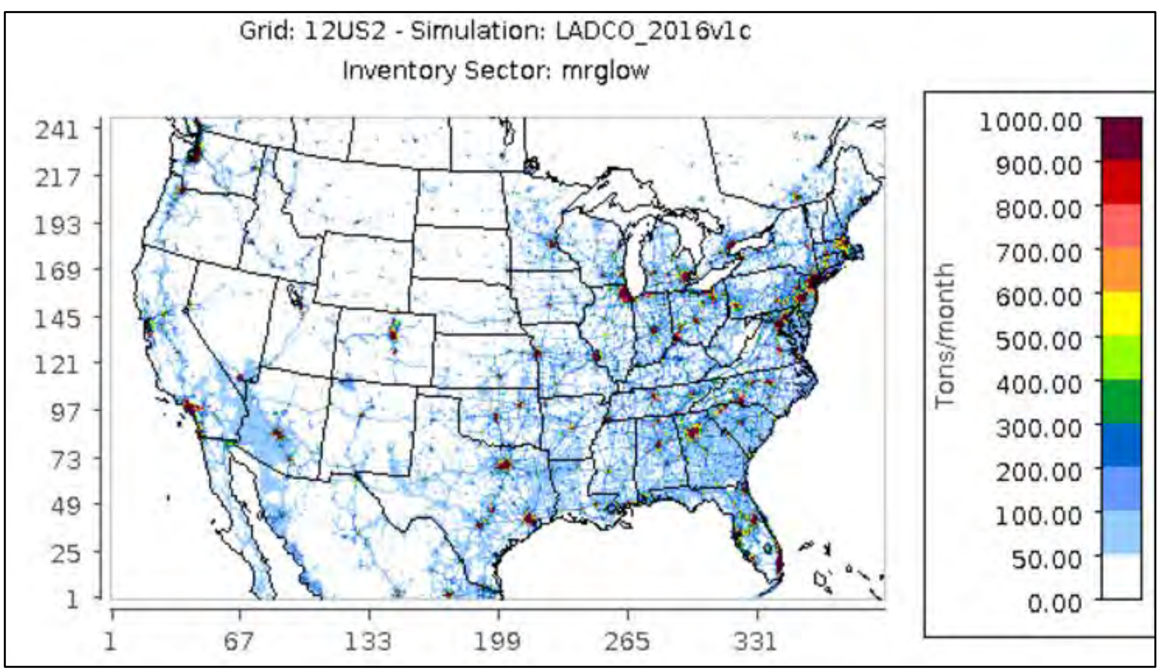

Figure 4-1. July 2016 total 12-km gridded CO surface layer emissions (tons/month)

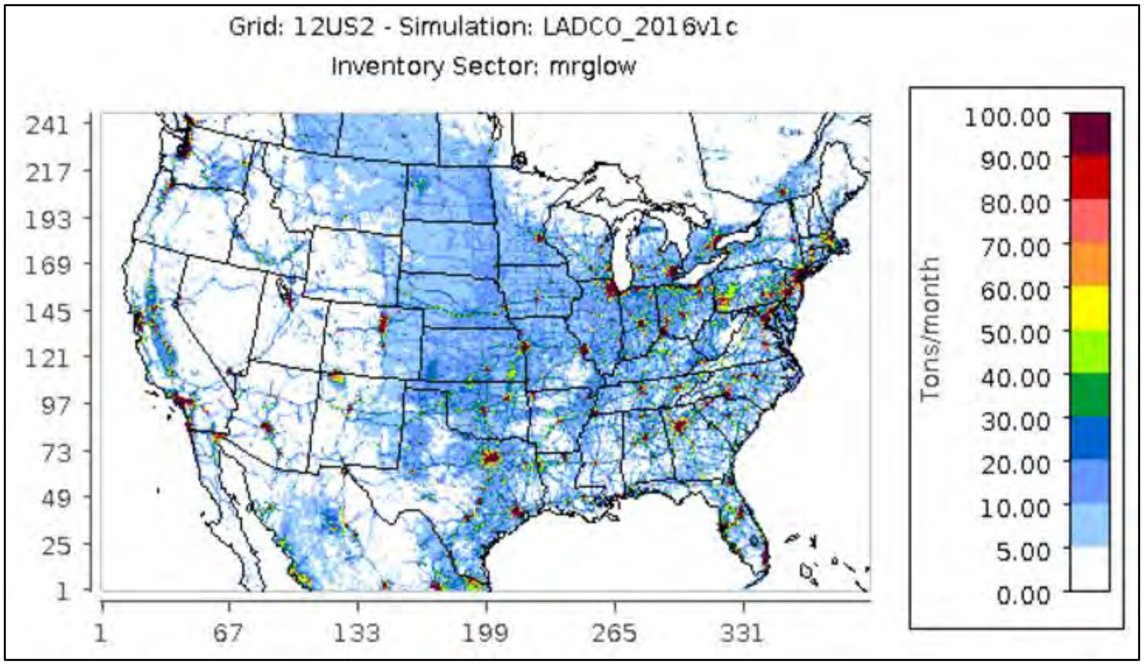

Figure 4-2. July 2016 total 12-km gridded NOx surface layer emissions (tons/month)

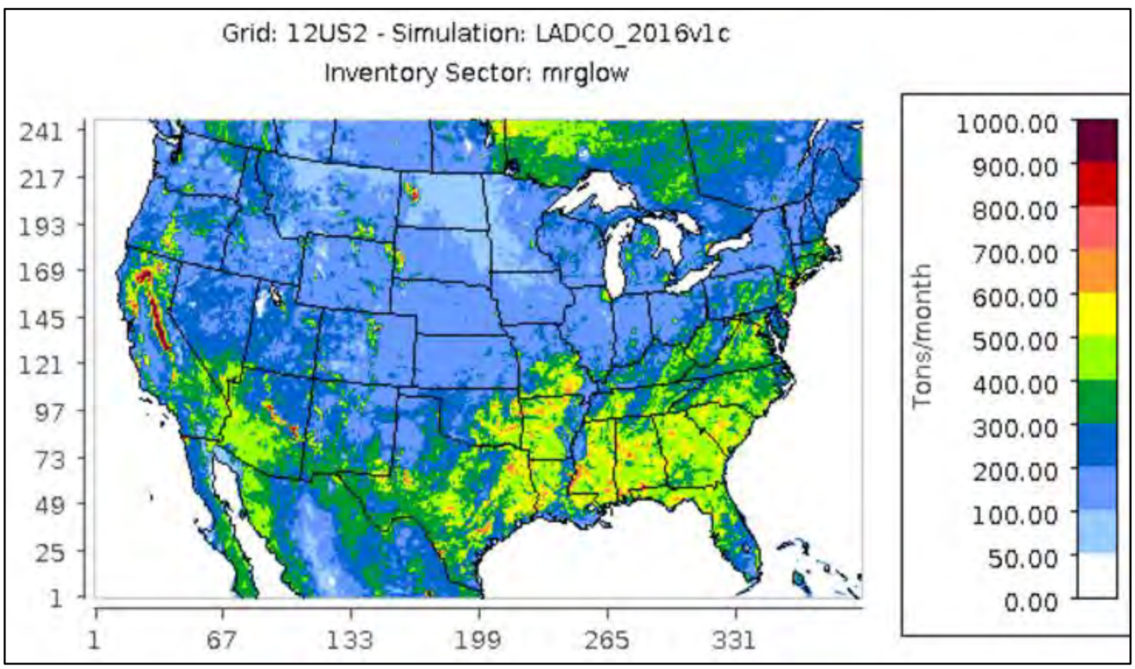

Figure 4-3. July 2016 total 12-km gridded VOC surface layer emissions (tons/month)

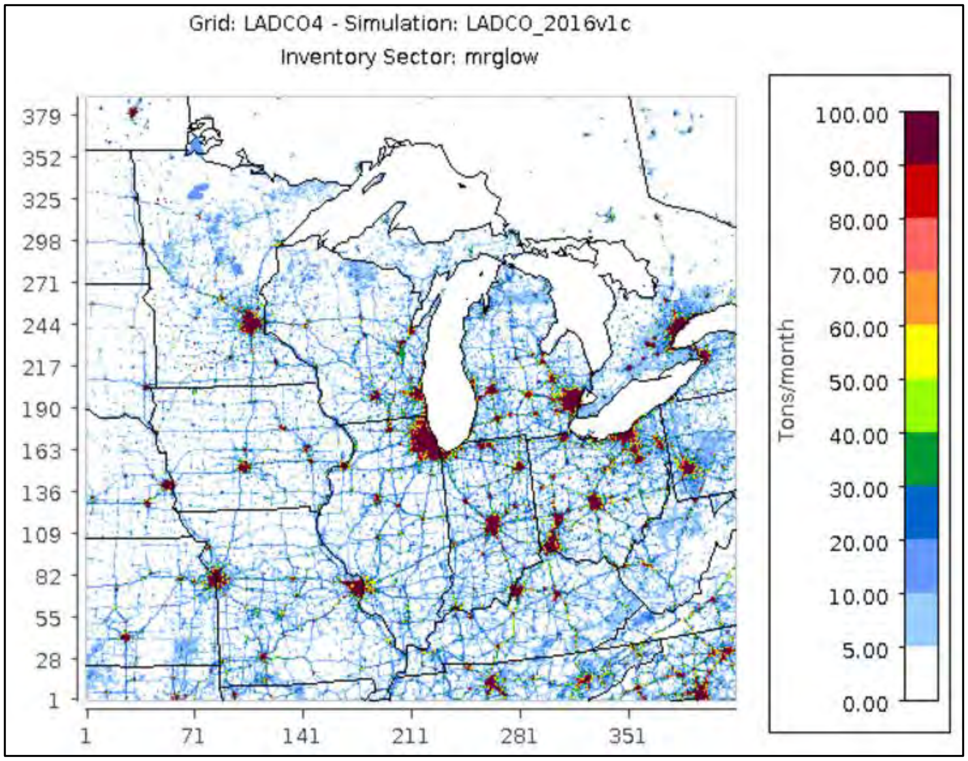

Figure 4-4. July 2016 4-km gridded CO surface layer emissions (tons/month)

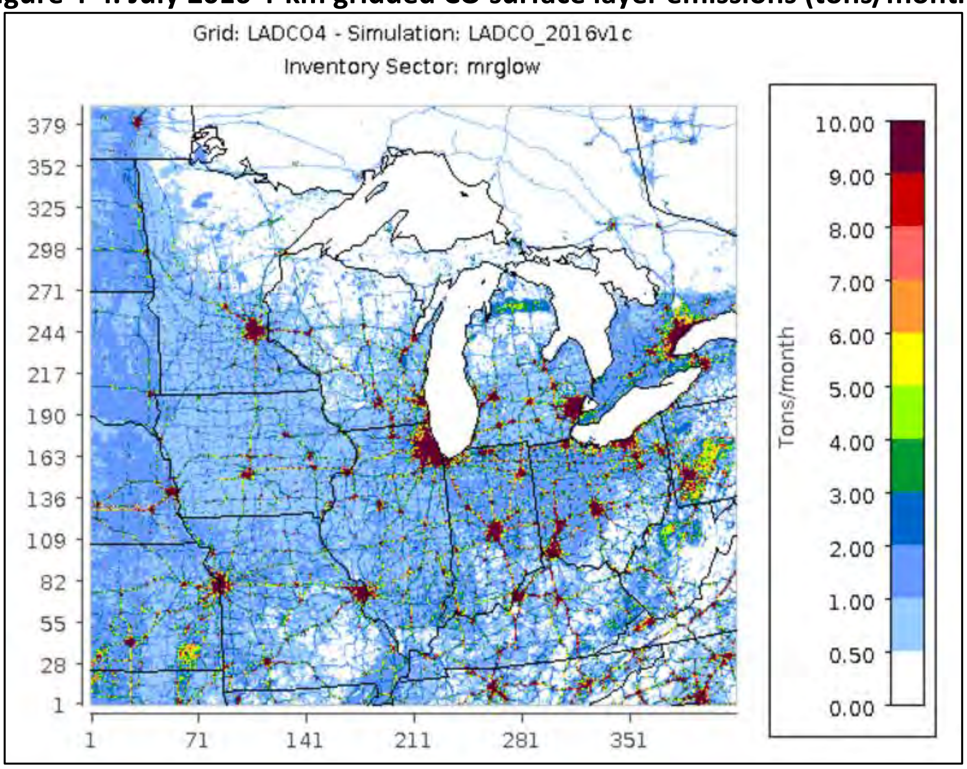

Figure 4-5. July 2016 4-km gridded NOx surface layer emissions (tons/month)

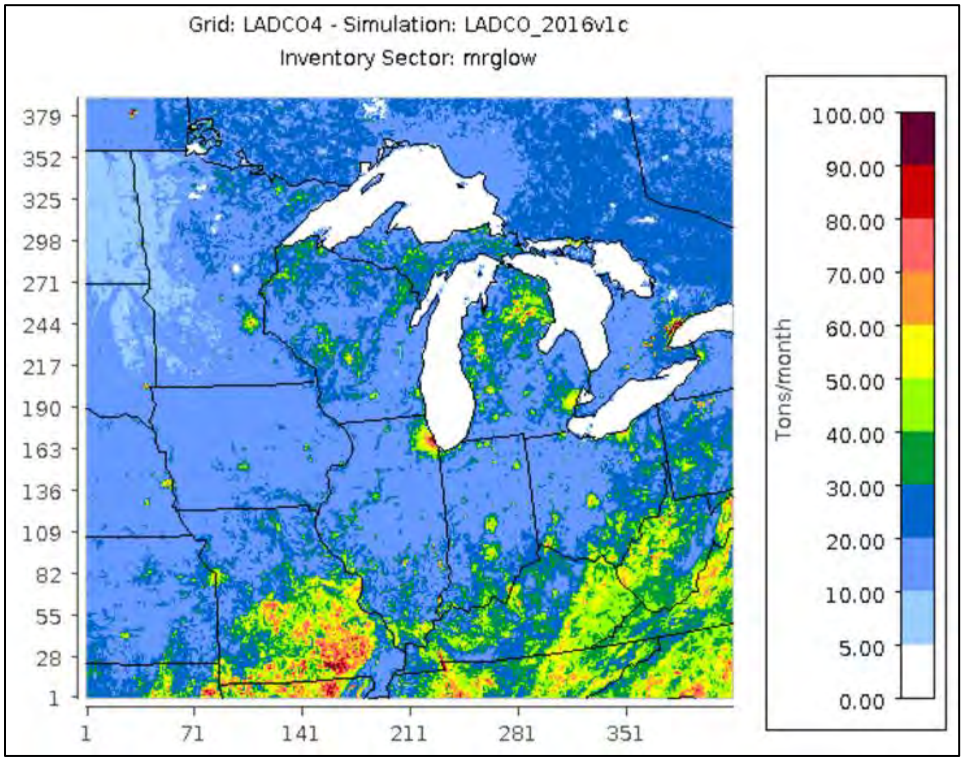

Figure 4-6. July 2016 4-km gridded VOC surface layer emissions (tons/month)

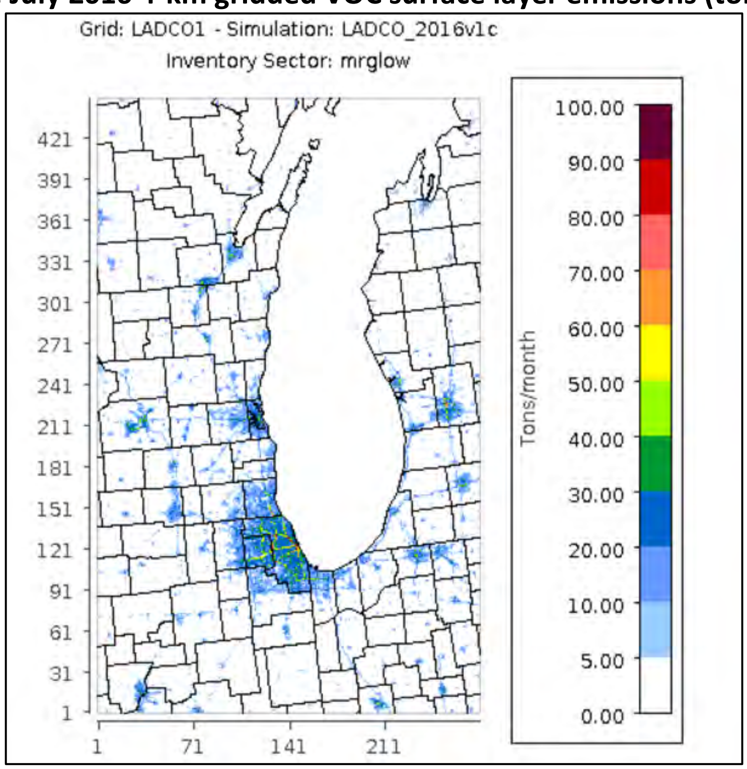

Figure 4-7. July 2016 1.33-km gridded CO surface layer emissions (tons/month)

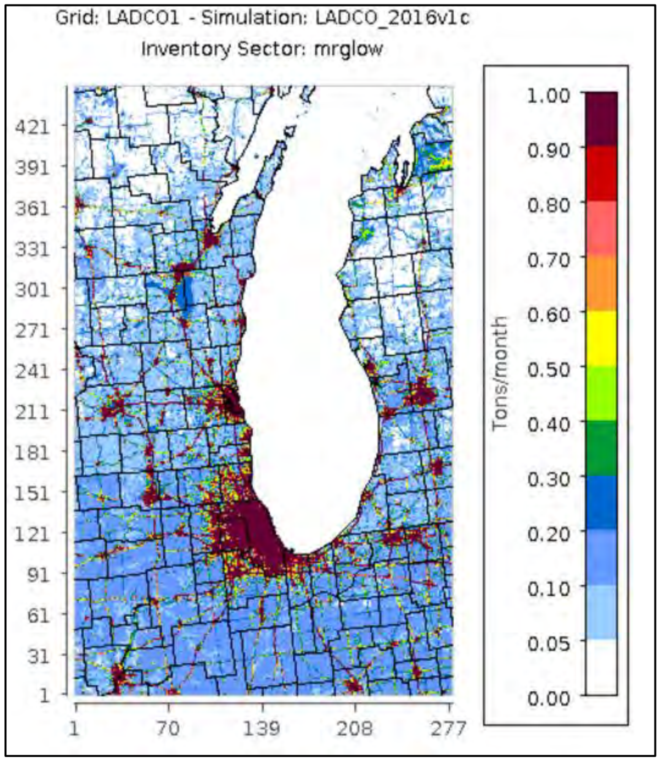

Figure 4-8. July 2016 1.33-km gridded NOx surface layer emissions (tons/month)

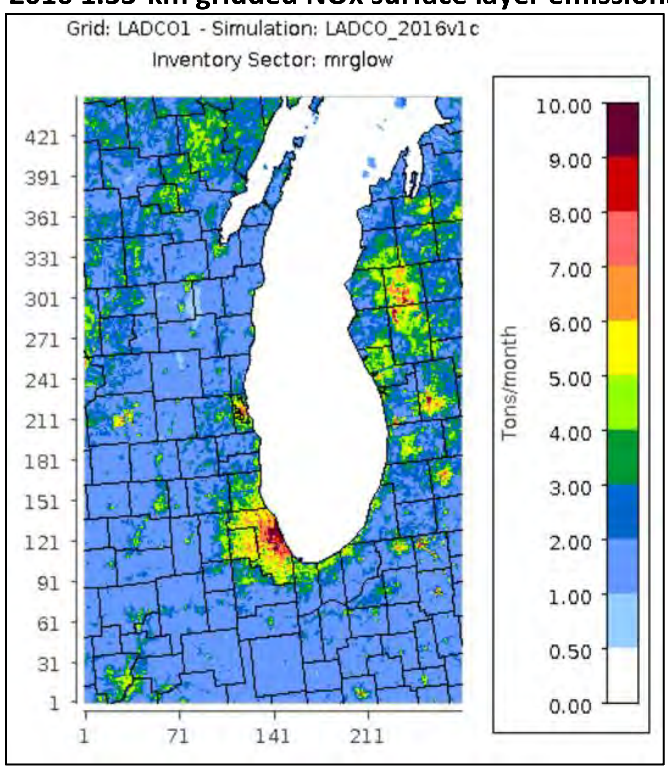

Figure 4-9. July 2016 1.33-km gridded VOC surface layer emissions (tons/month)

Table 4-2. 2016 average ozone season day CO emissions by inventory sector (tons/day)

Sector	IL	IN	MI	MN	OH	WI
Airports	91	27	44	37	45	25
Biogenic	344	220	391	424	247	313
C1/C2 Commercial Marine	2	1	2	0	1	1
C3 Commercial Marine	0	0	2	0	0	0
Nonpoint	164	112	202	118	265	157
Offroad Mobile	1,379	749	1,010	828	1,315	730
Nonpoint Oil & Gas	58	14	48		4	
Onroad Mobile	1,926	1,624	1,870	1,191	2,253	1,020
Point Oil & Gas	7	4	11	1	7	0
Agricultural Fires	1	0	1	6	0	1
Electricity Generation	29	25	30	21	40	27
Wild and Prescribed Fires	236	141	132	1,091	79	152
Industrial Point	80	543	149	38	360	56
Rail	17	8	2	7	12	5
RWC*	87	109	229	591	147	148
Total	**4,421**	**3,578**	**4,123**	**4,355**	**4,776**	**2,636**

* RWC = Residential Wood Combustion

Table 4-3. 2016 average ozone season day NOx emissions by inventory sector (tons/day)

Sector	IL	IN	MI	MN	OH	WI
Airports	27	5	10	9	6	3
Biogenic	141	77	51	104	64	59
C1/C2 Commercial Marine	16	4	13	2	7	5
C3 Commercial Marine	0	1	17	2	2	2
Nonpoint	98	24	78	47	72	42
Offroad Mobile	157	116	78	134	130	71
Nonpoint Oil & Gas	39	10	34		4	
Onroad Mobile	323	288	270	182	340	221
Point Oil & Gas	24	14	29	8	31	1
Agricultural Fires	0	0	0	0	0	0
Electricity Generation	76	182	100	46	132	41
Wild and Prescribed Fires	4	2	2	9	1	2
Industrial Point	83	110	107	62	90	55
Rail	91	43	13	38	65	28
RWC	1	1	3	7	2	2
Total	**1,082**	**876**	**805**	**652**	**946**	**533**

Table 4-4. 2016 average ozone season day VOC emissions by inventory sector (tons/day)

Sector	IL	IN	MI	MN	OH	WI
Agriculture	21	21	9	39	19	15
Airports	9	2	4	3	3	2
Biogenic	1,689	1,118	2,328	2,016	1,440	1,922
C1/C2 Commercial Marine	1	0	0	0	0	0
C3 Commercial Marine	0	0	1	0	0	0
Nonpoint	372	262	352	184	419	178
Offroad Mobile	106	59	100	94	120	80
Nonpoint Oil & Gas	161	44	62		43	
Onroad Mobile	173	150	169	105	205	90
Point Oil & Gas	4	1	4	0	5	1
Agricultural Fires	0	0	0	0	0	0
Electricity Generation	3	3	2	1	3	2
Wild and Prescribed Fires	56	33	31	256	19	36
Industrial Point	88	75	55	44	69	51
Rail	4	2	1	2	3	1
RWC	15	18	35	93	24	22
Total	**2,703**	**1,789**	**3,152**	**2,838**	**2,371**	**2,399**

4.2. 2023_{2016} Emissions Summary

The tables and figures in this section summarize the emissions used in the LADCO 2016-based 2023 CAMx simulation. Table 4-5 shows the LADCO state 2023 average OSDE for CO, NOx, and VOC for all sectors, including natural sources like biogenics and fires. Table 4-6 shows the percent difference in average OSDE between 2023 and 2016.Table 4-7 through Table 4-12 Figure 4-10 through Figure 4-24 are tile plots of the 12-km, 4-km, and 1.33-km gridded, July 2023 total CO, NOx, and VOC surface layer emissions, and emissions differences between 2023 and 2016. The difference plots show the locations where emissions are projected to change in 2023 relative to 2016. The emissions differences indicate widespread reductions across the region. The largest CO and NOx emissions reductions will occur along roadways and in urban areas; emissions increases are projected in oil and gas development regions, in Mexico, and in Canadian offshore sources in the Great Lakes. VOC emissions reductions are projected to occur in urban areas; increasing VOC emissions are expected in oil and gas development areas.

Table 4-5. 2023_{2016} average ozone season day emissions (OSDE) by state (tons/day)

State	CO	NOx	VOC
Illinois	3,799	798	2,609
Indiana	3,093	590	1,719
Michigan	3,528	578	3,049
Minnesota	3,996	493	2,772
Ohio	4,054	663	2,266
Wisconsin	2,308	367	2,339

Table 4-6. 2023-2016 percent difference in average OSDE by state

State	CO	NOx	VOC
Illinois	-14%	-26%	-3%
Indiana	-14%	-33%	-4%
Michigan	-14%	-28%	-3%
Minnesota	-8%	-24%	-2%
Ohio	-15%	-30%	-4%
Wisconsin	-12%	-31%	-3%

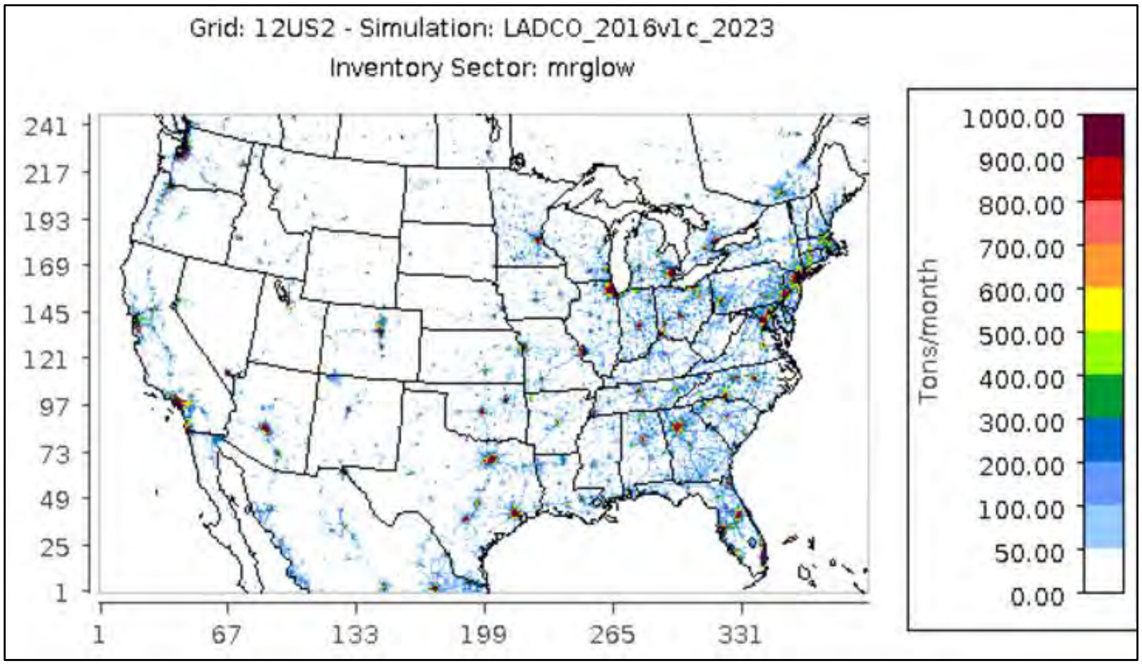

Figure 4-10. July 2023 total 12-km gridded CO surface layer emissions (tons/month).

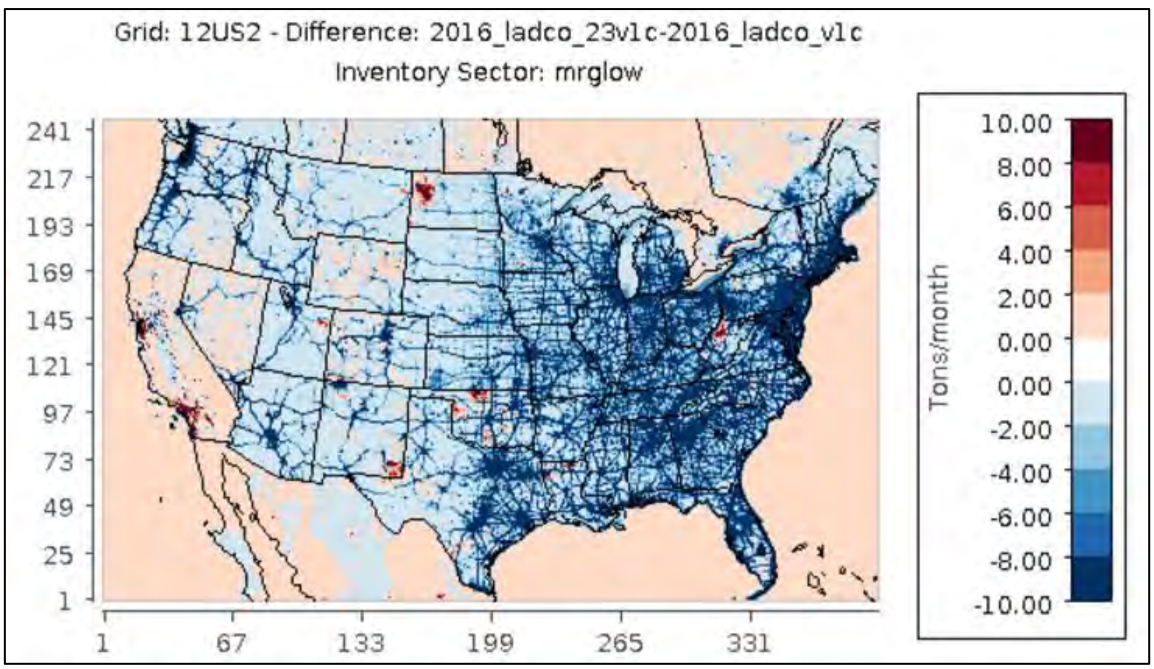

Figure 4-11. Difference (2023-2016) in July 12-km gridded CO surface layer emissions

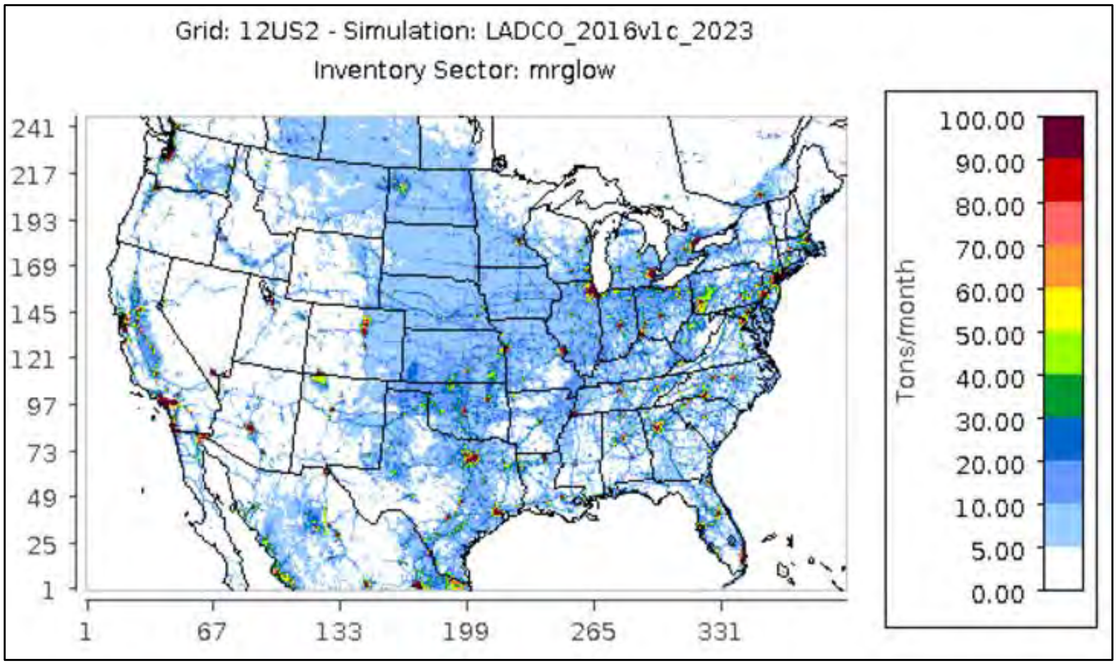

Figure 4-12. July 2023 total 12-km gridded NOx surface layer emissions (tons/month).

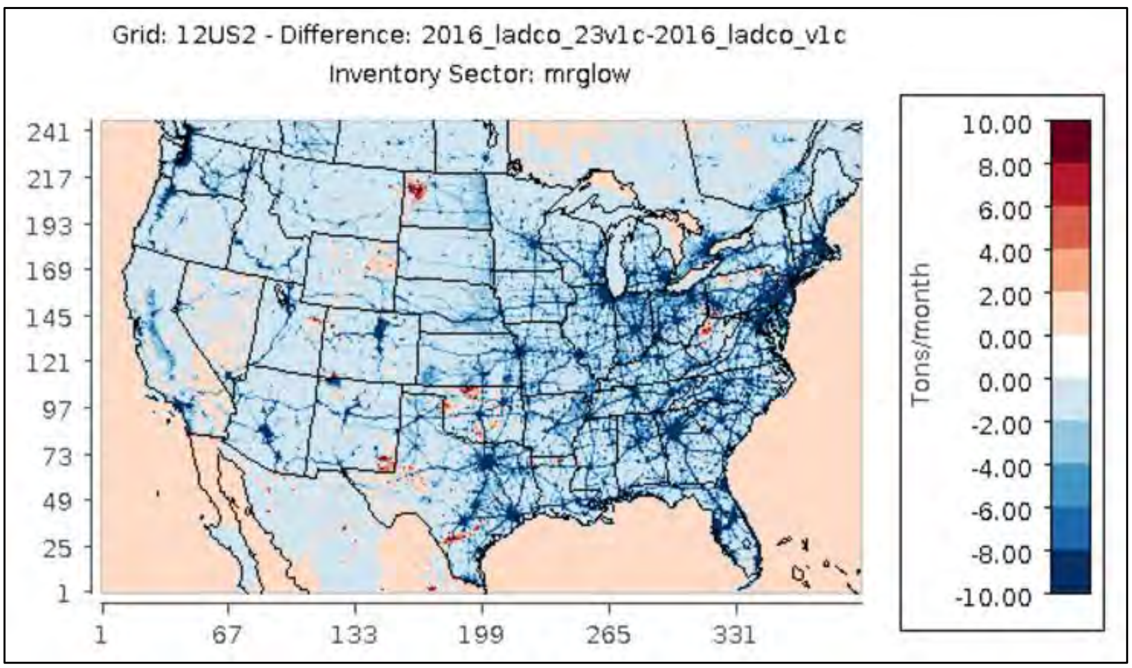

Figure 4-13. Difference (2023-2016) in July 12-km gridded NOx surface layer emissions (tons/month)

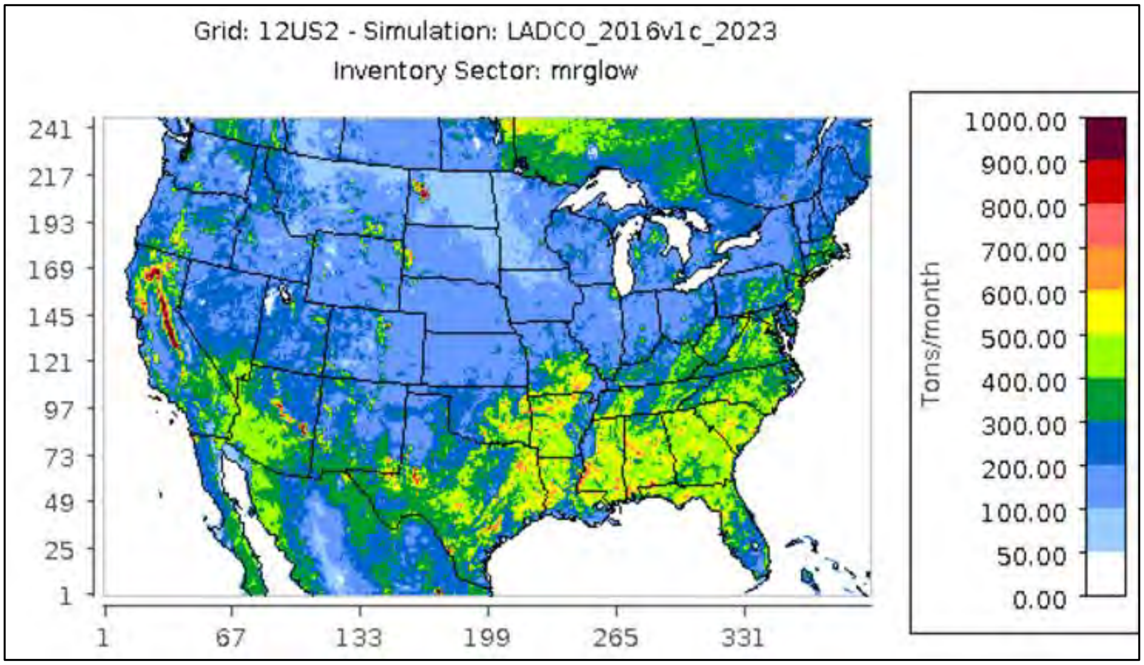

Figure 4-14. July 2023 total 12-km gridded VOC surface layer emissions (tons/month).

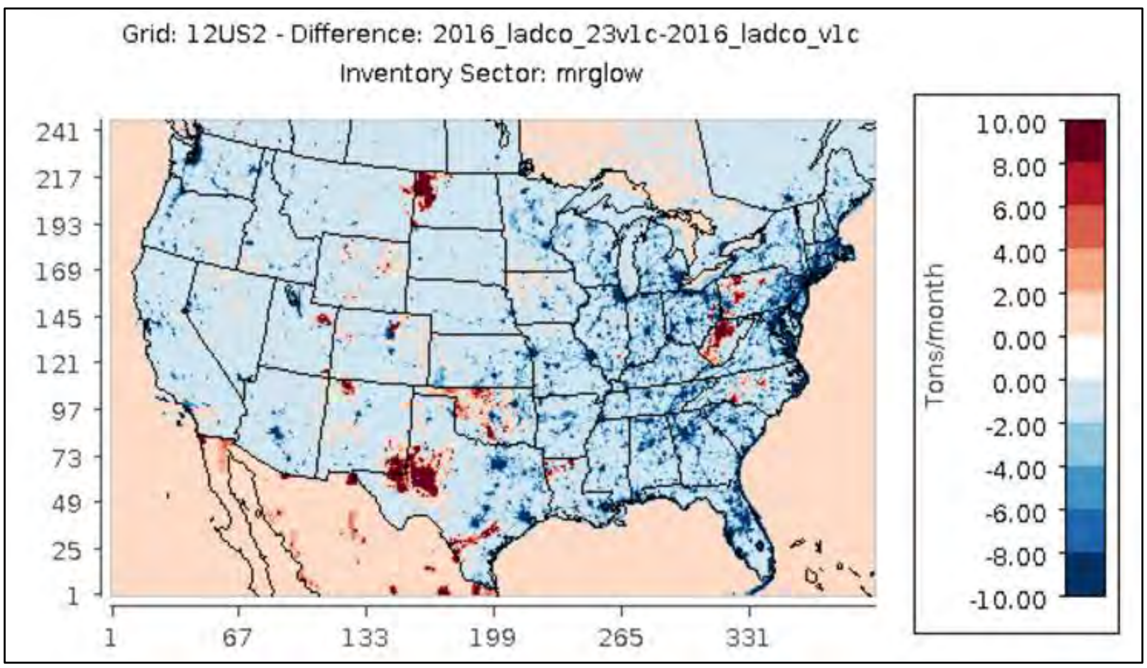

Figure 4-15. Difference (2023-2016) in July 12-km gridded VOC surface layer emissions (tons/month)

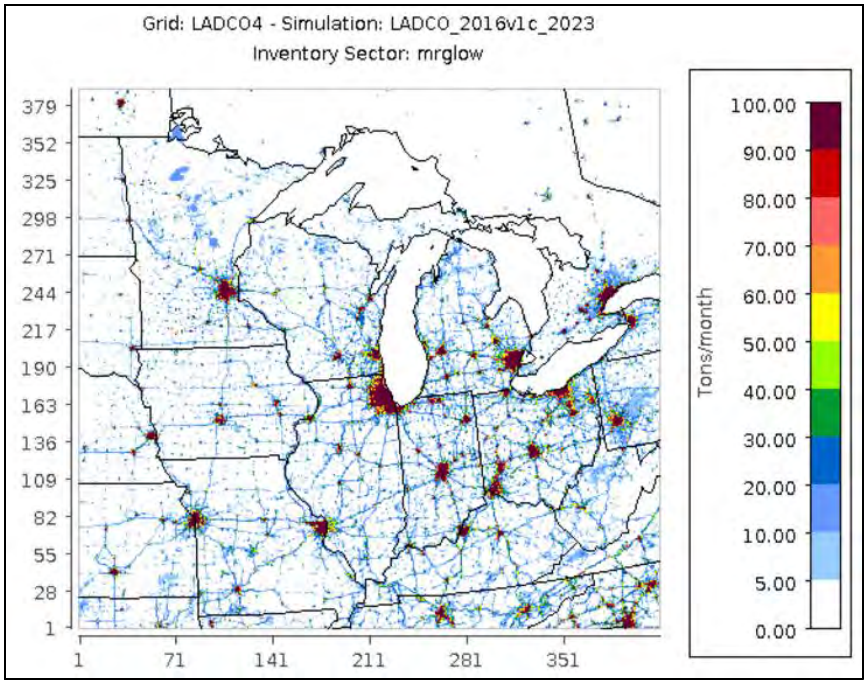

Figure 4-16. July 2023 total 4-km gridded CO surface layer emissions (tons/month).

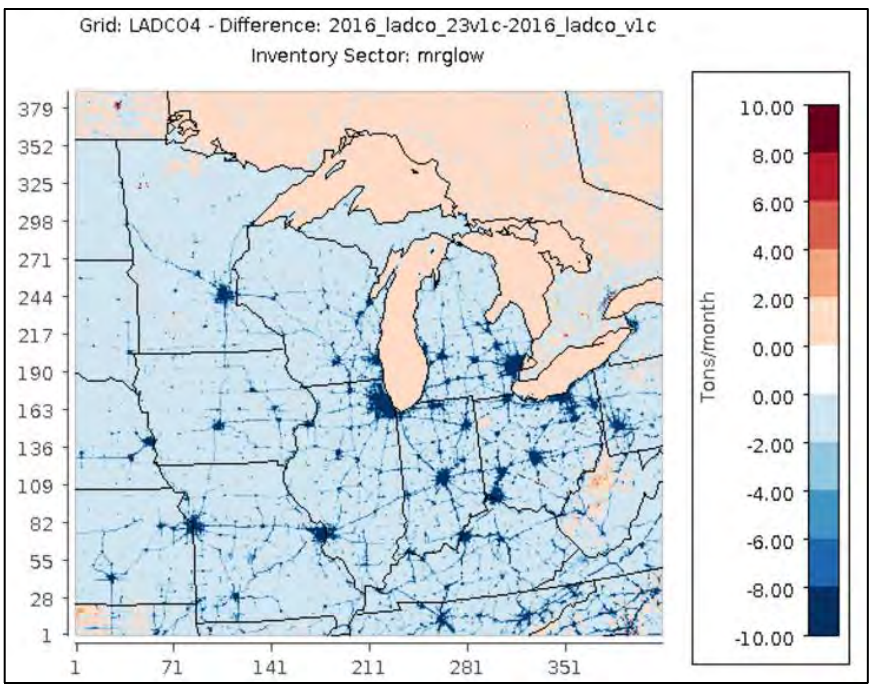

Figure 4-17. Difference (2023-2016) in July 4-km gridded CO surface layer emissions (tons/month)

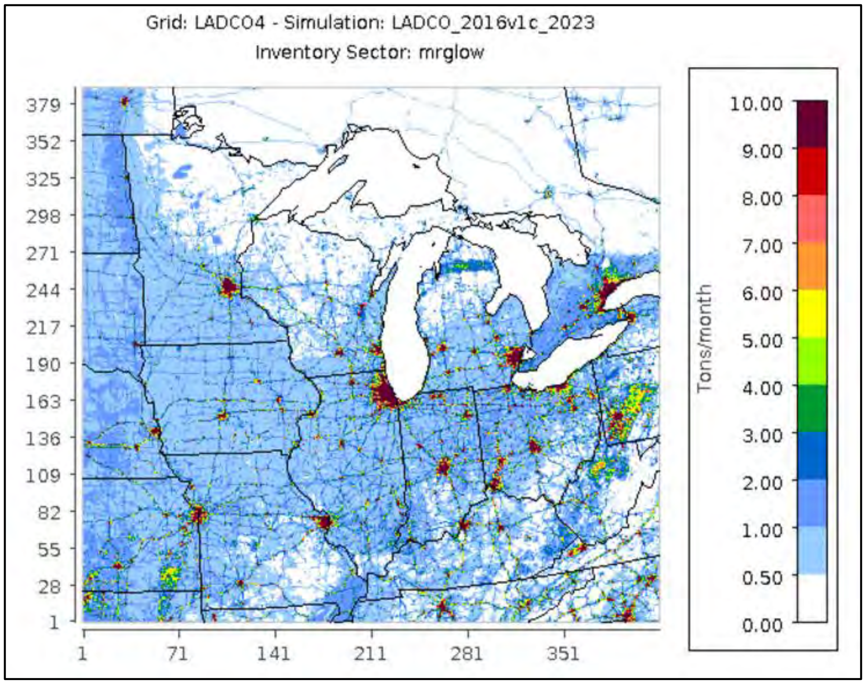

Figure 4-18. July 2023 total 4-km gridded NOx surface layer emissions (tons/month).

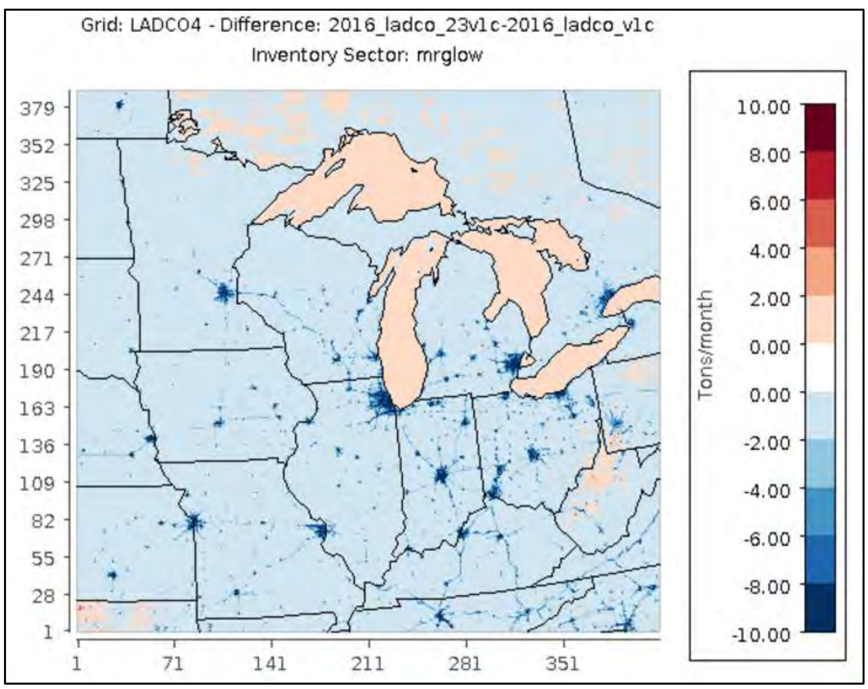

Figure 4-19. Difference (2023-2016) in July 12-km gridded NOx surface layer emissions (tons/month).

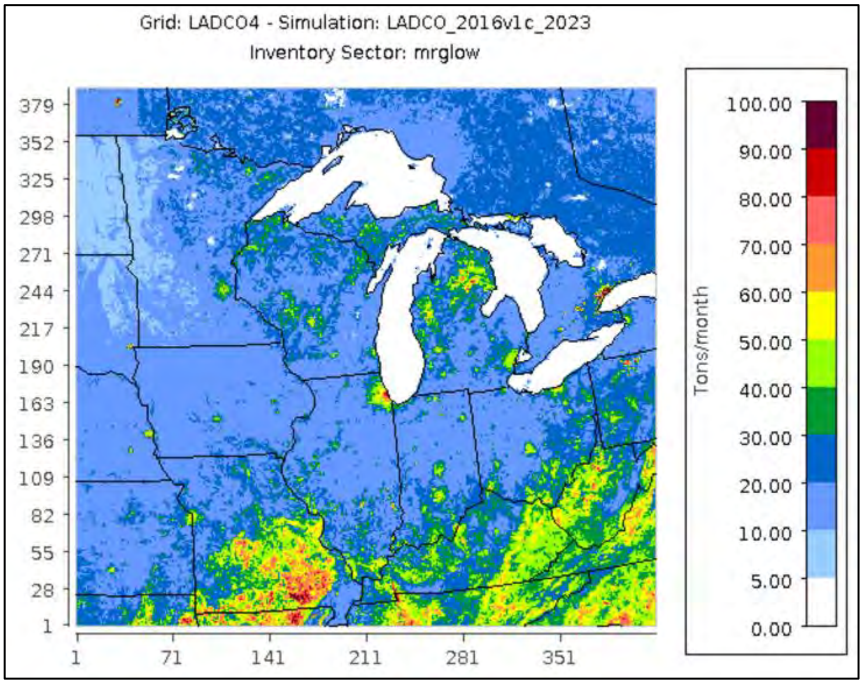

Figure 4-20. July 2023 total 4-km gridded VOC surface layer emissions (tons/month).

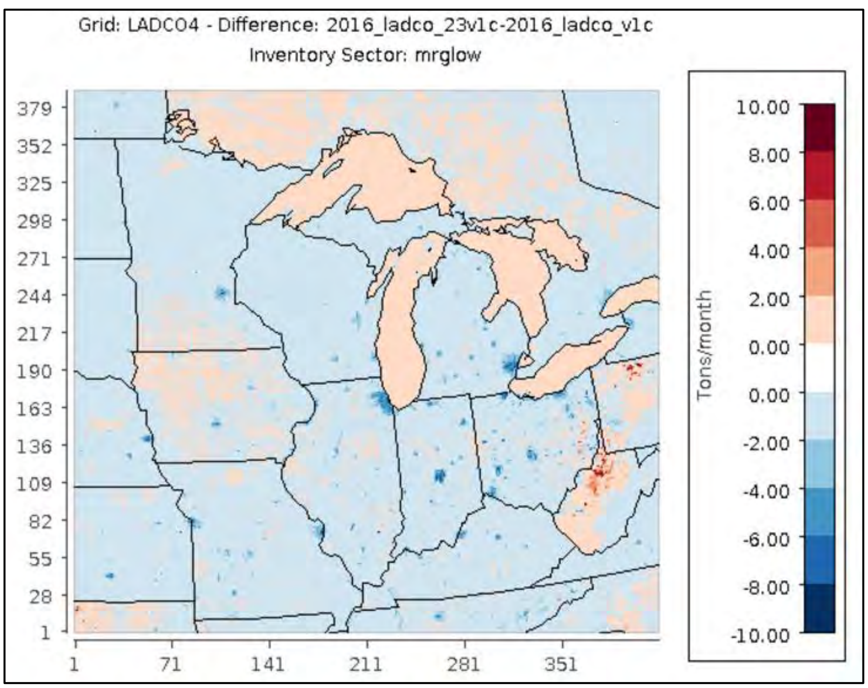

Figure 4-21. Difference (2023-2016) in July 4-km gridded VOC surface layer emissions (tons/month)

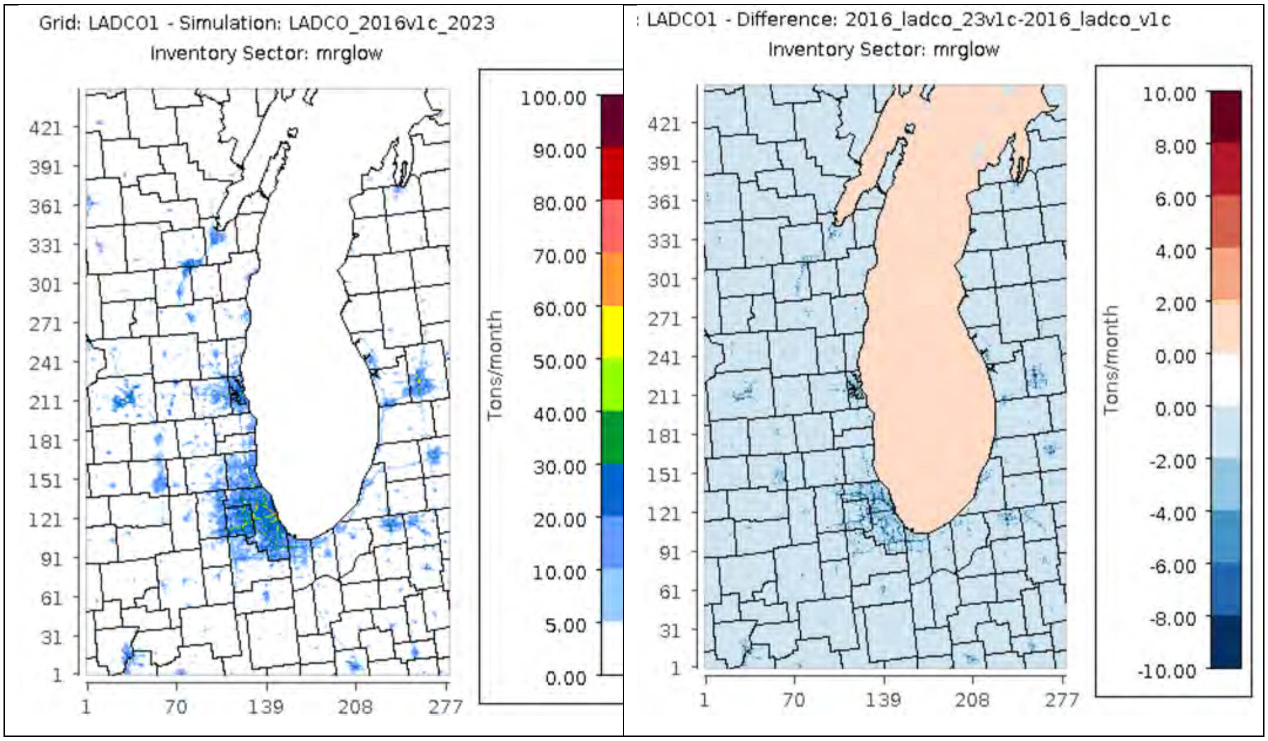

Figure 4-22. July 2023 total (left) and difference (2023-2016) [right] in 1-km gridded CO surface layer emissions (tons/month).

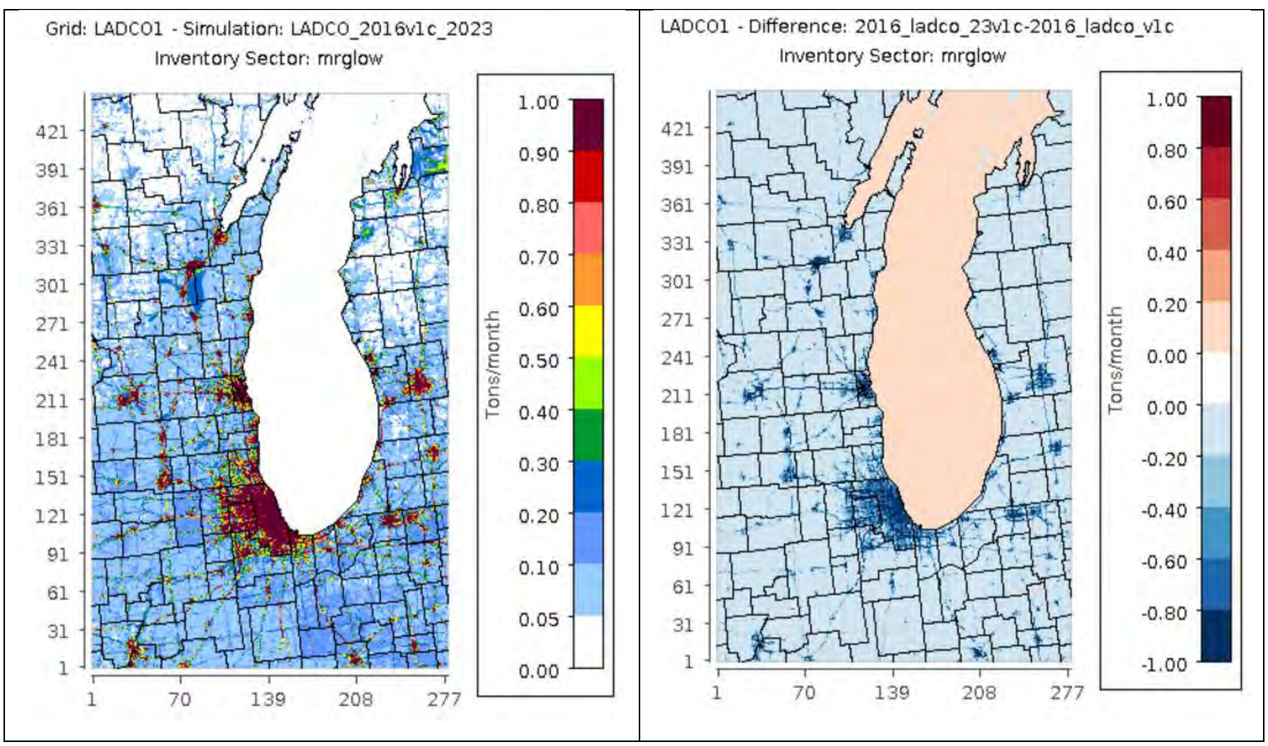

Figure 4-23. July 2023 total (left) and difference (2023-2016) [right] in 1-km gridded NOx surface layer emissions (tons/month).

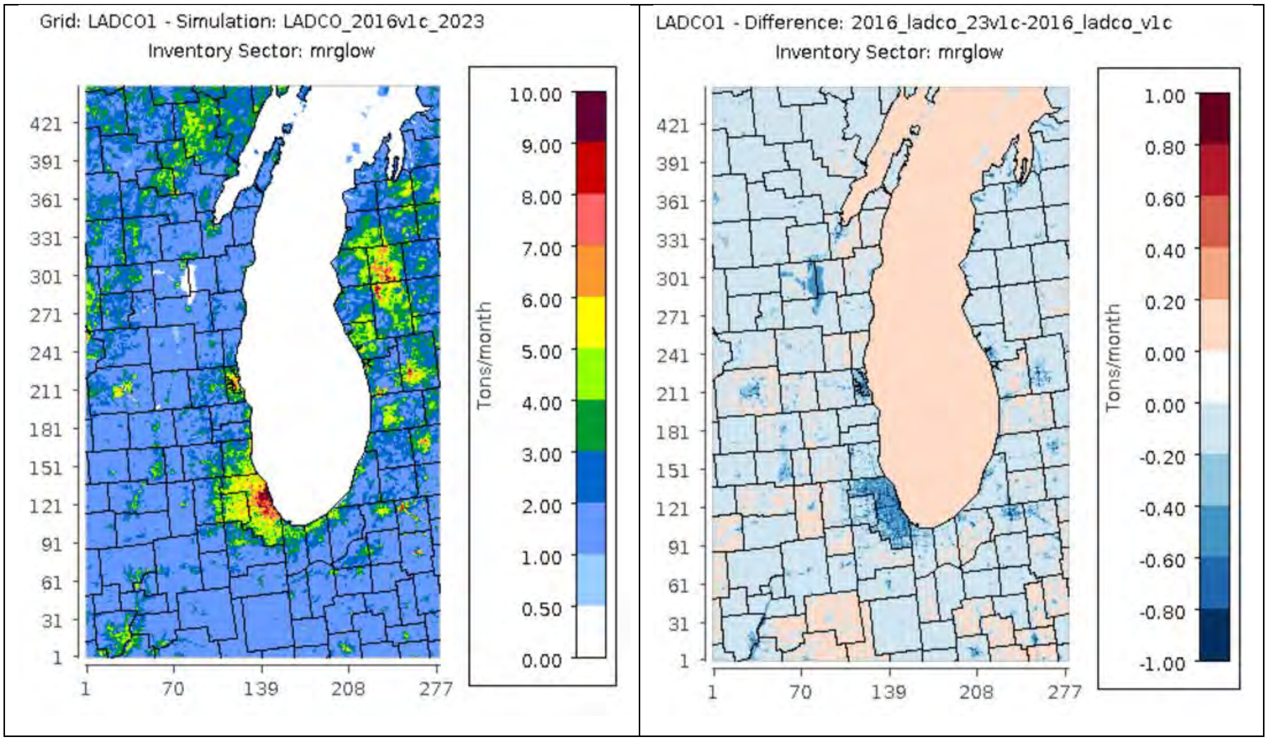

Figure 4-24. July 2023 total (left) and difference (2023-2016) [right] in 1-km gridded VOC surface layer emissions (tons/month).

Table 4-7 through Table 4-12 show the LADCO state 2023_{2016} average OSDE CO, NOx, and VOC emissions, and compare the future and base year OSDE values by state and inventory sector. Negative numbers in these tables indicate percent emissions reductions in 2023 relative to 2016. Comparisons of the EGU and industrial point source emissions changes between 2016 and 2023 is confounded by the different methods used by the U.S EPA and ERTAC EGU projection models for distinguishing EGU from non-EGU industrial point sources. ERTAC only forecasts emissions for sources with CEM data while EPA does economic projections of all units that sell power to the grid including facilities with co-generation units like paper mills and aluminum foundries. For the LADCO modeling that used ERTAC to project power plant emissions, we used the EPA 2023 inventory projections for those sources that generate power but do not have CEMs.

LADCO projects that overall CO, NOx, and VOC emissions will decrease in 2023 relative to 2016 in each of the LADCO states. The total NOx reductions range from -24% to -33% across the LADCO states, driven primarily by reductions in EGU point, onroad mobile, and offroad mobile source emissions. We project that the total VOC emissions reductions will range from -2% to -4% across the LADCO states. These reductions are driven by changes to onroad and offroad mobile sources.

Table 4-7. 2023 average ozone season day CO emissions by inventory sector (tons/day)

Sector	IL	IN	MI	MN	OH	WI
Airports	101	26	47	40	45	27
Biogenic	344	220	391	424	247	313
C1/C2 Commercial Marine	2	1	2	0	1	1
C3 Commercial Marine	0	0	2	0	0	0
Nonpoint	163	112	201	119	265	157
Offroad Mobile	1,355	747	975	810	1,283	699
Nonpoint Oil & Gas	55	13	43		6	
Onroad Mobile	1,339	1,141	1,322	858	1,572	723
Point Oil & Gas	9	5	12	1	10	0
Agricultural Fires	1	0	1	6	0	1
Electricity Generation	17	27	22	14	28	27
Wild and Prescribed Fires	236	141	132	1,091	79	152
Industrial Point	81	545	150	40	362	56
Rail	17	8	2	7	12	5
RWC	81	106	227	586	143	147
Total	**3,799**	**3,093**	**3,528**	**3,996**	**4,054**	**2,308**

Table 4-8. Percent difference between base and future year (2023-2016) average ozone season day CO emissions

Sector	IL	IN	MI	MN	OH	WI
Airports	11%	-3%	7%	6%	0%	6%
Biogenic	0%	0%	0%	0%	0%	0%
C1/C2 Commercial Marine	-1%	-1%	-1%	-1%	-1%	-1%
C3 Commercial Marine	15%	15%	15%	15%	15%	15%
Nonpoint	-1%	0%	0%	0%	0%	0%
Offroad Mobile	-2%	0%	-4%	-2%	-2%	-4%
Nonpoint Oil & Gas	-4%	-4%	-11%		74%	
Onroad Mobile	-31%	-30%	-29%	-28%	-30%	-29%
Point Oil & Gas	25%	36%	1%	0%	32%	41%
Agricultural Fires	0%	0%	0%	0%	0%	0%
Electricity Generation	-43%	6%	-26%	-34%	-31%	0%
Wild and Prescribed Fires	0%	0%	0%	0%	0%	0%
Industrial Point	1%	0%	0%	4%	1%	0%
Rail	1%	2%	0%	1%	1%	1%
RWC	-7%	-3%	-1%	-1%	-3%	-1%
Total	-14%	-14%	-14%	-8%	-15%	-12%

Table 4-9. 2023 average ozone season day NOx emissions by inventory sectors (tons/day)

Sector	IL	IN	MI	MN	OH	WI
Airports	34	6	13	11	7	4
Biogenic	141	77	51	104	64	59
C1/C2 Commercial Marine	11	3	9	2	5	4
C3 Commercial Marine	0	1	19	2	2	2
Nonpoint	94	23	75	47	70	41
Offroad Mobile	99	72	55	90	86	48
Nonpoint Oil & Gas	37	9	30		7	
Onroad Mobile	157	140	125	86	157	98
Point Oil & Gas	27	20	31	8	36	2
Agricultural Fires	0	0	0	0	0	0
Electricity Generation	34	88	53	29	83	27
Wild and Prescribed Fires	4	2	2	9	1	2
Industrial Point	82	112	101	67	87	54
Rail	77	36	11	32	55	24
RWC	1	1	3	7	2	2
Total	**798**	**590**	**578**	**493**	**663**	**367**

Table 4-10. Percent difference between base and future year (2023-2016) average ozone season day NOx emissions

Sector	IL	IN	MI	MN	OH	WI
Airports	24%	19%	25%	17%	13%	27%
Biogenic	0%	0%	0%	0%	0%	0%
C1/C2 Commercial Marine	-29%	-29%	-29%	-29%	-29%	-29%
C3 Commercial Marine	9%	9%	9%	9%	9%	9%
Nonpoint	-4%	-2%	-4%	-1%	-4%	-3%
Offroad Mobile	-37%	-38%	-29%	-33%	-33%	-32%
Nonpoint Oil & Gas	-4%	-5%	-12%		68%	
Onroad Mobile	-51%	-51%	-54%	-53%	-54%	-56%
Point Oil & Gas	12%	42%	5%	-3%	16%	20%
Agricultural Fires	0%	0%	0%	0%	0%	0%
Electricity Generation	-56%	-52%	-47%	-37%	-38%	-34%
Wild and Prescribed Fires	0%	0%	0%	0%	0%	0%
Industrial Point	-2%	1%	-6%	7%	-3%	-2%
Rail	-15%	-15%	-11%	-16%	-16%	-16%
RWC	-3%	1%	3%	2%	2%	3%
Total	-26%	-33%	-28%	-24%	-30%	-31%

Table 4-11. 2023 average ozone season day VOC emissions by inventory sectors (tons/day)

Sector	IL	IN	MI	MN	OH	WI
Agriculture	23	23	10	42	21	15
Airports	10	2	4	4	3	2
Biogenic	1,689	1,118	2,328	2,016	1,440	1,922
C1/C2 Commercial Marine	1	0	0	0	0	0
C3 Commercial Marine	0	0	1	0	0	0
Nonpoint	377	265	352	188	424	180
Offroad Mobile	82	48	70	64	89	54
Nonpoint Oil & Gas	157	44	59		48	
Onroad Mobile	102	86	98	61	119	53
Point Oil & Gas	5	1	4	1	7	1
Agricultural Fires	0	0	0	0	0	0
Electricity Generation	2	3	2	1	2	1
Wild and Prescribed Fires	56	33	31	256	19	36
Industrial Point	89	76	54	45	68	52
Rail	3	2	1	1	2	1
RWC	14	18	34	93	24	22
Total	**2,609**	**1,719**	**3,049**	**2,772**	**2,266**	**2,339**

Table 4-12. Percent difference between base and future year (2023-2016) average ozone season day VOC emissions

Sector	IL	IN	MI	MN	OH	WI
Agriculture	10%	8%	6%	8%	8%	2%
Airports	10%	3%	6%	5%	-2%	5%
Biogenic	0%	0%	0%	0%	0%	0%
C1/C2 Commercial Marine	-32%	-31%	-32%	-32%	-32%	-32%
C3 Commercial Marine	15%	15%	15%	15%	15%	15%
Nonpoint	1%	1%	0%	2%	1%	1%
Offroad Mobile	-23%	-19%	-29%	-32%	-26%	-32%
Nonpoint Oil & Gas	-2%	0%	-5%		12%	
Onroad Mobile	-41%	-43%	-42%	-41%	-42%	-41%
Point Oil & Gas	40%	50%	6%	10%	56%	45%
Agricultural Fires	0%	0%	0%	0%	0%	0%
Electricity Generation	-49%	-8%	-1%	-27%	-24%	-18%
Wild and Prescribed Fires	0%	0%	0%	0%	0%	0%
Industrial Point	1%	2%	0%	3%	-1%	0%
Rail	-21%	-20%	-13%	-22%	-22%	-22%
RWC	-4%	-2%	-1%	-1%	-2%	-1%
Total	-3%	-4%	-3%	-2%	-4%	-3%

4.2.1. LADCO 2023 Electricity Generating Unit Emissions

The ERTAC EGU model was developed using EGU activity pattern matching algorithms designed to provide hourly EGU emissions data for air quality planning. The original goal of the model was to create low-cost software that air quality planning agencies could use for developing EGU emissions projections. States needed a transparent model that was numerically stable and did not produce dramatic changes to the emissions forecasts with small changes in inputs. A key feature of the model includes data transparency; all the inputs to the model are publicly available. The code is also operationally transparent and includes extensive documentation, open source code, and a diverse user community to support new users of the software.

Operation of the ERTAC EGU model is straightforward given the complexity of the projection calculations and inputs. The model imports base year CEM data from U.S. EPA and sorts the data from the peak to the lowest generation hour. It applies hour-specific growth rates that include peak and off-peak rates. The model then balances the system for all units and hours that exceed physical or regulatory limits. ERTAC EGU applies future year controls to the emissions estimates and tests for reserve capacity, generates quality assurance reports, and converts the outputs to SMOKE-ready modeling files.

ERTAC EGU has distinct advantages over other EGU growth methodologies because it can generate hourly future year estimates that are key to understanding O_3 episodes. The model does not shutdown or mothball existing units because economics algorithms suggest they are not economically viable. Additionally, alternate control scenarios are easy to simulate with the model. In recent years significant effort has been put into the model to help users to prevent the generation of new coal plants to fit demand. The model allows portability of generation to different fuels like renewables and natural gas to prevent this.

Differences between the U.S. EPA and ERTAC EGU emissions forecasts arise from alternative forecast algorithms and from the data used to inform the model predictions. The U.S. EPA based the EGU emissions forecast in their 2016fh modeling platform on comments from states and stakeholders received through Spring 2020. ERTAC EGU 16.2 beta used CEM data from 2016 and state-reported changes to EGUs received through July 2021. The ERTAC EGU 16.2 beta emissions used for this modeling application represented the best available information on EGU forecasts for the Midwest and Eastern U.S. that was available in September 2021.

4.3. Emissions Summaries by Nonattainment Area

Table 4-13 presents average OSDE for CO, NOx, and VOC in 2016 and 2023 for each of the 2015 O_3 NAAQS NAAs in the LADCO region. These emissions include all sources, anthropogenic and natural, in the entirety of the counties contained in each NAA. The emissions in this table include the total county emissions and do not reflect partial county totals for those NAAs that have partial-county designations.

Table 4-13. Average ozone season day emissions by nonattainment area (tons/day)

State and NAA	CO		NOX		VOC	
	2016	2023	2016	2023	2016	2023
Illinois						
Chicago, IL	2,130	1,845	393	283	503	467
Indiana						
Chicago, IN	668	635	93	77	72	68
Kentucky						
Cincinnati, OH-KY	123	108	31	24	55	53
Michigan						
Allegan, MI	59	49	11	8	46	44
Berrien, MI	69	56	12	8	30	28
Muskegon, MI	66	54	9	6	40	37
Missouri						
St. Louis, MO-IL	759	650	156	113	340	326
Ohio						
Cleveland, OH	892	750	131	91	267	249
Wisconsin						
Chicago, WI	43	36	13	6	16	15
Milwaukee/Ozaukee, WI	458	406	82	60	130	123
Sheboygan, WI	41	35	10	5	19	18

5. Model Performance Evaluation

5.1. WRF 2016 Meteorology Modeling Performance Evaluation

LADCO used the WRF version 3.9.1.1 model (Advanced Research WRF dynamic core WRF-ARW) to simulate meteorology on 12-km, 4-km, and 1.33-km domains focused on the Great Lakes Basin for the year 2016. The physics options for the LADCO WRF simulation were based on the best performing configuration identified through a collaboration with University of Wisconsin researchers through a NASA Health and Air Quality (HAQ) program grant-funded project.

LADCO conducted qualitative and quantitative analysis to assess operational performance of the 2016 WRF modeling. Focus of this analysis is on the LADCO region. For the 4-km domains, LADCO evaluated the WRF performance by state; and for the 1.33 domains LADCO evaluated the performance across all monitors in the entire domain. LADCO compared modeled surface pressure, precipitation, and wind vectors against observations by season and for high-concentration ozone episodic events. We also performed a detailed analysis of the model during lake breeze events at the shoreline monitors of Lake Michigan and Lake Erie.

LADCO found that the 12-km and 4-km WRF simulations adequately captured the observed meso- and synoptic-scale processes during high-concentration ozone periods. The LADCO WRF 2016 output fields represent a reasonable approximation of the actual meteorology that occurred in 2016. While the WRF performance statistics for the 12-km grid resolution simulation are within the acceptable performance benchmarks, the simulation has a cold and dry bias in the summer across much of the Eastern U.S. For the 4-km WRF simulation all the summer season metrics, except for wind direction error, fall within the simple terrain model performance benchmarks; the wind direction error falls within the complex terrain benchmark (Table 5-1).

Table 5-1. 2016 summer season (JJA) 4-km WRF model performance for the LADCO states

State*	Temp2m (K)		MixingRatio2m (g/kg)		WS10m (m/s)		WD10m (degrees)	
	MAE	MB	MAE	MB	MAE	MB	MAE	MB
IL	1.0	0.1	1.2	-0.5	1.0	0.1	35.3	3.6
IN	1.1	0.1	1.4	-0.1	0.9	0.1	35.4	3.8
MI	1.2	0.0	1.0	0.0	1.0	0.1	34.4	5.5
MN	1.2	0.0	1.1	-0.1	1.1	0.2	33.4	4.0
OH	1.2	0.0	1.3	-0.3	0.9	-0.1	37.5	8.5
WI	1.2	-0.1	1.1	0.0	1.0	0.3	32.0	4.6

*Green shading indicates a metric that meets the performance benchmarks for simple conditions, orange for complex conditions, and red for outside of the performance benchmarks

The LADCO 1.33 km WRF simulations had very good model performance with low errors for all variables and biases near zero (Table 5-2). Both errors and biases for temperature and specific humidity at the 12-km grid resolution are reduced by about 20% at the 4-km resolution. Model performance remains about the same for the wind speed and direction when going from 12-km to 4-km resolution. There was not an appreciative improvement in model performance for the analyzed variables between the 4-km and 1.33-km resolution simulations.

Table 5-2. 2016 seasonal average 1.33-km WRF model performance statistics

Season*	Temp2m (K)		MixingRatio2m (g/kg)		WS10m (m/s)		WD10m (degrees)	
	MAE	MB	MAE	MB	MAE	MB	MAE	MB
	1.33 km d03: Lake Michigan							
Spring (AM)	1.3	0.0	0.9	0.5	1.3	0.1	34.1	1.1
Summer (JJA)	1.3	0.1	1.2	0.2	1.1	0.1	32.8	3.4
Fall (SO)	1.2	0.0	0.8	0.0	1.2	0.3	31.1	-0.1
	1.33 km d04: Detroit and Ohio River Valley							
Spring (AM)	1.3	-0.2	1.1	0.6	1.2	0.1	37.0	1.7
Summer (JJA)	1.3	0.7	1.3	0.3	1.1	0.0	37.1	5.1
Fall (SO)	1.3	0.0	0.8	-0.1	1.1	0.1	36.9	1.6

*Green shading indicates a metric that meets the performance benchmarks for simple conditions, orange

Analysis of WRF performance at shoreline monitors during lake breeze events showed that the model successfully reproduced the surface conditions. LADCO developed a CART statistical model using data from selected surface stations on the shorelines of Lake Michigan and Lake Erie for predicting lake-breeze days. The CART lake breeze model prediction accuracies were

92% for Lake Michigan and 82% for Lake Erie, on average. LADCO used the CART model to determine the typical meteorological conditions and indicators for lake-breeze days along the shores of Lake Michigan and Lake Erie. The model identified wind direction and 2-m temperature as the top two variables for explaining lake breeze vs. non-lake breeze events in the Lake Michigan shore, while 2-m temperature, wind speed, and specific humidity were the variables most associated with the lake breeze along the south shore of Lake Erie. WRF performed well predicting temperature, moisture, and winds at the shoreline monitors of both lakes during lake breeze events (Table 5-3). The WRF model errors and biases are within the WRF performance benchmarks for temperature, specific humidity and wind speed, and less than 30-degree errors for wind direction. The model performance is slightly degraded on the lake-breeze days compared to the non-lake breeze days on shoreline of Lake Michigan, while opposite is true on the south shore of Lake Erie. The errors and biases for lake breeze days were slightly improved at finer grids in Lake Michigan and Lake Erie shore.

Table 5-3. Average WRF model performance summary for lake breeze and non-lake breeze days along the shoreline of Lake Michigan

Variable*	Lake Breeze		Non-Lake Breeze	
	MAE	MB	MAE	MB
Temp2m	1.24	0.50	1.06	0.21
MixingRatio2m	1.30	-0.65	1.06	-0.41
Wind speed10m	1.14	-0.68	1.14	-0.73
Wind direction10m	25.93	1.73	22.29	-2.05

*Green shading indicates a metric that meets the performance benchmarks for simple conditions, orange

Additional details and results for the LADCO 2016 WRF model performance analysis are available in the LADCO Weather Research and Forecast 2016 Meteorological Model Simulation and Evaluation TSD (https://www.ladco.org/technical/modeling/ladco-2016-wrf-modeling).

5.2. CAMx 2016 Ozone Modeling Performance Evaluation

The CAMx model performance evaluation (MPE) results presented in this section establish the validity of the photochemical modeling platform that LADCO developed to support O_3 planning in the Great Lakes region. The MPE results are presented by increasing spatial resolution, first from a regional perspective, averaged across each state, and then by 2015 O_3 NAAQS nonattainment area.

LADCO simulated the April 1 – October 31, 2016 with CAMx using the 2016 CAMx modeling platform described previously. Figure 5-1 summarizes ground level O_3 concentrations during the 2016 O_3 season across the 2015 O_3 NAAQS NAAs in the LADCO region. The first high concentration O_3 episode in the season was a regional event in the middle of April. The last O_3 episode happened September 21-23 in the southern part of the LADCO domain. The model performance evaluation presented here will focus on April through September as these were the months in 2016 that experienced high O_3 concentration periods in this region.

5.2.1. Regional Model Performance Evaluation

Figure 5-2 is a set of spatial plots of monthly MDA8 O_3 normalized mean bias (NMB) for the LADCO 4-km CAMx simulation. Each colored symbol in the figure is an AQS or CASTNet monitoring location. Cool colors represent monitors at which the observed MDA O_3 concentrations were underestimated by the CAMx simulation; warm colors represent where CAMx overestimated the observations. Grey and lighter shades represent low bias, or acceptable model performance, relative to the model performance goals discussed in Section 3.7.2. The CAMx average monthly MDA8 O_3 NMB plots shown in Figure 5-2 reveal a seasonal trend in the bias. Early in the O_3 season (April – June) CAMx underpredicted O_3 throughout the LADCO region. For many of the northern and near-shore monitors in the LADCO region the monthly averaged NMB values miss the model performance criteria for O_3 (+/- 15%) in April. In the latter part of the season (July – September), CAMx overpredicted O_3 at most of the monitors in the region. The overpredictions in the later months of the season are worse in the southern and eastern areas of the LADCO region. The model misses the NMB O_3 performance criteria for sites in St. Louis, Ohio River valley, Indianapolis, and most of Ohio in August and September.

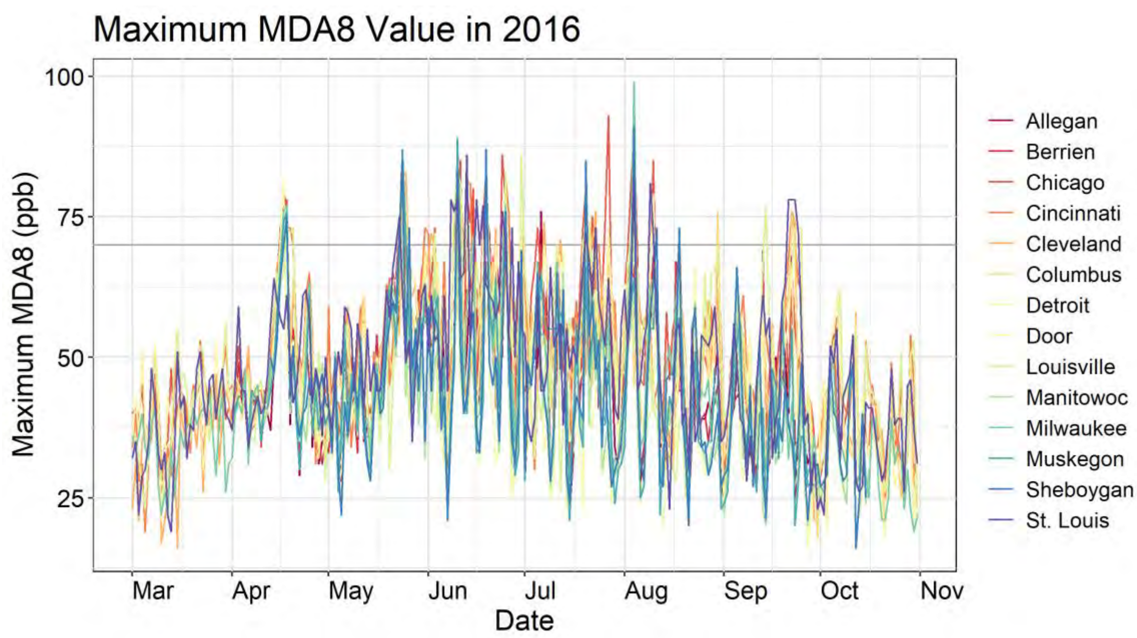

Figure 5-1. March 1 – October 31, 2016 observed MDA8 O_3 concentrations in the LADCO region 2015 O_3 NAAQS nonattainment and maintenance areas

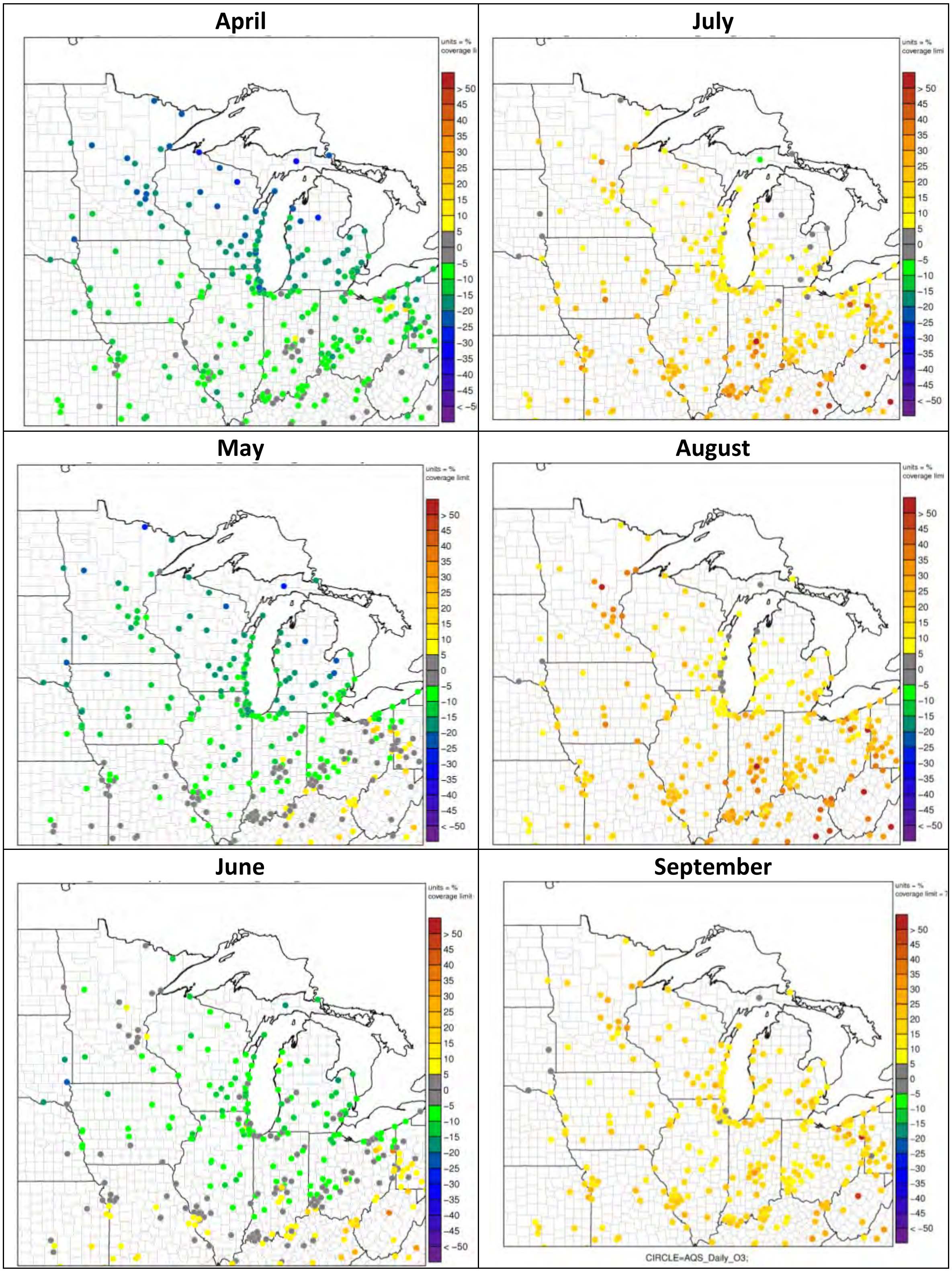

Figure 5-2. Monthly 2016 MDA8 O_3 normalized mean bias spatial stats plots; no concentration cutoff

5.2.2. Performance Evaluation by LADCO State

Table 5-4 through Table 5-8 show MDA8 O_3 performance statistics by month and state for the LADCO 2016 4-km CAMx simulation. The NMB, NME, and correlation coefficients in these tables are monthly averages across all Air Quality System (AQS) sites in each state. Each statistic is calculated for all days and for days only with observed MDA8 O_3 > 60 ppb. The latter is used to determine the performance of the model on days with high observed O_3 concentrations. These statistics quantify the LADCO CAMx 4-km simulation seasonal O_3 biases and show that the model performance generally improves (reductions in NMB and NME) at higher observed concentrations. The orange shading in these tables indicate the statistics which fall outside of the benchmark model performance criteria for O_3; the green shading indicates model performance that meets or exceeds the Emery, et al. (2017) benchmark goal for O_3.

Consistent with the spatial statistics plots in Figure 5-2 these tables highlight that the model underestimates (negative NMBs) O_3 in April through June and overestimates O_3 in July through September. On high O_3 concentration days (> 60 ppb) the early-season underestimates get worse while the late-season overestimates are improved. The model errors (NME) by state and month are predominantly within the performance benchmarks, and in many cases, they meet or exceed the performance goal of NME <15%. While the correlation (r) of the model with the observations on all days is within the performance benchmark criteria (> 0.5), on high O_3 days the correlations are outside of the benchmarks.

Despite the model performance deficits shown in these statistics, the O_3 model performance criteria for bias (NMB ≤±15%) is missed only for high concentrations in April and May at the AQS monitors. The performance goal for error (NME < 25%) is met across all but one of the location-months (IN in August) presented here.

Table 5-4. CAMx 4-km monthly MDA8 O_3 performance at AQS sites in IL

Region	NMB (%)		NME (%)		r	
	All	> 60ppb	All	> 60ppb	All	> 60ppb
April	-11.50	-13.50	15.40	13.70	0.83	0.74
May	-9.66	-18.60	15.10	18.60	0.74	0.66
June	-5.53	-10.50	11.70	11.80	0.75	0.46
July	16.50	9.31	18.90	12.10	0.74	0.15
August	16.40	-8.97	19.30	11.40	0.79	0.18
September	13.50	5.44	16.00	10.30	0.82	0.03

Table 5-5. CAMx 4-km monthly MDA8 O_3 performance at AQS sites in IN

Region	NMB (%)		NME (%)		r	
	All	> 60ppb	All	> 60ppb	All	> 60ppb
April	-6.94	-8.98	13.0	9.52	0.84	0.60
May	-5.30	-17.70	13.50	17.70	0.75	0.54
June	-1.34	-11.20	11.80	11.80	0.69	0.59
July	23.50	12.10	24.50	19.40	0.66	-0.66
August	25.30	-10.50	26.30	10.70	0.81	-0.03
September	18.00	4.66	18.80	5.73	0.88	1.00

Table 5-6. CAMx 4-km monthly MDA8 O_3 performance at AQS sites in MI

Region	NMB (%)		NME (%)		r	
	All	> 60ppb	All	> 60ppb	All	> 60ppb
April	-17.70	-16.60	18.80	16.60	0.87	0.68
May	-5.30	-17.70	17.40	19.30	0.80	0.74
June	-1.34	-11.20	14.30	15.80	0.83	0.46
July	23.50	12.10	14.30	12.50	0.78	-0.11
August	25.30	-10.50	16.20	10.20	0.83	0.73
September	18.00	4.66	17.60		0.81	

Table 5-7. CAMx 4-km monthly MDA8 O_3 performance at AQS sites in OH

Region	NMB (%)		NME (%)		r	
	All	> 60ppb	All	> 60ppb	All	> 60ppb
April	-8.56	-9.98	14.30	10.60	0.81	0.66
May	-2.21	-16.40	13.60	16.40	0.68	0.38
June	-1.61	-11.90	12.10	13.10	0.67	0.43
July	16.10	3.12	18.00	8.19	0.65	0.02
August	21.80	5.59	22.70	8.28	0.79	-0.28
September	16.40	-3.39	17.70	6.05	0.85	0.38

Table 5-8. CAMx 4-km monthly MDA8 O_3 performance at AQS sites in WI

Region	NMB (%)		NME (%)		r	
	All	> 60ppb	All	> 60ppb	All	> 60ppb
April	-19.40	-16.70	20.0	16.70	0.89	0.73
May	-15.10	-15.90	18.30	15.90	0.80	0.49
June	-8.85	-9.56	12.30	11.40	0.87	0.58
July	10.20	1.79	14.90	8.70	0.81	0.00
August	10.80	-12.20	15.00	12.70	0.86	0.73
September	14.60		16.40		0.78	

Figure 5-3 compares monthly, state averaged model performance (NMB) for MDA8 O_3 days > 60 ppb across four CAMx simulations. Three of the CAMx simulations are the runs used for this TSD at 12-km (Sim 1), 4-km (Sim 2), and 1.33-km (Sim 3) grid resolutions, and the fourth CAMx simulation is a 12-km resolution simulation run by LADCO that used U.S. EPA meteorology (Sim 4; US EPA, 2020). These plots show the same early season (April-June) underestimates and late season (July-September) overestimates as the bubble plots in Figure 5-2, although they include the 60 ppb concentration cutoff. The plots also show that from a state-wide average, there is not a significant performance difference between the model grid resolutions (Sim 1, Sim 2, and Sim 3). The CAMx two-way nested configuration used for these simulations explains the similarity in performance across the three resolutions[10]. The U.S. EPA meteorology used for Sim 4 produced lower MDA8 O_3 concentrations, which lead to worse model underpredictions in April through June, but improvements to the model overpredictions in July through September. The key takeaway from Figure 5-3 is that for most months and states, on average, the LADCO 2016 CAMx modeling predicts MDA8 O_3 concentrations > 60 ppb within the performance NMB benchmark (≤± 15%).

[10] With CAMx two-way nesting the fine grid, nested domains provide much of the solution to the parent grid

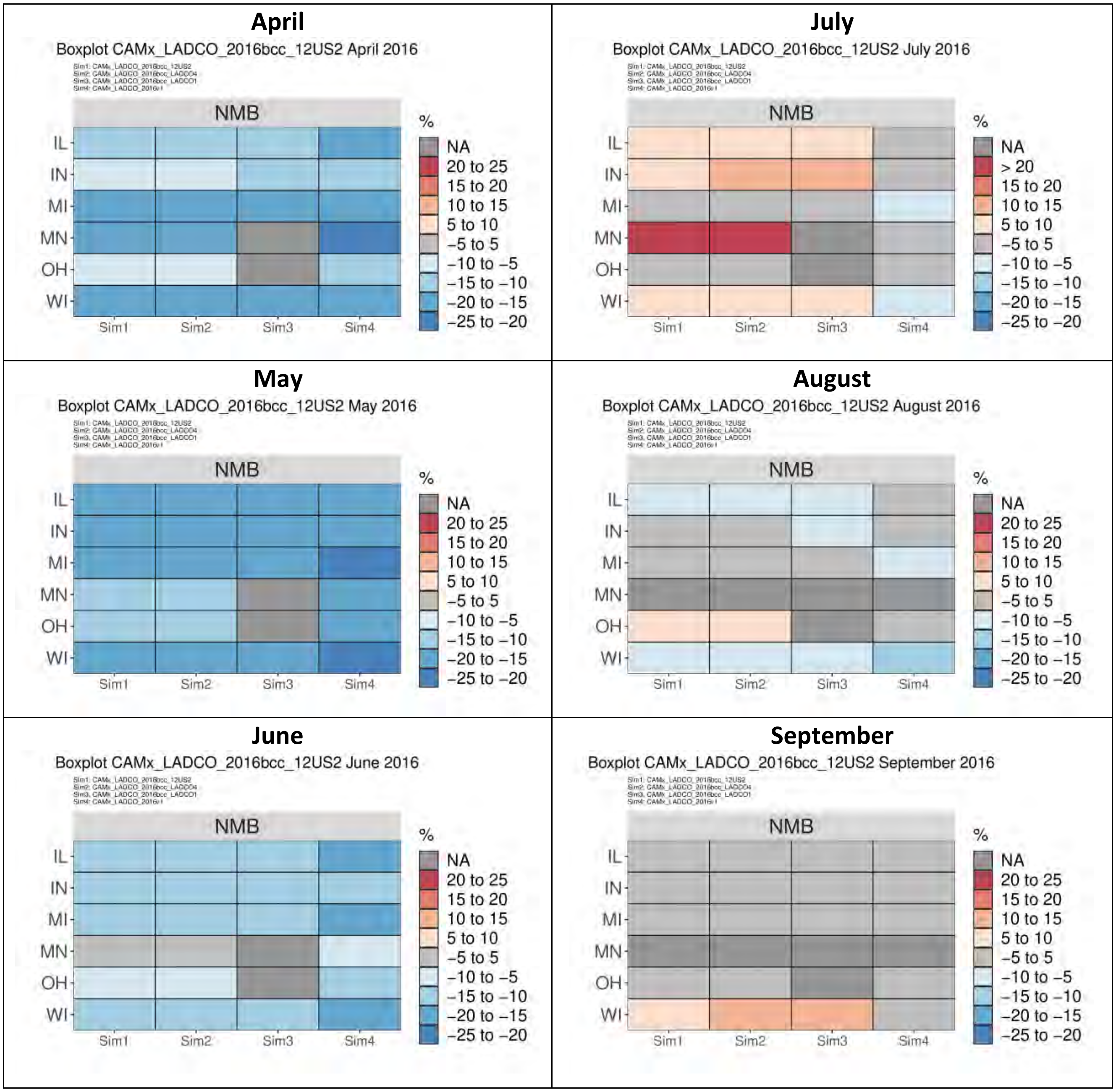

Figure 5-3. Monthly 2016 MDA8 O_3 normalized mean bias state summary plots on days with observed values > 60 ppb

Figure 5-4 through Figure 5-8 are monthly box and whisker plots of CAMx and observed MDA8 O_3 concentrations for AQS sites in IL, IN, MI, OH, WI, respectively. The box and whisker plots show the observed and model median concentrations as symbols connected by lines (blue for CAMx and black for observations), the 25th and 75th percentile concentrations as the bottom and top of each box, and the 5th and 95th percentile concentrations as the bottom and top of each whisker. Each figure compares CAMx and observations on all days, and only on days with MDA8 O_3 > 60 ppb. These plots further highlight the seasonal shift in biases as seen by the median values for CAMx relative to the observations across all the states. Where the observations for all days have a seasonal profile with median values that peak in all states in June, the seasonality of the median observed MDA8 O_3 on high-concentration days is generally flatter across the months. The CAMx predictions have a seasonal profile with peak median values in July in most states for both all days and high O_3 days.

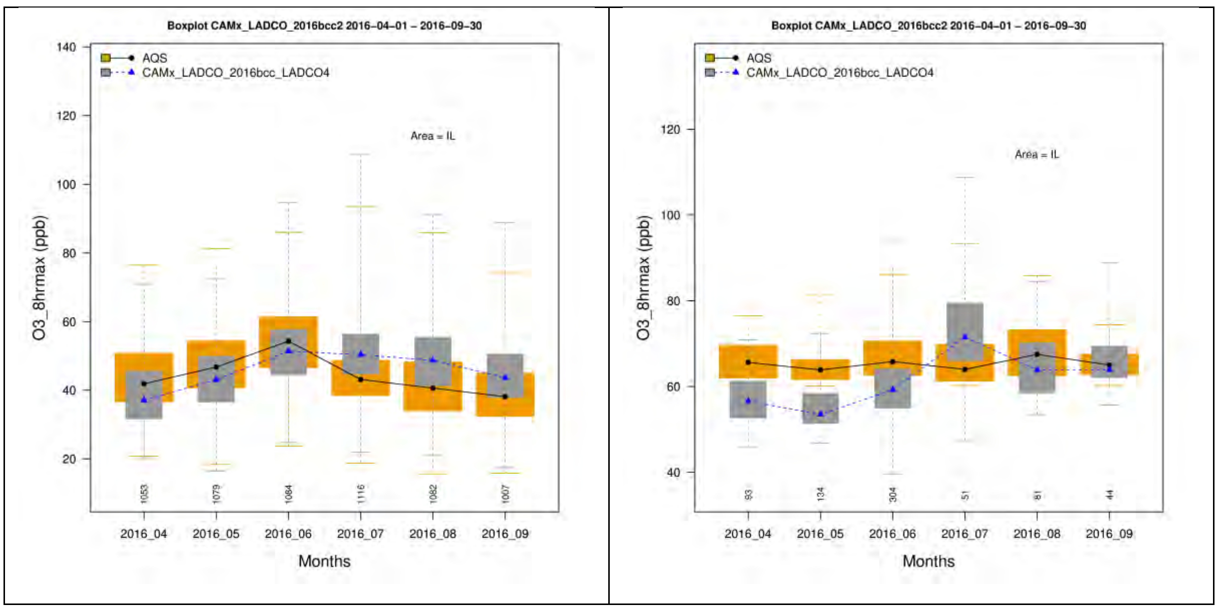

Figure 5-4. 2016 monthly MDA8 O_3 box and whisker plots comparing CAMx with AQS monitors for sites in IL; all days (left) and days with obs > 60 ppb (right)

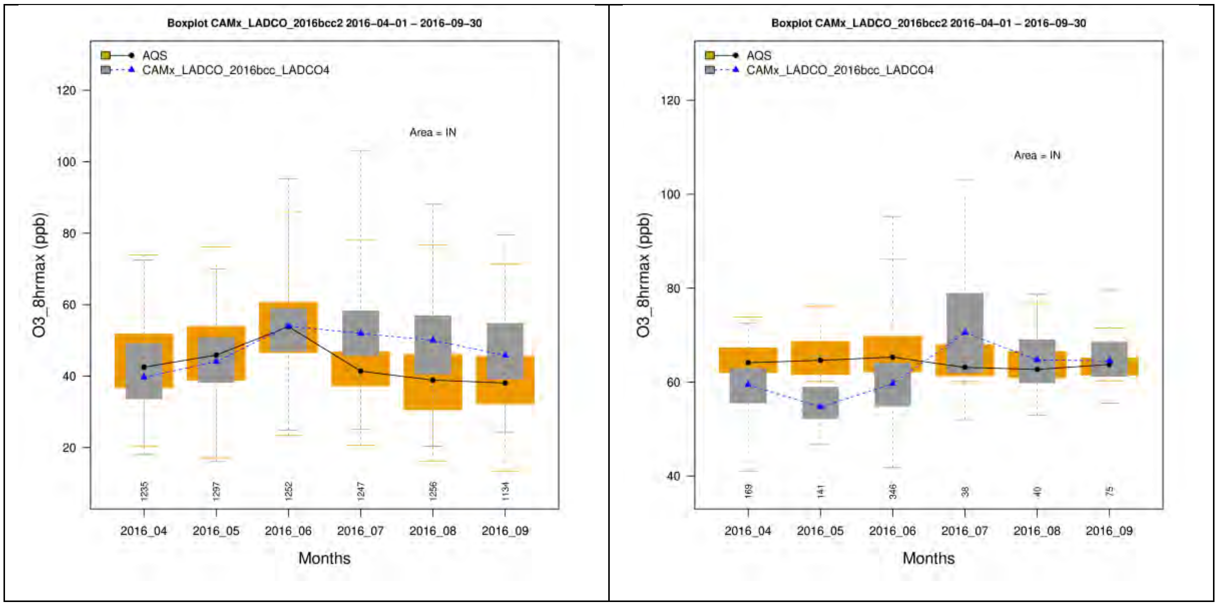

Figure 5-5. 2016 monthly MDA8 O_3 box and whisker plots comparing CAMx with AQS monitors for sites in IN; all days (left) and days with obs > 60 ppb (right)

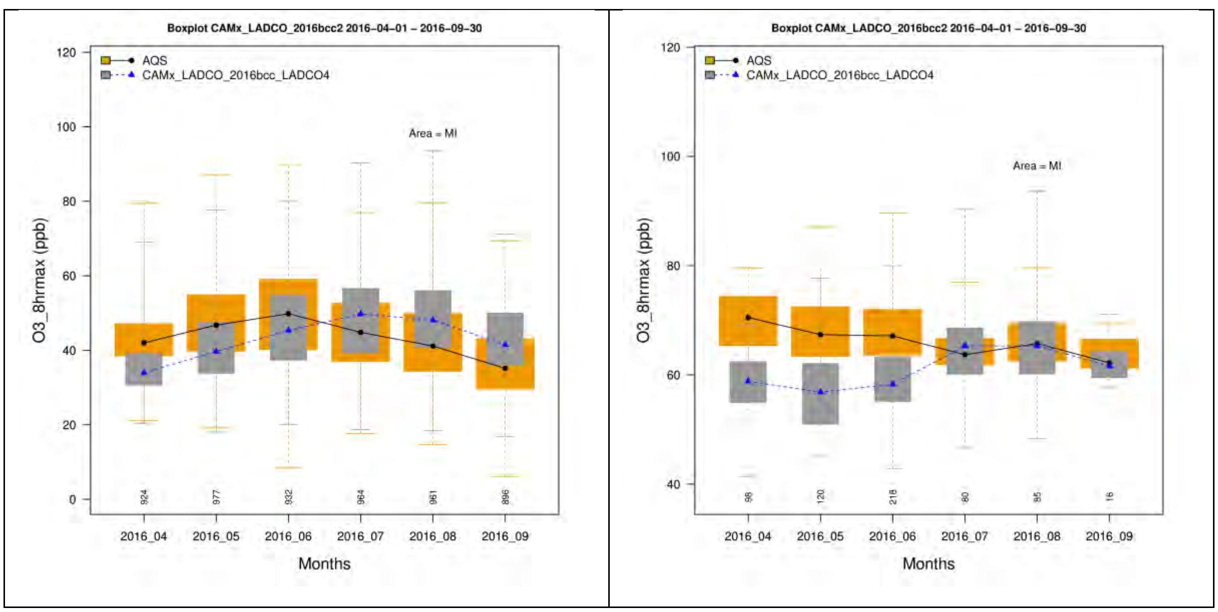

Figure 5-6. 2016 monthly MDA8 O_3 box and whisker plots comparing CAMx with AQS monitors for sites in MI; all days (left) and days with obs > 60 ppb (right)

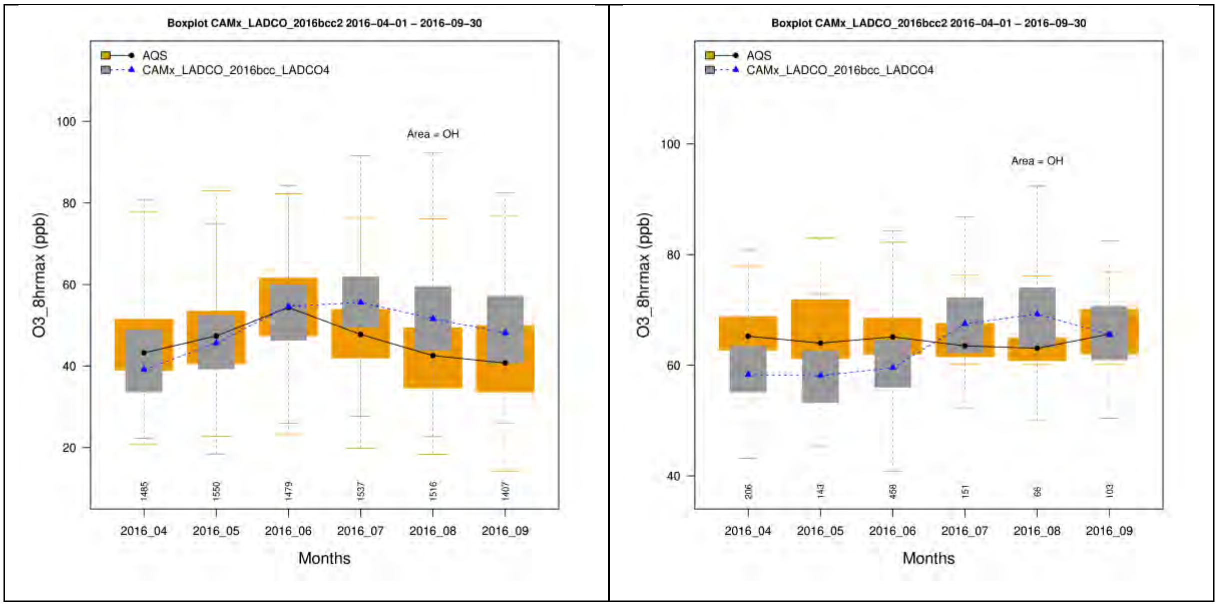

Figure 5-7. 2016 monthly MDA8 O_3 box and whisker plots comparing CAMx with AQS monitors for sites in OH; all days (left) and days with obs > 60 ppb (right)

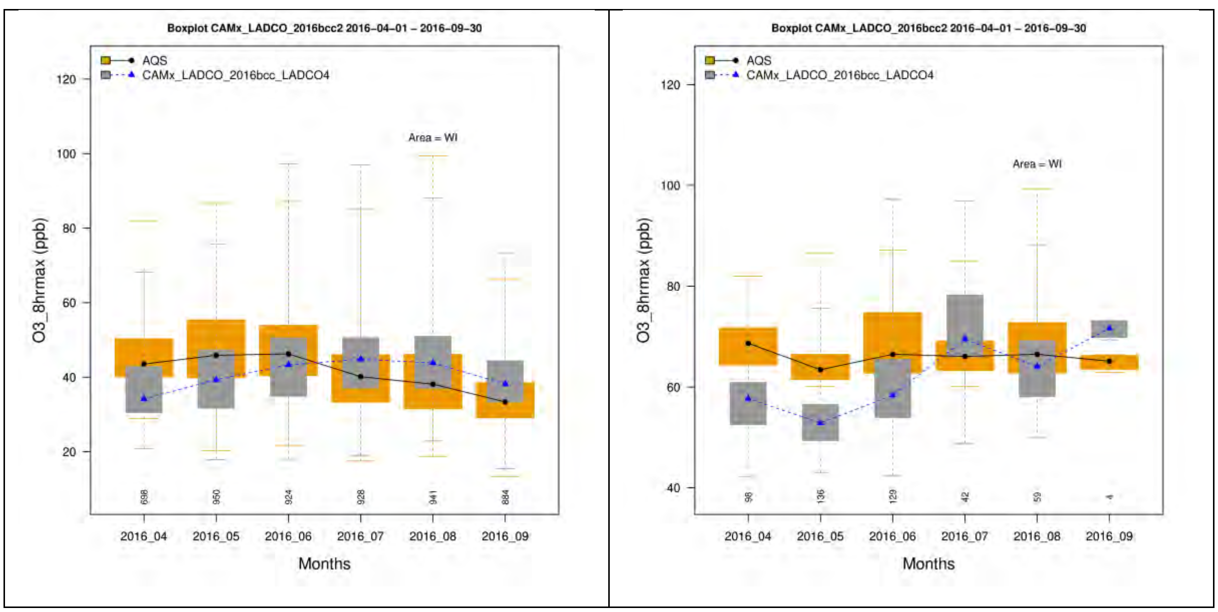

Figure 5-8. 2016 monthly MDA8 O_3 box and whisker plots comparing CAMx with AQS monitors for sites in WI; all days (left) and days with obs > 60 ppb (right)

5.2.3. Performance Evaluation by Ozone Nonattainment Area

This section presents the 2016 LADCO 4-km CAMx model performance evaluation results by month averaged across all the monitors in each of the different 2015 O_3 NAAQS NAAs. The statistics in the plots and tables described in this section indicate the skill of the model at simulating MDA8 O_3 on all days and on high concentrations days (observed MDA8 concentrations > 60 ppb) at the small set of monitors contained within each NAA boundary. In some cases, these performance results are based on a single monitor, particularly at the more rural, downwind NAAs.

Figure 5-9 and Figure 5-10 show the average percent NMB and NME, respectively, for high concentration MDA8 O_3 days at each NAA by month. The green dashed lines in these figures show the levels of the Emery et al (2017) MPE goal, and the orange dashed lines show the MPE benchmark. While the NMB results in Figure 5-9 reflect the more general trend already discussed of CAMx underestimating O_3 (NMB < 0) in April – June and overestimating O_3 (NMB > 0) in July – September, it shows that the model meets the less stringent performance criteria for most NAAs in all months. The exception is for the downwind Lake Michigan coastline NAAs in April and May. The LADCO 2016 CAMx model underestimated MDA8 O_3 on high concentration days for the Western MI NAAs and the Sheboygan County, WI NAA by more than 15% in April and May. The reasons for the model underpredictions >-15% at these locations early in the ozone season are not clear. The model shows particularly good performance for the Cleveland NAA, with biases within +/- 10% for all months other than May.

The NME plot in Figure 5-10 shows that the model performance improves as the O_3 season progresses with the lowest errors at all monitors in August and September. The model meets the MDA8 O_3 NME performance criteria (25%) for all NAAs and all months, and meets the more stringent performance goal (15%) for most monitors and months.

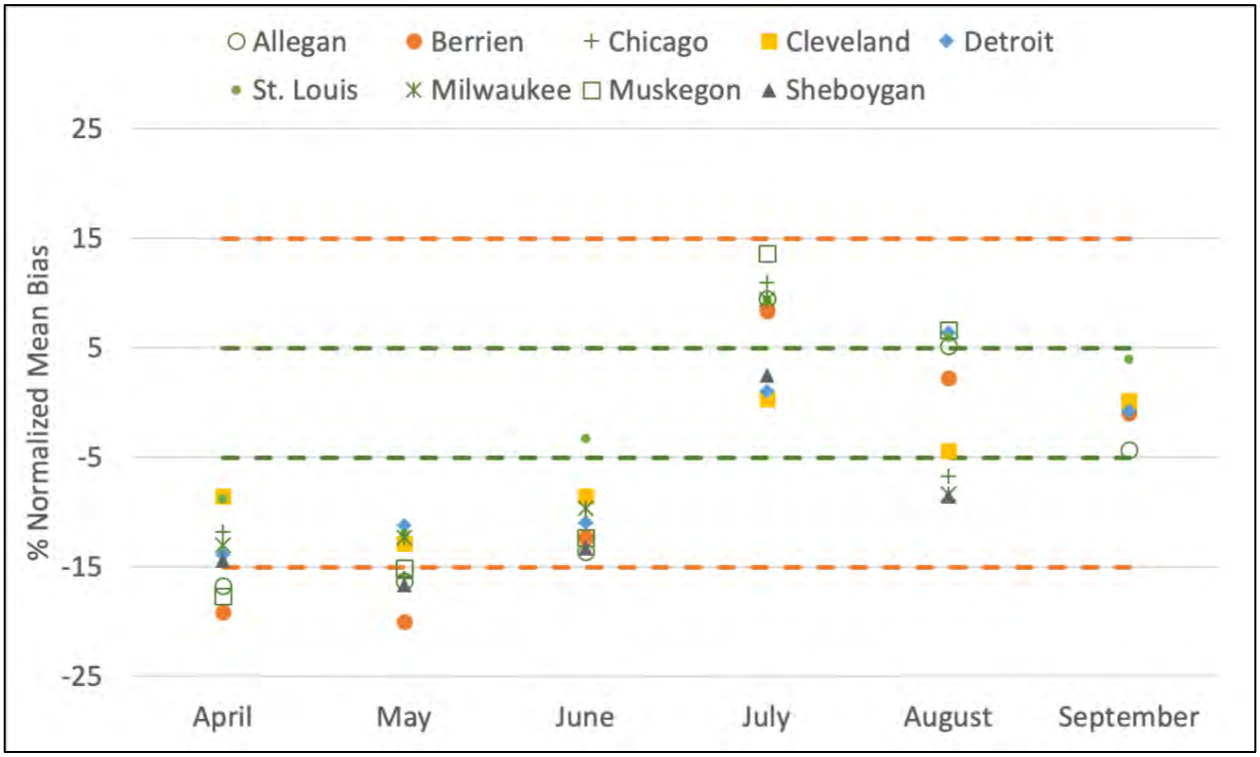

Figure 5-9. MDA8 O_3 average normalized mean bias by month and nonattainment area for days with MDA8 observations > 60 ppb; dashed lines indicate model performance benchmarks

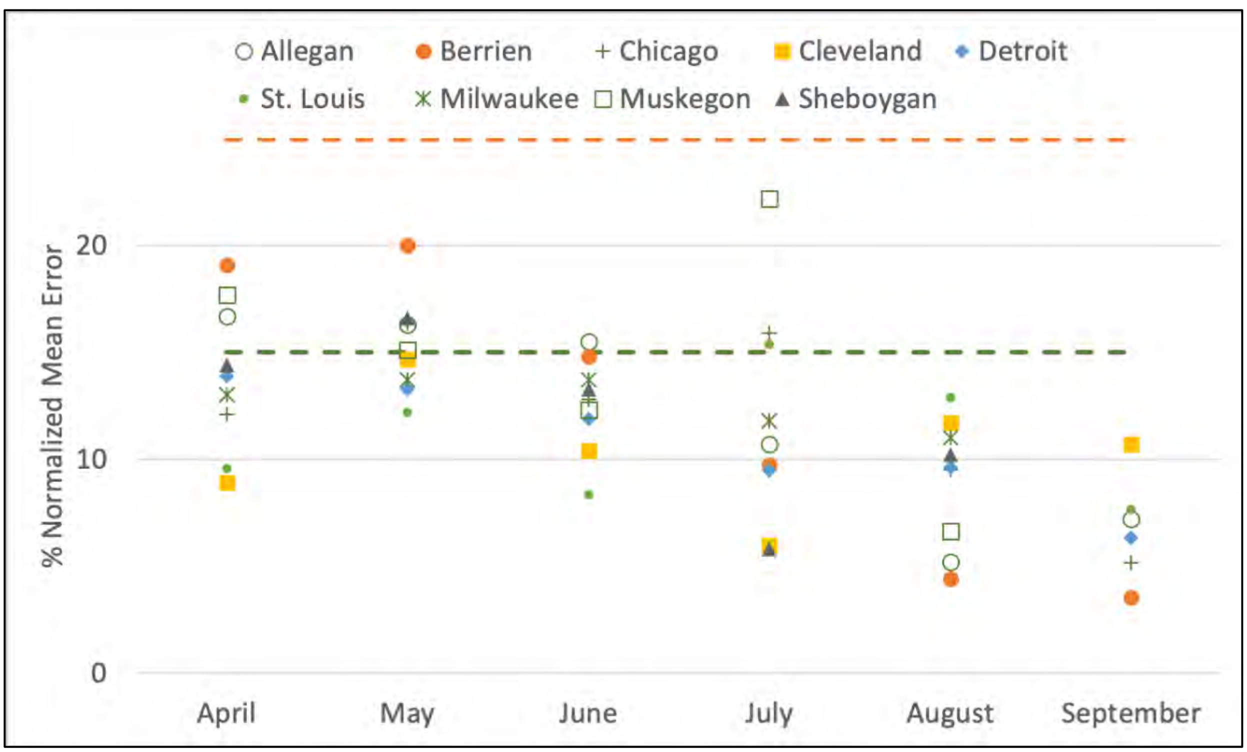

Figure 5-10. MDA8 O_3 average normalized mean error by month and nonattainment area for days with MDA8 observations > 60 ppb; dashed lines indicate model performance benchmarks

The Supplement to this TSD includes additional MDA8 O_3 model performance results for the 2015 O_3 NAAQS NAAs in the LADCO region. Box and whisker plots by NAA generally show similar patterns as the statewide figures, with CAMx underestimating O_3 in April – June and overestimating in July – September. Tables of monthly NMB, NME, and correlation coefficients are shaded (green = better than the performance goal; orange = worse than the performance criteria) to indicate how well CAMx simulates MDA8 O_3 on all days and on high concentration days. Along with a tabulated form of the data shown in Figure 5-9 and Figure 5-10 for the high concentration days, these tables include the performance statistics for all days.

Table S 1 in the Supplementary Materials lists LADCO 2016 CAMx 4-km simulation performance statistics for all monitors in each of the 2015 O_3 NAAQS NAAs. These statistics show the model performance on high observed concentration days (> 60 ppb) for the CAMx 4-km grid cell that contains each monitor. Although CAMx misses the Emery et al. (2017) performance criteria for correlation (>0.5) at some monitors, particularly in the Cleveland and Detroit NAAs, it meets or exceeds the performance criteria for NMB and NME at most of the monitor locations.

The value of including the NAA-specific performance data in this TSD is to demonstrate the validity of the LADCO 2016-based CAMx model to O_3 planning applications and attainment testing for the NAAs in the region.

5.3. CAMx 2016 Ozone Precursor Modeling Performance Evaluation

LADCO calculated performance statistics for O_3 precursor pollutants with 2016 observations from the AQS network. The LADCO CAMx 2016 4-km simulation is evaluated against hourly NO_2 and CO AQS observations, and 1-in-6 day 24-hour average formaldehyde, acetaldehyde, ethane, isoprene, and toluene observations from Photochemical Assessment Monitoring Station (PAMS) locations in the region. Figure 3-8 shows the locations of the AQS NO_2 (and CO) monitors and Figure 5-11 shows the locations of the PAMS monitors that collected the 2016 data used in the statistics presented here. The CAMx 4-km model results are paired in space and time with the AQS observations for the model grid cell in which each monitor is located.

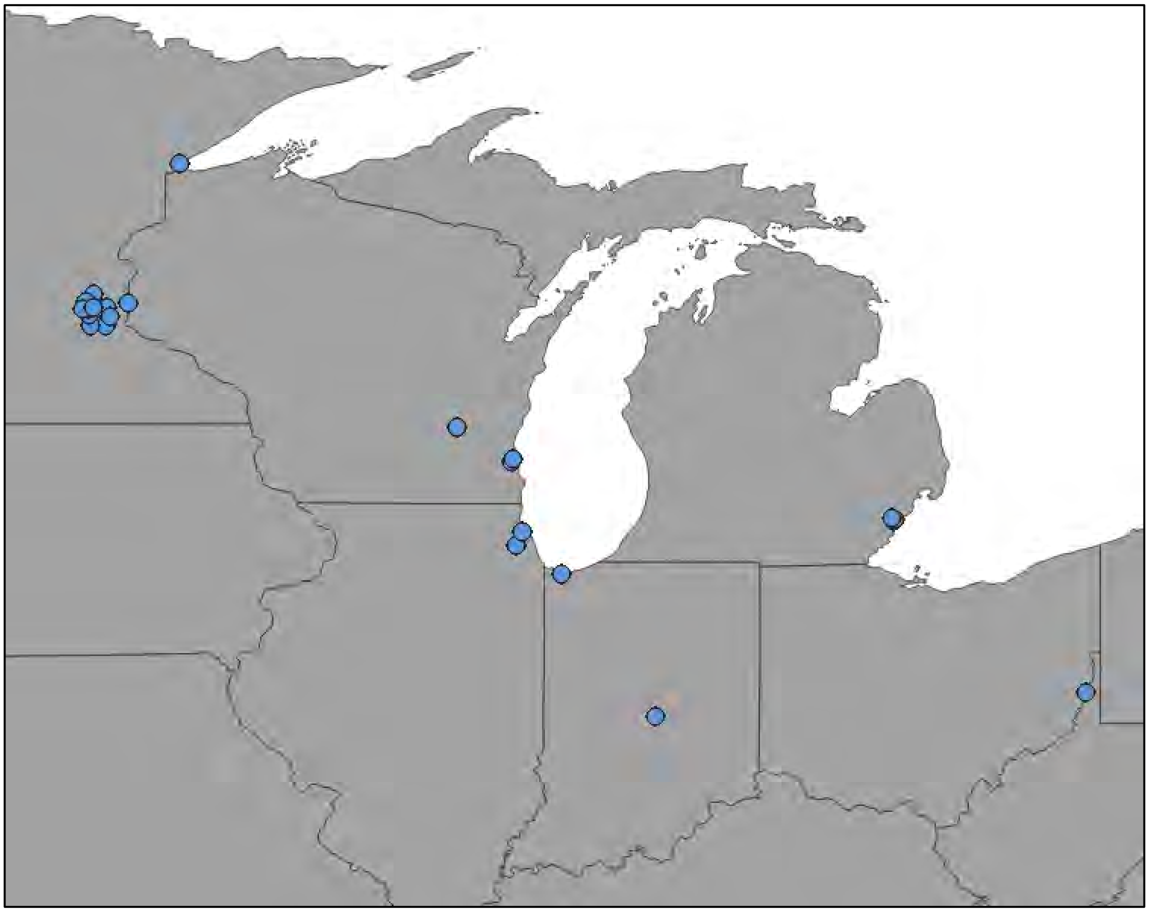

Figure 5-11. Locations of PAMs monitors with VOC observations for 2016 in the LADCO region

Table 5-9 summarizes the summer season (June – August) 4-km domain average CAMx performance statistics for the LADCO 2016 CAMx 4-km simulation. The model underestimates (NMB < 0) for all reported O_3 precursor species except for Acetaldehyde. Table 5-10 shows the state-averaged summer season NMB and NME from the LADCO 2016 CAMx 4-km simulation for NO_2, CO, formaldehyde, and isoprene. The state-averaged results mirror the regional-average results in which the CAMx simulation underestimated all reported species.

Figure 5-12 expands on these tables and shows state-averaged monthly NMB for April – September for select O_3 precursor species for the LADCO CAMx 2016 4-km simulation. The LADCO CAMx simulation underestimated (NMB < 0) most of the precursor species in most months during that period. The CAMx simulation significantly overestimated (NMB > 0) isoprene in April and May, likely related to mischaracterization of the biogenic emissions during that period.

There are an insufficient number of O_3 precursor species monitoring stations to estimate performance statistics by nonattainment area.

Table 5-9. LADCO CAMx 2016 4-km summer (JJA) average ozone precursor model performance statistics

Pollutant	CAMx Avg (ppb)	Obs Avg (ppb)	NMB (%)	NME (%)	r	# obs
NO_2	7.03	8.79	-19.76	53.84	0.53	69470
CO	174.37	276.00	-35.26	48.13	0.25	75234
Formaldehyde	2.19	3.67	-36.72	43.63	0.32	127
Acetaldehyde	0.89	0.91	3.30	36.20	0.23	127
Ethane	1.41	5.38	-60.77	61.94	0.16	201
Isoprene	0.24	0.30	-25.66	51.79	0.66	199
Toluene	0.46	0.58	-9.95	52.37	0.33	531

Table 5-10. LADCO CAMx 2016 4-km summer (JJA) average ozone precursor model performance statistics by state

State	NO_2		CO		Formaldehyde		Isoprene	
	NMB	NME	NMB	NME	NMB	NME	NMB	NME
IL	-3.18	45.00	-25.83	38.23	-18.57	26.57	-3.40	31.03
IN	-13.05	53.43	-45.50	61.83	-47.17	56.83	-17.70	61.80
MI	-33.50	48.63	-42.27	47.87	-51.03	51.60		
MN	2.05	60.40	-24.90	47.57				
OH	-35.00	53.80	-35.13	49.17				
WI	-35.90	61.77	-37.93	44.13	-30.10	39.53	-55.87	62.53

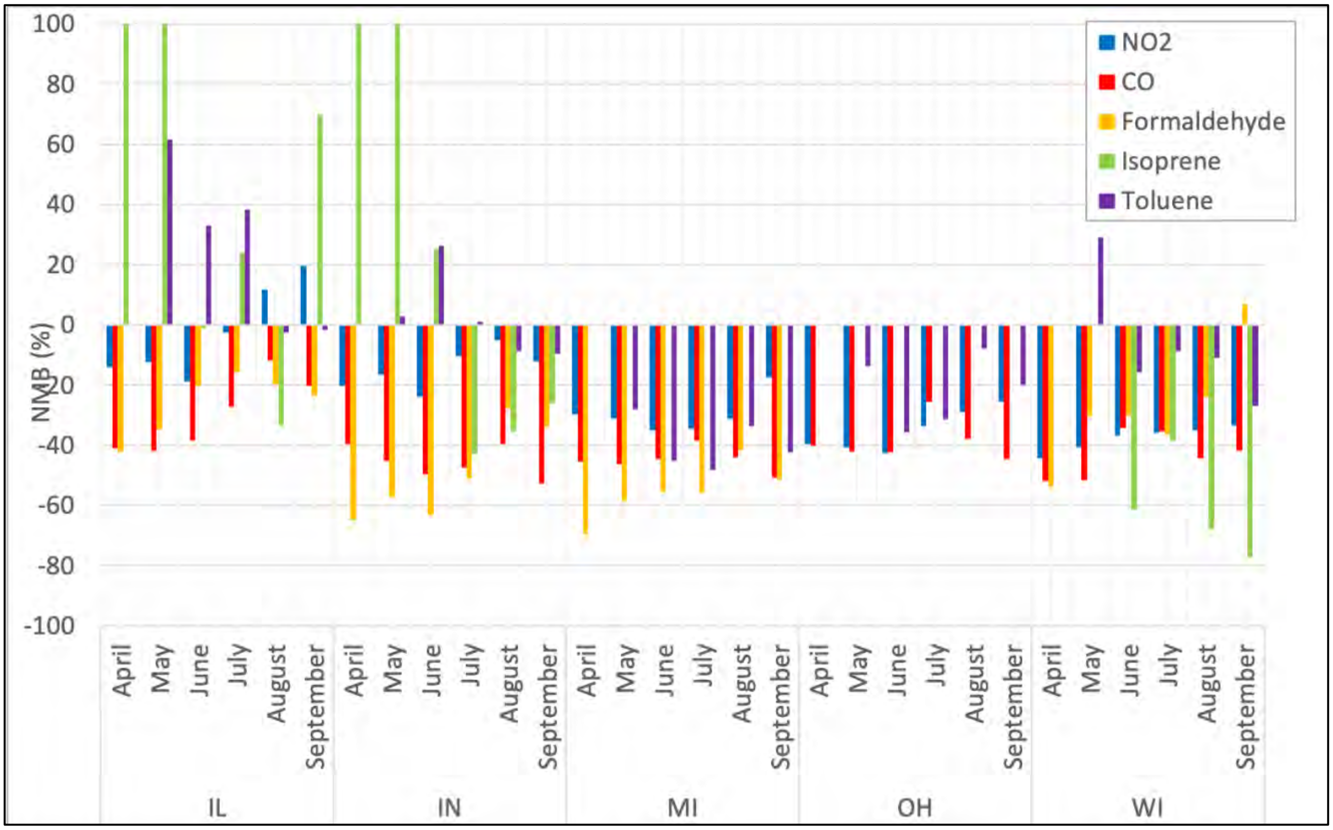

Figure 5-12. Monthly state average LADCO CAMx 2016 4km ozone precursor NMB

5.4. CAMx Model Performance Discussion

U.S. EPA (2019) reported model performance for the 2016 CAMx modeling platform upon which the LADCO 2016 modeling platform is based. The U.S. EPA evaluated the model by comparing CAMx-predicted MDA8 O_3 to observations at the U.S. EPA AQS and CASTNet networks. They performed statistical evaluations using modeled and observed data that were paired in space and time. U.S. EPA developed statistics across spatial and temporal scales and in aggregate across multiple sites by climate region.

The results provided by U.S. EPA (2019; 2022) from their operational model performance evaluations of their 2016 simulations are like the results of the LADCO 2016 CAMx modeling MPE. U.S. EPA and LADCO both found that the 2016 CAMx modeling platform on average underestimates MDA8 O_3 in April – June, and overpredicts in July – October. The biases in the April – June period are more severe than in the later months. In July – September the mean bias is within +/- 5 ppb at many sites in the LADCO region.

Investigation of the diurnal variability at key monitors demonstrated that CAMx generally captured day to day fluctuations in observed MDA8 O_3 but missed the peaks on many of the highest observed days, particularly during April – June.

The O_3 performance evaluation by nonattainment area reveals that the LADCO CAMx 4-km simulation met the model performance benchmarks averaged across the high concentration days (> 60 ppb).

The LADCO CAMx 4-km simulation underestimated most of the available O_3 precursor species, including NO_2, CO, isoprene, and formaldehyde in most months and locations. The exception was for isoprene, where the simulation significantly overestimated the observations in April and May.

The statistics and model performance metrics presented in this section demonstrate that the LADCO CAMx 2016 O_3 model performance is within conventional and accepted model performance benchmarks, and is a valid model for use in regulatory applications.

6. LADCO 2023 Air Quality Projections

6.1. Attainment Test Methods

LADCO followed the U.S. EPA Modeling Guidance for Demonstrating Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze (US EPA, 2018) to calculate future-year design values in 2023 (DVF_{2023}) for monitors in IL, IN, MI, OH, and WI[11]. As we used a base year of 2016, we estimated the base year design values using surface observations for the years 2014-2018 ($DVB_{2014\text{-}2018}$). LADCO estimated the DVF_{2023} with version 1.6 of the Software for Modeled Attainment Test Community Edition (SMAT-CE)[12]. SMAT-CE was configured to use the daily max average 8-hr (MDA8) O_3 concentration above 60 ppb in a 3x3 matrix around each monitor across for the 10 highest modeled days, per the U.S. EPA Guidance. If there are less than 10 days with MDA8 O3 greater than 60 ppb, SMAT-CE uses all days, if there are at least 5 days that meet the minimum threshold criteria[13].

Consistent with US EPA modeling guidance (US EPA, 2018), SMAT-CE uses a four-step process to estimate DVF_{2023}:

1. Calculate $DVB_{2014\text{-}2018}$ for each monitor
    - The O_3 design value is a three-year average of the 4^{th} highest daily maximum 8 hour average O_3 ($MDA8_4$):

$$DV_{2016} = (MDA8_{4,2014} + MDA8_{4,2015} + MDA8_{4,2016})/3$$

    - Weighted 5-year average of design values centered on the base model year (2016):

$$DVB_{2014\text{-}2018} = (DV_{2016} + DV_{2017} + DV_{2018})/3$$

2. Find highest base year modeled days surrounding each monitor
    - Find ten days with the highest base year modeled MDA8 from within a 3x3 matrix of grid cells surrounding each monitor
    - At least 5 days with modeled MDA8 >= 60 ppb are needed to retain the monitor for the future year DV calculation

[11] MN is not included because there are no 2015 O3 NAAQS nonattainment or maintenance areas in the state

[12] https://www.epa.gov/scram/photochemical-modeling-tools

[13] 26 sites dropped out of the SMAT-CE design value calculation because their data did not meet the threshold criteria; none of these sites are located in 2015 O3 NAQQS nonattainment or maintenance areas

3. Calculate relative response factor (RRF) for each monitor
   - Calculate multi-day average MDA8 for the base and future years from the maximum paired in space values in the 3x3 matrix
   - Calculate the RRF as the ratio of the multi-day average future to multi-day average base year MDA8:

$$RRF = MDA8_{2023,avg}/MDA8_{2016,avg}$$

4. Calculate DVF_{2023} for each monitor

$$DVF_{2023} = RRF * DVB_{2014\text{-}2018}$$

LADCO used the DVF_{2023} to identify nonattainment sites in 2023 using the 5-year weighted average baseline design values (2014-2018) per U.S. EPA (2018). Under this methodology, sites with an average DVF_{2023} that exceeds the 2015 O_3 NAAQS (71.0 ppb or greater) would be considered nonattainment in 2023.

6.2. 2023 CAMx Modeling Results

LADCO modified the emissions in the U.S. EPA 2016fh CAMx modeling platform to create a LADCO 2016 modeling platform with a projection year to 2023 (see Section 3.4). The LADCO 2023 CAMx simulation forecasted air quality on three nested modeling domains, including EGU emissions forecasts from the ERTAC v16.1 model. Figure 6-1 and Figure 6-2 show April through September 2016 maximum MDA8 O_3 for the LADCO 2016 and 2023 CAMx simulations, respectively, on the CONUS12 modeling domain. Figure 6-3 shows the difference (2023-2016) in O_3 season maximum MDA8 O_3 between the two simulations. Cool colors indicate that the 2023 simulation forecasted lower O_3 than the 2016 simulation; warm colors indicate higher O_3 in the 2023 forecast. As Figure 6-3 is a difference of the O_3 season maximum MDA O_3 concentrations, it represents the extent to which the highest concentrations are forecast to change in 2023.

The LADCO 2023 CAMx 12-km simulation predicted lower seasonal maximum O_3 concentrations across much of the modeling domain, with the largest reductions occurring in the eastern U.S., and in some urban areas in the west, namely Phoenix and Denver. Note that the concentration changes shown in these figures mask finer temporal resolution features (i.e., hourly and daily) that also exist between the base and future year simulations.

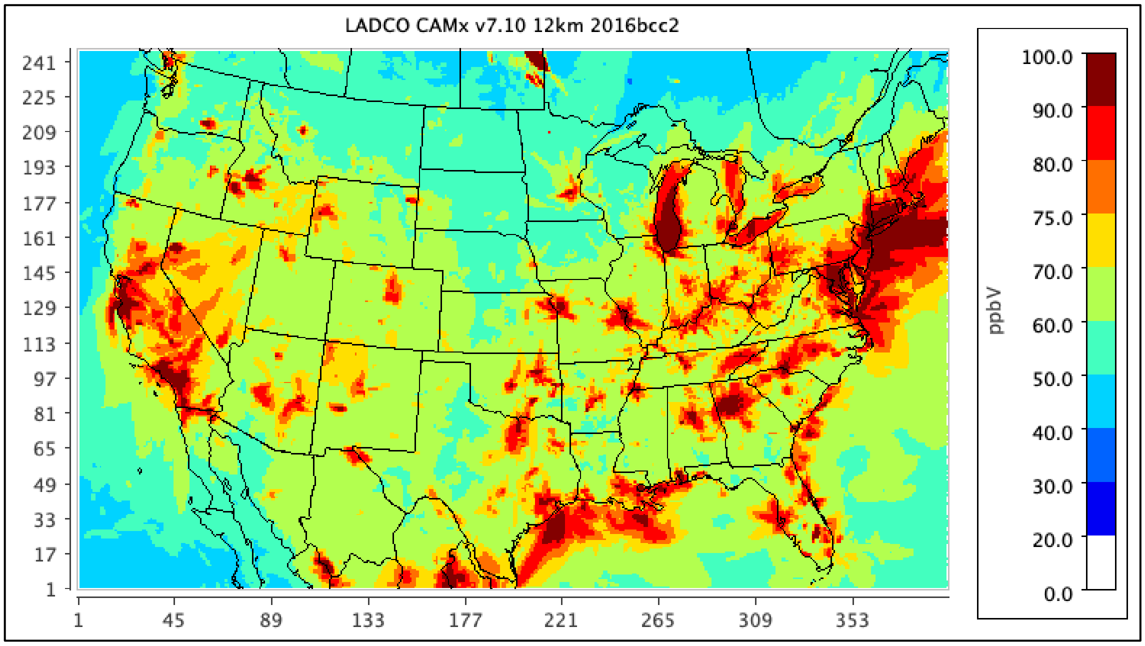

Figure 6-1. LADCO CAMx 12-km 2016 O_3 season maximum MDA8 O_3 concentrations

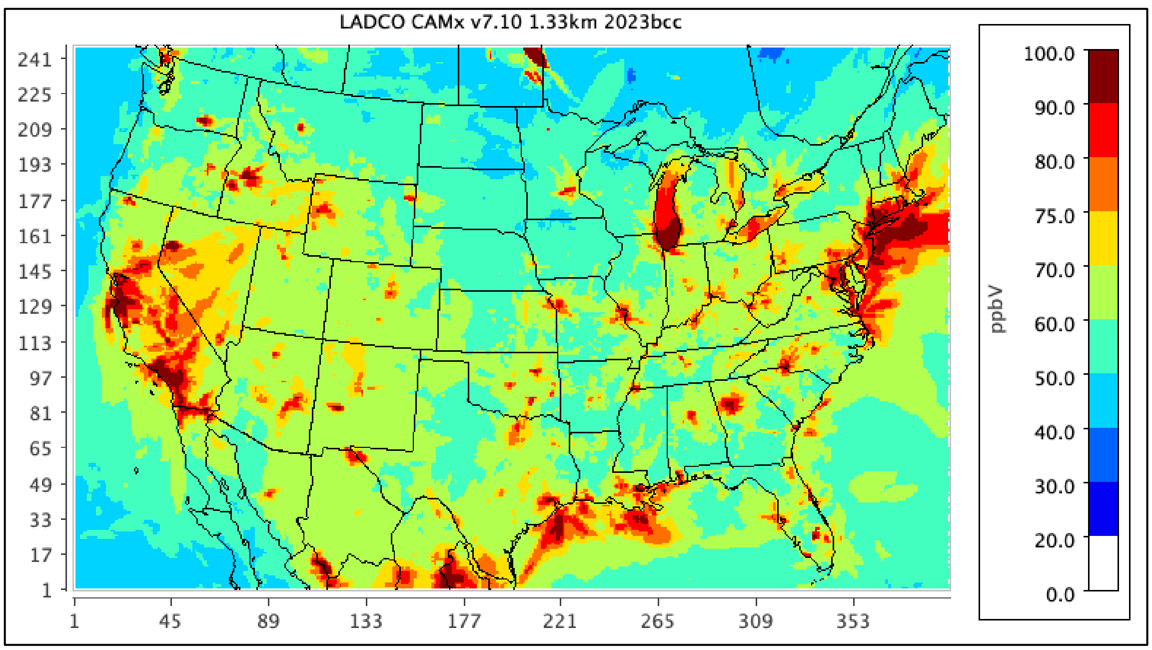

Figure 6-2. LADCO CAMx 12-km 2023 O_3 season maximum MDA8 O_3 concentrations

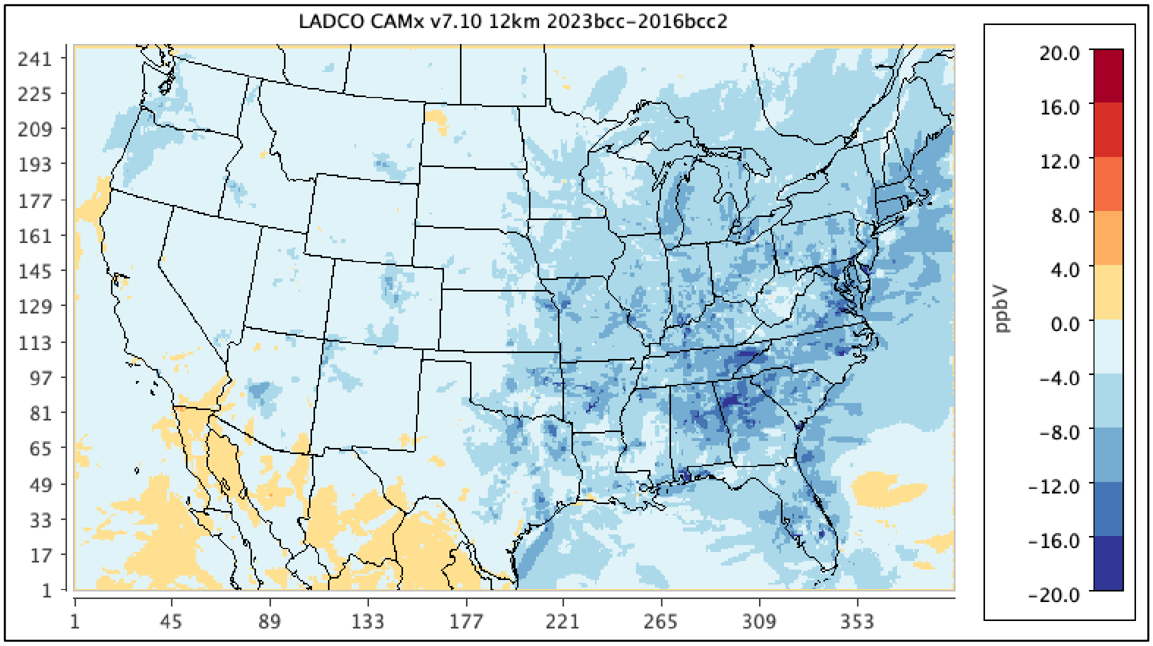

Figure 6-3. LADCO CAMx 12-km difference (2023-2016) in O_3 season maximum MDA8 O_3 concentrations

Figure 6-4 and Figure 6-5 show April through September 2016 maximum MDA8 O_3 for the LADCO 2016 and 2023 CAMx simulations, respectively, on the LADCO 4-km modeling domain. Figure 6-6 shows the difference (2023-2016) in O_3 season maximum MDA8 O_3 between the two simulations. The LADCO simulation forecasts a 4-8 ppb decrease in seasonal maximum MDA8 O_3 across much of the domain in 2023. The largest concentration decreases (12-16 ppb) in 2023 are forecast downwind of the urban areas, particularly in the southern half of the domain. Concentration decreases in the range of 8-12 ppb are forecast over Lakes Michigan and Erie.

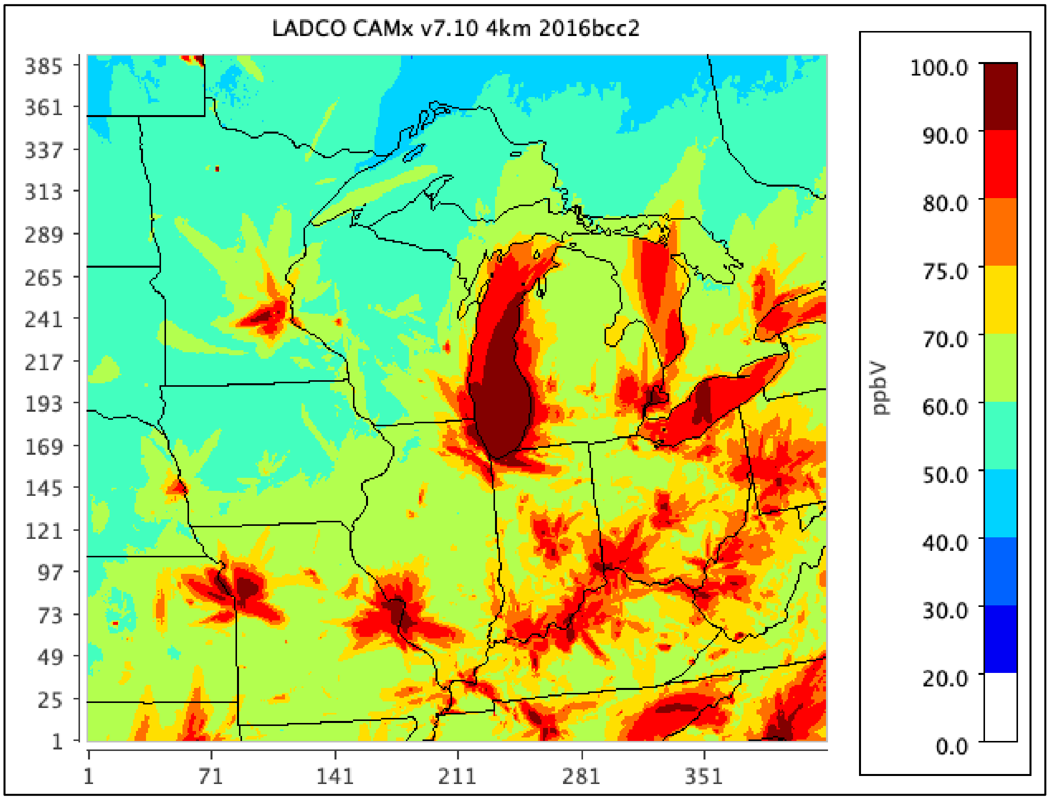

Figure 6-4. LADCO CAMx 4-km 2016 O_3 season maximum MDA8 O_3 concentrations

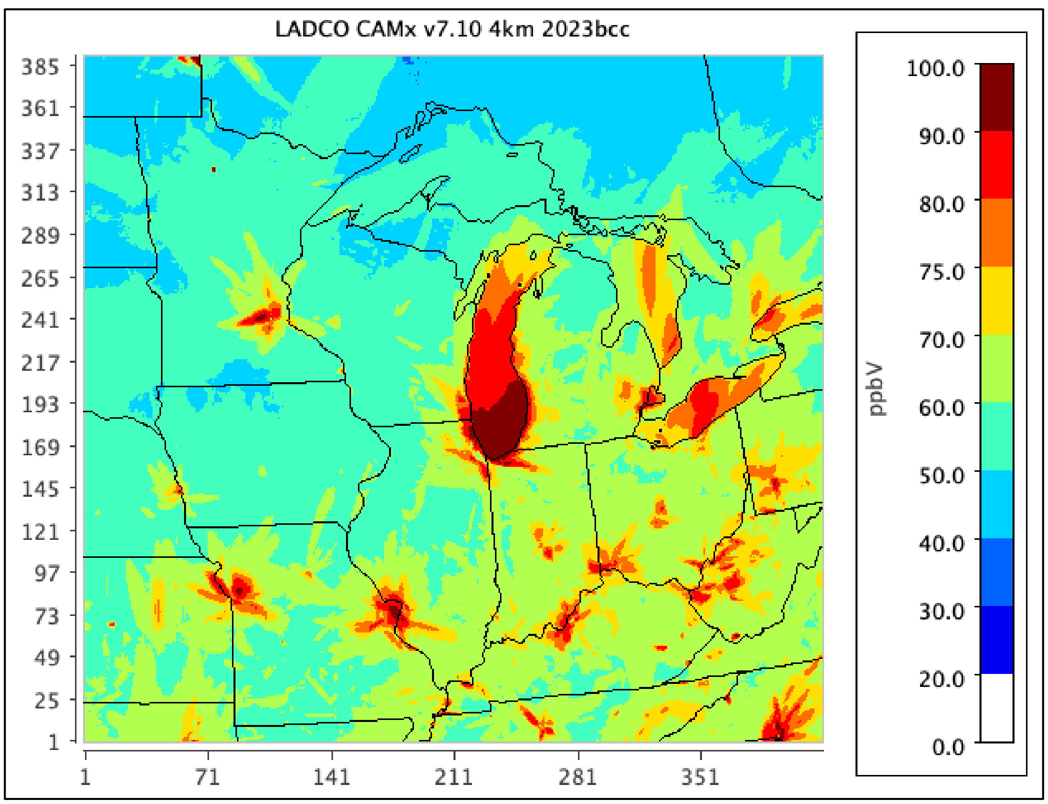

Figure 6-5. LADCO CAMx 4-km 2023 O_3 season maximum MDA8 O_3 concentrations

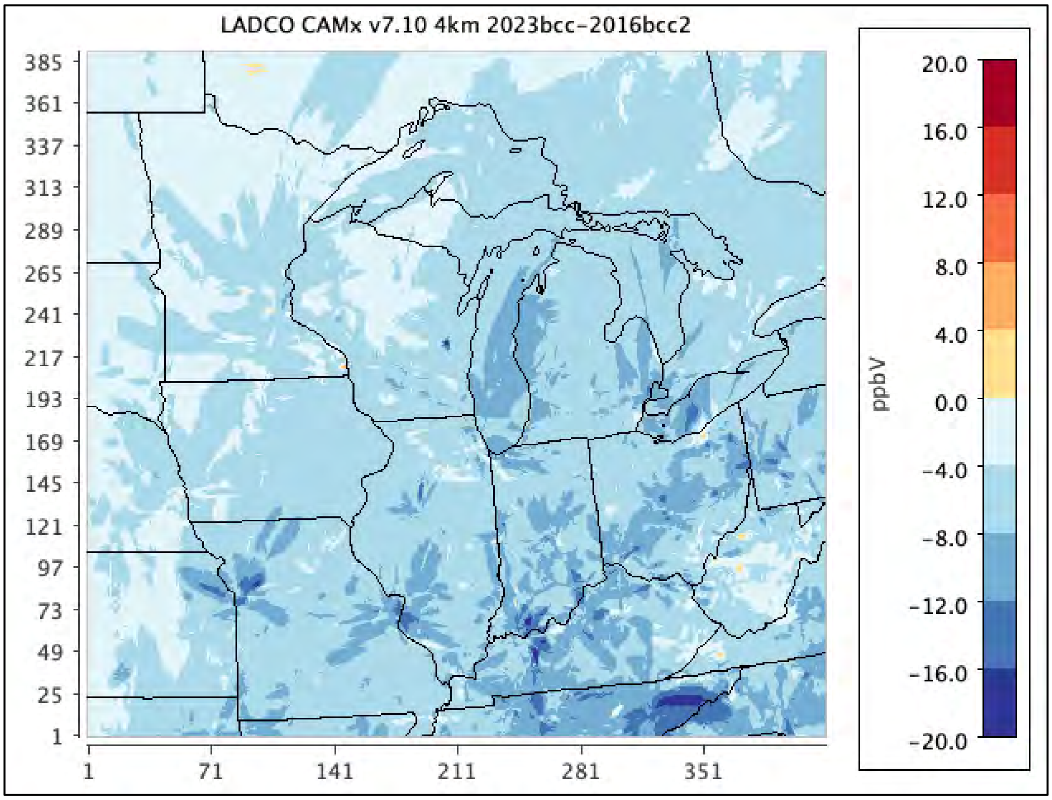

Figure 6-6. LADCO CAMx 4-km difference (2023-2016) in O_3 season maximum MDA8 O_3 concentrations

Figure 6-7 and Figure 6-8 show April through September 2016 maximum MDA8 O_3 for the LADCO 2016 and 2023 CAMx simulations, respectively, on the LADCO 1.33-km modeling domain. Figure 6-9 shows the difference (2023-2016) in O_3 season maximum MDA8 O_3 between the two simulations. The LADCO simulation forecasts a 4-8 ppb decrease in seasonal maximum MDA8 O_3 across much of the domain in 2023. The largest concentration decrease (12-16 ppb) in 2023 is forecast over Lake Winnebago in Wisconsin. Concentration decreases in the range of 8-12 ppb are forecast over Lake Michigan and extend inland into northern Indiana and western Michigan.

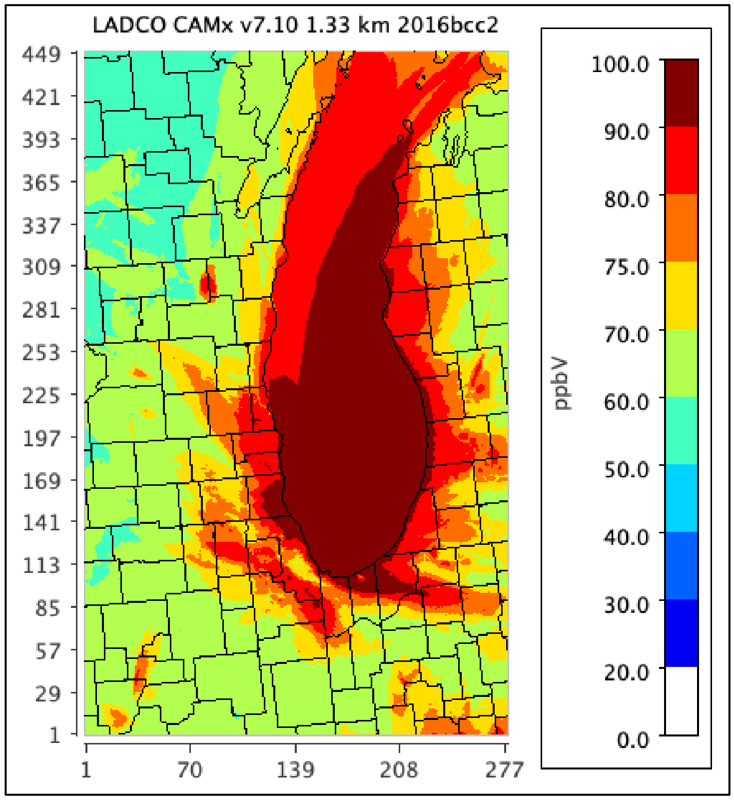

Figure 6-7. LADCO CAMx 1.33-km 2016 O_3 season maximum MDA8 O_3 concentrations

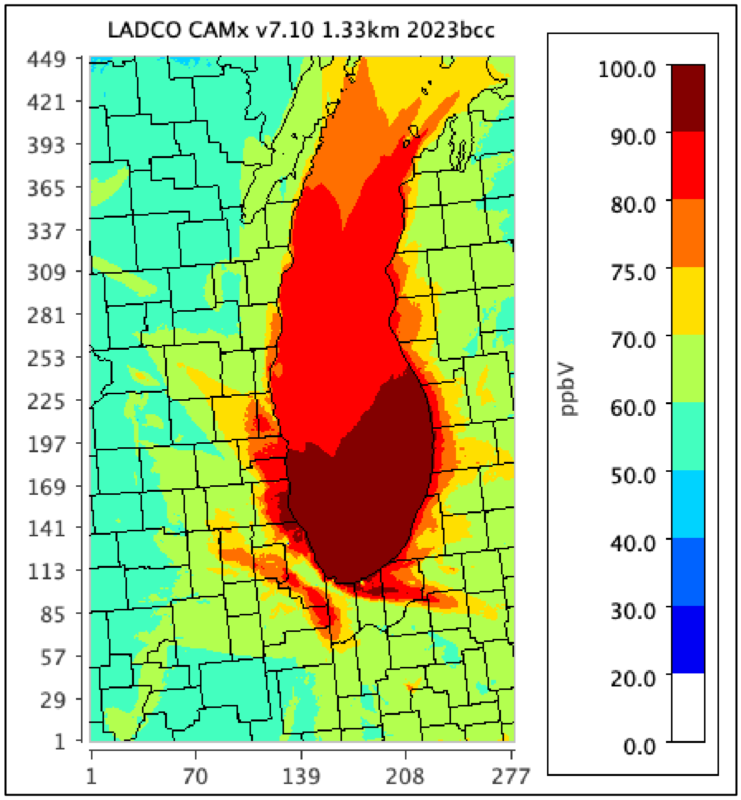

Figure 6-8. LADCO CAMx 1.33-km 2023 O_3 season maximum MDA8 O_3 concentrations

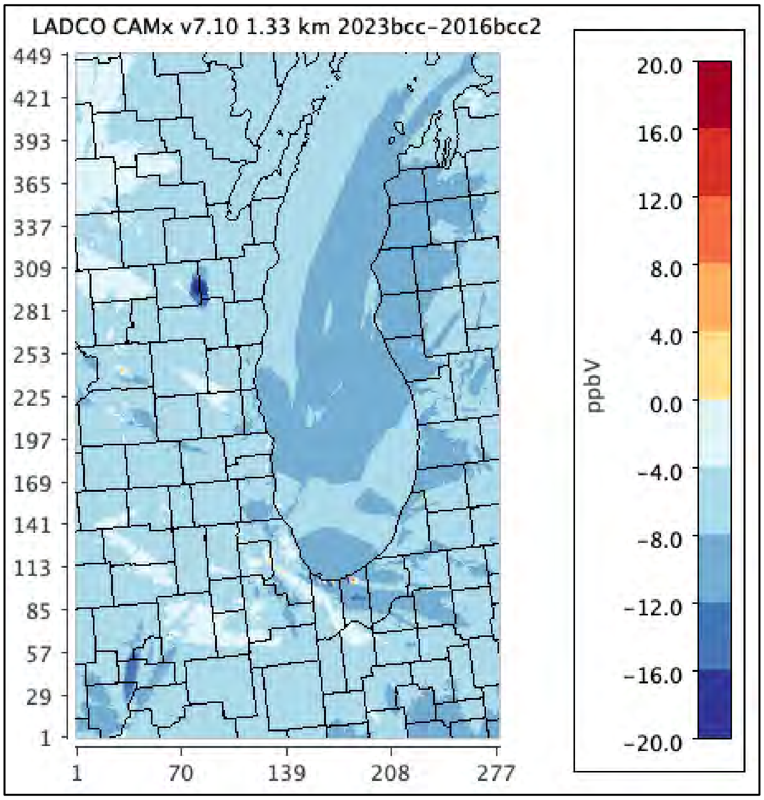

Figure 6-9. LADCO CAMx 1.33-km difference (2023-2016) in O_3 season maximum MDA8 O_3 concentrations

6.3. 2023 O_3 Design Values

Figure 6-10 shows the O_3 DVF_{2023} values from the LADCO 2023 4-km CAMx simulation. Figure 6-11 is a map of the SMAT-CE 2023 relative response factors (RRFs) from the LADCO CAMx 4-km modeling. LADCO generated these results with SMAT-CE using the standard U.S. EPA attainment test configuration (top 10 modeled days, 3x3 cell matrix around the monitor, including water cells). We are showing the DVF_{2023} calculated from the 4-km CAMx simulation because the domain encompasses the entire LADCO region, and presents an optimized model configuration relative to the 12-km domain. As described previously in this TSD, the CAMx two-way nesting configuration used by LADCO propagates the fine grid model solution upward to the parent grids. The solution for the model grid cells in the 4-km modeling domain that include the 1.33-km nested domain is primarily from the 1.33-km simulation. Similarly, the model solution in the grid cells in the 12-km modeling domain that include the 4-km domain is primarily from the 4-km simulation.

The LADCO O_3 DVF_{2023} values presented here used observational data completeness criteria based on the 2015 O_3 NAAQS. The completeness criteria are tied to the level of the standard in cases in which the number of valid observations falls below a statutory threshold but when at least one of the valid observations is greater than the NAAQS (see 40 CFR Part 50 Appendix U, Section 3(d)). By using the 2015 O_3 NAAQS for determining completeness, LADCO includes more available data points in the DV calculations than if we had used the 2008 O_3 NAAQS completeness criteria because the lower standard is more inclusive of the available monitoring data (i.e., there are more MDA8 O_3 observations >= 70 ppb than there are observations >= 75 ppb). Per U.S. EPA modeling guidance (U.S. EPA, 2018), LADCO truncated the SMAT-CE average DVF_{2023} values to integer numbers.

The LADCO 2023 CAMx simulation predicts that two monitors in the region will have an average DVF_{2023} that exceeds the 2015 O_3 NAAQS: Sheboygan Kohler Andrae in Sheboygan County, Wisconsin (DVF_{2023} = 75) and Chiwaukee Prairie in Kenosha County, Wisconsin (DVF_{2023} =71). The RRF plot shows that the LADCO CAMx modeling projected all the monitors along the western shore of Lake Michigan and southern shore of Lake Erie, along with a few other areas of the region, to have 5-9% reductions in their DVF_{2023} values (RRFs = 0.91-0.95). Most of the monitors in the region are forecast to have 10-14% DVF_{2023} reductions (RRFs = 0.86-0.9). Table 6-1 presents the average DVF_{2023} values for monitors in each of the 2015 O_3 NAAQS NAAs in the region. As with the DVF_{2023} and RRF figures in this section, this table presents the DVF_{2023} values calculated from the LADCO 4-km CAMx modeling using a matrix of 3x3 grid cells surrounding each monitor and including water cells in the calculation.

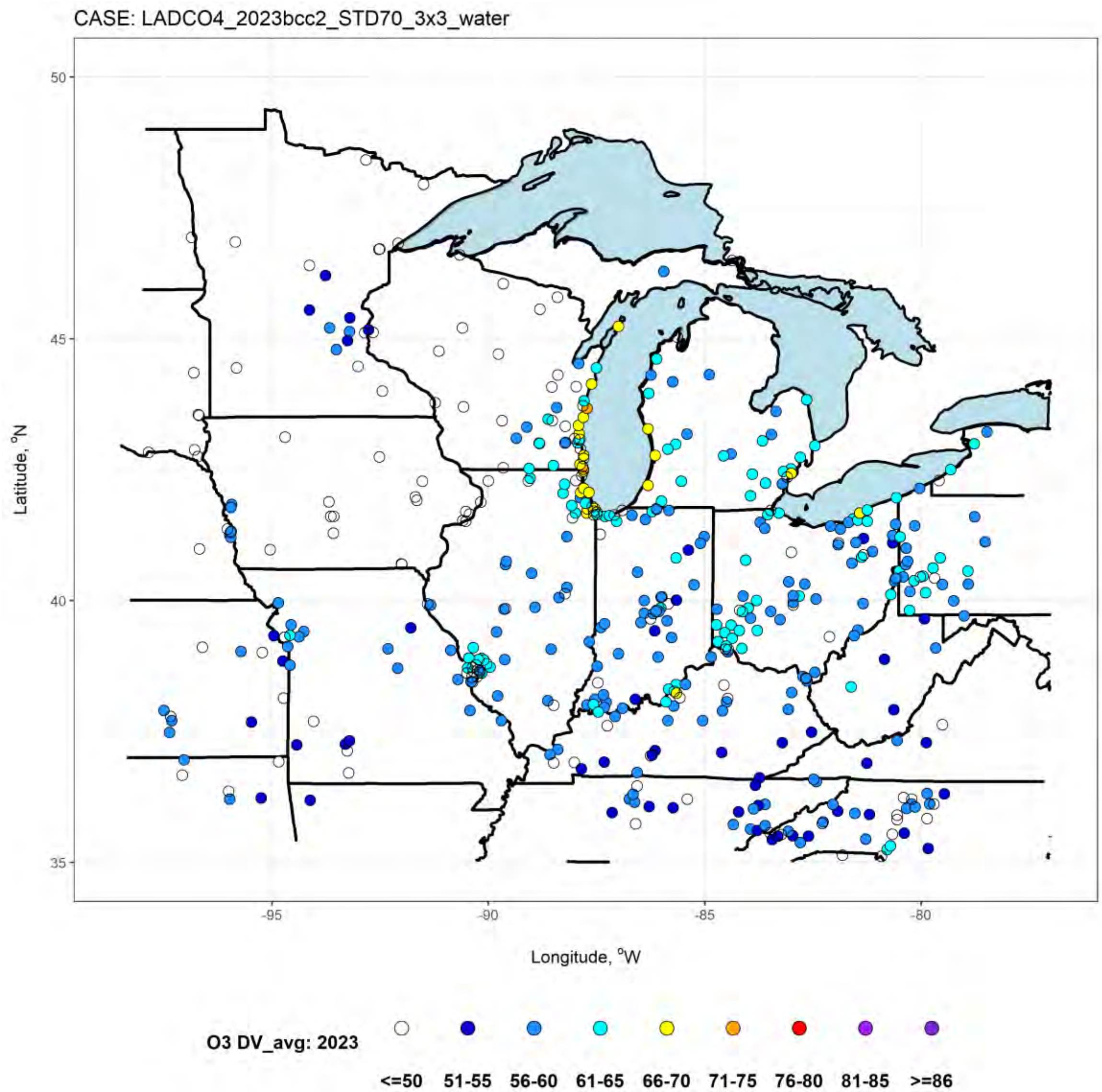

Figure 6-10. DVF_{203} O_3 design values calculated with water cells included from the LADCO 2023 4-km CAMx simulation.

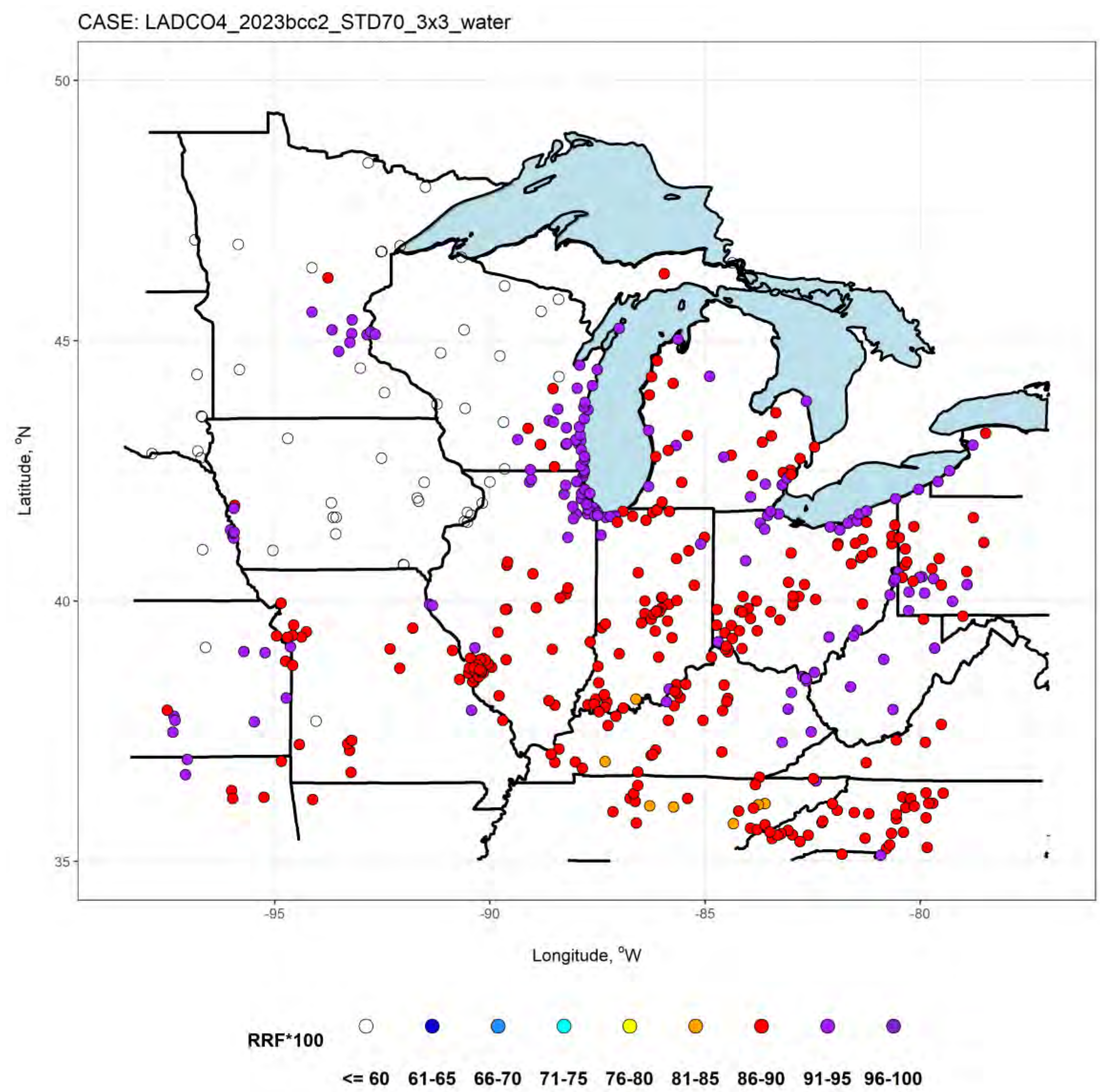

Figure 6-11. 2023 RRFs calculated with water cells included from the LADCO 2023 4-km CAMx simulation.

Table 6-1. 2023 O_3 design values at each monitor in the 2015 O_3 NAAQS NAAs in the LADCO region; calculated from the LADCO 4-km CAMx modeling with water cells included in the 3x3 matrix surrounding the monitor

State	NAA	AQS Site ID	Site Name	2021 DV	2023 DV	RRF
Michigan	Allegan County, MI	260050003	HOLLAND	75	66.9	0.9084
Michigan	Berrien County, MI	260210014	COLOMA	71	67.3	0.9185
Michigan	Muskegon County, MI	261210039	MUSKEGON	74	68.6	0.9149
Illinois	Chicago, IL-IN-WI	170310001	ALSIP	71	67.5	0.9251
Illinois	Chicago, IL-IN-WI	170314201	NORTHBRK	74	68.0	0.9285
Illinois	Chicago, IL-IN-WI	170317002	EVANSTON	73	68.9	0.9324
Illinois	Chicago, IL-IN-WI	170310032	CHI_SWFP	75	66.6	0.9214
Illinois	Chicago, IL-IN-WI	170310076	CHI_COM	0	67.9	0.9436
Illinois	Chicago, IL-IN-WI	170971007	ZION	73	67.9	0.9218
Illinois	Chicago, IL-IN-WI	170314007	DESPLNS	69	66.1	0.9187
Illinois	Chicago, IL-IN-WI	170314002	CICERO	70	64.9	0.9448
Illinois	Chicago, IL-IN-WI	171110001	CARY	71	63.7	0.9151
Illinois	Chicago, IL-IN-WI	170436001	LISLE	70	65.3	0.9383
Illinois	Chicago, IL-IN-WI	170890005	ELGIN	70	64.3	0.9285
Illinois	Chicago, IL-IN-WI	170311601	LEMONT	72	64.8	0.9363
Illinois	Chicago, IL-IN-WI	170311003	CHI_TAFT	71	63.3	0.9281
Illinois	Chicago, IL-IN-WI	171971011	BRAIDWD	64	60.2	0.9227
Illinois	Chicago, IL-IN-WI	170313103	SCHILPRK	64	59.4	0.9486
Indiana	Chicago, IL-IN-WI	181270026	Valparaiso	68	62.5	0.9022
Indiana	Chicago, IL-IN-WI	181270024	Ogden Dunes	72	63.4	0.9097
Indiana	Chicago, IL-IN-WI	180890022	Gary-IITRI	69	62.2	0.912
Indiana	Chicago, IL-IN-WI	180892008	Hammond-141st St	68	61.1	0.9259
Wisconsin	Chicago, IL-IN-WI	550590019	CHIWAUKEE	74	71.6	0.9183
Wisconsin	Chicago, IL-IN-WI	550590025	Kenosha-Water Tower	72	67.6	0.9184
Ohio	Cincinnati, OH-KY	390610006	Sycamore	70	65.8	0.8985
Ohio	Cincinnati, OH-KY	390170018	Middletown Airport	67	63.8	0.8955
Ohio	Cincinnati, OH-KY	390170023	Crawford Woods	66	64.4	0.8915
Ohio	Cincinnati, OH-KY	390610010	Colerain	67	64.8	0.9099
Ohio	Cincinnati, OH-KY	390610040	Taft NCore	69	63.8	0.895
Ohio	Cincinnati, OH-KY	391650007	Lebanon	70	63.4	0.8844
Ohio	Cincinnati, OH-KY	390179991	Oxford	64	62.8	0.9042
Ohio	Cincinnati, OH-KY	390250022	Batavia	66	62.3	0.8914
Ohio	Cleveland, OH	390850003	Eastlake	72	67.1	0.9113
Ohio	Cleveland, OH	390550004	Notre Dame	66	63.8	0.8958

Ohio	Cleveland, OH	390355002	Mayfield	68	63.3	0.9142
Ohio	Cleveland, OH	390350034	District 6	70	63.3	0.9185
Ohio	Cleveland, OH	390850007	Painesville	66	62.7	0.9095
Ohio	Cleveland, OH	390930018	Sheffield	58	59.7	0.9095
Ohio	Cleveland, OH	390350064	Berea BOE	66	59.5	0.9123
Ohio	Cleveland, OH	391030004	Chippewa	61	57.5	0.8953
Ohio	Cleveland, OH	391530020	Patterson Park	64	56.9	0.899
Ohio	Cleveland, OH	390350060	GT Craig NCore	63	58.1	0.9272
Ohio	Cleveland, OH	391331001	Lake Rockwell	62	55.6	0.8983
Michigan	Detroit, MI	261630019	East 7 MILE	70	66.3	0.9085
Michigan	Detroit, MI	261250001	OAK PARK	69	64.1	0.9077
Michigan	Detroit, MI	261470005	PORT HURON	70	64.8	0.9008
Michigan	Detroit, MI	260990009	NEW HAVEN	68	64.4	0.8994
Michigan	Detroit, MI	261619991	Ann Arbor	62	62.8	0.9067
Michigan	Detroit, MI	260991003	WARREN	66	61.0	0.9077
Michigan	Detroit, MI	261610008	YPSILANTI	66	62.0	0.917
Michigan	Detroit, MI	261630001	ALLEN PARK	67	60.9	0.9193
Indiana	Louisville, KY-IN	180431004	New Albany	64	64.9	0.9148
Indiana	Louisville, KY-IN	180190008	Charlestown State Park	63	62.9	0.8952
Wisconsin	Milwaukee, WI	551010020	Racine	73	69.5	0.9148
Wisconsin	Milwaukee, WI	550890009	HARRINGTON BCH	70	68.7	0.9381
Wisconsin	Milwaukee, WI	550790085	BAYSIDE	70	66.5	0.9282
Wisconsin	Milwaukee, WI	550890008	GRAFTON	71	66.0	0.926
Wisconsin	Milwaukee, WI	550790026	MILWAUKEE SER	68	63.1	0.928
Wisconsin	Milwaukee, WI	550790010	MILWAUKEE 16TH ST	61	61.0	0.9354
Wisconsin	Milwaukee, WI	551330027	CLEVELAND AVE	65	60.5	0.9209
Wisconsin	Sheboygan County, WI	551170006	SHEBOYGAN	72	75.1	0.9391
Wisconsin	Sheboygan County, WI	551170009	Sheboygan-Haven	65	65.2	0.9328
Illinois	St. Louis, MO-IL	171191009	MARYVILL	67	61.5	0.8923
Illinois	St. Louis, MO-IL	171193007	WOOD_WTP	69	63.0	0.8916
Illinois	St. Louis, MO-IL	171630010	East St. Louis	65	62.1	0.9
Illinois	St. Louis, MO-IL	171199991	Alhambra	64	59.5	0.8846

6.3.1. Alternative DVF_{2023} Results

Confidence in the ability of photochemical models to accurately estimate O_3 over water is a persistent concern with the use of the models for air quality planning. This concern prompted measurement campaigns in the Eastern U.S. to address the issue (see the 2017 Lake Michigan

Ozone Study, Long Island Sound Tropospheric Ozone Study, and OWLETS). The meteorology and chemistry processes in model grid cells that are dominated by water (> 50% landuse area) are a challenge to simulate because the conventional technical formulations of the models were not optimized for water cells. Even with the introduction of new algorithms to simulate the dynamical and chemical features of water cells, a lack of over-water observations hinders our ability to verify the accuracy of the models in simulating these conditions.

In consideration that the models may not perform well in simulating water cells, U.S. EPA and others have presented alterative DVF calculation approaches that exclude water cells (US EPA, 2017; US EPA, 2018b). Per U.S. EPA (2018, pg. 109), when appropriate there may be cases where certain cells along the periphery of the 3 x 3 model grid cell matrix have different modeled responses than what would be expected at the monitor location at the center of a matrix due to a specific local topographic or geographical feature (e.g., a large water body or a significant elevation change). A potential example of this situation would be a matrix of grid cells where several grid cells are over water and where the meteorological conditions and relevant emissions sources differ substantially from the land-based monitor location. Again, in these types of cases and with appropriate justification, air agencies could consider removing the unrepresentative cells from the calculation.

Section 4.2.2 of the U.S EPA (2018) modeling guidance states, “In cases in which the spatial representativeness of a monitoring location is much smaller or larger than the area covered by the 3x3 array of cells, air agencies may consider assessing site-specific model response over an alternative grid cell array as part of corroborative analyses that inform the aggregate weight of evidence determination. Additionally, there may be cases where certain cells along the periphery of the 3 x 3 array have different modeled responses than what would be expected at the monitor location at the center of array due to a specific local topographic or geographical feature (e.g., a large water body or a significant elevation change). “

Factoring in the impact of water cells on the DVF calculation does not require additional CAMx simulations. It is implemented through a postprocessing sequence per U.S. EPA (2018b) in which model grid cells that are dominated by water (> 50% landuse area) are removed from the 3x3 matrix in the RRF and DVF calculation. One important modification to this process is to override the exclusion condition for cells that contain monitors; in other words, grid cells that contain monitors will be included in the 3x3 matrix regardless of the amount of water coverage in the cell.

Adjustments to the size of the grid cell matrix used in the DVF calculation is a configuration that can be adjusted in SMAT-CE. The program gives users the option to calculate DVs using only the model grid cell that contains a monitor, or matrices of 3x3, 5x5, or 7x7 cells around a monitor location. LADCO's 2016 CAMx modeling platform used a 3:1 nesting ratio to simulation air quality at 12-km, 4-km, and 1.33-km resolution. To normalize the area around a monitor used for calculating DVFs, the size of the matrix surrounding a monitor can be increased at finer grid resolutions.

LADCO conducted a series of attainment test experiments to understand the impacts on DVFs of excluding water cells or changing the size of the grid cell matrix. Table 6-2 shows the results of attainment test experiments for controlling[14] monitors at the lakeshore nonattainment areas in the region. The results in this table compare DVF_{2023} values for SMAT-CE configurations that include/exclude water cells and use different matrix sizes around the monitor. The range of DVF_{2023} values at a monitor resulting from the different configurations presented in the table averages about 0.5 ppb.

Table 6-2. Comparison of LADCO 2023 4-km O_3 design values at shoreline nonattainment area monitors in the region

NAA	AQS Site ID	3x3		5x5		7x7	
		Water	No Water	Water	No Water	Water	No Water
Allegan County, MI	260050003	66.9	66.9	67.6	67.2	67.5	67.2
Berrien County, MI	260210014	67.3	67.3	67.8	67.4	67.9	67.7
Muskegon County, MI	261210039	68.6	68.6	68.9	68.6	68.9	68.5
Chicago, IL-IN-WI	550590019	71.6	72.0	71.3	71.8	71.5	71.8
Cleveland, OH	390850003	67.1	66.5	67.3	66.7	67.4	66.5
Detroit, MI	261630019	66.3	66.3	66.0	66.0	66.0	66.1
Milwaukee, WI	551010020	69.5	69.4	69.6	69.4	69.4	69.5
Sheboygan County, WI	551170006	75.1	74.6	75.1	74.7	74.5	74.6

[14] The controlling monitor is the monitor location in the nonattainment area with the highest base year design value

Figure 6-12 compares different DVF_{2023} estimates for the Sheboygan Kohler Andrae monitor in Wisconsin. This figure adds the impacts of model grid resolution on the DVF_{2023} estimates by comparing configurations that include/exclude water cells, different grid cell matrix sizes, and model resolution. As seen in the table above, the attainment test configuration has a modest impact (~0.5 ppb) on the DVF_{2023} results, and will only be important for monitors that have estimated DVFs that are close to the NAAQS value.

LADCO's CAMx DVF estimates are available in supporting materials to this TSD in the following spreadsheet. The spreadsheet includes tables and figures of DVF_{2023} values calculated from the LADCO 12-km, 4-km, and 1.33-km CAMx modeling that use the different SMAT-CE configurations presented here.

LADCO 2016-based 2023 Design Value Forecasts (19 MB; XLSX)

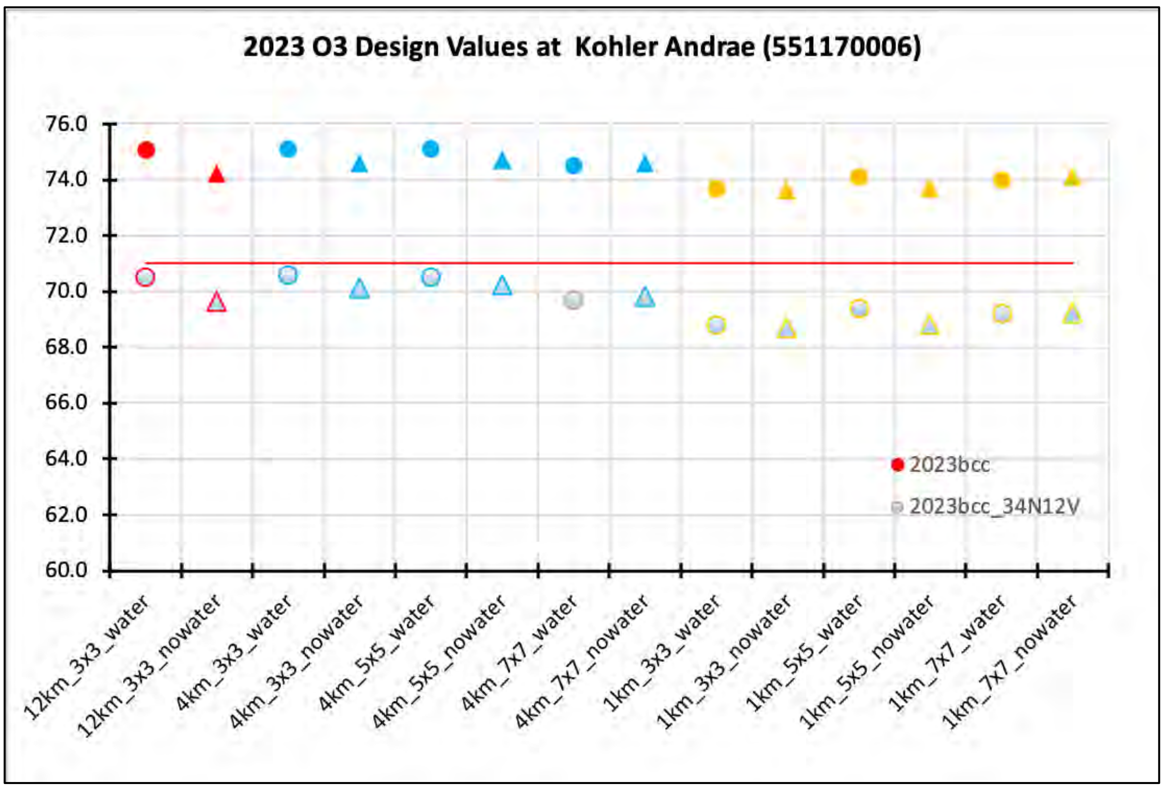

Figure 6-12. Alternative DVF_{2023} results for Sheboygan Kohler Andrae, WI

7. Source Apportionment Modeling Results

LADCO conducted source apportionment modeling with CAMx to quantify source-receptor relationships for O_3 in 2016. The CAMx APCA results show the extent to which emission from different source regions or inventory sectors impact ground-level O_3 concentrations in the region. The information provided by APCA can be used to inform air quality planners about the main drivers of O_3 formation at specific locations. The techniques used by LADCO to process the APCA results provide information on the sources that contribute to the annual 4th highest MDA8 O_3 concentrations at each monitor location.

In Section 3.4.1 we discussed the APCA configurations for the LADCO 2016-based CAMx simulations. The configuration description includes the APCA emission sector tags and geographic source region tags used for quantifying the contributions of upwind states, regions, and inventory sectors at downwind O_3 monitors.

7.1. APCA Post-processing for Source Contribution Estimates

LADCO post-processed the CAMx APCA tagged species model outputs to create SMAT-CE input files. This process involved operations on both the 2016 core model concentration outputs and the source apportionment outputs. The core model outputs are the total O_3 concentrations, while the source apportionment outputs track the amount of O_3 formed by either NOx or VOC emissions from the tagged sources.

The model attainment test software SMAT-CE processes daily average O_3 concentrations from a 3 x 3 grid cell matrix surrounding each O_3 monitor location in the CAMx modeling domain. LADCO used the following steps to prepare the SMAT-CE input files and to run the software to calculate the contribution of the tracers to O_3 at downwind receptors.

1. Combine hourly CAMx core model output into hourly total concentrations (File A).
2. Generate hourly pseudo total concentration outputs (File X') for each source tag by subtracting the tagged source apportionment output (File X) from File A.
3. Generate daily average total (File $\bar{A}$) concentration files from File A and File X', respectively

4. Extract the results in File $\bar{A}$ and File $\bar{X}'$ from 3x3 grid cells surrounding each monitor location in the modeling domain. LADCO then converted the extracted netCDF data to comma-delimited (CSV) files in the SMAT-CE input file format; the CSV outputs for File $\overline{A2}$ and File $\overline{X2'}$ were then ready for SMAT-CE.
5. Run SMAT-CE version 1.6 using the File $\overline{A2}$ and File $\overline{X2'}$ with observed surface O_3 data as inputs
6. We then used R to prepare the raw SMAT-CE for easy import to a spreadsheet for plotting and tabulation of the results.

LADCO's CAMx APCA O_3 tracer estimates are available in the supporting materials to this TSD in the following spreadsheet:

LADCO 2016-based O3 tracer contributions (8 MB; XLSX)

7.2. CAMx 2016 APCA Results

This section illustrates some of the results from the LADCO CAMx 2016-based APCA configurations that are included in the spreadsheet described in the previous section. The LADCO CAMx 2016 geographic tracer APCA modeling estimated the amount of O_3 contributed by O_3 precursor (NOx and VOC) emissions originating from states, groups of counties, biogenic, initial and boundary condition (ICBC), and international (Canada and Mexico) anthropogenic sources. The LADCO CAMx 2016 inventory sectors tracer APCA modeling estimated the amount of O_3 contributed by O_3 precursor emissions from various inventory sectors.

Figure 7-1 through Figure 7-10 show the contributions of emissions from the geographic and sectors tags to the 2016 O3 design value (DV_{2016}), or the annual 4th highest MDA8 O_3 at each monitor in Illinois, Indiana, Michigan, Ohio, and Wisconsin, respectively. These results are summarized by the NAAs in each state below.

7.2.1. APCA Tracer Contributions to Illinois O_3

Chicago

Figure 7-1 shows that the IL monitors with the highest DV_{2016} values in the state are in the Chicago NAA. NOx and VOC emissions from the Chicago metro and suburban counties are the largest contributors to O_3 at the Chicago NAA monitors. The Chicago metro/suburban area tracers contribute about 35-40% of the DV_{2016} at the monitors north and northwest of downtown Chicago. For example, the Chicago metro/suburban county emissions are associated with 37% of the DV_{2016} at the Zion, IL monitor (170971007) near the border with Wisconsin. Emissions from these same counties contribute ~24-30% of the DV_{2016} at monitors to the south of downtown. For example, emissions from these counties contribute 24% of the DV_{2016} at the South Water Treatment Plant (170310032). Emissions from the northern Indiana counties are the next largest single source region contributor to the Chicago NAA monitors, associated with about 5% of the DV_{2016} values.

Figure 7-2 shows that onroad mobile non-diesel (~12-15%) and onroad mobile diesel (~8-11%) sources are the largest emissions contributors to the Chicago DV_{2016} values. Other anthropogenic emissions sectors with notable contributions to Chicago O_3 concentrations include non-EGU point (~6-10%), offroad diesel engines (~5-7%), and offroad non-diesel engines (~5-6%).

East St. Louis

Emissions from anthropogenic sources in Missouri are the largest contributor to DV_{2016} values at monitors in the East St. Louis, IL counties (~30-40%). Other significant contributors to the East St. Louis, IL DV_{2016} values include emissions from the East St. Louis, IL counties (~10-15%), statewide emissions in TX and LA (~5%), and statewide emissions from the rest of the CenSARA states (~7%). Onroad mobile diesel (~12-13%) and onroad mobile non-diesel (~12-13%) emissions are the largest anthropogenic inventory sector contributors to O_3 at the East St. Louis, IL monitors. EGU point (~10-13%) and offroad diesel engines (~6-8%) are also important sources of emissions that contribute to O_3 at the East St. Louis monitors.

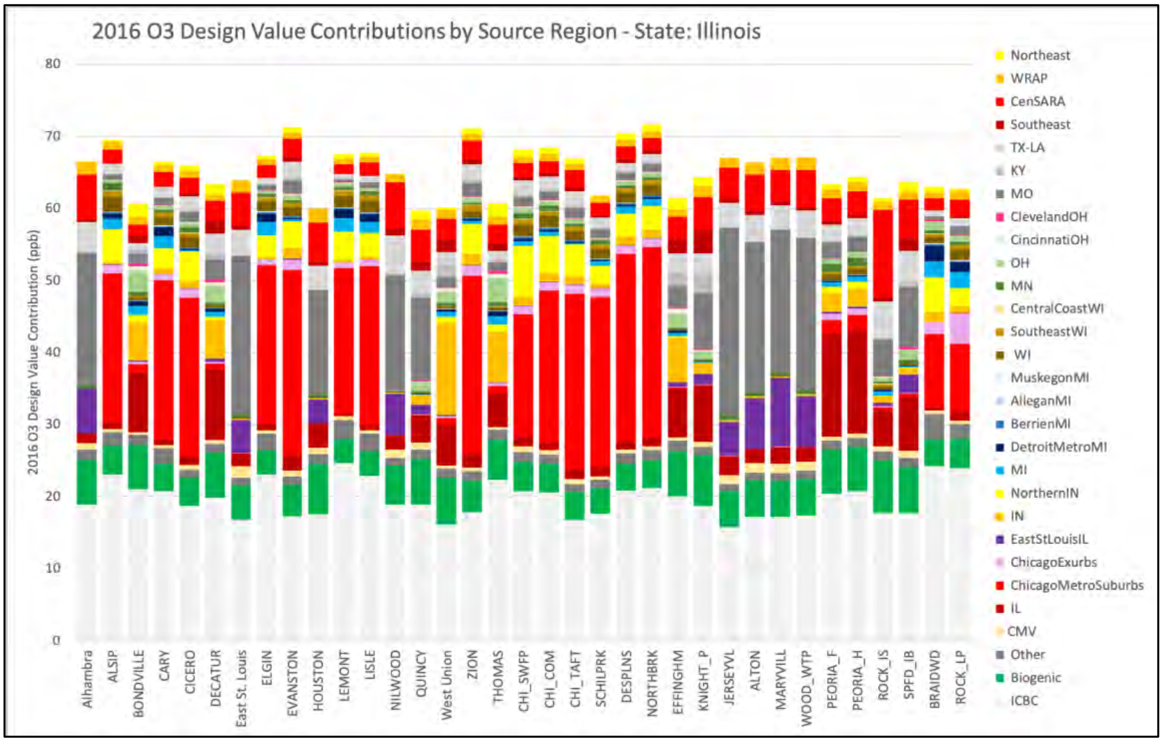

Figure 7-1. Geographic tracer contributions to 2016 MDA8 O_3 at IL monitors

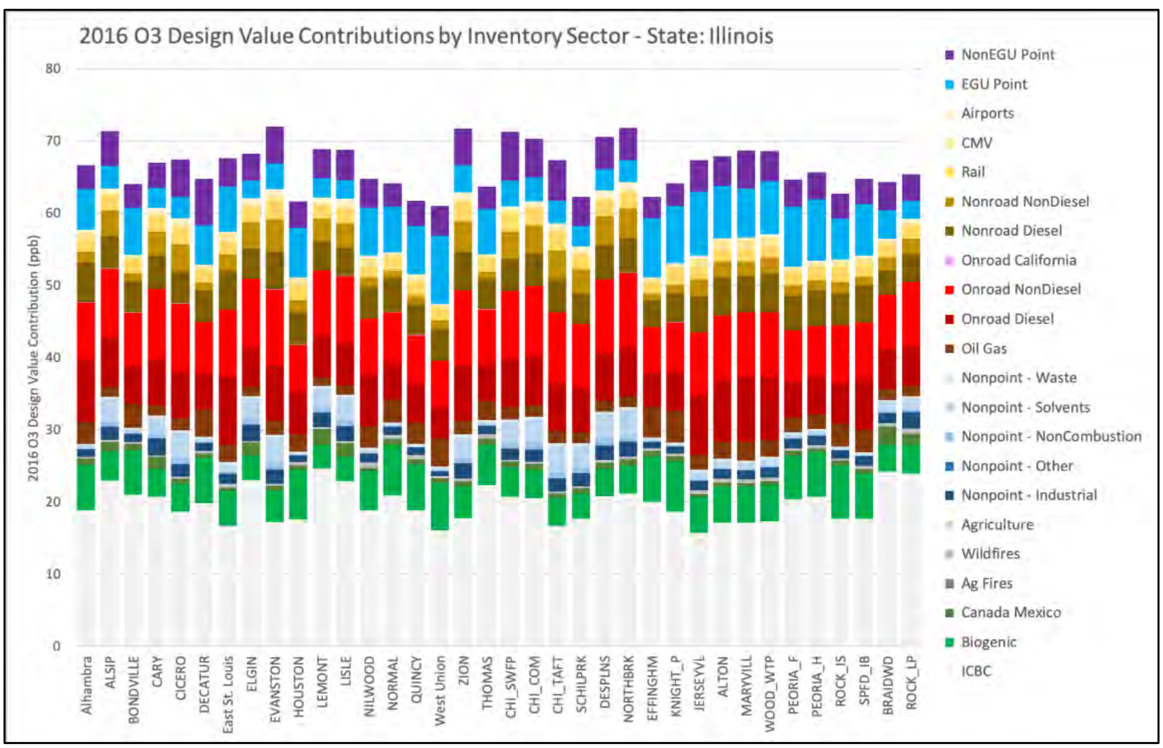

Figure 7-2. Inventory sector tracer contributions to 2016 MDA8 O_3 at IL monitors

7.2.2. APCA Tracer Contributions to Indiana O_3

Indianapolis

Figure 7-3 shows that the IN monitors with the highest DV_{2016} values in the state are in Indianapolis, northern Indiana near Lake Michigan, and in the Louisville area. Statewide emissions from Indiana, excluding the northern counties, are the largest contributor (~33-34%) to O_3 at the Indianapolis monitors. No other single source region contributes more than about 4% of the O_3 at the Indianapolis monitors. Figure 7-7 shows the inventory sectors contributing to O_3 concentrations in Indiana. Ozone at the Indianapolis monitors is most impacted by emissions from onroad mobile non-diesel (~17%) and onroad mobile diesel (~10%) sources. Other notable contributors to DV_{2016} values in Indianapolis include emissions from offroad diesel engines (~8%) and EGU point (~7%) sources.

Northwest Indiana

Ozone at the northern Indiana monitors is primarily impacted by emissions from the northern Indiana counties (~15-23%) and from the Chicago metro/suburban counties (~10-18%). The largest sources contributing to O_3 at the northern Indiana O_3 monitors include onroad mobile non-diesel (~13%), non-EGU point (~10-12%), onroad mobile diesel (~10%), offroad diesel engines (~7%), offroad non-diesel engines (~6-7%), and EGU point (~5%).

Louisville Area

Statewide emissions from Kentucky are the largest contributor to O_3 (~27%) at the Louisville area monitors in Indiana. Indiana statewide NOx and VOC emissions contribute about 10-13% of the DV_{2016} at these monitors. Ozone concentrations in the Indiana counties in the Louisville area are impacted most by emissions from onroad mobile non-diesel (~15-16%), EGU point (~12-13%), onroad mobile diesel (~10%), non-EGU point (~7%), and offroad diesel engines (~6%).

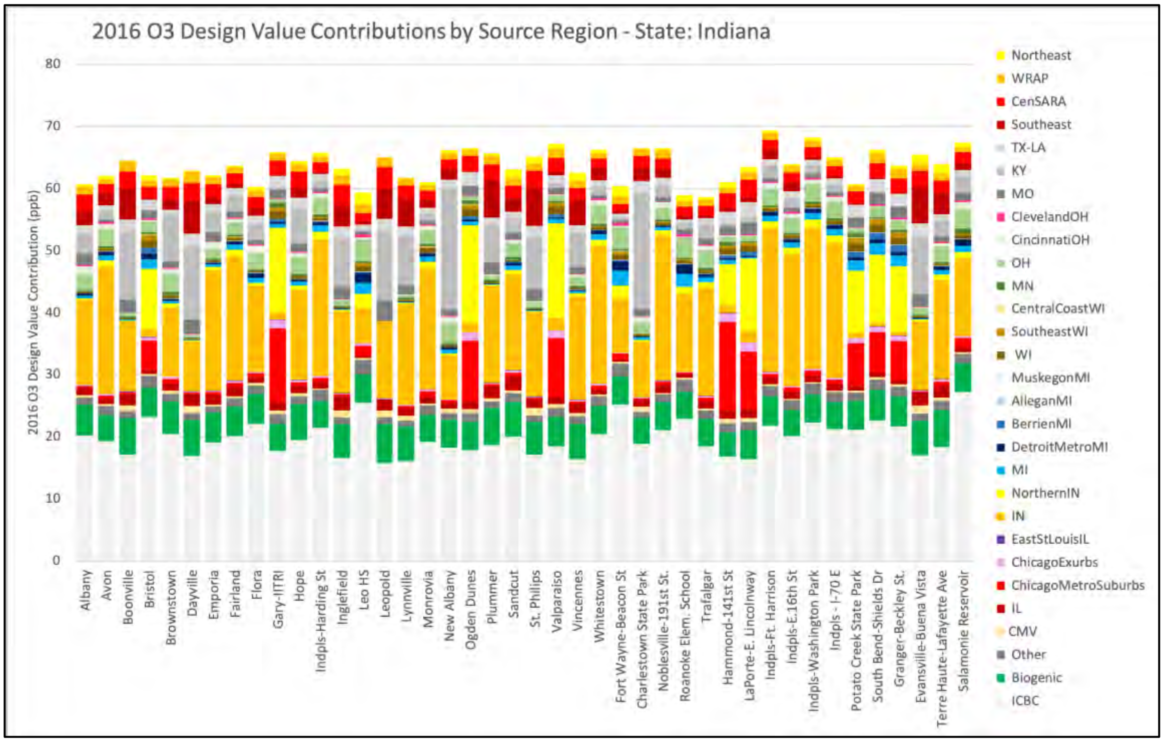

Figure 7-3. Geographic tracer contributions to 2016 MDA8 O_3 at IN monitors

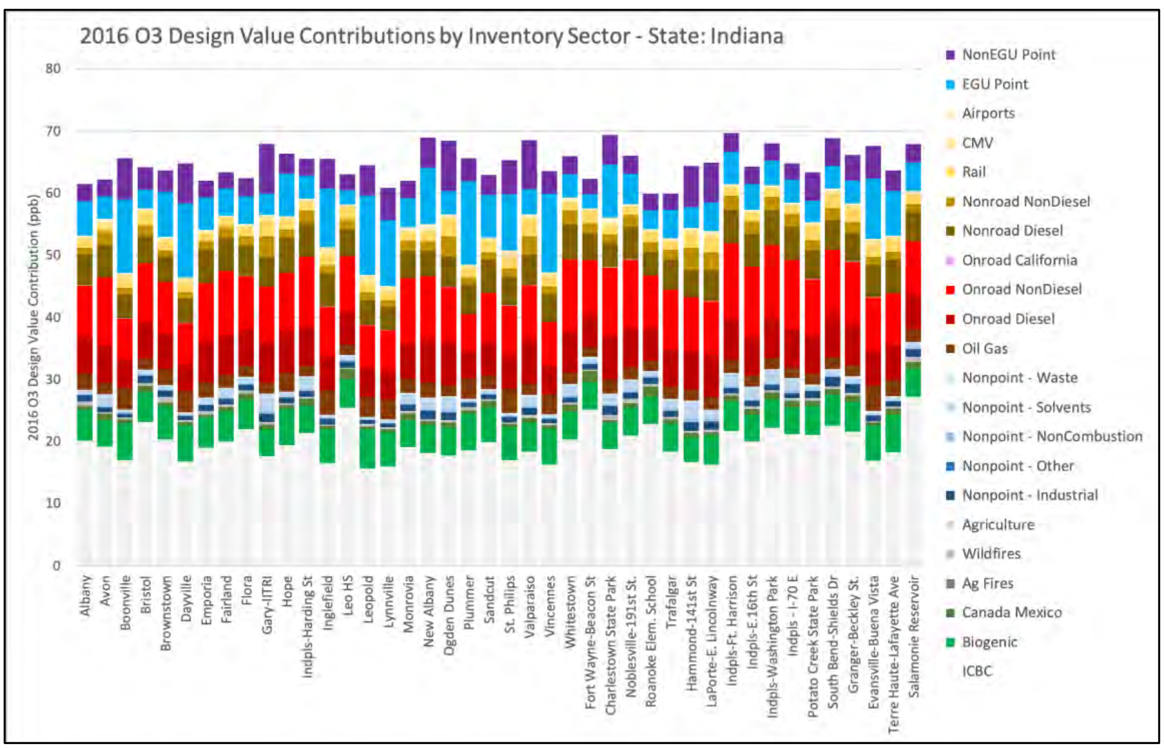

Figure 7-4. Inventory sector tracer contributions to 2016 MDA8 O_3 at IN monitors

7.2.1. APCA Tracer Contributions to Michigan O_3

Detroit

Figure 7-5 shows that the monitors in Michigan with the highest DV_{2016} values are along the shore of Lake Michigan and in the Detroit area. The geographic source regions with the largest NOx and VOC emissions contributions to O_3 at Detroit monitors include the Detroit metro counties (~18-25%) and the rest of state Michigan (~3-5%). Canadian emissions sources contribute ~5-9% of the DV_{2016} value, with the largest impact (9%) at the Port Huron monitor (261470005). Figure 7-6 shows that onroad mobile non-diesel emissions sources are the largest contributor to O_3 at the Detroit monitors (~10-15%). Other notable anthropogenic emissions sectors contributing to O_3 in Detroit include EGU point (~5-8%), onroad mobile diesel (~5-8%), non-EGU point (~5-6%), and offroad diesel engines (~4-5%).

Western Michigan

Emissions from the Chicago metro/surburban counties are the largest contributor (~16-22%) to the DV_{2016} values at the western Michigan monitors. Other notable emissions source regions include the northern Indiana counties (~8-14%), and the CenSARA states (~12-14%). The inventory sectors that have the largest contributions to O_3 at the western Michigan monitors include onroad mobile non-diesel (~13%), onroad mobile diesel (~11%), non-EGU point (~10%), and EGU point (~6-7%).

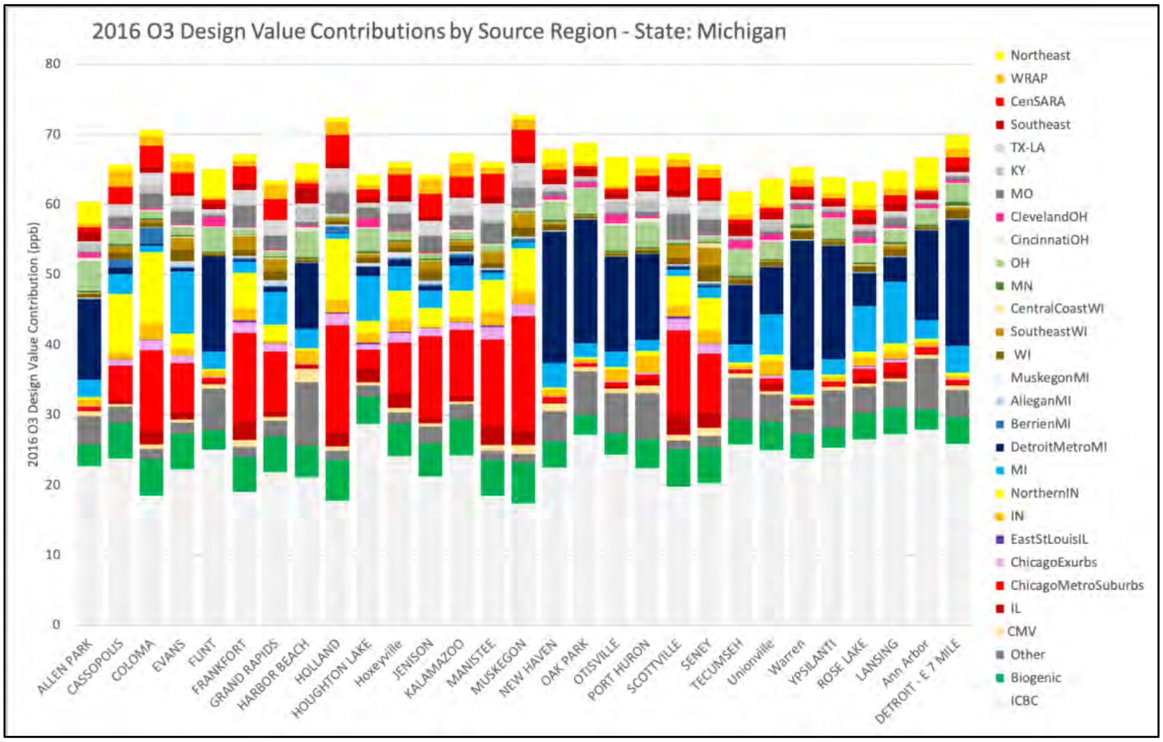

Figure 7-5. Geographic tracer contributions to 2016 MDA8 O_3 at MI monitors

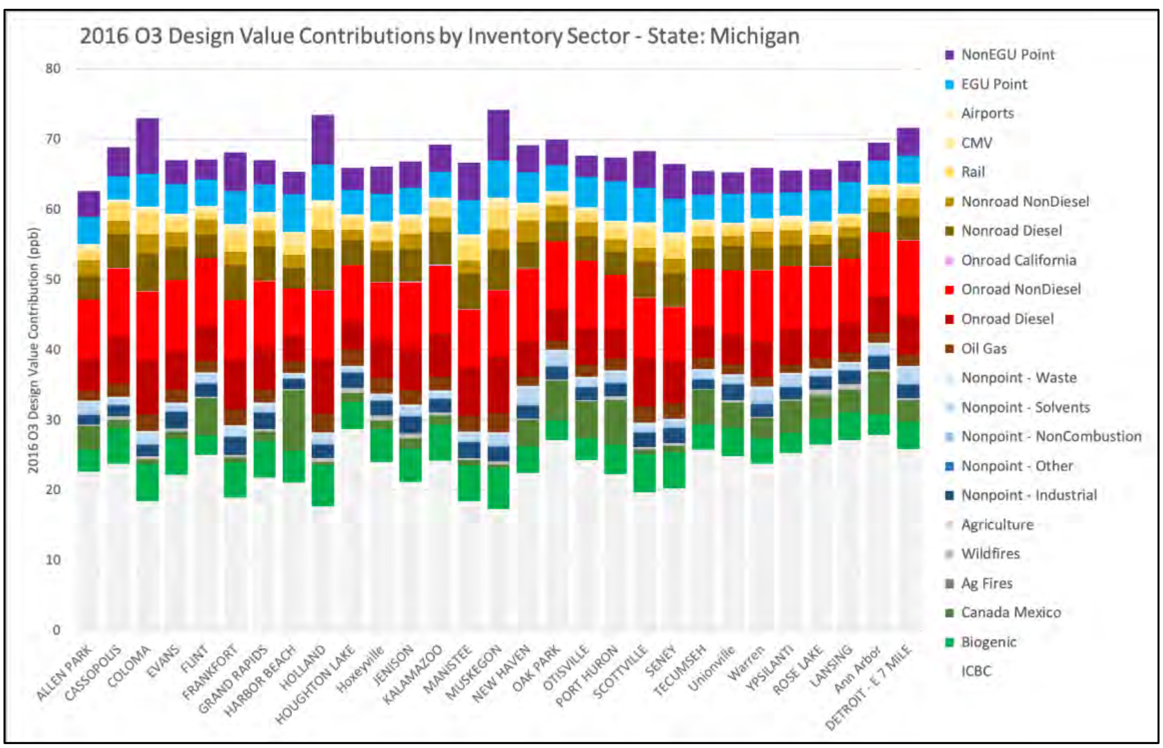

Figure 7-6. Inventory sector tracer contributions to 2016 MDA8 O_3 at MI monitors

7.2.1. APCA Tracer Contributions to Ohio O_3

Cincinnati

Figure 7-7 shows that NOx and VOC emissions from the Cincinnati counties are the largest contributor (~15-20%) to the DV_{2016} values at the Cincinnati O_3 monitors. Other notable geographic source regions that contribute to O_3 concentrations in Cincinnati include statewide Kentucky (~10-13%), the CenSARA states (~7-10%), the rest of Ohio (~5-10%), and statewide Indiana (~4-7%). Figure 7-8 shows that the largest inventory sector contributors to Cincinnati O_3 include emissions from onroad mobile non-diesel (~15-16%), EGU point (~12-14%), onroad mobile diesel (~9-10%), and non-EGU point (~5%) sources.

Cleveland

Ozone at the Cleveland monitors is most impacted by NOx and VOC emissions from the Cleveland area counties (~15-23%), the rest of Ohio statewide (~12-15%), and the states in the SESARM region (~10-13%). Onroad mobile non-diesel emissions sources are the largest contributor (~13-15%) to O_3 in the Cleveland area. Other notable anthropogenic inventory sectors that contribute to Cleveland O_3 include onroad mobile diesel (~7-9%), EGU point (~7-8%), non-EGU point (~6%), offroad diesel engines (~7-8%), and offroad non-diesel engines (~5-6%).

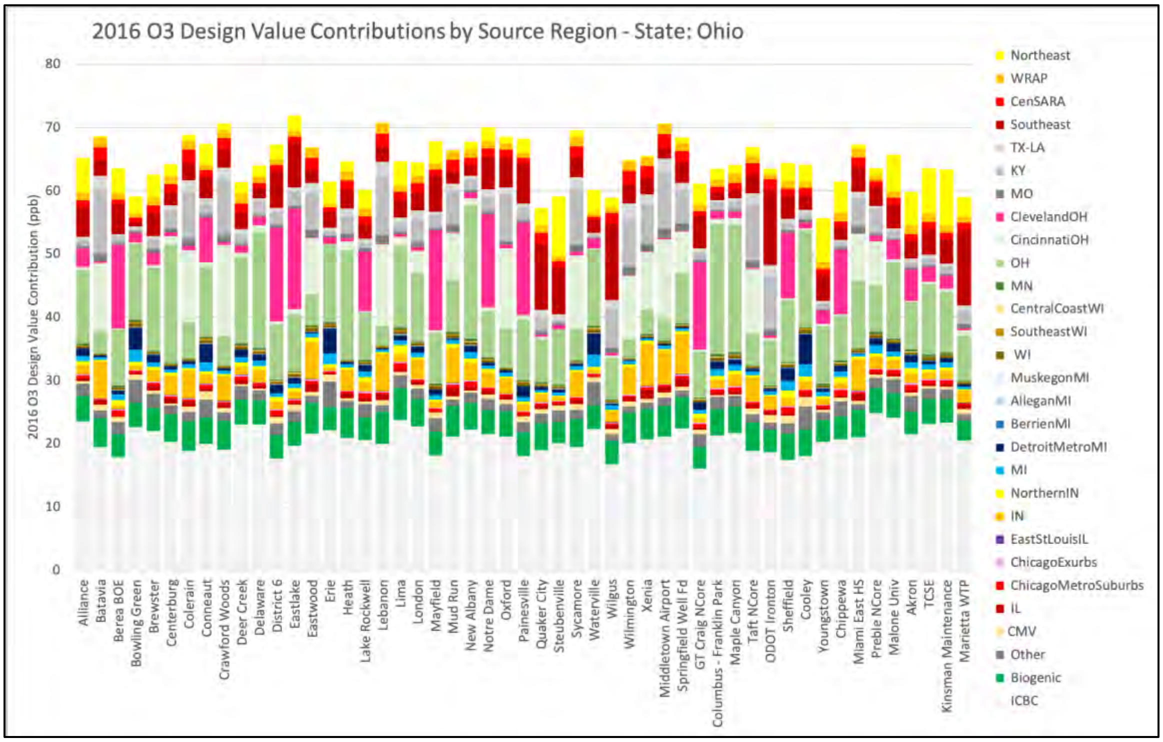

Figure 7-7. Geographic tracer contributions to 2016 MDA8 O_3 at OH monitors

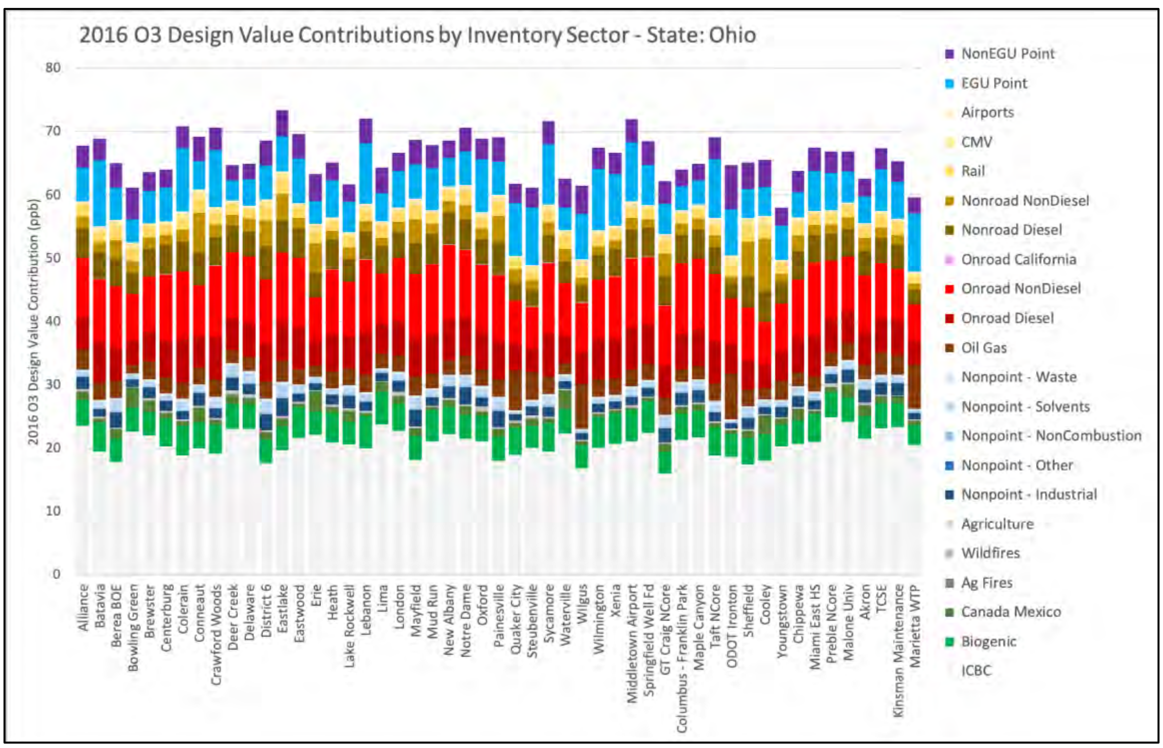

Figure 7-8. Inventory sector tracer contributions to 2016 MDA8 O_3 at OH monitors

7.2.1. APCA Tracer Contributions to Wisconsin O_3

Southeast Wisconsin

Figure 7-9 shows that highest DV_{2016} values in Wisconsin are measured at the Lake Michigan coastline monitors. Ozone concentrations in the southeastern counties (Kenosha and Racine) near the border with Illinois are most impacted by NOx and VOC emissions from the Chicago metro/suburban counties (~27-32%). Other notable geographic source regions contributing to O_3 in southeast Wisconsin include the northern Indiana counties (~6-7%) and the CenSARA states (~8-10%). Emissions sources in the southeast Wisconsin counties contribute ~1-2% of the DV_{2016}. Figure 7-10 shows that onroad mobile non-diesel sources are the largest contributor to O_3 in this area (~14%). Other anthropogenic inventory sectors with notable contributions to O_3 in southeast Wisconsin include onroad mobile diesel (~11%), non-EGU point (~7-8%), offroad diesel engines (~7-8%), offroad non-diesel engines (~5-6%), and EGU point (~5-6%).

Milwaukee

Emissions from the Chicago metro/surburban counties are the largest contributor to O_3 at monitors in Milwaukee (~18-19%). Emissions from southeast Wisconsin counties, which include Milwaukee, contribute about 7-9% of the DV_{2016} values. Other notable geographic source regions contributing to Milwaukee O_3 include NOx and VOC emissions from the northern Indiana counties (~5-6%) and the CenSARA states (~7%). Onroad mobile non-diesel sources are the largest contributor to O_3 in this area (~13%). Other anthropogenic inventory sectors with notable contributions to O_3 in Milwaukee include onroad mobile diesel (~10%), non-EGU point (~7%), offroad diesel engines (7%), and EGU point (~6%).

Sheboygan County

Emissions from the Chicago metro/surburban counties are the largest contributor to O_3 at monitors in Sheboygan county (~19-21%). Other notable anthropogenic emission source regions to Sheboygan county O_3 include the CenSARA states (~8%) and the northern Indiana counties (~7%). Anthropogenic emissions from the Wisconsin central coast counties, which include Sheboygan county, contribute ~1% to the DV_{2016} value for this area. Onroad mobile non-diesel sources are the largest contributor to O_3 in this area (~13%). Other anthropogenic inventory sectors with notable contributions to O_3 in Sheboygan county include onroad mobile diesel (~9%), non-EGU point (~8%), offroad diesel engines (7%), and EGU point (~6%).

Door County

Emissions from the Chicago metro/surburban counties are the largest contributor to O_3 at monitors in Door county (~17%). Other notable anthropogenic emission source regions to Door county O_3 include the CenSARA states (~11%) and the northern Indiana counties (~7%). Onroad mobile non-diesel sources are the largest contributor to O_3 in this area (~12%). Other anthropogenic inventory sectors with notable contributions to O_3 in Door county include onroad mobile diesel (~10%), non-EGU point (~8%), offroad diesel engines (7%), and EGU point (~7%).

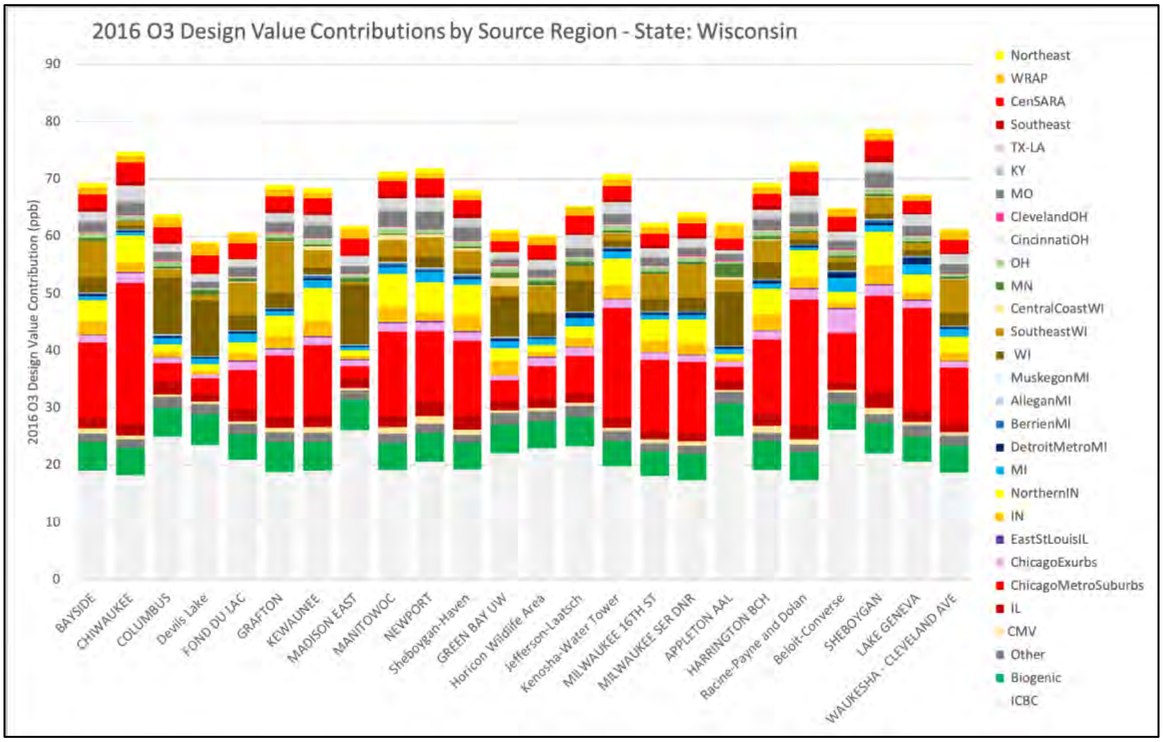

Figure 7-9. Geographic tracer contributions to 2016 MDA8 O_3 at WI monitors

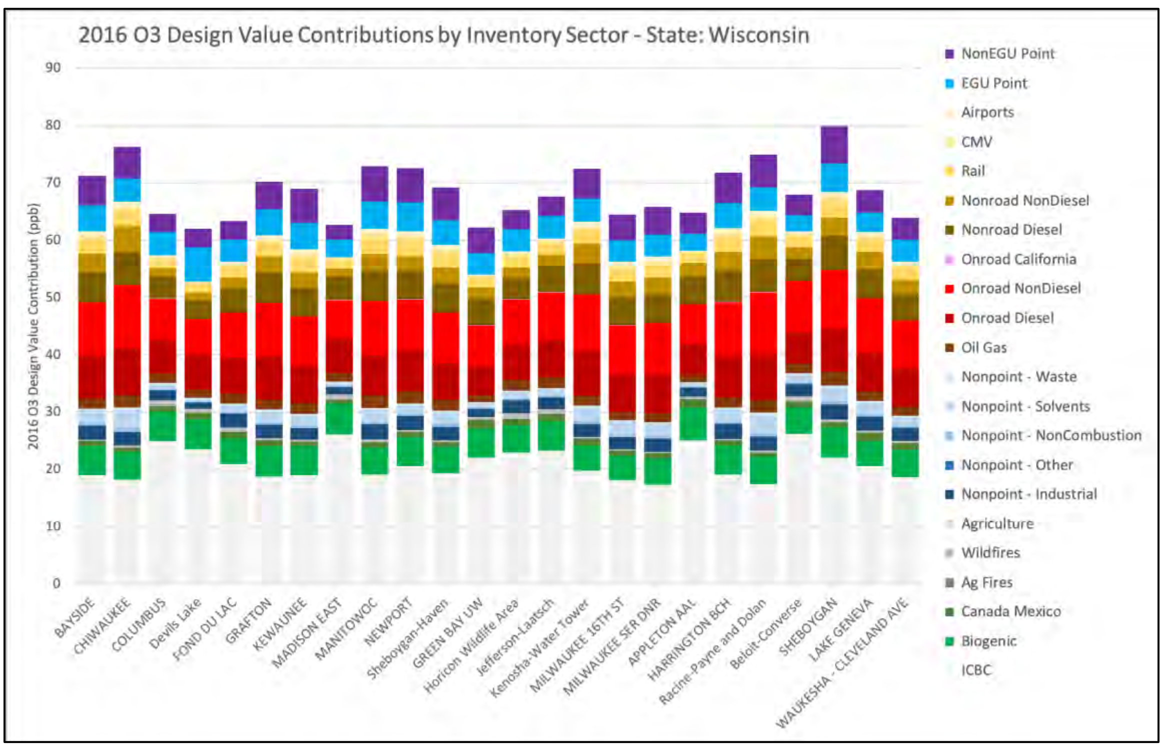

Figure 7-10. Inventory sector tracer contributions to 2016 MDA8 O_3 at WI monitors

8. 2016 Version 1 Modeling Platform Justification

As described in Section 3, LADCO used a modified version of the 2016v1 Inventory Collaborative emissions inventory and the U.S. EPA 2016fh emissions modeling platform to build the LADCO 2016 modeling platform. The LADCO 2016 platform used WRF 3.9.1 meteorology data optimized for the Great Lakes Basin (LADCO, 2022) and CAMx v7.10 to simulate 2016 and 2023 ozone concentrations. A key feature of the LADCO 2016 platform is the use of 12-km/4-km/1.33-km two-way nested domains centered on the LADCO region and Lake Michigan. Section 5 validated the performance of the LADCO 2016 platform for simulating O_3 concentrations in the Great Lakes region.

LADCO originally developed the 2016 modeling platform in early 2021 for demonstrating progress for the second regional haze planning period (LADCO, 2021). We extended the regional haze CAMx modeling to include the LADCO 2016 WRF meteorology and nested domains during spring and summer 2021, completing the LADCO CAMx simulations documented in this TSD (LADCO CAMx 2016bcc2 and 2023bcc) in late 2021.

U.S. EPA officially released the full 2016v2 emissions modeling platform in February 2022 (US EPA, 2022b). Starting in July 2021, U.S. EPA began to release components of the 2016v2 platform with MOVES3 onroad mobile source emission factors tables and inventory data for 2016 and 2023. U.S. EPA then released the rest of the inventory and modeling platform components by October 2021.

When U.S. EPA began to release the 2016v2 emissions data in summer 2021, LADCO was already committed to using the 2016v1-based emissions modeling platform to support 2015 O_3 NAAQS moderate area attainment demonstrations. As described in this section, LADCO's use of the 2016v1 emissions was justified for the following reasons:

1. LADCO had already invested significant resources into developing and evaluating the 2016v1-based platform when U.S. EPA released the 2016v2 data, and we did not have time to restart the modeling and evaluation to meet our commitments to our member states
2. While there are differences in the NOx and VOC emissions estimates between the 2016v1 and 2016v2 platforms, the differences are driven primarily by changes to the biogenic and

onroad mobile sectors. LADCO feels that the 2016v2 platform methodological updates to the models used to estimate the emissions for these sectors, BEIS and MOVES, respectively, require further evaluation for sources in the Great Lakes region. As described below, LADCO's modeling using 2016v1 emissions is well within the model performance benchmarks and is a better model than U.S. EPA's model using 2016v2 emissions in the LADCO region. Therefore, we did not feel that it was a good use of our time or resources to evaluate the extent to which the changes to these sectors impacted model performance and attainment testing for receptors in the Great Lakes region.

3. The LADCO 2016v1-based modeling platform has equal or better skill at simulating O_3 in the Great Lakes region than the U.S. EPA 2016v2-based platform

8.1.1. 2016v1 and 2016v2 Emissions Comparison

A comparison of the 2016fh and 2016v2 EMP estimates of NOx and VOC emissions shows differences for the states in the LADCO region. Table 8-1 shows that the 2016 annual, state total anthropogenic VOC emissions decrease across a range of 1% (WI) to 21% (MI) in the v2 platform relative to 2016fh. The 2023 annual, state total anthropogenic VOC emissions differences range from a 4% (WI) increase to a 19% (MI) decrease in the v2 platform relative to 2016fh. Table 8-2 shows that the 2016 annual, state total anthropogenic NOx emissions differences range from a 4% increase in OH to 6% decrease in WI. The 2023 annual, state total anthropogenic NOx emissions changes range from a negligible decrease in MN to a 10% decrease in OH.

Table 8-1. LADCO state annual total anthropogenic VOC emissions in the 2016fh and 2016v2 platforms (tons/year)

	2016			2023		
State	**2016fh**	**V2**	**V2-fh (%)**	**2016fh**	**V2**	**V2-fh (%)**
Illinois	358,774	323,933	-10%	323,736	300,714	-7%
Indiana	238,181	191,731	-20%	212,422	173,352	-18%
Michigan	318,496	253,054	-21%	274,125	221,088	-19%
Minnesota	244,278	220,320	-10%	212,262	198,488	-6%
Ohio	340,110	286,892	-16%	303,176	261,050	-14%
Wisconsin	181,182	179,946	-1%	154,312	160,096	4%

Table 8-2. LADCO state annual total anthropogenic NOx emissions in the 2016fh and 2016v2 platforms (tons)

State	2016			2023		
	2016fh	V2	V2-fh (%)	2016fh	V2	V2-fh (%)
Illinois	350,279	338,053	-3%	256,826	243,255	-5%
Indiana	305,578	303,099	-1%	200,095	186,696	-7%
Michigan	284,877	275,104	-3%	212,245	197,776	-7%
Minnesota	211,544	208,421	-1%	151,136	150,577	0%
Ohio	334,833	348,213	4%	242,282	218,930	-10%
Wisconsin	178,423	168,119	-6%	118,851	112,283	-6%

Figure 8-1 and Figure 8-2 are thematic maps of 2016fh and v2 platform differences in annual county total (anthropogenic + natural) NOx and VOC emissions in 2016 and 2023. The maps show that the emissions differences between the two platforms are not spatially uniform. The 2016 NOx emissions map (Figure 8-1, top) for example shows that many of the counties in the Great Lakes region have higher annual total NOx emissions in the 2016v2 platform relative to 206fh, despite lower state total emissions.

Table 8-3 compares the annual state total biogenic emissions between the 2016fh and v2 platforms. The statewide biogenic NO emissions increase across the region in the v2 platform relative to 2016fh ranging from +13% (IL) to +30% (WI). The statewide biogenic VOC emissions decrease in the v2 platform across the region with a range from -22% (OH) to -44% (IL). The biogenic sector is the single largest VOC emissions source on an annual, statewide basis.
As 2016fh emissions are generally higher than those included in 2016v2, LADCO's modeling using 2016fh emissions is likely conservative and predicting higher O_3 than if 2016v2 emissions were used.

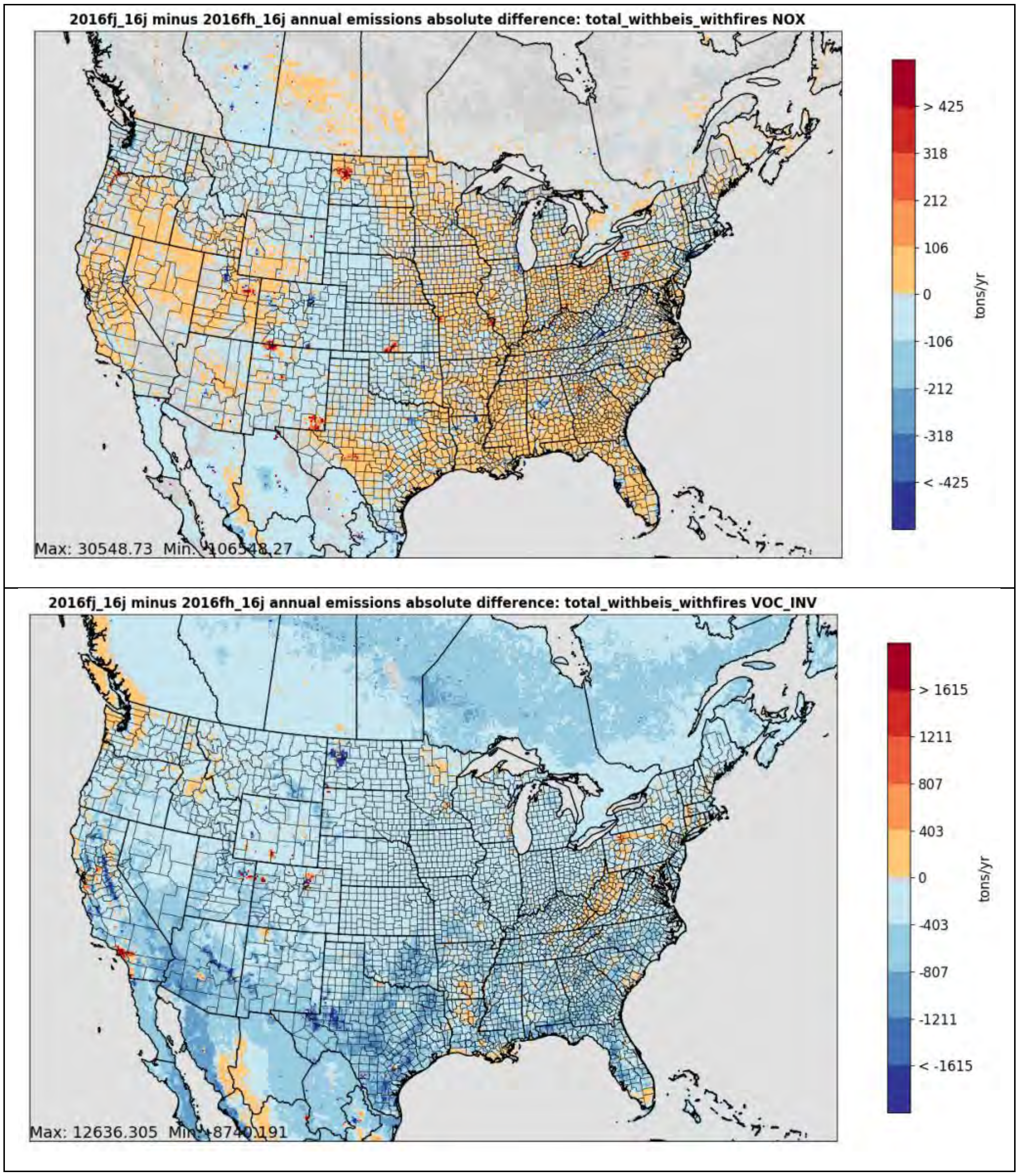

Figure 8-1. Comparison of annual 2016 NOx (top) and VOC (bottom) emissions between the 2016fh and 2016v2 modeling platforms

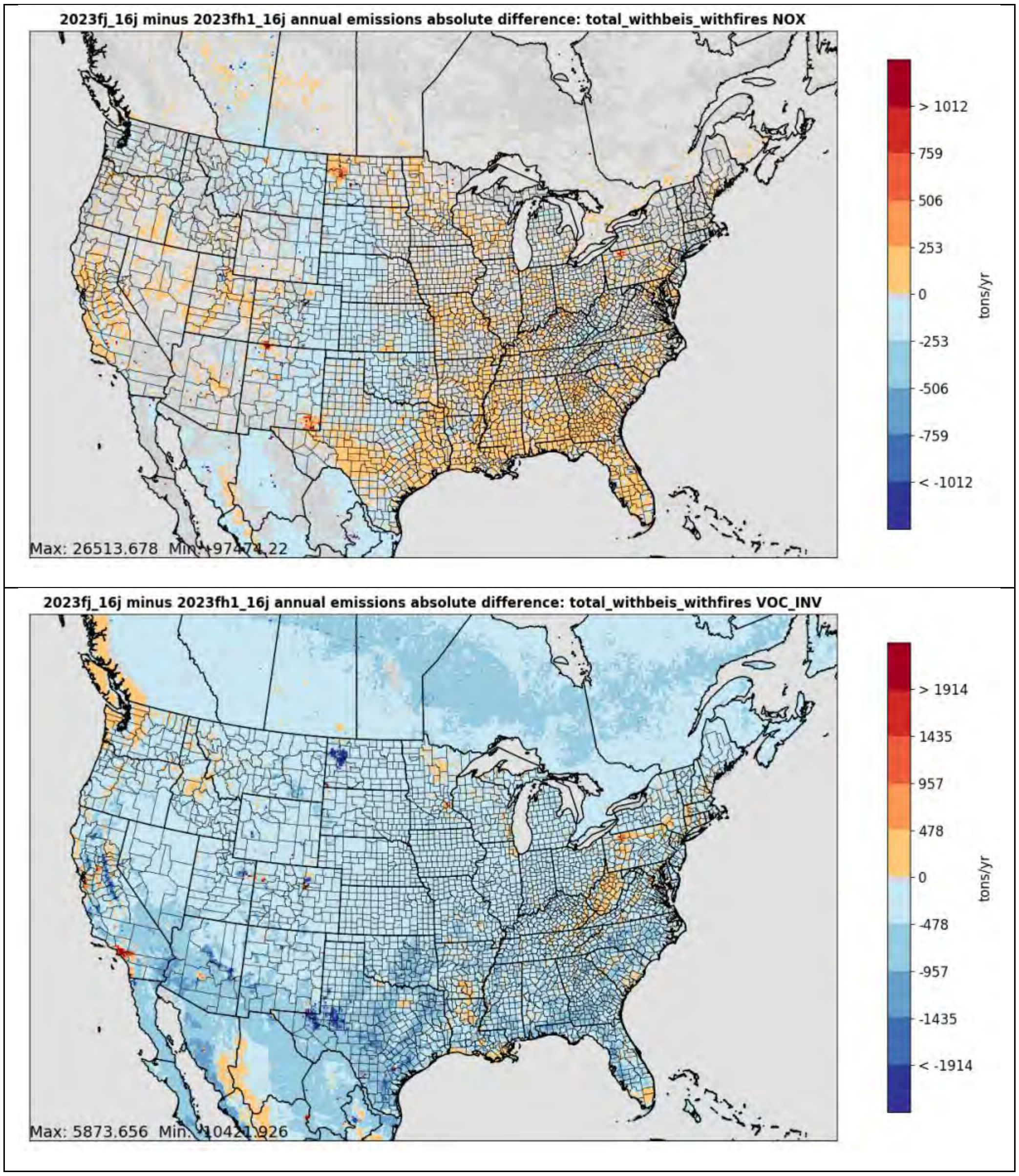

Figure 8-2. Comparison of annual 2023 NOx (top) and VOC (bottom) emissions between the 2016fh and 2016v2 modeling platforms

Table 8-3. Annual state total biogenic emissions in the 2016fh and v2 platforms (tons)

	NO			VOC		
State	**2016fh**	**V2**	**V2-fh (%)**	**2016fh**	**V2**	**V2-fh (%)**
Illinois	38,921	44,043	13%	422,736	236,316	-44%
Indiana	21,381	24,667	15%	279,976	188,777	-33%
Michigan	14,572	17,990	23%	593,916	401,359	-32%
Minnesota	28,031	35,863	28%	510,385	366,050	-28%
Ohio	18,120	21,720	20%	360,156	279,428	-22%
Wisconsin	16,095	20,871	30%	484,780	324,112	-33%

8.1.2. 2016v1 and 2016v2 Ozone Model Performance Comparison

Figure 8-3 through Figure 8-10 compare LADCO 2016v1 and U.S. EPA 2016v2 12-km CAMx model performance in simulating O_3 season (May – September) MDA8 O_3 on days with observed concentrations > 60 ppb. The U.S. EPA figures are extracted from the U.S. EPA 2016v2 modeling platform technical support document (U.S. EPA, 2022). The figures show average O_3 season bias and error statistics at sites in the LADCO region. Each pair of figures compares the CAMx performance between the LADCO and U.S. EPA simulations. Note that the color scales are normalized in these figures, with the color scale legend included in the LADCO plot for each statistic. Figure 8-3 and Figure 8-4 show LADCO and U.S. EPA CAMx mean error (ME), respectively. The LADCO simulation has a lower ME compared to the U.S. EPA simulation at almost every site in and near the LADCO states. Most notably, the LADCO simulation has a significantly lower ME (5-10 ppb) at the lakeshore monitors throughout the region.

Figure 8-5 and Figure 8-6 compare the seasonal normalized mean error (NME) on high MDA8 O_3 days between the LADCO and U.S. EPA simulations, respectively. The NME comparison highlights the superior performance of the LADCO CAMx simulation throughout the domain and most notably at the lakeshore monitors. While the two simulations have similar NME values at sites around the Ohio River Valley and south, the LADCO simulation has NMEs that are consistently 5-10% lower at inland sites in Illinois, Indiana, and Ohio. Compared to the EPA CAMx simulation, the LADCO simulation has NMEs that are 10-15% lower at lakeshore sites, and at inland sites in Wisconsin and Michigan.

Figure 8-7 and Figure 8-8 show O_3 season average MDA8 O_3 mean bias (MB) for days with observations higher than 60 ppb. Both simulations had very good performance around the Ohio River Valley with MB values less than ±5 ppb. The LADCO simulation outperforms the U.S. EPA simulation at nearly all monitors in the LADCO states. The U.S. EPA CAMx simulation on average underestimates high MDA8 O_3 concentrations by 5-15 ppb, with the worst performance around Lake Michigan and at inland sites in Wisconsin and Michigan. The LADCO CAMx simulation also underestimates MDA8 O_3 on average at these sites but has MBs in the range of 0-10 ppb.

Figure 8-9 and Figure 8-10 compare the O_3 season normalized mean bias (NMB) for the LADCO and U.S. EPA CAMx simulations. These figures show similar performance differences as the previous error and MB plots, with the LADCO CAMx simulation systematically outperforming the U.S. EPA CAMx simulation at nearly all sites in the domain. Most notably, LADCO CAMx simulated very low seasonal averaged NMB (<10%) at all the controlling monitors in the 2015 O_3 NAAQS NAAs in the region. The U.S. EPA simulation for many of these monitors underestimated MDA8 O_3 on high concentration days by 10-30%.

These comparisons of the LADCO and U.S. EPA CAMx simulations indicate that on average, for high O_3 concentration days the LADCO 2016v1-based CAMx is a better model of ground-level O_3 for the Great Lakes region than the U.S. EPA 2016v2-based CAMx model. These comparisons reflect differences in both meteorology and emissions inputs to the model, but taken together the LADCO CAMx model presented here is well within the model performance benchmarks cited by U.S. EPA (2022), and superior to the current U.S. EPA model for this region.

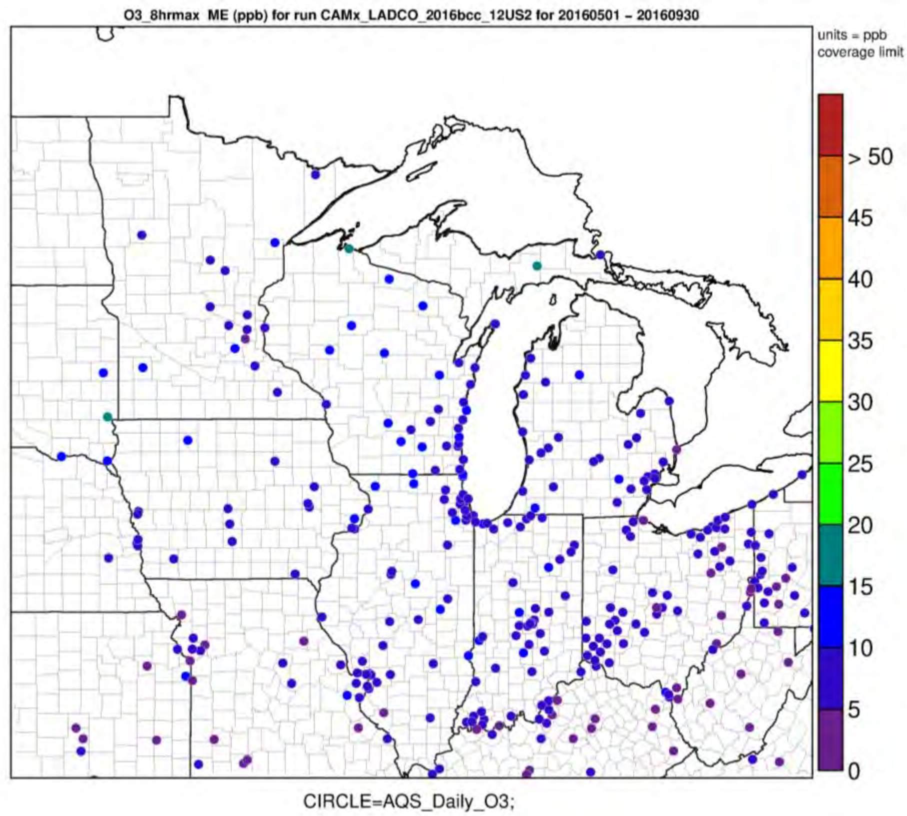

Figure 8-3. LADCO CAMx 12km MDA8 O3 May – September average mean error for days > 60 ppb.

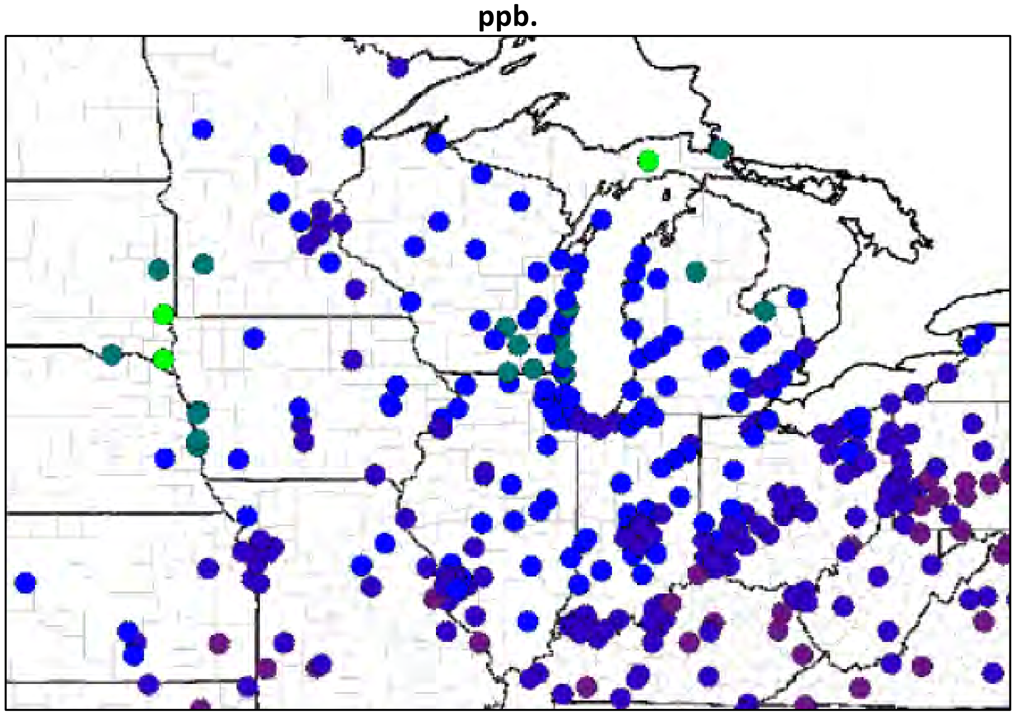

Figure 8-4. US EPA 2016v2 (2016fj_v710_CB6r5) CAMx 12km MDA8 O3 May – September average mean error for days > 60 ppb (US EPA, 2022).

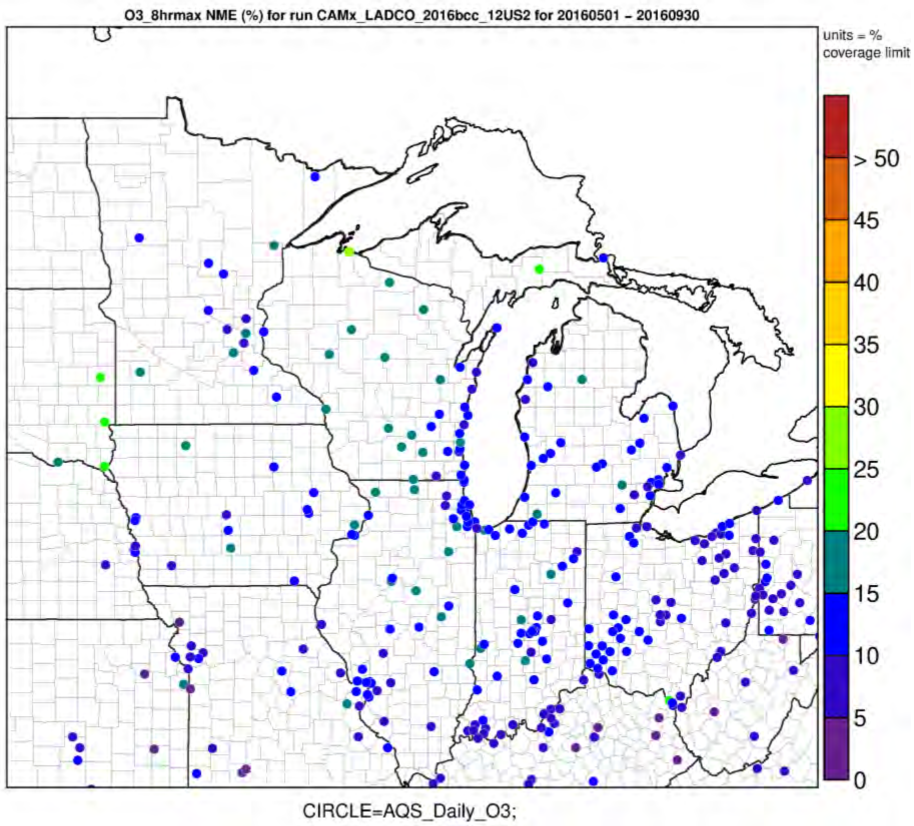

Figure 8-5. LADCO CAMx 12km MDA8 O3 May – September average normalized mean error for days > 60 ppb.

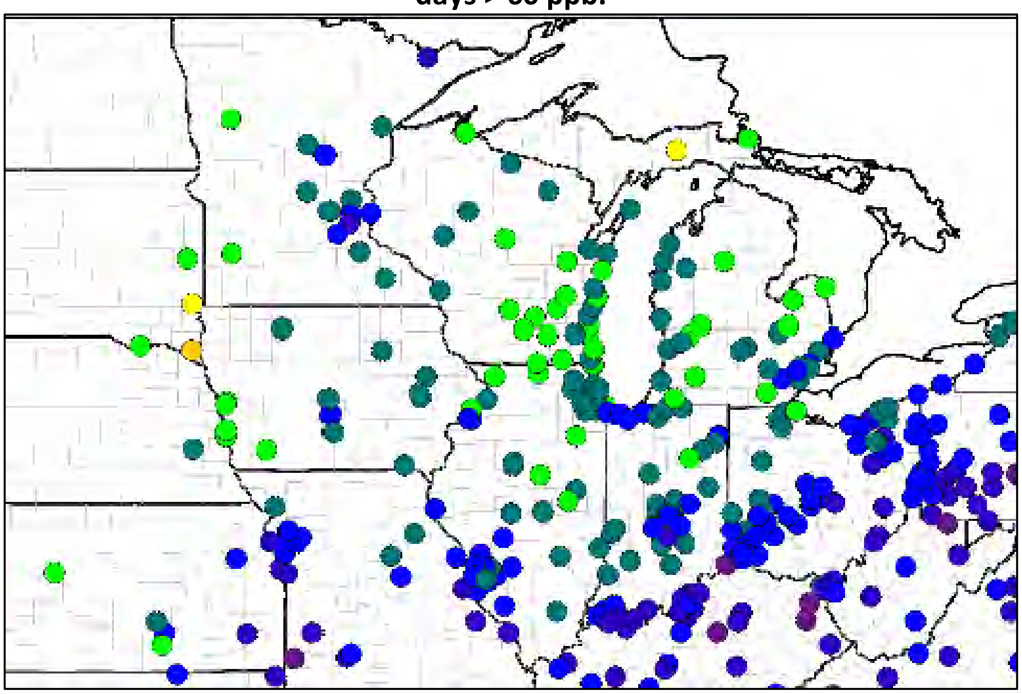

Figure 8-6. US EPA 2016v2 (2016fj_v710_CB6r5) CAMx 12km MDA8 O3 May – September average normalized mean error for days > 60 ppb (US EPA, 2022).

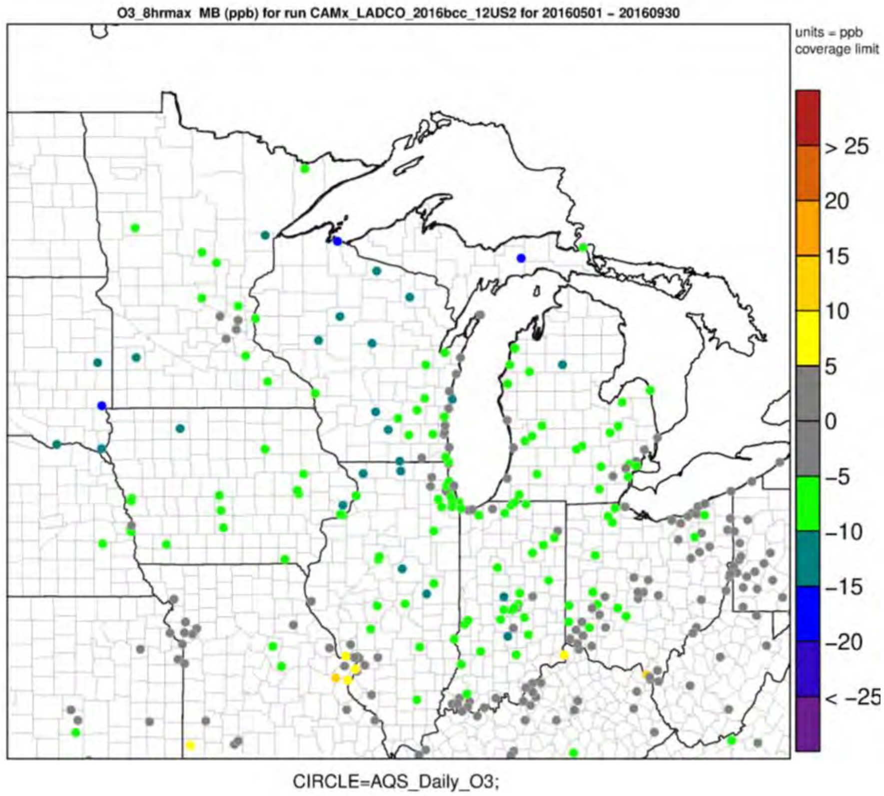

Figure 8-7. LADCO CAMx 12km MDA8 O3 May – September average mean bias for days > 60 ppb.

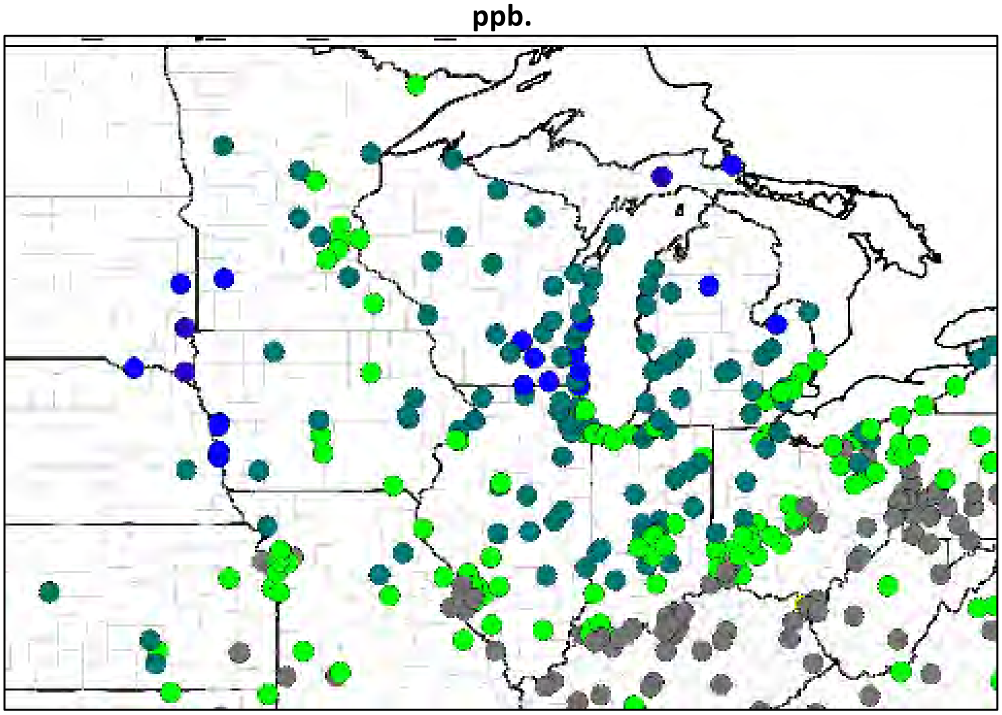

Figure 8-8. US EPA 2016v2 (2016fj_v710_CB6r5) CAMx 12km MDA8 O3 May – September average mean bias for days > 60 ppb (US EPA, 2022).

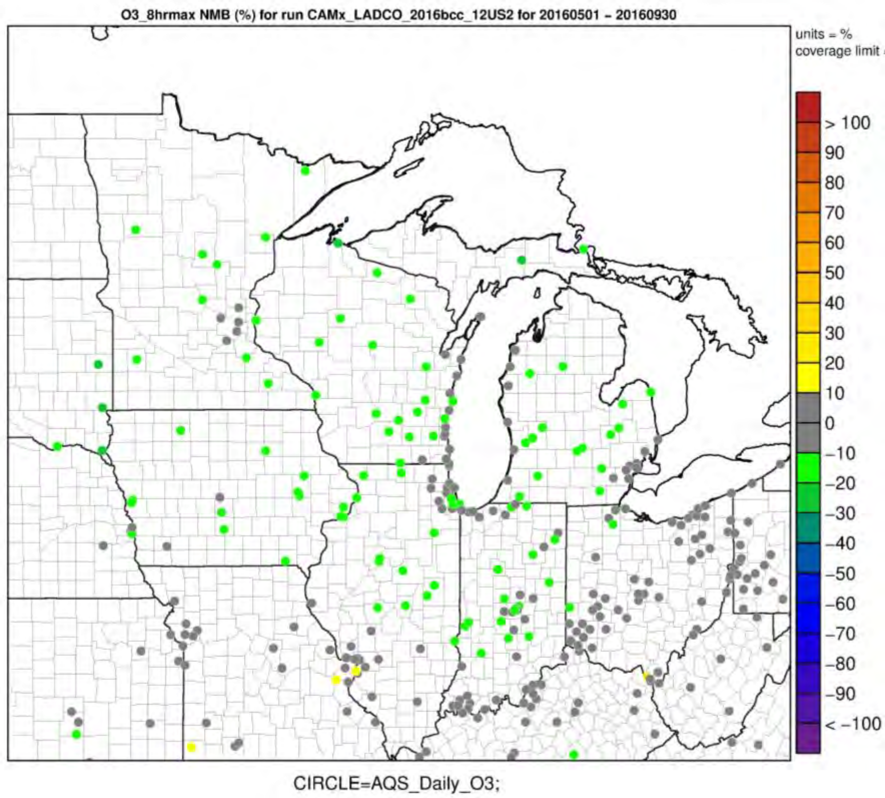

Figure 8-9. LADCO CAMx 12km MDA8 O3 May – September average normalized mean bias for days > 60 ppb.

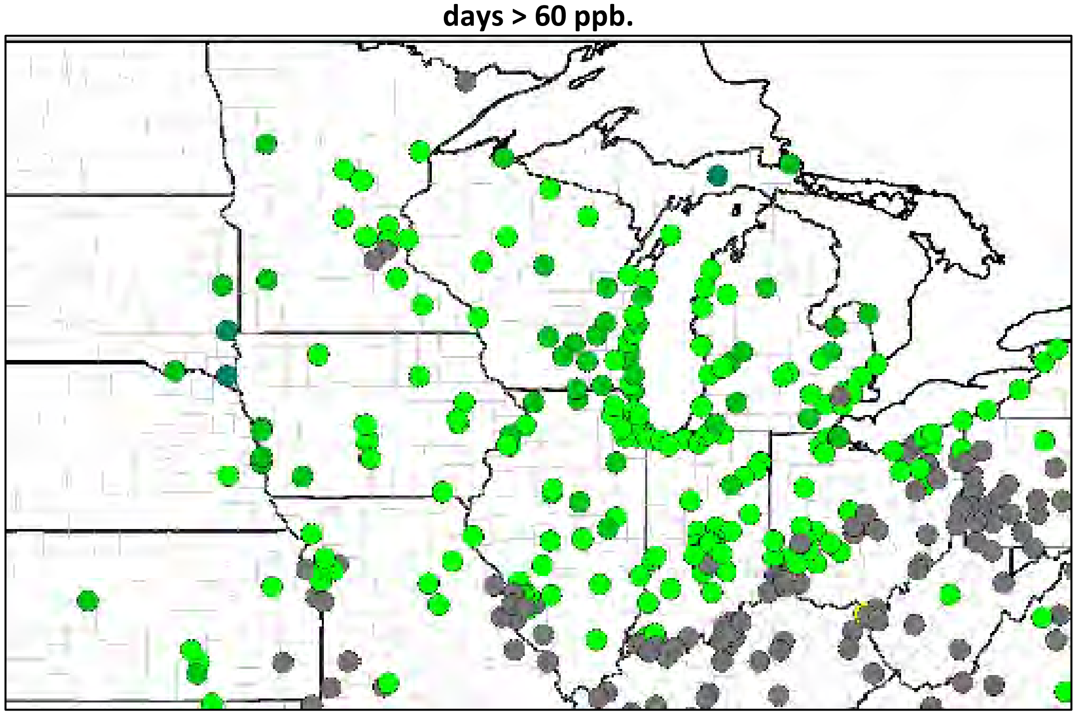

Figure 8-10. US EPA 2016v2 (2016fj_v710_CB6r5) CAMx 12km MDA8 O3 May – September average normalized mean bias for days > 60 ppb (US EPA, 2022).

8.1.3. 2016v1 and 2016v2 Attainment Test Comparison

Table 8-4 compares the 2023 O_3 attainment test results for the LADCO 2016v1-based and U.S. EPA 2016v2-based CAMx modeling. The O_3 future year design values (DVF_{2023}) in this table are calculated from CAMx 12-km simulations that used similar SMAT-CE configurations (3x3 cells surrounding the monitors, including water cells in the calculations). The table compares average and DVF_{2023} values. The table shows 2023 DVs for every site in all 2015 O_3 NAAQS nonattainment areas in the LADCO region.

There is no systematic difference between the LADCO and U.S. EPA CAMx-estimated DVF_{2023} values. The LADCO CAMx simulation forecasted that two sites in the Great Lakes region will exceed the 2015 O_3 NAAQS in 2023, the coastal Wisconsin sites Sheboygan Kohler Andrae and Chiwaukee Prairie. The U.S. EPA CAMx simulation forecasted that four sites in the LADCO region will exceed the NAAQS, the same two sites as the LADCO simulation plus Racine County, Wisconsin and Evanston, Illinois.

Table 8-4. LADCO and US EPA v2 2023 average O_3 design values at all monitors in the LADCO region 2015 O3 NAAQS nonattainment areas

State	NAA	Site ID	Site Name	LADCO 2023 DV	EPA 2023 DV
Michigan	Allegan County, MI	260050003	HOLLAND	67.5	67.8
Michigan	Berrien County, MI	260210014	COLOMA	67.7	68.7
Michigan	Muskegon County, MI	261210039	MUSKEGON	68.9	69.1
Illinois	Chicago, IL-IN-WI	170310001	ALSIP	67.7	69.6
Illinois	Chicago, IL-IN-WI	170314201	NORTHBRK	67.6	70.0
Illinois	Chicago, IL-IN-WI	170317002	EVANSTON	68.2	71.1
Illinois	Chicago, IL-IN-WI	170310032	CHI_SWFP	67.0	70.1
Illinois	Chicago, IL-IN-WI	170310076	CHI_COM	66.9	69.3
Illinois	Chicago, IL-IN-WI	170971007	ZION	67.8	70.0
Illinois	Chicago, IL-IN-WI	170314007	DESPLNS	66.4	68.8
Illinois	Chicago, IL-IN-WI	170314002	CICERO	64.3	66.9
Illinois	Chicago, IL-IN-WI	171110001	CARY	64.1	64.5
Illinois	Chicago, IL-IN-WI	170436001	LISLE	65.5	65.8
Illinois	Chicago, IL-IN-WI	170890005	ELGIN	64.0	64.8
Illinois	Chicago, IL-IN-WI	170311601	LEMONT	64.5	65.2
Illinois	Chicago, IL-IN-WI	170311003	CHI_TAFT	63.3	65.8
Illinois	Chicago, IL-IN-WI	170313103	SCHILPRK	57.8	59.5
Indiana	Chicago, IL-IN-WI	181270026	Valparaiso	63.0	64.5

Indiana	Chicago, IL-IN-WI	181270024	Ogden Dunes	63.8	65.5
Indiana	Chicago, IL-IN-WI	180890022	Gary-IITRI	62.4	65.2
Indiana	Chicago, IL-IN-WI	180892008	Hammond-141st St	60.5	63.3
Wisconsin	Chicago, IL-IN-WI	550590019	CHIWAUKEE	**71.5**	**73.6**
Wisconsin	Chicago, IL-IN-WI	550590025	Kenosha-Water Tower	67.5	69.2
Ohio	Cincinnati, OH-KY	390610006	Sycamore	64.9	64.6
Ohio	Cincinnati, OH-KY	390170018	Middletown Airport	63.2	62.4
Ohio	Cincinnati, OH-KY	390170023	Crawford Woods	64.5	63.4
Ohio	Cincinnati, OH-KY	390610010	Colerain	64.7	62.7
Ohio	Cincinnati, OH-KY	390610040	Taft NCore	63.9	62.8
Ohio	Cincinnati, OH-KY	391650007	Lebanon	63.3	62.9
Ohio	Cincinnati, OH-KY	390179991	Oxford	62.1	61.1
Ohio	Cincinnati, OH-KY	390250022	Batavia	62.3	60.4
Ohio	Cleveland, OH	390850003	Eastlake	67.5	65.6
Ohio	Cleveland, OH	390550004	Notre Dame	63.6	62.0
Ohio	Cleveland, OH	390355002	Mayfield	63.6	61.9
Ohio	Cleveland, OH	390350034	District 6	63.0	62.1
Ohio	Cleveland, OH	390850007	Painesville	63.1	62.1
Ohio	Cleveland, OH	390930018	Sheffield	59.6	58.4
Ohio	Cleveland, OH	390350064	Berea BOE	59.6	58.5
Ohio	Cleveland, OH	391030004	Chippewa	58.1	56.2
Ohio	Cleveland, OH	391530020	Patterson Park	56.9	54.9
Ohio	Cleveland, OH	390350060	GT Craig NCore	57.3	56.1
Ohio	Cleveland, OH	391331001	Lake Rockwell	55.6	53.8
Michigan	Detroit, MI	261630019	East 7 MILE	66.2	65.7
Michigan	Detroit, MI	261250001	OAK PARK	64.4	64.4
Michigan	Detroit, MI	261470005	PORT HURON	65.6	66.4
Michigan	Detroit, MI	260990009	NEW HAVEN	64.3	64.5
Michigan	Detroit, MI	261619991	Ann Arbor	62.6	63.2
Michigan	Detroit, MI	260991003	WARREN	60.7	60.2
Michigan	Detroit, MI	261610008	YPSILANTI	62.2	62.5
Michigan	Detroit, MI	261630001	ALLEN PARK	60.9	60.2
Indiana	Louisville, KY-IN	180431004	New Albany	64.0	63.6
Indiana	Louisville, KY-IN	180190008	Charlestown State Park	62.9	62.2
Wisconsin	Milwaukee, WI	551010020	Racine	69.6	**71.1**

Wisconsin	Milwaukee, WI	550890009	HARRINGTON BCH	68.3	68.7
Wisconsin	Milwaukee, WI	550790085	BAYSIDE	66.7	66.5
Wisconsin	Milwaukee, WI	550890008	GRAFTON	66.0	66.6
Wisconsin	Milwaukee, WI	550790026	MILWAUKEE SER	62.6	63.5
Wisconsin	Milwaukee, WI	550790010	MILWAUKEE 16TH ST	59.7	60.7
Wisconsin	Milwaukee, WI	551330027	CLEVELAND AVE	59.9	60.3
Wisconsin	Sheboygan County, WI	551170006	SHEBOYGAN	**75.1**	**74.7**
Wisconsin	Sheboygan County, WI	551170009	Sheboygan-Haven	65.6	65.1
Illinois	St. Louis, MO-IL	171191009	MARYVILL	61.9	62.3
Illinois	St. Louis, MO-IL	171193007	WOOD_WTP	63.1	63.8
Illinois	St. Louis, MO-IL	171630010	East St. Louis	61.3	62.4
Illinois	St. Louis, MO-IL	171199991	Alhambra	60.2	60.4

9. Conclusions and Significant Findings

LADCO presents in this TSD a regional air quality modeling platform for quantifying and evaluating future year O_3 concentrations pursuant to testing attainment of the 2015 O_3 NAAQS moderate area designations for receptors at nonattainment areas throughout the Great Lakes Basin. After establishing that the LADCO 2016-based modeling platform is an acceptable tool for simulating regional O_3 concentrations, we presented the results from projections of future O_3 concentrations and for calculating O_3 design values in 2023. A summary of the significant findings from the LADCO modeling follows.

- Finding 1: While the LADCO 2016v1-based CAMx modeling platform has an underprediction bias for high O_3 concentrations, the LADCO platform skill is the same or better than U.S. EPA 2016 modeling platforms used to support recent O_3 regulatory actions.
- Finding 2: The LADCO 2023 CAMx simulation predicts that two monitors in the LADCO region will have an average DV_{2023} that exceeds the 2015 O_3 NAAQS.
- Finding 3: Excluding water cells in the attainment test calculation results in both higher and lower DVs_{2023} for the lakeshore monitors in the LADCO region.
- Finding 4: Compared to the U.S. EPA 2016v2 CAMx modeling platform, the LADCO CAMx modeling platform is a superior model of O_3 in the Great Lakes Basin

As with all regional air quality modeling applications, there are uncertainties in the model inputs and in the model formulation that produce biases in the results presented here. LADCO determined that when the modeling for this application was started in Fall 2021 the LADCO 2016 WRF meteorology, U.S. EPA 2016fh emissions modeling platform, and the ERTAC EGU 16.2 beta emissions were the best available data for forecasting 2023 air quality for the LADCO member states.

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APPENDIX A2

Air Quality System (AQS) Monitoring Data Values for Indiana's Portion (Lake (Partial) and Porter (Partial) Counties, Illinois' Portion, and Wisconsin's Portion of the Chicago, Illinois-Indiana-Wisconsin (IL-IN-WI), 2015 8-Hour Ozone Nonattainment Area

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

User ID: BJR

DESIGN VALUE REPORT

Report Request ID: 2105348 Report Code: AMP480 May. 12, 2023

GEOGRAPHIC SELECTIONS

Tribal Code	State	County	Site	Parameter	POC	City	AQCR	UAR	CBSA	CSA	EPA Region
	18	089									
	18	127									
	17	031									
	17	043									
	17	089									
	17	097									
	17	111									
	17	197									
	55	059									

PROTOCOL SELECTIONS

Parameter Classification	Parameter	Method	Duration
DESIGN VALUE	44201		

SELECTED OPTIONS

Option Type	Option Value
SINGLE EVENT PROCESSING	EXCLUDE REGIONALLY CONCURRED EVENTS
MERGE PDF FILES	YES
AGENCY ROLE	PQAO
USER SITE METADATA	STREET ADDRESS
QUARTERLY DATA IN WORKFILE	NO
WORKFILE DELIMITER	,
USE LINKED SITES	YES

DATE CRITERIA

Start Date	End Date
2017	2022

APPLICABLE STANDARDS

Standard Description
Ozone 8-hour 2015

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: May. 12, 2023

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015
Statistic: Annual 4th Maximum **Level:** .07

Design Value Year: 2017

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State: Illinois

			2017				2016				2015				3 - Year		
Site ID	Poc	STREET ADDRESS	Valid Days	Percent Complete	4th Max	Cert& Eval	Valid Days	Percent Complete	4th Max	Cert& Eval	Valid Days	Percent Complete	4th Max	Cert& Eval	Percent Complete	Design Value	D. V. Validity
17-031-0001		4500 W. 123RD ST.	223	91	.078	Y	203	95	.075	Y	207	97	.066	Y	94	.073	Y
17-031-0032		3300 E. CHELTENHAM PL.	243	99	.074	Y	213	100	.077	Y	207	97	.066	Y	99	.072	Y
17-031-0076		7801 LAWNDALE	238	97	.078	Y	210	98	.075	Y	212	99	.065	Y	98	.072	Y
17-031-1003		6545 W. HURLBUT ST.	229	93	.060	Y	208	97	.075	Y	212	99	.068	Y	96	.067	Y
17-031-1601		729 HOUSTON	238	97	.070	Y	211	99	.073	Y	209	98	.066	Y	98	.069	Y
17-031-3103		4743 MANNHEIM RD.	237	97	.061	Y	206	96	.067	Y	210	98	.058	Y	97	.062	Y
17-031-4002		1820 S. 51ST AVE.	222	91	.068	Y	213	100	.076	Y	212	99	.061	Y	97	.068	Y
17-031-4007		9511 W. HARRISON ST	242	99	.071	Y	212	99	.076	Y	211	99	.068	Y	99	.071	Y
17-031-4201		750 DUNDEE ROAD	351	96	.070	Y	212	99	.079	Y	213	100	.068	Y	98	.072	Y
17-031-7002		531 E. LINCOLN	240	98	.073	Y	205	96	.076	Y	205	96	.070	Y	97	.073	Y
17-043-6001		RT. 53	221	90	.069	Y	185	86	.074	Y	210	98	.067	Y	91	.070	Y
17-089-0005		665 DUNDEE RD.	237	97	.069	Y	204	95	.074	Y	211	99	.065	Y	97	.069	Y
17-097-1007		ILLINOIS BEACH STATE PARK	243	99	.074	Y	213	100	.077	Y	211	99	.070	Y	99	.073	Y
17-111-0001		FIRST ST. & THREE OAKS RD.	233	95	.070	Y	210	98	.073	Y	201	94	.064	Y	96	.069	Y
17-197-1011		36400 S. ESSEX RD.	234	96	.068	Y	214	100	.064	Y	209	98	.064	Y	98	.065	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015
Statistic: Annual 4th Maximum **Level:** .07

Design Value Year: 2018

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State: Illinois

			2018				2017				2016				3 - Year		
Site ID	**Poc**	**STREET ADDRESS**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Percent Complete**	**Design Value**	**D. V. Validity**
17-031-0001		4500 W. 123RD ST.	239	98	.079	Y	223	91	.078	Y	203	95	.075	Y	95	.077	Y
17-031-0032		3300 E. CHELTENHAM PL.	227	93	.076	Y	243	99	.074	Y	213	100	.077	Y	97	.075	Y
17-031-0076		7801 LAWNDALE	241	98	.074	Y	238	97	.078	Y	210	98	.075	Y	98	.075	Y
17-031-1003		6545 W. HURLBUT ST.	210	86	.073	Y	229	93	.060	Y	208	97	.075	Y	92	.069	Y
17-031-1601		729 HOUSTON	236	96	.068	Y	238	97	.070	Y	211	99	.073	Y	97	.070	Y
17-031-3103		4743 MANNHEIM RD.	238	97	.065	Y	237	97	.061	Y	206	96	.067	Y	97	.064	Y
17-031-4002		1820 S. 51ST AVE.	235	96	.072	Y	222	91	.068	Y	213	100	.076	Y	96	.072	Y
17-031-4007		9511 W. HARRISON ST	242	99	.075	Y	242	99	.071	Y	212	99	.076	Y	99	.074	Y
17-031-4201		750 DUNDEE ROAD	354	97	.083	Y	351	96	.070	Y	212	99	.079	Y	97	.077	Y
17-031-7002		531 E. LINCOLN	242	99	.084	Y	240	98	.073	Y	205	96	.076	Y	98	.077	Y
17-043-6001		RT. 53	230	94	.071	Y	221	90	.069	Y	185	86	.074	Y	90	.071	Y
17-089-0005		665 DUNDEE RD.	243	99	.072	Y	237	97	.069	Y	204	95	.074	Y	97	.071	Y
17-097-1007		ILLINOIS BEACH STATE PARK	235	96	.074	Y	243	99	.074	Y	213	100	.077	Y	98	.075	Y
17-111-0001		FIRST ST. & THREE OAKS RD.	241	98	.074	Y	233	95	.070	Y	210	98	.073	Y	97	.072	Y
17-197-1011		36400 S. ESSEX RD.	238	97	.071	Y	234	96	.068	Y	214	100	.064	Y	98	.067	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
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3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015
Statistic: Annual 4th Maximum **Level:** .07

Design Value Year: 2019

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State: Illinois

			2019				2018				2017				3 - Year		
Site ID	Poc	STREET ADDRESS	Valid Days	Percent Complete	4th Max	Cert& Eval	Valid Days	Percent Complete	4th Max	Cert& Eval	Valid Days	Percent Complete	4th Max	Cert& Eval	Percent Complete	Design Value	D. V. Validity
17-031-0001		4500 W. 123RD ST.	234	96	.070	Y	239	98	.079	Y	223	91	.078	Y	95	.075	Y
17-031-0032		3300 E. CHELTENHAM PL.	236	96	.071	Y	227	93	.076	Y	243	99	.074	Y	96	.073	Y
17-031-0076		7801 LAWNDALE	234	96	.065	Y	241	98	.074	Y	238	97	.078	Y	97	.072	Y
17-031-1003		6545 W. HURLBUT ST.	233	95	.069	Y	210	86	.073	Y	229	93	.060	Y	91	.067	Y
17-031-1601		729 HOUSTON	236	96	.068	Y	236	96	.068	Y	238	97	.070	Y	96	.068	Y
17-031-3103		4743 MANNHEIM RD.	241	98	.064	Y	238	97	.065	Y	237	97	.061	Y	97	.063	Y
17-031-4002		1820 S. 51ST AVE.	209	85	.064	Y	235	96	.072	Y	222	91	.068	Y	91	.068	Y
17-031-4007		9511 W. HARRISON ST	232	95	.066	Y	242	99	.075	Y	242	99	.071	Y	98	.070	Y
17-031-4201		750 DUNDEE ROAD	348	95	.069	Y	354	97	.083	Y	351	96	.070	Y	96	.074	Y
17-031-7002		531 E. LINCOLN	243	99	.069	Y	242	99	.084	Y	240	98	.073	Y	99	.075	Y
17-043-6001		RT. 53	242	99	.070	Y	230	94	.071	Y	221	90	.069	Y	94	.070	Y
17-089-0005		665 DUNDEE RD.	244	100	.071	Y	243	99	.072	Y	237	97	.069	Y	99	.070	Y
17-097-1007		ILLINOIS BEACH STATE PARK	244	100	.066	Y	235	96	.074	Y	243	99	.074	Y	98	.071	Y
17-111-0001		FIRST ST. & THREE OAKS RD.	227	93	.070	Y	241	98	.074	Y	233	95	.070	Y	95	.071	Y
17-197-1011		36400 S. ESSEX RD.	243	99	.060	Y	238	97	.071	Y	234	96	.068	Y	97	.066	Y

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Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015
Statistic: Annual 4th Maximum **Level:** .07

Design Value Year: 2020
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State: Illinois

			2020				2019				2018				3 - Year		
Site ID	**Poc**	**STREET ADDRESS**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Percent Complete**	**Design Value**	**D. V. Validity**
17-031-0001		4500 W. 123RD ST.	243	99	.076	Y	234	96	.070	Y	239	98	.079	Y	98	.075	Y
17-031-0032		3300 E. CHELTENHAM PL.	236	96	.077	Y	236	96	.071	Y	227	93	.076	Y	95	.074	Y
17-031-0076		7801 LAWNDALE	184	75	.068	Y	234	96	.065	Y	241	98	.074	Y	90	.069	Y
17-031-1003		6545 W. HURLBUT ST.	212	87	.077	Y	233	95	.069	Y	210	86	.073	Y	89	.073	Y
17-031-1601		729 HOUSTON	211	86	.078	Y	236	96	.068	Y	236	96	.068	Y	93	.071	Y
17-031-3103		4743 MANNHEIM RD.	243	99	.068	Y	241	98	.064	Y	238	97	.065	Y	98	.065	Y
17-031-4002		1820 S. 51ST AVE.	228	93	.079	Y	209	85	.064	Y	235	96	.072	Y	91	.071	Y
17-031-4007		9511 W. HARRISON ST	228	93	.072	Y	232	95	.066	Y	242	99	.075	Y	96	.071	Y
17-031-4201		750 DUNDEE ROAD	356	97	.079	Y	348	95	.069	Y	354	97	.083	Y	96	.077	Y
17-031-7002		531 E. LINCOLN	222	91	.074	Y	243	99	.069	Y	242	99	.084	Y	96	.075	Y
17-043-6001		RT. 53	236	96	.073	Y	242	99	.070	Y	230	94	.071	Y	96	.071	Y
17-089-0005		665 DUNDEE RD.	230	94	.073	Y	244	100	.071	Y	243	99	.072	Y	98	.072	Y
17-097-1007		ILLINOIS BEACH STATE PARK	240	98	.076	Y	244	100	.066	Y	235	96	.074	Y	98	.072	Y
17-111-0001		FIRST ST. & THREE OAKS RD.	206	84	.076	Y	227	93	.070	Y	241	98	.074	Y	92	.073	Y
17-197-1011		36400 S. ESSEX RD.	241	98	.067	Y	243	99	.060	Y	238	97	.071	Y	98	.066	Y

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Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015
Statistic: Annual 4th Maximum **Level:** .07

Design Value Year: 2021

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State: Illinois

			2021				2020				2019				3 - Year		
Site ID	Poc	STREET ADDRESS	Valid Days	Percent Complete	4th Max	Cert& Eval	Valid Days	Percent Complete	4th Max	Cert& Eval	Valid Days	Percent Complete	4th Max	Cert& Eval	Percent Complete	Design Value	D. V. Validity
17-031-0001		4500 W. 123RD ST.	227	93	.068	Y	243	99	.076	Y	234	96	.070	Y	96	.071	Y
17-031-0032		3300 E. CHELTENHAM PL.	219	89	.077	Y	236	96	.077	Y	236	96	.071	Y	94	.075	Y
17-031-0076		7801 LAWNDALE	228	93	.070	Y	184	75	.068	Y	234	96	.065	Y	88	.067	N
17-031-1003		6545 W. HURLBUT ST.	213	87	.068	Y	212	87	.077	Y	233	95	.069	Y	90	.071	Y
17-031-1601		729 HOUSTON	239	98	.072	Y	211	86	.078	Y	236	96	.068	Y	93	.072	Y
17-031-3103		4743 MANNHEIM RD.	243	99	.060	Y	243	99	.068	Y	241	98	.064	Y	99	.064	Y
17-031-4002		1820 S. 51ST AVE.	243	99	.067	Y	228	93	.079	Y	209	85	.064	Y	92	.070	Y
17-031-4007		9511 W. HARRISON ST	238	97	.069	Y	228	93	.072	Y	232	95	.066	Y	95	.069	Y
17-031-4201		750 DUNDEE ROAD	361	99	.075	Y	356	97	.079	Y	348	95	.069	Y	97	.074	Y
17-031-7002		531 E. LINCOLN	238	97	.078	Y	222	91	.074	Y	243	99	.069	Y	96	.073	Y
17-043-6001		RT. 53	235	96	.069	Y	236	96	.073	Y	242	99	.070	Y	97	.070	Y
17-089-0005		665 DUNDEE RD.	241	98	.068	Y	230	94	.073	Y	244	100	.071	Y	97	.070	Y
17-097-1007		ILLINOIS BEACH STATE PARK	243	99	.077	Y	240	98	.076	Y	244	100	.066	Y	99	.073	Y
17-111-0001		FIRST ST. & THREE OAKS RD.	239	98	.069	Y	206	84	.076	Y	227	93	.070	Y	92	.071	Y
17-197-1011		36400 S. ESSEX RD.	244	100	.065	Y	241	98	.067	Y	243	99	.060	Y	99	.064	Y

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3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015
Statistic: Annual 4th Maximum **Level:** .07

Design Value Year: 2022

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State: Illinois

Site ID	Poc	STREET ADDRESS	2022 Valid Days	2022 Percent Complete	2022 4th Max	2022 Cert& Eval	2021 Valid Days	2021 Percent Complete	2021 4th Max	2021 Cert& Eval	2020 Valid Days	2020 Percent Complete	2020 4th Max	2020 Cert& Eval	3 - Year Percent Complete	3 - Year Design Value	3 - Year D. V. Validity
17-031-0001		4500 W. 123RD ST.	239	98	.073	Y	227	93	.068	Y	243	99	.076	Y	97	.072	Y
17-031-0032		3300 E. CHELTENHAM PL.	221	90	.072	Y	219	89	.077	Y	236	96	.077	Y	92	.075	Y
17-031-0076		7801 LAWNDALE	237	97	.074	Y	228	93	.070	Y	184	75	.068	Y	88	.070	Y
17-031-1003		6545 W. HURLBUT ST.	244	100	.070	Y	213	87	.068	Y	212	87	.077	Y	91	.071	Y
17-031-1601		729 HOUSTON	243	99	.071	Y	239	98	.072	Y	211	86	.078	Y	94	.073	Y
17-031-3103		4743 MANNHEIM RD.	230	94	.062	Y	243	99	.060	Y	243	99	.068	Y	97	.063	Y
17-031-4002		1820 S. 51ST AVE.	242	99	.068	Y	243	99	.067	Y	228	93	.079	Y	97	.071	Y
17-031-4007		9511 W. HARRISON ST	242	99	.070	Y	238	97	.069	Y	228	93	.072	Y	96	.070	Y
17-031-4201		750 DUNDEE ROAD	353	97	.070	Y	361	99	.075	Y	356	97	.079	Y	98	.074	Y
17-031-7002		531 E. LINCOLN	231	94	.071	Y	238	97	.078	Y	222	91	.074	Y	94	.074	Y
17-043-6001		RT. 53	244	100	.068	Y	235	96	.069	Y	236	96	.073	Y	97	.070	Y
17-089-0005		665 DUNDEE RD.	230	94	.070	Y	241	98	.068	Y	230	94	.073	Y	95	.070	Y
17-097-1007		ILLINOIS BEACH STATE PARK	242	99	.070	Y	243	99	.077	Y	240	98	.076	Y	99	.074	Y
17-111-0001		FIRST ST. & THREE OAKS RD.	240	98	.070	Y	239	98	.069	Y	206	84	.076	Y	93	.071	Y
17-197-1011		36400 S. ESSEX RD.	243	99	.064	Y	244	100	.065	Y	241	98	.067	Y	99	.065	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
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3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: May. 12, 2023

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015
Statistic: Annual 4th Maximum **Level:** .07

Design Value Year: 2017

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State: Indiana

			2017				2016				2015				3 - Year		
Site ID	**Poc**	**STREET ADDRESS**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Percent Complete**	**Design Value**	**D. V. Validity**
18-089-0022		201 MISSISSIPPI ST., IITRI BUNKER	238	97	.070	Y	177	97	.070	Y	171	93	.064	Y	96	.068	Y
18-089-0030		1751 OLIVER ST/ WHITING HIGH SCHOOL				*				*	182	99	.070	Y	33	.070	N
18-089-2008		1300 141 ST STREET	230	94	.069	Y	174	95	.068	Y	145	79	.060	Y	89	.065	N
18-127-0024		84 DIANA RD/ WATER TREATMENT PLANT	240	98	.072	Y	181	99	.070	Y	182	99	.066	Y	99	.069	Y
18-127-0026		1000 WESLEY ST./ VALPARAISO WATER DEPT.	231	94	.077	Y	172	94	.071	Y	174	95	.060	Y	94	.069	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
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Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015
Statistic: Annual 4th Maximum **Level:** .07

Design Value Year: 2018

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State: Indiana

			2018				2017				2016				3 - Year		
Site ID	Poc	STREET ADDRESS	Valid Days	Percent Complete	4th Max	Cert& Eval	Valid Days	Percent Complete	4th Max	Cert& Eval	Valid Days	Percent Complete	4th Max	Cert& Eval	Percent Complete	Design Value	D. V. Validity
18-089-0022		201 MISSISSIPPI ST., IITRI BUNKER	233	95	.071	Y	238	97	.070	Y	177	97	.070	Y	96	.070	Y
18-089-2008		1300 141 ST STREET	240	98	.062	Y	230	94	.069	Y	174	95	.068	Y	96	.066	Y
18-127-0024		84 DIANA RD/ WATER TREATMENT PLANT	233	95	.071	Y	240	98	.072	Y	181	99	.070	Y	97	.071	Y
18-127-0026		1000 WESLEY ST./ VALPARAISO WATER DEPT.	244	100	.071	Y	231	94	.077	Y	172	94	.071	Y	96	.073	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
AIR QUALITY SYSTEM
PRELIMINARY DESIGN VALUE REPORT

Report Date: May. 12, 2023

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015
Statistic: Annual 4th Maximum **Level:** .07

Design Value Year: 2019

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State: Indiana

			2019				2018				2017				3 - Year		
Site ID	**Poc**	**STREET ADDRESS**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Percent Complete**	**Design Value**	**D. V. Validity**
18-089-0022		201 MISSISSIPPI ST., IITRI BUNKER	231	94	.065	Y	233	95	.071	Y	238	97	.070	Y	95	.068	Y
18-089-2008		1300 141 ST STREET	244	100	.065	Y	240	98	.062	Y	230	94	.069	Y	97	.065	Y
18-127-0024		84 DIANA RD/ WATER TREATMENT PLANT	233	95	.068	Y	233	95	.071	Y	240	98	.072	Y	96	.070	Y
18-127-0026		1000 WESLEY ST./ VALPARAISO WATER DEPT.	236	96	.071	Y	244	100	.071	Y	231	94	.077	Y	97	.073	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
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Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015
Statistic: Annual 4th Maximum **Level:** .07

Design Value Year: 2020

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State: Indiana

			2020				2019				2018				3 - Year		
Site ID	**Poc**	**STREET ADDRESS**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Percent Complete**	**Design Value**	**D. V. Validity**
18-089-0022		201 MISSISSIPPI ST., IITRI BUNKER	225	92	.074	Y	231	94	.065	Y	233	95	.071	Y	94	.070	Y
18-089-2008		1300 141 ST STREET	224	91	.071	Y	244	100	.065	Y	240	98	.062	Y	96	.066	Y
18-127-0024		84 DIANA RD/ WATER TREATMENT PLANT	235	96	.076	Y	233	95	.068	Y	233	95	.071	Y	95	.071	Y
18-127-0026		1000 WESLEY ST./ VALPARAISO WATER DEPT.	242	99	.067	Y	236	96	.071	Y	244	100	.071	Y	98	.069	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015
Statistic: Annual 4th Maximum **Level:** .07

Design Value Year: 2021
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State: Indiana

			2021				2020				2019				3 - Year		
Site ID	Poc	STREET ADDRESS	Valid Days	Percent Complete	4th Max	Cert& Eval	Valid Days	Percent Complete	4th Max	Cert& Eval	Valid Days	Percent Complete	4th Max	Cert& Eval	Percent Complete	Design Value	D. V. Validity
18-089-0022		201 MISSISSIPPI ST., IITRI BUNKER	240	98	.070	Y	225	92	.074	Y	231	94	.065	Y	95	.069	Y
18-089-2008		1300 141 ST STREET	240	98	.068	Y	224	91	.071	Y	244	100	.065	Y	96	.068	Y
18-127-0024		84 DIANA RD/ WATER TREATMENT PLANT	237	97	.072	Y	235	96	.076	Y	233	95	.068	Y	96	.072	Y
18-127-0026		1000 WESLEY ST./ VALPARAISO WATER DEPT.	243	99	.066	Y	242	99	.067	Y	236	96	.071	Y	98	.068	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
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Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015
Statistic: Annual 4th Maximum **Level:** .07

Design Value Year: 2022

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State: Indiana

			2022				2021				2020				3 - Year		
Site ID	**Poc**	**STREET ADDRESS**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Percent Complete**	**Design Value**	**D. V. Validity**
18-089-0022		201 MISSISSIPPI ST., IITRI BUNKER	232	95	.071	Y	240	98	.070	Y	225	92	.074	Y	95	.071	Y
18-089-2008		1300 141 ST STREET	234	96	.069	Y	240	98	.068	Y	224	91	.071	Y	95	.069	Y
18-127-0024		84 DIANA RD/ WATER TREATMENT PLANT	244	100	.073	Y	237	97	.072	Y	235	96	.076	Y	98	.073	Y
18-127-0026		1000 WESLEY ST./ VALPARAISO WATER DEPT.	237	97	.067	Y	243	99	.066	Y	242	99	.067	Y	98	.066	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Report Date: May. 12, 2023

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015
Statistic: Annual 4th Maximum **Level:** .07

Design Value Year: 2017
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State: Wisconsin

			2017				2016				2015				3 - Year		
Site ID	**Poc**	**STREET ADDRESS**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Percent Complete**	**Design Value**	**D. V. Validity**
55-059-0019		CHIWAUKEE PRAIRIE, 11838 FIRST COURT	245	100	.079	Y	213	100	.080	Y	211	99	.075	Y	100	.078	Y
55-059-0025		4504 64th Ave.	245	100	.076	Y	213	100	.076	Y	213	100	.068	Y	100	.073	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
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Report Date: May. 12, 2023

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015
Statistic: Annual 4th Maximum **Level:** .07

Design Value Year: 2018

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State: Wisconsin

			2018				2017				2016				3 - Year		
Site ID	Poc	STREET ADDRESS	Valid Days	Percent Complete	4th Max	Cert& Eval	Valid Days	Percent Complete	4th Max	Cert& Eval	Valid Days	Percent Complete	4th Max	Cert& Eval	Percent Complete	Design Value	D. V. Validity
55-059-0019		CHIWAUKEE PRAIRIE, 11838 FIRST COURT	245	100	.079	Y	245	100	.079	Y	213	100	.080	Y	100	.079	Y
55-059-0025		4504 64th Ave.	245	100	.080	Y	245	100	.076	Y	213	100	.076	Y	100	.077	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
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Report Date: May. 12, 2023

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015
Statistic: Annual 4th Maximum **Level:** .07

Design Value Year: 2019

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State: Wisconsin

			2019				2018				2017				3 - Year		
Site ID	**Poc**	**STREET ADDRESS**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Percent Complete**	**Design Value**	**D. V. Validity**
55-059-0019		CHIWAUKEE PRAIRIE, 11838 FIRST COURT	245	100	.067	Y	245	100	.079	Y	245	100	.079	Y	100	.075	Y
55-059-0025		4504 64th Ave.	245	100	.066	Y	245	100	.080	Y	245	100	.076	Y	100	.074	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
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Report Date: May. 12, 2023

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015
Statistic: Annual 4th Maximum **Level:** .07

Design Value Year: 2020

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State: Wisconsin

			2020				2019				2018				3 - Year		
Site ID	**Poc**	**STREET ADDRESS**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Valid Days**	**Percent Complete**	**4th Max**	**Cert& Eval**	**Percent Complete**	**Design Value**	**D. V. Validity**
55-059-0019		CHIWAUKEE PRAIRIE, 11838 FIRST COURT	245	100	.078	Y	245	100	.067	Y	245	100	.079	Y	100	.074	Y
55-059-0025		4504 64th Ave.	245	100	.078	Y	245	100	.066	Y	245	100	.080	Y	100	.074	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
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Report Date: May. 12, 2023

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015
Statistic: Annual 4th Maximum **Level:** .07

Design Value Year: 2021
REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.
State: Wisconsin

			2021				2020				2019				3 - Year		
Site ID	Poc	STREET ADDRESS	Valid Days	Percent Complete	4th Max	Cert& Eval	Valid Days	Percent Complete	4th Max	Cert& Eval	Valid Days	Percent Complete	4th Max	Cert& Eval	Percent Complete	Design Value	D. V. Validity
55-059-0019		CHIWAUKEE PRAIRIE, 11838 FIRST COURT	237	97	.079	Y	245	100	.078	Y	245	100	.067	Y	99	.074	Y
55-059-0025		4504 64th Ave.	245	100	.072	Y	245	100	.078	Y	245	100	.066	Y	100	.072	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

Pollutant: Ozone(44201)
Standard Units: Parts per million(007)
NAAQS Standard: Ozone 8-hour 2015
Statistic: Annual 4th Maximum **Level:** .07

Design Value Year: 2022

REPORT EXCLUDES MEASUREMENTS WITH REGIONALLY CONCURRED EVENT FLAGS.

State: Wisconsin

Site ID	Poc	STREET ADDRESS	2022 Valid Days	2022 Percent Complete	2022 4th Max	2022 Cert& Eval	2021 Valid Days	2021 Percent Complete	2021 4th Max	2021 Cert& Eval	2020 Valid Days	2020 Percent Complete	2020 4th Max	2020 Cert& Eval	3 - Year Percent Complete	3 - Year Design Value	3 - Year D. V. Validity
55-059-0019		CHIWAUKEE PRAIRIE, 11838 FIRST COURT	243	99	.070	Y	237	97	.079	Y	245	100	.078	Y	99	.075	Y
55-059-0025		4504 64th Ave.	245	100	.071	Y	245	100	.072	Y	245	100	.078	Y	100	.073	Y

Notes: 1. Computed design values are a snapshot of the data at the time the report was run (may not be all data for year).
2. Some PM2.5 24-hour DVs for incomplete data that are marked invalid here may be marked valid in the Official report due to additional analysis.
3. Annual Values not meeting completeness criteria are marked with an asterisk ('*').

CERTIFICATION EVALUATION AND CONCURRENCE FLAG MEANINGS

FLAG	MEANING
M	The monitoring organization has revised data from this monitor since the most recent certification letter received from the state.
N	The certifying agency has submitted the certification letter and required summary reports, but the certifying agency and/or EPA has determined that issues regarding the quality of the ambient concentration data cannot be resolved due to data completeness, the lack of performed quality assurance checks or the results of uncertainty statistics shown in the AMP255 report or the certification and quality assurance report.
S	The certifying agency has submitted the certification letter and required summary reports. A value of "S" conveys no Regional assessment regarding data quality per se. This flag will remain until the Region provides an "N" or "Y" concurrence flag.
U	Uncertified. The certifying agency did not submit a required certification letter and summary reports for this monitor even though the due date has passed, or the state's certification letter specifically did not apply the certification to this monitor.
X	Certification is not required by 40 CFR 58.15 and no conditions apply to be the basis for assigning another flag value
Y	The certifying agency has submitted a certification letter, and EPA has no unresolved reservations about data quality (after reviewing the letter, the attached summary reports, the amount of quality assurance data submitted to AQS, the quality statistics, and the highest reported concentrations).

APPENDIX A3

Mobile Source Emission Budgets and MOVES3.1 Input Data and Parameters, Northwest Indiana Regional Planning Commission (NIRPC) Lake, Porter, and LaPorte Counties, Indiana

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Northwest Indiana (Lake and Porter Counties)
Nonattainment/Maintenance Area Onroad Mobile Emission Estimates
OZONE Estimates Should be Shown in Tons per Summer Day

County	Emission Type	2017		2023	
		VOC	NOx	VOC	NOx
		Tons/Summer Day	Tons/Summer Day	Tons/Summer Day	Tons/Summer Day
Calumet, Hobart, North, Ross, and St. John Townships **(Lake County, IN)**	Running & Non-Running	2.02	6.53	1.78	4.41
Center, Jackson, Liberty, Pine, Portage, Union, Washington, Westchester Townships **(Porter County, IN)**	Running & Non-Running	0.84	3.39	0.75	2.30
All Counties Running and Non-running TOTALS		**2.86**	**9.92**	**2.53**	**6.71**

= Actual MOVES Model Runs

General Notes:
1) Make sure the units of measurement are in Tons per Summer Day
2) It will be typical for there to be an interim as well as a horizon year MVEB
3) Make sure that any margins of safety applied to budget years are within overall margin of safety in table below

: All Sources Emission Year
: All Sources Emission Year AND MVEB Year
: Recommended Margin of Safety at 15% for Comparison Purposes

Motor Vehicle Emission Budget/Margin of Safety Discussion Sheet							
Total Onroad Emissions	**2023**	**2023 + 10%**	**Mobile MOS (@ 10%)**	**2023 + 15%**	**Mobile MOS (@ 15%)**	**2023 + 20%**	**Mobile MOS (@ 20%)**
VOC (tons/summer day)	2.53	2.78	0.25	2.91	0.38	3.04	0.51
NO_x (tons/summer day)	6.71	7.38	0.67	7.72	1.01	8.05	1.34

Maximum All Source Margin of Safety Allowable

	2019 to 2030 Decrease
VOC	3.29
NOx	11.50

All Sources in Tons per Summer Day

Sector	**2017 VOC**	**2023 VOC**
EGU	0.24	0.13
Nonpoint	16.55	16.65
Nonroad	3.32	0.20
Onroad	2.86	2.53
Point	9.99	10.16
Total	**32.96**	**29.67**
All Source Safety Margin		3.29
Sector	**2017 NO_x**	**2023 NOx**
EGU	3.79	0.58
Nonpoint	8.58	6.94
Nonroad	5.02	0.22
Onroad	9.92	6.71
Point	55.08	56.44
Total	**82.39**	**70.89**
All Source Safety Margin		11.50

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NORTHWESTERN INDIANA REGIONAL PLANNING COMMISSION nirpc

RESOLUTION 21-07

A RESOLUTION OF THE NORTHWESTERN INDIANA REGIONAL PLANNING COMMISSION MAKING THE AIR QUALITY CONFORMITY DETERMINATION FOR THE NWI 2050 PLAN AMENDMENT #2 AND THE 2022 TO 2026 TRANSPORTATION IMPROVEMENT PROGRAM WITH RESPECT TO OZONE

April 15, 2021

WHEREAS, Northwest Indiana's citizens require a safe, efficient, effective, resource-conserving regional transportation system that maintains and enhances regional mobility and contributes to improving the quality of life in Northwest Indiana; and

WHEREAS, the Northwestern Indiana Regional Planning Commission, hereafter referred to as "the Commission", being designated the Metropolitan Planning Organization (MPO) for the Lake, Porter and LaPorte County area, has established a regional, comprehensive, cooperative, and continuing (3-C) transportation planning process to develop the unified planning work program, a transportation plan, and a transportation improvement program to facilitate federal funding for communities, counties, and transit operators, and to provide technical assistance and expertise to regional transportation interests; and

WHEREAS, the Commission performs the above activities to satisfy requirements of the Fixing America's Surface Transportation (FAST) Act of 2015 (PL 114-94), applicable portions of all prior federal transportation program authorizing legislation, as well as other federal, state, and local laws mandating or authorizing transportation planning activities; and

WHEREAS, the implementation of the Clean Air Act Amendments of 1990 has established National Ambient Air Quality Standards for ozone; and

WHEREAS, Lake and Porter Counties have been designated as a nonattainment area with respect to the 2008 "8-hour" standard for ozone; and LaPorte County has been designated as a maintenance area with respect to the 1997 "8-hour" standard for ozone; and

WHEREAS, the United States Environmental Protection Agency's Transportation Conformity Rule in 40 CFR Parts 51 and 93 requires all Transportation Conformity non-exempt and regionally significant projects included in a Metropolitan Planning Organization's transportation improvement program to be referenced to that Metropolitan Planning Organization's transportation plan; and

WHEREAS, the *NWI 2050* Plan is the Metropolitan Planning Organization's transportation plan and the 2022 to 2026 Transportation Improvement Program is the Metropolitan Planning Organization's transportation improvement program; and

WHEREAS, the Commission's Interagency Consultation Group on Air Quality comprised of the Commission, the Federal Highway Administration, the Federal Transit Administration, the Environmental Protection Agency, the Indiana Department of Environmental Management, and the Indiana Department of Transportation reviewed the Air Quality Conformity Determination Report and recommended its adoption by the Commission; and

WHEREAS, the Commission has solicited public comment on the Air Quality Conformity Determination Report between March 9, 2021 and April 8, 2021; and

WHEREAS, the Commission's Technical Planning Committee recommended Resolution 21-06 to the Commission for adoption;

NOW, THEREFORE, BE IT RESOLVED that the Northwestern Indiana Regional Planning Commission hereby adopts the Air Quality Conformity Determination for the NWI 2050 Plan Amendment #2 and the 2022 to 2026 Transportation Improvement Program Amendment with respect to ozone.

Duly adopted by the Northwestern Indiana Regional Planning Commission this fifteenth day of April, 2021.

George H. Topoll
Chairperson

ATTEST:

Richard Hardaway
Secretary

Air Quality Conformity Determination Report

Between

***NWI 2050* Plan Amendment #2,**

The **2022 to 2026 Transportation Improvement Program**

and

The **Indiana State Implementation Plan (SIP)**

April 15, 2021

Northwestern Indiana Regional Planning Commission

www.nirpc.org

Table of Contents

Acknowledgements

This *Air Quality Conformity Determination Report* between the *NWI 2050* Plan Amendment #2, the 2022 to 2026 Transportation Improvement Program (2020-2024 TIP) and the Indiana State Implementation Plan (SIP) was prepared by the Northwestern Indiana Regional Planning Commission (NIRPC). Individuals from the following agencies (hereafter collectively referred to as the Interagency Consultation Group on Air Quality or ICG) contributed their efforts towards the completion of the *Air Quality Conformity Determination Report*. They include:

- Northwestern Indiana Regional Planning Commission (NIRPC)
- Indiana Department of Transportation (INDOT)
- Indiana Department of Environment Management (IDEM)
- Federal Highway Administration (FHWA)
- Federal Transit Administration (FTA)
- United States Environmental Protection Agency (EPA)

Executive Summary

As part of its transportation planning process as a Metropolitan Planning Organization, NIRPC at least every 4 years is required to develop both a Metropolitan Transportation Plan, a plan of the Northwestern Indiana Region's priorities for the next few decades, as well as a Transportation Improvement Program, a listing of transportation projects (every 2 years) that are consistent with the Metropolitan Transportation Plan. Because NIRPC administers these transportation planning requirements in at least one area designated by the United States Environmental Protection Agency (EPA) as nonattainment or maintenance for one or more criteria pollutants in the Clean Air Act (CAA), NIRPC is also subjected to air quality conformity requirements.

The Clean Air Act (CAA) section 176(c) (42 U.S.C. 7506(c)) requires that federally funded or approved highway and transit activities are consistent with ("conform to") the purpose of the State Implementation Plan (SIP). Conformity to the purpose of the SIP means that transportation activities will not cause or contribute to new air quality violations, worsen existing violations, or delay timely attainment of the relevant NAAQS or any interim milestones (42 U.S.C. 7506(c)(1)). EPA's air quality conformity rules establish the criteria and procedures for determining whether metropolitan transportation plans (MTPs), transportation improvement programs (TIPs), and federally supported highway and transit projects conform to the SIP (40 CFR Parts 51.390 and 93). Additionally, EPA's air quality conformity rules dictate that any TIP amendment that includes regionally significant, non-exempt projects are also subject to air quality conformity requirements.

Of the six criteria pollutants regulated by the CAA (Ozone, Particulate Matter, Carbon Monoxide, Lead, Sulfur Dioxide, and Nitrogen Dioxide), only Ozone applies for this *Air Quality Conformity Determination Report* because it is the only one of the pollutants for which EPA has designated portions of the NIRPC planning area (Lake, Porter, and LaPorte Counties) nonattainment or maintenance that the ICG has found to have transportation-related emissions contributing to the nonattainment or maintenance designation. While portions of Lake County (East Chicago) are designated as a maintenance area for Particulate Matter less than 10 microns in diameter (PM10) as well as Carbon Monoxide (CO), the EPA has found onroad mobile sources (transportation) not to be significant contributors to the PM10 designation, so an air quality conformity review is not required for that standard (68 FR 1372). Moreover, the second 10-year maintenance plan for the 1971 CO National Ambient Air Quality Standard (NAAQS) expired on December 14, 2019, so an air quality conformity determination is no longer required (74 FR 52891). The EPA has made area designations for Ozone for the 1997, 2008, and 2015 NAAQSs. Air quality conformity must be demonstrated for the area designated under each NAAQS, unless an area for a newer designation is completely within the area from an older designation, in which case demonstrating conformity for the larger area is considered adequate for meeting the air quality conformity determination requirements. Lake and Porter Counties are designated as maintenance for the 1997 Ozone NAAQS and nonattainment for the 2008 Ozone NAAQS. Portions of northern Lake County are designated as nonattainment for the 2015 Ozone NAAQS, but since this area is completely within the area designated by the 2008 NAAQS, an air quality conformity determination for the 2008 Ozone NAAQS is adequate for the 2015 NAAQS. LaPorte County is designated maintenance for the 1997 Ozone NAAQS. Per the *South Coast Air Quality Management District v. EPA* decision and EPA's *Transportation Conformity Guidance for the South Coast II Court Decision*, LaPorte County is subjected to less stringent air quality conformity determination requirements.

This *Air Quality Conformity Determination Report* was completed consistent with CAA requirements, existing associated regulations at 40 CFR Parts 51.390 and 93, and the *South Coast II* decision, according to EPA's *Transportation Conformity Guidance for the South Coast II Court Decision* issued on November 29, 2018.

1.0 Background

1.1 Air Quality Conformity Process

The concept of air quality conformity was introduced in the Clean Air Act (CAA) of 1970, which included a provision to ensure that transportation investments conform to a State implementation plan (SIP) for meeting the Federal air quality standards. Conformity requirements were made substantially more rigorous in the CAA Amendments of 1990. The air quality conformity regulations that detail implementation of the CAA requirements were first issued in November 1993, and have been amended several times. The regulations establish the criteria and procedures for transportation agencies to demonstrate that air pollutant emissions from MTPs, TIPs and projects are consistent with (“conform to”) the State’s air quality goals in the SIP. This document has been prepared for State and local officials who are involved in decision making on transportation investments.

Air quality conformity is required under CAA Section 176(c) to ensure that Federally-supported (though not necessarily federally funded) transportation activities are consistent with (“conform to”) the purpose of a State’s SIP. Air quality conformity establishes the framework for improving air quality to protect public health and the environment. Conformity to the purpose of the SIP means Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) funding and approvals are given to highway and transit activities that will not cause new air quality violations, worsen existing air quality violations, or delay timely attainment of the relevant air quality standard, or any interim milestone.

Lake, Porter, and LaPorte Counties were designated as nonattainment for the 1997 Ozone NAAQS effective June 15, 2004 according to 69 FR 23857. On July 19, 2007, LaPorte County was reclassified to attainment with a maintenance plan (became a maintenance area) according to 72 FR 39574. On May 11, 2010, Lake and Porter Counties were reclassified to attainment with a maintenance plan (became a maintenance area) according to 75 FR 26113.

Lake and Porter Counties were designated as nonattainment for the 2008 Ozone NAAQS effective July 20, 2012 according to 77 FR 34221. EPA denied IDEM’s redesignation request for Lake and Porter Counties for attainment on January 9, 2015, so Lake and Porter Counties remain a nonattainment area for the 2008 Ozone NAAQS.

Portions of Lake County (Calumet, Hobart, North, Ross, and St. John Townships) were designated as nonattainment for the 2015 Ozone NAAQS effective August 3, 2018 according to 83 FR 25776. Since these townships are all completely within the 2008 Ozone NAAQS nonattainment area that spans all of Lake and Porter Counties, demonstrating air quality conformity for all of Lake and Porter Counties with respect to the 2008 Ozone NAAQS satisfies the requirement for demonstrating air quality conformity for the Lake County portion of the 2015 Ozone NAAQS.

2.0 Metropolitan Transportation Plan (MTP)

Metropolitan Planning Organizations (MPOs) operating fully or in part in NAAQS nonattainment or maintenance areas such as NIRPC are required to develop a metropolitan transportation plan (MTP) at least every 4 years that looks out to a horizon at least 20 years in the future according to 23 CFR Part 450.324.

2.1 *NWI 2050* Plan

The *NWI 2050* Plan was adopted by the NIRPC Full Commission on May 16, 2019.[1] This plan satisfies the requirements mentioned in section 2.0 above and is the MTP for the Northwestern Indiana Region that includes all of Lake, Porter, and LaPorte Counties in Indiana.

The *NWI 2050* Plan includes the regionally significant, non-exempt transportation projects as shown in Table 2.1.1 completed since the 2017 baseline year subject to the air quality conformity requirements (see Appendix A-2 for Regional Significance Guidance)

[1] Available at: http://bit.ly/NWI2050Plan

Table 2.1.1 Air Quality Conformity-Required Projects Included in *NWI 2050* Plan

Projects Complete by 2020	Beginning Point	End Point	Sponsor	Federal Estimated Cost (YOE)	Non-Federal Estimated Cost (YOE)
I 65 Added Travel Lanes	US 30	SR 2	INDOT	2018: $55,800,000	2018: $6,200,000
Cline Ave Bridge	Riley Rd Interchange	Michigan Ave Interchange	East Chicago	$0	2019: $150,000,000
45th Ave Added Center Turn Lane	Chase St	Grant St	Lake County	2016: $184,780	2016: $46,195
101st Ave Added Travel Lanes	Georgia St	Mississippi St	Merrillville	2019: $2,423,000	2019: $643,546
Parrish Ave Added Center Turn Lane	Joliet St	US 231	St. John	$0	2018: $1,950,000
Broadway Metro Express	Gary Metro Center	Methodist Southlake Hospital	Gary Public Transportation Corporation	2017: $7,600,000	2017: $1,900,000
US 20 Added Center Turn Lane	US 421	US 35/SR 212	INDOT	2018: $8,961,600	2018: $2,240,400
US 20 Interchange Modification at US-35/SR 212	Meer Rd	US 35/SR 212 Interchange	INDOT	2018: $517,600	2018: $129,400
US 20 New Interchange at SR 2	1,590 feet from US 20/SR 2 Interchange	1,590 feet from US-20/SR-2 Interchange	INDOT	2019: $9,398,400	2019: $2,349,600

Projects Complete by 2025	Beginning Point	End Point	Sponsor	Federal Estimated Cost (YOE)	Non-Federal Estimated Cost (YOE)
US 41 Added Center Turn Lane	Standard Ave	US 231	INDOT	2019: $3,991,200	2019: $997,800
SR 49 Consecutive Intersection Improvements	Porter Ave	Gateway Blvd	INDOT	2023: $10,856,317	2023: $2,714,079
US 20 Added Center Turn Lane	SR 39	Fail Rd	INDOT	2023: $14,460,108	2023: $3,615,027
109th Ave Consecutive Intersection Improvements	SR 53	Iowa St	Crown Point/INDOT	2021: $2,643,125	2021: $7,576,875
Gostlin St/Sheffield Ave/Chicago St Added Travel Lanes	Illinois State Line	US 41	Hammond	2020: $9,400,000	2020: $2,350,000
45th St Added Center Turn Lane	Colfax St	Chase St	Lake County	2020: $9,928,142	2020: $2,482,036
Mississippi St Added Travel Lanes	93rd Ave	101st Ave	Merrillville	2020: $3,612,000	2020: $903,250
45th St Grade Separation and Realignment	0.3 miles West of Calumet Ave	Southwood Dr	Munster	2019: $16,800,000	2019: $4,843,293
93rd Ave Added Center Turn Lane	White Oak Ave	US 41	St. John	$0	2024: $3,487,347
109th Ave Added Center Turn Lane	Calumet Ave	US 41	St. John	$0	2024: $3,812,928
Calumet Ave Added Center Turn Lane	101st Ave	109th Ave	St. John	$0	2024: $3,398,710
Vale Park Rd Extension	Winter Park Dr	Windsor Tr	Valparaiso	$0	2020: $4,480,000
South Shore Line Double Track	Tennessee St	Michigan Blvd	NICTD	$0	2022: $388,603,154
West Lake Corridor commuter rail service	Hammond Gateway Station	Main St - Munster/Dyer	NICTD	$0	2022: $768,335,733

Projects Complete by 2030	Beginning Point	End Point	Sponsor	Federal Estimated Cost (YOE)	Non-Federal Estimated Cost (YOE)
US 41 Added Center Turn Lane	US 231	135th Pl	INDOT	2028: $36,877,815	2028: $9,219,454
Willowcreek Rd Extension	700 N	SR 130	Porter County	2025: $4,617,000	2025: $1,188,000
85th Ave Added Center Turn Lane	US 41	Parrish Ave	St. John	$0	2028: $5,828,139
93rd Ave Added Travel Lanes	Calumet Ave	Cline Ave	St. John	$0	2028: $36,217,098
109th Ave Added Travel Lanes	Calumet Ave	US 41	St. John	$0	2028: $10,220,018
Blaine Ave Added Center Turn Lane	93rd Ave	101st Ave	St. John	$0	2028: $5,438,393
Calumet Ave Added Travel Lanes	101st Ave	109th Ave	St. John	$0	2028: $9,906,218
Cline Ave Added Travel Lanes	101st Ave	109th Ave	St. John	$0	2028: $4,513,833
Cline Ave Gap Extension	93rd Ave	101st Ave	St. John	2028: $8,100,000	2028: $2,025,000
White Oak Ave Added Center Turn Lane	93rd Ave	101st Ave	St. John	$0	2028: $7,051,199
Kennedy Ave Added Travel Lanes	Main St	US 30	Schererville	2025: $17,401,579	2025: $4,350,395
Vale Park Rd Added Center Turn Lane	Calumet Ave	Silhavy Rd	Valparaiso	2027: $3,423,275	2027: $855,819

Projects Complete by 2040	**Beginning Point**	**End Point**	**Sponsor**	**Federal Estimated Cost (YOE)**	**Non-Federal Estimated Cost (YOE)**
Main St Extension	Burnham Ave (Illinois)	Columbia Ave/Sheffield Ave	Munster	2032: $2,848,472	2032: $712,118
Willowcreek Rd Extension	SR 130	US 30	Porter County	2030: $31,920,000	2030: $7,980,000
Division Rd Added Center Turn Lane	Sturdy Rd	375 E	Valparaiso	2038: $2,868,640	2040: $717,160
LaPorte County North-South Connector	SR 39	US 35	LaPorte County	2035: $104,000,000	2035: $26,000,000

Projects Complete by 2050	**Beginning Point**	**End Point**	**Sponsor**	**Federal Estimated Cost (YOE)**	**Non-Federal Estimated Cost (YOE)**
Division Rd Added Center Turn Lane	SR 2	Sturdy Rd	Valparaiso/Porter County	2048: $6,151,100	2048: $1,537,775

2.2 *NWI 2050* Plan Amendment #2

NWI 2050 Plan Amendment #2 changed the End Point in the US 41 Added Center Turn Lane project from SR 2 to 135th Pl in the Projects Complete by 2030 section of Table 2.1.1 above. This amendment also moved the Main St Extension project from the Projects Complete by 2030 section to the Projects Complete by 2040 section of Table 2.1.1 above. This amendment also added two new projects/phases to Table 2.1.1. It added the Cline Ave Gap Extension project to the Projects Complete by 2030 section and added the Willowcreek Rd Extension with Beginning Point SR 130 and End Point US 30 to the Projects Complete by 2040 section of Table 2.1.1 above.

3.0 Transportation Improvement Program (TIP)

Metropolitan Planning Organizations (MPOs) such as NIRPC are required to develop a Transportation Improvement Program (TIP), which is a listing of FHWA and FTA funded transportation projects, covering a period of at least 4 years and in cooperation with the state and public transit providers according to 23 CFR Part 450.326. MPOs in Indiana produce TIPs covering 5 years.

3.1 2022 to 2026 Transportation Improvement Program (TIP)

The 2022 to 2026 Transportation Improvement Program (2022-2026 TIP) will be adopted by the NIRPC Full Commission on April 15, 2021.[2] The 2022-2026 TIP satisfies the requirements mentioned in section 3.0 above and is the TIP for the Northwestern Indiana Region that includes all of Lake, Porter, and

[2] Available at

LaPorte Counties in Indiana.

The 2022-2026 TIP includes all federally funded projects in the State Fiscal Years 2022 to 2026 (July 1, 2021 through June 30, 2026) but does not include all of the projects listed in Table 2.1.1 above, namely those beyond the year 2026 or those that are not federally funded.

4.0 Air Quality Conformity Determination: General Process

Generally, demonstrating air quality conformity between an MTP/TIP and a SIP means showing that regionally significant, non-exempt highway and transit projects will not cause new air quality violations, worsen existing air quality violations, or delay timely attainment of the relevant air quality standard, or any interim milestone. The State of Indiana developed a Regional Significance Guidance document included in Appendix A-2 that satisfies the 40 CFR Part 93.101 definition of regionally significant project. A non-exempt project is any project not included as an exempt project type in 40 CFR Part 93.126. Thus, demonstrating air quality conformity is required for any transportation project that meets the Regional Significance Guidance and that is not on the list of exempt projects.

In nonattainment or maintenance areas for transportation-related criteria pollutants, demonstrating air quality conformity is required for all newly adopted MTPs and TIPs, and for any amendments to MTPs or TIPs that include regionally significant, non-exempt projects. Since the *NWI 2050* Plan Amendment #2 is a MTP amendment and the 2022-2026 TIP is a newly adopted TIP, it is necessary to demonstrate air quality conformity to the SIP with respect to the applicable criteria pollutants and their associated precursors. In this case the only applicable criteria pollutant is Ozone, which includes Nitrous Oxides (NOx) and Volatile Organic Compounds (VOC) as precursors.

5.0 Requirements

5.1 Overview

The air quality conformity regulation at 40 CFR 93.109 sets forth the criteria and procedures for demonstrating air quality conformity. The air quality conformity criteria for MTPs and TIPs include: latest planning assumptions (93.110), latest emissions model (93.111), consultation (93.112), transportation control measures (93.113(b) and (c), fiscal constraint, consistency with motor vehicle emissions budgets in the SIP, and regional emissions analysis or interim emissions test (93.118 and/or 93.119).

For the 1997 Ozone NAAQS areas that are not designated nonattainment or maintenance for either the 2008 Ozone NAAQS or 2015 Ozone NAAQS (i.e. LaPorte County), air quality conformity can be demonstrated with only the latest planning assumptions, consultation, transportation control measures, and fiscal constraint requirements per 40 CFR 93.109(c) and the EPA Transportation Conformity Guidance for the South Coast II Court Decision.[3] Thus, all of the additional requirements in the previous paragraph only are applied to demonstrating air quality conformity with respect to Lake and Porter Counties in this *Air Quality Conformity Determination Report*.

For the 1987 PM10 NAAQS maintenance area in East Chicago, the EPA has found that onroad mobile sources do not significantly contribute to that designation, so conformity air quality review requirements do not apply for the PM10 standard and therefore are not analyzed in this *Air Quality Conformity Determination Report*.

5.2 Latest Planning Assumptions

Use of the latest planning assumptions in demonstrating air quality conformity is required per 40 CFR 93.110 of the Transportation Conformity Rule. Use of the latest planning assumptions ensures that the underlying assumptions and data that are inputted into the regional emissions analysis accurately reflect the planning assumptions of the region demonstrating air quality conformity. As part of the *NWI 2050* Plan and 2022 to 2026 TIP development, the Northwestern Indiana Region developed demographic forecasts for population and employment growth as shown on Table 5.2.1.

Table 5.2.1 Demographic Baseline and Forecasts for Lake, Porter, and LaPorte Counties

Year	Population	Households	Employment
2017	766,924	291,750	286,970
2020	773,689	294,313	292,121
2025	784,974	298,567	300,688
2030	796,251	302,838	309,281
2040	818,813	311,378	326,436
2050	841,382	319,903	343,604

Population forecasts are based on the baseline 2017 year as found in the US Census Bureau's American Community Survey, 2013-2017 Estimates Table B01003. The 2050 horizon year population forecast is based on an average of 5 different sources that have already conducted population forecasts for the NWI Region: INDOT Statewide Travel Demand Model, INDOT REMI PI+ 2.0 Model, Woods & Poole Economics, Inc., Louis Berger Group (for the Chicago Metropolitan Agency for Planning), and the Indiana

[3] Available from https://www.epa.gov/sites/production/files/2018-11/documents/420b18050.pdf

Business Research Center.[4] The interim years between the 2017 baseline year and the 2050 horizon year are extrapolated from a simple linear trend model of fit. Household forecasts are based on the baseline 2017 year as found in the US Census Bureau's American Community Survey, 2013-2017 Estimates Table S1101. All other years are based on the number of persons per household for each county found by dividing the county's population by its number of households. Employment forecasts are based on the baseline 2017 year as found in the US Bureau of Labor Statistics' Quarterly Census of Employment and Wages (QCEW) State and County Wages series annual average employment. The 2050 horizon year employment forecast is based on an average of 4 different sources that have already conducted employment forecasts for the NWI Region: INDOT Statewide Travel Demand Model, INDOT REMI PI+ 2.0 Model, Woods & Poole Economics, Inc., and Louis Berger Group (for the Chicago Metropolitan Agency for Planning).[5] The interim years between the 2017 baseline year and the 2050 horizon year are extrapolated from a simple linear trend model of fit.

The Highway Performance Monitoring System (HPMS) data provides the basis or an analysis of the growth in Vehicle-Miles of Travel as shown on Table 5.2.2.

[4] INDOT Statewide Travel Demand Model, INDOT REMI PI+ 2.0 Model, and Woods & Poole Economics, Inc. population forecasts were emailed to NIRPC by INDOT on October 11, 2017 and have privacy restrictions- these forecasts are technically for a 2045 horizon year that is extrapolated out to 2050 based on a linear trend model of fit; Louis Berger Group forecasts are available at https://datahub.cmap.illinois.gov/dataset/89f66569-5f51-4c14-8b02-5ecc1ca00909/resource/a812de2f-d465-47f2-87df-0427e81da2cf/download/CMAPSocioeconomicForecastFinal-Report04Nov2016.pdf; Indiana Business Research Center forecasts available at http://www.stats.indiana.edu/pop_proj/

[5] INDOT Statewide Travel Demand Model, INDOT REMI PI+ 2.0 Model, and Woods & Poole Economics, Inc. forecasts were emailed to NIRPC by INDOT on October 11, 2017 and have privacy restrictions- these forecasts are technically for a 2045 horizon year that is extrapolated out to 2050 based on a linear trend model of fit; Louis Berger Group forecasts are available at https://datahub.cmap.illinois.gov/dataset/89f66569-5f51-4c14-8b02-5ecc1ca00909/resource/a812de2f-d465-47f2-87df-0427e81da2cf/download/CMAPSocioeconomicForecastFinal-Report04Nov2016.pdf

Table 5.2.2 Growth in Vehicle Miles Traveled (VMT) in Lake, Porter, and LaPorte Counties

Year	Daily VMT Estimate (HPMS)	Annual Rate of Growth
1992	17,722,061	
1993	18,160,891	2.48%
1994	18,663,552	2.77%
1995	19,847,112	6.34%
1996	19,842,716	-0.02%
1997	21,058,741	6.13%
1998	21,638,065	2.75%
1999	21,249,847	-1.79%
2000	21,527,000	1.33%
2001	21,987,000	2.11%
2002	22,147,635	0.73%
2003	22,201,000	0.24%
2004	22,154,000	-0.21%
2005	22,216,000	0.28%
2006	22,305,000	0.40%
2007	22,397,000	13.95%
2008	21,792,000	-13.96%
2009	26,507,120	21.21%
2010	20,359,000	-23.19%
2011	26,545,000	30.38%
2012	25,461,000	-4.08%
2013	26,066,000	2.37%
2014	26,797,850	2.81%
2015	29,805,800	11.22%
2016	30,858,000	3.53%
2017	31,044,000	0.60%

Based on this data, the actual annual rate of growth of travel can be determined. For the three-county area as shown in Table 5.2.2, the rates range from -23.19% to 30.38% between 1992 and 2017. Over this period, the annual rate of daily VMT growth is 2.27%.

Vehicle registration data have been received from the Indiana Bureau of Motor Vehicles. These data are split by vehicle type, and have an associated date of approximately December 31, 2014. The Indiana Department of Environmental Management provided vehicle age information for cars and light trucks, from the application of a vehicle identification number (VIN) decoder as well as registrations by vehicle type directly from the Bureau of Motor Vehicles. This vehicle registration data have been used in MOVES, reflecting vehicle fleet age by vehicle type for smaller vehicles. For larger vehicle types, default data have been determined to be the best available fleet age information.

The NIRPC Travel Demand Model was used to relate the Latest Planning Assumptions to the Regional Emissions Analysis (Section 5.8). For questions or inquiries about the NIRPC Travel Demand Model, please contact Scott Weber, Transportation Planner/Analyst (sweber@nirpc.org).

5.3 Latest Emissions Model

For demonstrating air quality conformity for the Lake and Porter Counties 2008 Ozone NAAQS, the MOVES2014a model has been used for this *Air Quality Conformity Determination Report*. Although technically the MOVES3 is the latest emissions model, EPA allows MOVES2014a to satisfy the latest emissions model requirements for air quality conformity purposes until January 9, 2023.[6] The latest emissions model requirement does not apply to demonstrating air quality conformity for the 1997 Ozone NAAQS with respect to LaPorte County as mentioned in the EPA *Transportation Conformity Guidance for the South Coast II Court Decision*. The Motor Vehicles Emissions Budgets (MVEB) for 2008 Ozone NAAQS with respect to Lake and Porter Counties are based on the INDOT Air Quality Post-Processor (AQPP), which combines inputs from the NIRPC Travel Demand Model and MOVES2014a.

5.4 Consultation Requirements

The consultation requirements in 40 CFR 93.112 were addressed both for interagency consultation and public consultation.

Interagency consultation was conducted with NIRPC, INDOT, IDEM, FHWA, FTA, and EPA. NIRPC staff convened a preliminary virtual meeting on February 11, 2021. NIRPC staff sent an email to representatives from each of these agencies with a draft copy of this *Air Quality Conformity Determination Report* on February 24, 2021. Representatives from each of these agencies offered feedback and recommended edits as appropriate before this *Air Quality Conformity Determination Report* was released for public comment on March 1, 2021. All interagency consultation was conducted consistent with the Indiana Conformity SIP. See section 7.1 for details of the interagency consultation correspondence.

Public consultation was conducted consistent with planning rule requirements in 23 CFR 450. NIRPC followed its *Engage NWI* public participation plan.[7] The *Air Quality Conformity Determination Report* was made available to public comment on the NIRPC website from March 1, 2021 to March 31, 2021, fulfilling the 30-day public comment period that *Engage NWI* requires for Conformity Determinations. [add a sentence about comments that may or may not be received].

5.5 Timely Implementation of TCMs

The Indiana SIP with respect to Lake, Porter, and LaPorte Counties does not include any TCMs.

5.6 Fiscal Constraint

Air quality conformity requirements in 40 CFR 93.108 state that transportation plans and TIPs must be fiscally constrained consistent with DOT's metropolitan planning regulations at 23 CFR part 450. The *NWI 2050 Plan*, including Amendment #2, and 2022-2026 TIP are fiscally constrained, as demonstrated

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[6] See https://www.epa.gov/moves/latest-version-motor-vehicle-emission-simulator-moves and 86 FR 1106
[7] Available at https://www.nirpc.org/wp-content/uploads/2019/09/FINAL-Engage-NWI-Commission-Adopted.pdf.

in the Action Plan section of the *NWI 2050* Plan, including in Amendment #2,[8] and the Fiscal Constraint section of the 2022-2026 TIP.[9]

5.7 Consistency with the Motor vehicle emissions budgets in the SIP

This *Air Quality Conformity Determination Report* is prepared consistent with the applicable EPA-approved Motor vehicle emissions budgets (MVEB) for the Ozone precursors of NOx and VOC. The MVEB are based on prior consultation between members of the Interagency Consultation Group on Air Quality (see Acknowledgments section) and are formulated using the latest emissions model and the NIRPC Travel Demand Model. Table 5.9.1 shows the MVEB for the applicable analysis years in the Regional Emissions Analysis. The consistency with the Motor vehicle emissions budgets requirement does not apply to demonstrating air quality conformity for the 1997 Ozone NAAQS with respect to LaPorte County as mentioned in the EPA *Transportation Conformity Guidance for the South Coast II Court Decision*.

5.8 Regional Emissions Analysis Methodology

The regional emissions analysis applicable to Lake and Porter Counties has estimated emissions of VOC and NO_X as ozone precursors. The regional emissions analysis includes estimates of emissions from the entire transportation system, including all regionally significant, non-exempt projects contained in the *NWI 2050* Plan Amendment #2 (see Table 2.1.1) and all other regionally significant, non-exempt highway and transit projects expected in the nonattainment area in the time frame of the transportation plan. Table 5.9.1 shows that regional emissions for the ozone precursors fall at or below the budgets in the State Implementation Plan for the 2008 Ozone NAAQS with respect to Lake and Porter Counties.

The emissions analysis methodology meets the requirements of 40 CFR 93.122(b) of the Transportation Conformity Rule, for air quality conformity determinations based on estimates of regional transportation-related emissions completed after January 1, 1997.

Implementation of the Lake and Porter County projects in the *NWI 2050* Plan Amendment #2 and 2022-2026 TIP results in motor vehicle emissions that are at or below the levels of the applicable Motor vehicle emissions budgets, as shown in Table 5.9.1.

The regional emissions analysis for the transportation projects includes calculations of vehicle emissions at the aggregate level for the entire transportation system, including all regionally significant, non-exempt projects expected in the nonattainment area. The analysis includes FHWA/FTA-funded projects proposed in the *NWI 2050* Plan (including in Amendment #2), all Indiana Toll Road projects and all other regionally significant, non-exempt projects which are disclosed to NIRPC (see Table 2.1.1 for the complete list). Vehicle miles traveled (VMT) from projects which are not regionally significant and non-exempt are estimated in accordance with reasonable professional practice, using the NIRPC Travel Demand Model.

The regional emissions analysis does not include any TCM. The regional emissions analysis does not include emissions reduction credit from projects, programs, activities, or control measures which require a regulatory action in order to be implemented.

Ambient temperatures used for the regional emissions analysis are consistent with those used to estimate the emissions in 2017. All other factors, for example the fraction of travel in a hot stabilized engine mode, are consistently applied.

[8] Available at [insert link here]
[9] Available at [insert link here]

Reasonable methods have been used to estimate nonattainment area VMT on off-network roadways within the urban transportation planning area, and on roadways outside the urban transportation planning area. For 2017, 2020, 2025, 2030, 2040, and 2050, estimates of regional transportation-related emissions used to support the conformity determination have been made using the MOVES2014a post-processor updated with the latest vehicle registration data. Regional transportation-related emissions estimates are included for 2011 since 2011 appears in the Lake and Porter Counties 2008 Ozone NAAQS attainment demonstration.

Land use, population, employment, and other network-based travel model assumptions have been documented based on the best available information (see Section 5.3). The distribution of population, households, and employment is based on prior 5-year moving averages of those trends in each of the 380 Travel Analysis Zones (TAZs) in Lake and Porter Counties and is a reasonable state of the practice.

A capacity-sensitive assignment methodology has been used, and emissions estimates are based on a methodology, which differentiates between peak and off-peak link volumes and speeds, and uses speeds based on final assigned volumes, post-processed in the database. TAZ-to-TAZ travel impedances used to distribute trips between origin and destination pairs are in reasonable agreement with the travel times that are estimated from final assigned traffic volumes, using a feedback procedure iterated five times. These times have also been used for modeling mode splits. The network-based travel model is reasonably sensitive to changes in the time(s), cost(s), and other factors affecting travel choices. Reasonable methods in accordance with good practice have been used to estimate traffic speeds and delays in a manner that is sensitive to the estimated volume of travel on each roadway segment represented in the network-based travel model. Highway Performance Monitoring System (HPMS) estimates of vehicle miles traveled (VMT) are considered the primary measure of VMT within the portion of the nonattainment area and for the functional classes of roadways included in the nonattainment area.

The regional emissions analysis requirement does not apply to demonstrating air quality conformity for the 1997 Ozone NAAQS with respect to LaPorte County as mentioned in the EPA *Transportation Conformity Guidance for the South Coast II Court Decision*.

5.9 Regional Emissions Analysis Results

Table 5.9.1 shows the Regional Emissions Analysis Results for demonstrating air quality conformity between the *NWI 2050* Plan Amendment #1 and 2020 to 2024 TIP Amendment #7 and the Indiana SIP for the 2008 Ozone NAAQS with respect to Lake and Porter Counties.

Table 5.9.1 Regional Emissions Analysis for Lake and Porter Counties - 2008 Ozone NAAQS

Year:	2011	2017	2020	2025	2030	2040	2050
NOx Budget	28.41	28.41	16.68	16.68	16.68	16.68	16.68
NOx Emissions	24.70	18.77	13.01	8.56	6.60	5.22	5.34
VOC Budget	11.02	11.02	6.85	6.85	6.85	6.85	6.85
VOC Emission	9.58	8.03	6.18	4.92	3.77	2.60	2.58

As shown in Table 5.9.1, baseline and forecasted emissions for the Ozone precursors of NOx and VOC are at or below the motor vehicle emissions budgets (MVEBs) in the Indiana SIP. Therefore, air quality conformity is demonstrated for the *NWI 2050* Plan Amendment #2 and 2022-2026 TIP for the 2008 Ozone NAAQS with respect to Lake and Porter Counties. Per the EPA *Transportation Conformity Guidance for the South Coast II Court Decision*, air quality conformity is demonstrated for the *NWI 2050* Plan Amendment #2 and 2022-2026 TIP for the 1997 Ozone NAAQS with respect to LaPorte County without a regional emissions analysis. Only the latest planning assumptions, consultation, transportation control measures, and fiscal constraint are required to demonstrate air quality conformity with respect to LaPorte County.

6.0 Conclusion

The air quality conformity determination process completed for the *NWI 2050* Plan Amendment #2 and the 2022 to 2026 Transportation Improvement Program (2022-2026 TIP) demonstrates that these planning documents meet the Clean Air Act and Transportation Conformity Rule requirements for the applicable National Ambient Air Quality Standards (NAAQS).

7.0 Appendices

7.1 Appendix A-1: Interagency Consultation Group Correspondence

NIRPC staff on January 29, 2021 emailed members of the Interagency Consultation Group on Air Quality, comprised of NIRPC, INDOT, IDEM, FHWA, FTA, and EPA, about coordinating a preliminary Interagency Consultation Group (ICG) meeting. According to the results of a Doodle Poll to determine the date for the preliminary meeting that worked best, the preliminary ICG meeting was held virtually on February 11, 2021. Scott Weber (NIRPC), Kathy Luther (NIRPC), Charles Bradsky (NIRPC), Stephanie Belch (INDOT), Alan Holderread (INDOT), John Krueckeberg (INDOT), Shawn Seals (IDEM), Cecilia Godfrey (FTA), and Anthony Maietta (EPA) attended the preliminary ICG virtual meeting. During the preliminary meeting, Scott Weber led the discussion of six agenda topics: timeline of conformity deliverables, latest planning assumptions, projects subject to conformity, relevant National Ambient Air Quality Standards (NAAQS), regional emissions analysis scope, and next steps for the ICG. The ICG concurred that planning for a NIRPC Executive Board/Full Commission approval of the *Air Quality Conformity Determination Report* on April 15, 2021 seems appropriate. The ICG agreed that meeting this deadline requires that NIRPC staff circulate the draft report for public comment from March 1, 2021 to March 31, 2021 and agreed to suggest any comments to NIRPC staff by February 26, 2021 via email before releasing the draft report for public comment. The ICG agreed that the latest planning assumptions from the previous *Air Quality Conformity Determination Report* from May 2020 are still in effect for this conformity report because the four-year planning regime of *NWI 2050* is still in effect. Scott Weber updated the ICG on the projects subject to conformity requirements—projects whose statuses have changed since the May 2020 report and new projects added in NIRPC's latest Notice of Funding Availability (NOFA) for the FY 2022-2026 TIP from new project applications. There are two projects whose statuses have changed: the End Point of the INDOT US 41 Added Center Turn Lane project changed from SR 2 to 135th Pl and the Town of Munster Main St Extension project changed from complete by 2030 to complete by 2040. There are two projects subject to conformity requirements that were added as a result of the NOFA for the FY 2022-2026 TIP: the Town of St. John's Cline Ave Gap Extension project added to the complete by 2030 section of Table 2.1.1 and Porter County's Willowcreek Rd Extension from SR 130 to US 30 added to the complete by 2040 section of Table 2.1.1. The ICG agreed that the relevant NAAQS subject to conformity requirements are: the 1997 8-hour Ozone orphan maintenance area designation for LaPorte County, subject to the *South Coast* guidance, the 1997 8-hour Ozone nonattainment area for Lake and Porter Counties (superseded by the 2008 8-hour Ozone nonattainment area for the same exact geographical area of Lake and Porter Counties), and the 2015 8-hour Ozone nonattainment area for five townships in Lake County (North, Calumet, St. John, Ross, and Hobart). However, since the five-township area is completely contained in the larger nonattainment area for the same criteria pollutant from an earlier NAAQS and since there are adequate or approved Motor Vehicle Emissions Budgets for the 2015 8-hour Ozone NAAQS for the five township area, the ICG agreed that demonstrating conformity for the entire Lake and Porter County region would be sufficient for meeting the 2015 8-hour Ozone NAAQS conformity requirements. Anthony Maietta commented to Scott Weber that he would check on the status of 2025 and 2030 Motor Vehicle Emissions budgets that IDEM proposed in their February 27, 2020 Redesignation Request and Maintenance Plan for the State Implementation Plan and which EPA issued a Notice of Proposed Rulemaking finding adequate for in an April 20, 2020 *Federal Register* notice. The ICG agreed that the relevant years for the regional emissions analysis are 2011, 2017, 2020, 2025, 2030, 2040, and 2050. Robert Dirks (FHWA) was not able to participate in the preliminary virtual ICG meeting but called Scott Weber the next day, February 12, 2021, where Scott Weber filled him in on what transpired at the ICG meeting. Scott Weber emailed the ICG a copy of the draft *Air Quality Conformity Determination Report* on February 24, 2021. Finding no issues with the draft *Air Quality Conformity Determination Report*, NIRPC staff released the draft for a 30-day public comment period from March 9, 2021 to April 8, 2021 in accordance with *Engage NWI*, NIRPC's federally compliant public participation plan. No comments were received.

7.2 Appendix A-2: Regional Significance Guidance

Regional Significance Guidance

This document is being provided as a guidance resource for local municipalities and project implementers to:

1. Help define what is meant by the term "regionally significant project"
2. Provide information on the regional air quality conformity process
3. Provide guidance on expected project-level informational requirements of local municipalities.

This document does not in any way change, modify, or supersede any regulatory or statutory requirements of the Clean Air Act, Clean Air Act Amendments, or other related federal and state legislation. The final determination on whether a project can be considered regionally significant is reserved by the air quality consultation committee.

NIRPC provides the conformity process as a service to local governments. By excluding regionally significant projects from the regional emissions analysis, project implementers may risk a violation of the Clean Air Act, and non-conformity for the regional transportation plan and transportation improvement program. The applicable federal regulations are included at the end of this document.

NIRPC's transportation network model includes all roads functionally classified a collector and higher and all interchange ramps. The collectors and some local roads are included to accurately load traffic onto the higher classification roads, including the minor arterials, principal arterials, expressways and interstates. All roads functionally classified as Minor Arterial or above should be considered as regionally significant. This includes all freeways, expressways, interchange ramps, principal arterials and minor arterials. All fixed guide-way transit services, including commuter rail are regionally significant. Fixed route bus services can also be regionally significant when they offer a significant alternative to regional highway travel.

Transportation projects, whether single or multi-jurisdictional, that modify these facilities can be regionally significant. Individually, projects can be considered as regionally significant when they are above certain thresholds. Collectively, when a series of smaller projects on a regionally significant facility are completed, the overall improvements can be regionally significant.

Thresholds of regional significance for the anticipated overall improvement projects are listed.

Interstates, Expressways, Toll Roads	
Expansion Type	Threshold
New Segment	No Minimum
Added Through Lanes	No Minimum
Continuous Auxiliary Lanes	> ¼ mile
New Interchanges	No Minimum
Modification of Existing Interchanges	AQ Consultation Required

Principal Arterials	
Expansion Type	Threshold
New Segment	No Minimum
Added Through Lanes	No Minimum
Continuous Auxiliary Lanes	> 1 mile
New Interchanges	No Minimum
Modification of Existing Interchanges	AQ Consultation Required
Separation of existing railroad grade crossings	Not regionally significant

Minor Arterials	
Expansion Type	Threshold
New Segment	¾ to 1 mile - AQ Consultation Required
New Segment	> 1 mile
Added Through Lanes	¾ to 1 mile - AQ Consultation Required
Added Through Lanes	> 1 mile
Continuous Auxiliary Lanes	> 1 mile
Separation of existing railroad grade crossings	Not regionally significant

Rail and Fixed Guide-way Transit	
Expansion Type	Threshold
New Route or Service	No Minimum
Route Extension with Station	> 1 mile from current terminus
Added track or guide-way capacity	> 1 mile
New Intermediate Station	AQ Consultation Required

Bus and Demand Response Transit	
Expansion Type	Threshold
New Fixed Route	AQ Consultation Required
New Demand Response Service	Not Regionally Significant
Added Service to existing	Not Regionally Significant

New segments or added through lanes on arterials that are also associated with large land development projects may need AQ consultation even if the project is below the threshold in the table. Land development projects can be regionally significant when they have the potential to generate many trips or vehicle-miles of travel. Such developments are incorporated into the regional model during the update of socioeconomic forecasts, at the beginning of the update cycle for a new regional transportation plan. Local agencies shall provide their comprehensive plans to NIRPC as they're updated, which reflect the known development projects.

Local agencies should proactively include anticipated developments in their comprehensive plans without specific reference to potential high profile private sector developments.

Implementation

Conceptual "place-holder" projects can be included in the conformity determination long before commitments are made for their implementation. For plan milestone years, anticipated projects should be included. Local agencies shall submit to NIRPC thoroughfare plans that use the functional classification system as they're adopted. Functional classification changes shall be done in the context of the Regional Transportation Plan.

At the start of each conformity cycle, NIRPC will solicit new project and related development information from all local agencies, so that the analysis will use the latest planning assumptions. Local agencies that wish to proceed with transportation improvement projects, regardless of funding sources, must respond to the solicitation to be sure that their projects are included in the regional emissions analysis. Projects that are excluded from the analysis may be delayed until the next conformity cycle (a minimum of six months), when they will be included in the regional emissions analysis. In addition, at the start of each plan update cycle NIRPC will request an update of land development that local agencies anticipate, for inclusion in the regional emissions analysis, by including updated population, household and employment data.

This guidance is intended to help NIRPC and project sponsors to comply with the following federal regulation: **40 CFR Part 93** (Transportation Conformity Rule Amendments: Flexibility and Streamlining; Final Rule) **§93.101** (Definitions) *Regionally significant project means a transportation project (other than an exempt project) that is on a facility which serves regional transportation needs (such as access to and from the area outside the region, major activity centers in the region, major planned developments such as new retail malls, sports complexes, etc., or transportation terminals as well as most terminals themselves) and would normally be included in the modeling of a metropolitan area's transportation network, including at a minimum all principal arterial highways and all fixed guideway transit facilities that offer an alternative to regional highway travel.*; **§93.105** (Consultation) **(c)** (Interagency Consultation Procedures: Specific Processes) *Interagency consultation procedures shall also include the following specific processes:* **(ii)** *Determining which minor arterials and other transportation projects should be considered "regionally significant" for the purposes of regional emissions analysis (in addition to those functionally classified as principal arterial or higher or fixed guideway systems or extensions that offer an alternative to regional highway travel), and which projects should be considered to have a significant change in design concept and scope from the transportation plan or TIP.*; **§93.121** (Requirements for adoption or approval of projects by other recipients of funds designated under title 23 U.S.C. or the Federal Transit Laws.) **(a)** *Except as provided in paragraph (b) of this section, no recipient of Federal funds designated under title 23 U.S.C. or the Federal Transit Laws shall adopt or approve a regionally significant highway or transit project, regardless of funding source, unless the recipient finds that the requirements of one of the following are met:* **(1)** *The project was included in the first three years of the most recently conforming transportation plan and TIP (or the conformity determination's regional emissions analysis), even if conformity status is currently lapsed; and the project's design concept and scope have not changed significantly from those analyses; or* **(2)** *There is a currently conforming transportation plan and TIP, and a new regional emissions analysis including the project and the currently conforming plan and TIP demonstrates that the transportation plan and TIP would still conform if the project were implemented (consistent with the requirements of §93.118 and/or 93.119 for a project not from a conforming transportation plan and TIP).* **(b)** *In isolated rural nonattainment areas and maintenance areas subject to §93.109(g), no recipient…*

APPENDIX A4

Conceptual Model of Surface Ozone Formation in Chicago

Lake Michigan Air Directors Consortium (LADCO) Technical Support Document

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Conceptual Model of Surface Ozone Formation in Chicago

July 2022

1.1 Current Conditions

Figure 1 shows maps of the 2021 4th highest daily maximum 8-hour average ozone (MDA8) concentrations and three-year (2019-2021) design values (DVs) for the surface monitors in the Chicago nonattainment area (NAA). Table 1 and Table 2 show the annual ozone (O_3) DV data in tabulated form. Table 1 shows the annual DVs in the entire Chicago NAA from 2015 to 2021; the NAA DV is a reading from the "controlling" monitor, or the monitor with the highest 3-year DV in the entire NAA. Table 2 shows the annual DVs for all monitors in the Chicago NAA from 2015 to 2021.

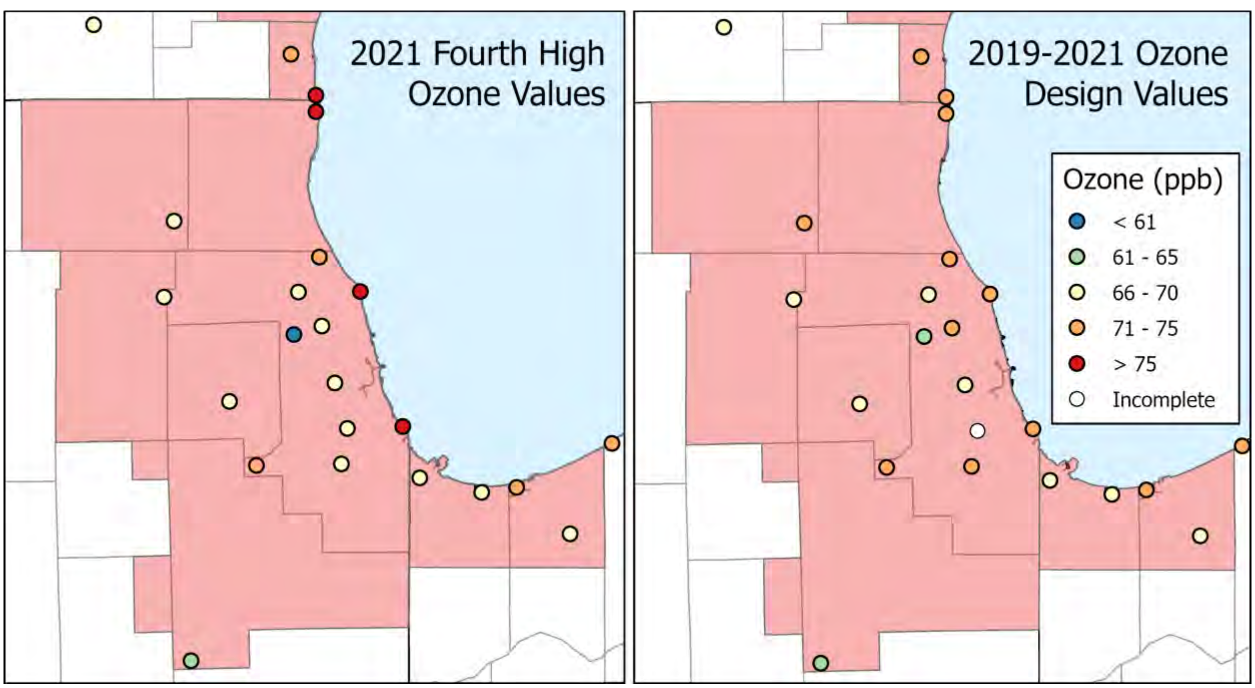

Figure 1. 2021 MDA8 O_3 4th highest and 2019-2021 design values in the Chicago NAA.

Table 1. Chicago area O_3 NAAQS NAA design values (ppb). Design values were downloaded from AQS.

Designated Area	2015	2016	2017	2018	2019	2020	2021
Chicago-Naperville, IL-IN-WI	75	77	78	79	75	77	75

Table 2. Chicago area O_3 NAAQS NAA monitor design values (ppb). Design values were downloaded from AQS.

State	County	AQS Site ID	2015	2016	2017	2018	2019	2020	2021
IL	Cook	170310001	65	69	73	77	75	75	71
IL	Cook	170310032	68	70	72	75	73	74	75
IL	Cook	170310076	64	69	72	75	72	69	67
IL	Cook	170311003	66	69	67	69	67	73	71
IL	Cook	170311601	66	69	69	70	68	71	72
IL	Cook	170313103	61	62	62	64	63	65	64
IL	Cook	170314002	62	66	68	72	68	71	70
IL	Cook	170314007	68	71	71	74	70	71	69
IL	Cook	170314201	68	71	72	77	74	77	74
IL	Cook	170317002	70	72	73	77	75	75	73
IL	DuPage	170436001	64	68	70	71	70	71	70
IL	Kane	170890005	65	68	69	71	70	72	70
IL	Lake	170971007	71	73	73	75	71	72	73
IL	Will	171971011	63	64	65	67	66	66	64
IN	Lake	180890022	65	67	68	70	68	70	69
IN	Lake	180892008	63	65		66	65	66	68
IN	Porter	181270024	68	69	69	71	70	71	72
IN	Porter	181270026	63	66	69	73	73	69	68
WI	Kenosha	550590019	75	77	78	79	75	74	74
WI	Kenosha	550590025	69	71	73	77	74	74	72

1.2 Meteorology and Transport

Ozone concentrations are significantly influenced by meteorological factors. Ozone production is driven by high temperatures and sunlight, as well as precursor concentrations. Ozone concentrations at a given location are also dependent on wind direction, which governs which sources or source regions are upwind. Wind-drive transport in turn affects how much O_3 and O_3 precursors impact a given area.

Qualitatively, O_3 episodes in the region are associated with hot weather, clear skies (sometimes hazy), low wind speeds, high solar radiation, and winds with a southerly component. These conditions are often a result of a slow-moving high-pressure system to the east of the region. The relative importance of various meteorological factors is discussed later in this section. Transport of O_3 and its precursors is a significant factor and occurs on several spatial scales. Regionally, over a multi-day period, somewhat stagnant summertime conditions can lead to the build-up in O_3 and O_3 precursor concentrations over a large spatial area. This polluted air mass can be transported long distances (10s to 1000s of km), resulting in elevated O_3 levels in locations far downwind. Locally, emissions from urban areas add to the regional background leading to O_3 concentration hot spots downwind. Depending on the synoptic wind patterns (and local land-lake breezes), different downwind areas are affected.

The following key findings related to transport can be made:

- Ozone transport is an issue affecting many portions of the eastern U.S. The Lake Michigan area (and other areas in the LADCO region) both receives high levels of incoming (transported) O_3 and O_3 precursors from upwind source areas on many hot summer days, and contributes to the high levels of O_3 and O_3 precursors affecting downwind receptor areas.
- The presence of Lake Michigan influences the formation and transport of O_3 in the region, particularly at sites within a few kilometers of the shoreline. Depending on large-scale synoptic winds and local-scale lake breezes, different parts of the area experience high O_3 concentrations. For example, during southerly flow, high O_3 can occur in eastern Wisconsin, and during southwesterly flow, high O_3 can occur in western Michigan.
- Downwind shoreline areas around Lake Michigan are affected by transport of O_3 from major cities in the Lake Michigan area and from areas further upwind.

1.3 Ozone Trends

Figure 2 illustrates the 19-year trends in 3-year O_3 DVs at individual surface monitors in the Chicago NAA. The red horizontal lines mark the 2015 and 2008 O_3 NAAQS. After the decadal high year in 2012, surface O_3 concentrations have declined through 2019. There has generally been an increasing trend in O_3 concentrations in the Chicago NAA monitors since the decadal low year in 2015.

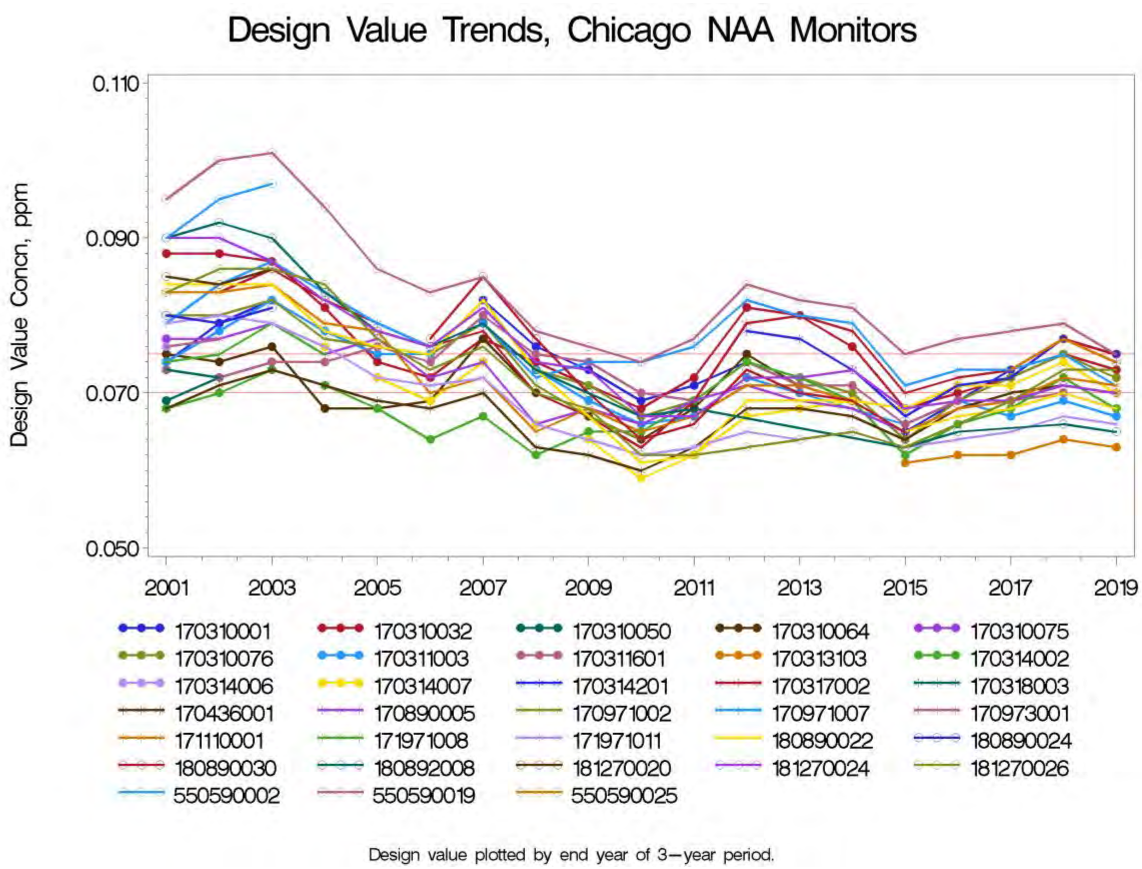

Figure 2. 3-year O_3 design value trends from 2001 to 2019 at all monitors in the Chicago NAA

Given the effect of meteorology on ambient O_3 levels, year-to-year variations in meteorology can make it difficult to assess short term (e.g. – less than 10 years) trends in O_3 concentrations. One approach to adjust the trends in O_3 concentrations for meteorological influences is through the use of Classification and Regression Trees (CART). CART is a statistical technique which partitions data sets into similar groups (Breiman et al., 1984). LADCO performed a CART analysis using data for the period 2005-2018 for urban and downwind monitors in the Chicago NAA. The CART model searches through over thirty National Weather Service meteorological variables collected at airports[1] to determine which are most efficient in predicting O_3. Although the exact selection of predictive variables changes from site to site, the most common predictors of high surface O_3 concentrations during the period we analyzed are temperature, wind direction, and relative humidity. Only occasionally were upper air variables, transport time or distance, lake breeze, or other variables significant as predictors.

For each group of monitors in the NAAs we analyzed, LADCO developed regression trees that classify each summer day (May-September) by its meteorological conditions. Similar days are assigned to nodes, which are equivalent to branches of the regression tree. By grouping days with similar meteorology, the influence of meteorological variability on changes in O_3 concentrations is partially controlled for in the trend; the remaining trend is presumed to be due to trends in precursor emissions or other non-meteorological influences.

Trends over the 13-year period ending in 2018 were found to be declining for each monitor or composite area noted. These plots reflect long term trends and are not meant to depict trends over shorter time periods.

1.3.1 Northern Chicago NAA CART Analysis

LADCO used O_3 data from the Zion, IL and Chiwaukee, WI monitoring sites to identify trends in the surface concentrations downwind of Chicago using CART. Meteorological surface and aloft data used in this analysis are from the National Climatic Data Center's Integrated Surface Database and Integrated Radiosonde Archive; we used HYSPLIT trajectories to develop transport vectors.

Figure 3 shows the distribution of O_3 among Zion and Chiwaukee CART nodes. Each boxplot represents a group of days with common meteorological conditions. Node U identifies the predictor variables that are associated with the highest mean observed O_3 concentrations at these monitors during the period of analysis (2005-2018). The days captured by this node have an average daily maximum O_3 concentration of 74 ppb and the following meteorological conditions:

[1] National Climatic Data Center Integrated Surface Database

- 24-hr southerly transport vector distance is >39 km
- average relative humidity is <70%
- afternoon wind direction is <211 deg
- max temperature is >85 F

Node T identifies the predictor variables that are associated with the second highest mean observed O_3 concentrations at these monitors during the period of analysis. Node T captures days with an average daily maximum O_3 concentration of 65 ppb and the following meteorological conditions:

- 24-hr southerly transport vector is >39 km
- average relative humidity is <70%
- afternoon wind direction is < 211 deg
- max temperature is <85 F and >78 F

CART identifies that the most significant predictors of high O_3 concentrations at Zion and Chiwaukee are warm and dry conditions with southerly flow. Daily maximum temperature is the only meteorological difference between nodes T and U. With all transport variables being equal, the cooler conditions represented by node T group days with an average O_3 concentration that is 9 ppb lower than the warmer days (>85 F) captured in node U.

Figure 4 shows the Zion, IL and Chiwaukee, WI O_3 trends by CART node. The node associated with the highest O_3 concentrations (node U) shows a distinct downward trend in O_3 concentrations during the 13-year CART analysis period. By controlling for the meteorological influence on O_3 concentrations during the most polluted days, this trend indicates that O_3 concentrations in the northern part of the Chicago NAA are declining as the result of changes to emissions and other non-meteorological predictors.

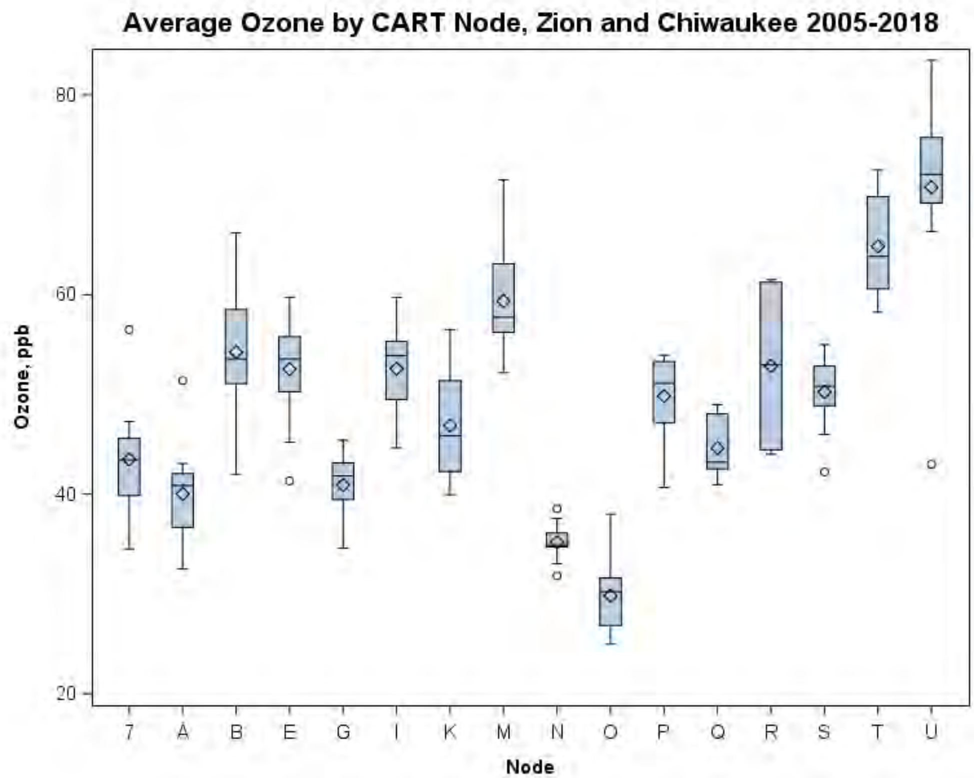

Figure 3. Northern Chicago NAA ozone concentrations by CART node.

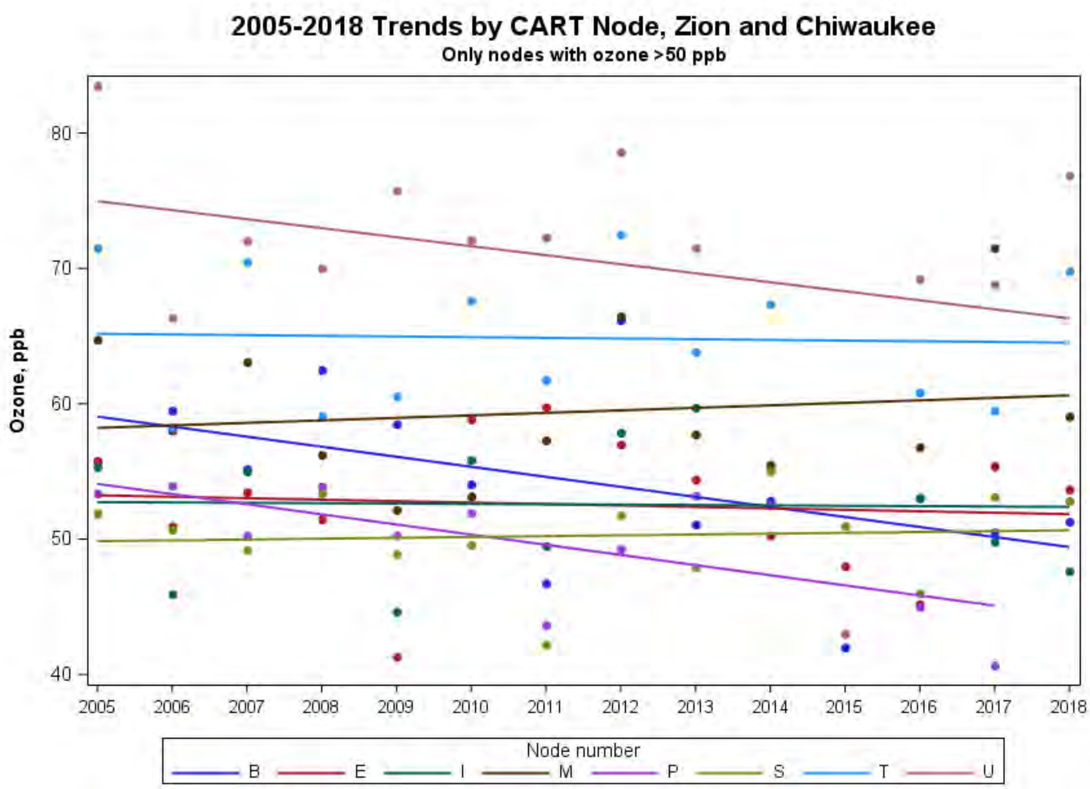

Figure 4. Northern Chicago NAA O_3 trends by CART node

1.4 Conceptual Model of Ozone in the Chicago NAA

A conceptual model is a qualitative summary of the physical, chemical, and meteorological processes that control the formation and distribution of pollutants in a given region. Based on the data and analyses presented above, and of previous conceptual models and technical support documents developed for the Lake Michigan region, a conceptual model of the behavior, meteorological influences, and causes of high O_3 in the Chicago NAA is summarized below:

- Historical O_3 data show a downward trend over the past 20 years, due likely to federal and state emission control programs. Concentrations declined sharply from 2002 through 2010, and again from 2012 through 2015. Ozone concentrations at the “controlling” monitors in the Chicago NAA have been on the rise since 2015.
- Ozone concentrations are strongly influenced by meteorological conditions, with more high O_3 days and higher O_3 levels during summers with above normal temperatures. Nevertheless, meteorologically adjusted trends at the controlling monitors show that concentrations have declined even on hot days, providing strong evidence that emission reductions of O_3 precursors have been effective.
- Inter- and intra-regional transport of O_3 and O_3 precursors affects many portions of the LADCO states, and is the principal cause of nonattainment in some areas far from population or industrial centers.
- The presence of Lake Michigan influences the formation, transport, and duration of elevated O_3 concentrations along its shoreline. Depending on large-scale synoptic winds and local-scale lake breezes, different parts of the area experience high O_3 concentrations. For example, under southerly flow, high surface O_3 concentrations can occur in eastern Wisconsin, and under southwesterly flow, high surface O_3 can occur in western Michigan.
- A natural lake-land breeze circulation pattern is a major cause of the high O_3 concentrations observed along the lakeshore. This pattern is driven by surface temperature gradients

between the lake and the land. At night and in the early morning a land breeze (land –> lake) forms when the lake surface is warmer than the land surface. The land breeze transports O_3 precursors from industrial and mobile sources on land out over the lake. When the sun rises, the O_3 precursors over the lake begin to rapidly react to form O_3, and high over-lake concentrations are often observed during the summer. A lake breeze (lake –> land) forms when the land surface becomes warmer than the lake, typically in the early afternoon during the summer. The lake breeze transports the concentrated O_3 and precursors from the lake, inland to a narrow band along the lake shore. The O_3 concentrations observed along the lakeshore that violate the NAAQS are often associated with lake-land breeze patterns.

- Areas in closer proximity to the Lake shoreline display the most frequent and most elevated O_3 concentrations.

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APPENDIX A5

Lake Michigan Air Directors Consortium (LADCO)
Task 2 Control Measures Screening

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	Shortlist	Measure #	Source Category	Emission Reduction Measure Name	Pollutant	Absolute Reductions (TPY)															
						Allegan, MI	Berrien, MI	Chicago, IL	Chicago, IN	Chicago, WI	Cincinatti, OH	Cleveland, OH	Columbus, OH	Detroit, MI	Door, WI	Louisville, IN	Manitowoc County, WI	Muskegon, MI	Northern Milwaukee/Ozaukee, WI	Sheboygan, WI	St. Louis, IL
.		Residential/Commercial/Industrial Boilers, Heaters and IC Engines - Natural gas (nonpoint)																			
Nonpoint S NP - 1	0	NP - 1	Commercial/ Institutional Natural Gas	Natural Gas Water Heater Replacement	NOx	2	5	297	7	4	33	70	45	174	6.3E-01	3	2	4	37	3	14
Nonpoint S NP - 2	-	NP - 2	Industrial Natural Gas Combustion	RACT to 25 tpy (Low NOx Burner)	NOx	2	1	160	1.2E-01	7.7E-01	16	30	12	37	4.1E-01	6.2E-02	1	2	6	3	0
Nonpoint S NP - 3	-	NP - 3	Industrial Natural Gas Combustion	RACT to 50 tpy (Low NOx Burner)	NOx	2	1	160	0	7.4E-01	15	30	12	37	4.0E-01	0	1	2	6	3	0
Nonpoint S NP - 4	-	NP - 4	Natural-Gas-Fired, Fan-Type Central Furnaces	Natural-Gas-Fired, Fan-Type Central Furnaces Emissions Limits	NOx	1	2	141	6	2	16	39	21	85	2.4E-01	2	9.5E-01	3	15	1	8
Nonpoint S NP - 5	0	NP - 5	Boilers, Steam Generators and Process Heaters	Rules 4306, 4320 Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters	NOx	11	14	1,155	16	10	120	249	133	495	3	7	7	15	98	18	32
Nonpoint S NP - 5	0	NP - 5	Boilers, Steam Generators and Process Heaters	Rules 4306, 4320 Advanced Emission Reduction Options for Boilers, Steam Generators, and Process Heaters	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nonpoint S NP - 6	0	NP - 6	Residential/Commercial/ Institutional Water Heaters and/or Space Heaters	Low NOx Water Heaters and Low NOx Burner Space Heaters	NOx	8	14	896	38	13	104	252	137	555	2	10	6	17	98	10	48
Nonpoint S NP - 7	0	NP - 7	Commercial/Residential Heaters/Boilers	Zero and Near-Zero Emission Burners and Incentives	NOx	12	17	1,017	43	16	135	303	170	613	4	13	8	20	116	12	59
Nonpoint S NP - 7	0	NP - 7	Commercial/Residential Heaters/Boilers	Zero and Near-Zero Emission Burners and Incentives	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nonpoint S NP - 8	-	NP - 8	Commercial and Residential Cooking Appliances	Low Emissions Burners and Incentives	NOx	7.0E-01	1	76	4	1	9	23	12	47	1.2E-01	8.9E-01	5.5E-01	2	8	8.1E-01	4
Nonpoint S Other combustion (indu		Other combustion (industrial wood, residential/industrial propane, gas/oil/LPG/wood-fired heaters etc.)																			
Nonpoint S NP - 9	-	NP - 9	Industrial Coal Combustion	RACT to 25/50 tpy (Low NOx Burner)	NOx	6.1E-01	4.9E-01	0	0	0	0	0	0	12	0	0	0	5.8E-01	0	0	0
Nonpoint S NP - 10	-	NP - 10	Industrial Oil Combustion	RACT to 25/50 tpy (Low NOx Burner)	NOx	1.8E-01	1.4E-01	10	0	0	4.6E-01	2	5.7E-01	4	0	0	0	1.8E-01	0	0	3.0E-01
Nonpoint S NP - 11	-	NP - 11	Process Heaters - Distillate Oil, Residual Oil, or Other Fuel	Low NOx Burner and Selective Non-Catalytic Reduction	NOx	0	0	5	0	0	0	1	0	85	0	0	0	4.5E-01	3.5E-01	0	1
Nonpoint S NP - 12	-	NP - 12	Bakery Products	Catalytic Incineration	VOC	0	0	27	0	0	5	3	0	2	0	0	2	0	4.1E-01	0	5.5E-01
Nonpoint S Open Burning/Prescribe		Open Burning/Prescribed Forest Burning																			
Nonpoint S NP - 13	0	NP - 13	Open Burning	Episodic Ban (Daily Only)	NOx	4	2	4	5	1	41	35	31	41	1	6	2	3	1	2	3
Nonpoint S NP - 13	0	NP - 13	Open Burning	Episodic Ban (Daily Only)	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nonpoint S NP - 14	-	NP - 14	Open Burning	SCAQMD Open Burn Program Rule 444	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nonpoint S NP - 14	-	NP - 14	Open Burning	SCAQMD Open Burn Program Rule 444	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nonpoint S NP - 15	-	NP - 15	Open Burning	Opening Burning Rule 4103	NOx	1.8E-01	1.1E-01	2.0E-01	2.1E-01	6.7E-02	2	2	1	2	5.2E-02	2.8E-01	7.4E-02	1.5E-01	5.1E-02	8.6E-02	1.4E-01
Nonpoint S NP - 15	-	NP - 15	Open Burning	Opening Burning Rule 4103	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nonpoint S NP - 16	-	NP - 16	Open Burning	CARB Outdoor Residential Waste Burning Requirements	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nonpoint S NP - 16	-	NP - 16	Open Burning	CARB Outdoor Residential Waste Burning Requirements	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nonpoint S NP - 17	-	NP - 17	Open Burning	Alternatives to Burning: Biomass	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nonpoint S NP - 17	-	NP - 17	Open Burning	Alternatives to Burning: Biomass	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nonpoint S Emissions-Intensive Sol		Emissions-Intensive Solvent Utilization Categories : Architectural Coatings, Graphic Arts and Degreasing																			
Nonpoint S NP - 18	-	NP - 18	Architectural Coatings	VOC Coating Content Limits	VOC	6	7	409	23	8	81	133	94	222	1	9	4	8	49	6	25
Nonpoint S NP - 19	0	NP - 19	Graphic Arts	VOC Coating Content Limits	VOC	0	27	148	46	0	473	630	320	400	0	105	0	11	0	0	7
Nonpoint S NP - 20	-	NP - 20	Solvent Degreasers	VOC Content Limits	VOC	9	9	427	23	0	76	177	63	218	0	16	0	11	33	0	30
Nonpoint S NP - 21	-	NP - 21	Cold Cleaning Degreasing	Process Modification	VOC	13	13	625	34	0	111	258	92	318	0	24	0	16	49	0	43
Nonpoint S NP - 22	-	NP - 22	Cold Cleaning Degreasing	Reformulation-Process Modification (Ozone Transport Commission Rule)	VOC	1	1	53	3	0	9	22	8	27	0	2	0	1	4	0	4
Nonpoint S NP - 23	-	NP - 23	Open Top Degreasing	Process Modification	VOC	13	13	638	35	0	114	264	94	325	0	24	0	16	50	0	44
Nonpoint S NP - 24	-	NP - 24	Open Top Degreasing	Reformulation-Process Modification	VOC	9	9	427	23	0	76	177	63	218	0	16	0	11	33	0	30
Nonpoint S Solvents: Consumer, Co		Solvents: Consumer, Commercial, Household, Personal Care Products																			
Nonpoint S NP - 25	-	NP - 25	Pharmaceuticals and Cosmetics Manufacturing Operations	VOC Content Limits	VOC	3	0	3	0	0	3.9E-01	0	1.6E-01	5.7E-01	0	0	0	0	3.9E-02	0	0
Nonpoint S NP - 26	0	NP - 26	Consumer Products	California Consumer Products Rules Cumulative through 2010 Proposed Amendments	VOC	29	35	1,842	111	39	385	632	449	1,058	7	45	18	40	233	27	114
Nonpoint S NP - 27	-	NP - 27	Consumer Products	Reformulation (2001/2006 OTC Model Rule)	VOC	9	10	554	33	12	116	190	135	318	2	13	5	12	70	8	34
Nonpoint S NP - 28	-	NP - 28	Pesticide Application	Reformulation	VOC	2	2	15	2	3.9E-01	2	1	3	4	5.2E-01	5.9E-01	6.7E-01	5.5E-01	2.5E-01	5.1E-01	9
Nonpoint S NP - 29	-	NP - 29	Household solvents, Personal Products	Cleaner Product Certification Program	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nonpoint S NP - 30	-	NP - 30	Household solvents, Personal Products, FIFRA	CARB Consumer Product Regulations	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nonpoint S Surface Coating and Ot		Surface Coating and Other Solvents																			
Nonpoint Source NP - 31	-	NP - 31	Coatings, Solvents, Adhesives, and Lubricants	Reduce the Allowable VOC Content in Product Formulas	VOC	5.5E-01	5.8E-01	29	2	1.6E-01	5	11	5	15	2.8E-02	9.9E-01	7.5E-02	7.1E-01	3	1.1E-01	2
Nonpoint S NP - 32	0	NP - 32	Adhesive and Sealant Applications	VOC Content Limits	VOC	10	11	635	36	13	125	206	146	344	2	15	6	13	76	9	39
Nonpoint S NP - 33	-	NP - 33	Solvent Cleaning Operations	VOC Content Limits	VOC	9	9	427	23	0	76	177	63	218	0	16	0	11	33	0	30
Nonpoint S NP - 34	-	NP - 34	Adhesives - Industrial	Reformulation	VOC	3.3E-01	1.0E-01	11	0	0	1	4	3	38	0	0	3.8E-01	8.3E-01	1	6	7.6E-02
Nonpoint S NP - 35	0	NP - 35	Adhesives and Coatings	UV/EB-Cured Adhesives and Coatings	VOC	38	24	933	68	23	275	451	294	912	8	37	22	34	147	22	58
Nonpoint S NP - 36	-	NP - 36	Marine and Pleasure Craft Coatings	VOC Coating Content Limits	VOC	5	0	0	0	2.2E-01	0	0	0	3	9	7.1E-01	8.5E-01	8.2E-01	9.5E-01	0	0
Nonpoint S NP - 37	-	NP - 37	Coating of Metal Parts and Products	VOC Coating Content Limits	VOC	29	2	0	0	1	70	52	50	74	0	16	17	17	2	3	0
Nonpoint S NP - 38	-	NP - 38	Paper, Fabric, and Film Coating Operations	VOC Coating Content Limits	VOC	0	7.8E-01	0	2	0	12	33	5	9	0	5	0	0	0	0	0
Nonpoint S NP - 39	-	NP - 39	Motor Vehicle and Mobile Equipment Non-Assembly Line Coating Operations	VOC Coating Content Limits	VOC	25	15	50	18	5	104	177	103	937	1	8	8	17	38	5	4
Nonpoint S NP - 40	-	NP - 40	Coatings and Ink Manufacturing	Coating and Ink Manufacturing Requirements	VOC	0	0	11	0	0	3	5	0	0	0	0	0	3.3E-02	0	0	1.5E-03
Nonpoint S NP - 41	0	NP - 41	Coatings and Ink Manufacturing	UV/EB-Cured Coatings & Inks	VOC	27	39	903	95	20	600	873	496	833	7	117	18	35	127	20	54
Nonpoint S NP - 42	-	NP - 42	Aerosol Coatings	Aerosol Coatings	VOC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nonpoint S NP - 43	0	NP - 43	Architectural, Traffic, and Industrial Maintenance Coatings	Ozone Transport Commission (OTC) Model Rule and South Coast -Rule 1113 Phase III VOC limits	VOC	8	9	515	32	12	109	179	126	280	2	13	5	11	70	8	32
Nonpoint S NP - 44	-	NP - 44	Coating Operations at Aerospace Manufacturing and Rework Operations	Control Technology Guidelines	VOC	0	3.8E-02	0	0	0	8.5E-01	8.1E-01	0	4.3E-01	0	0	0	1.6E-01	1.1E-02	0	0
Nonpoint S NP - 45	-	NP - 45	Metal Can and Metal Coil Surface Coating	Process Modification	VOC	0	0	0	0	0	4	3	3	3	0	0	0	0	0	0	0
Nonpoint S NP - 46	-	NP - 46	Metal Can and Metal Coil Surface Coating	Permanent Total Enclosure (PTE)	VOC	0	0	0	0	0	39	28	28	33	0	0	0	0	0	0	0
Nonpoint S NP - 47	-	NP - 47	Metal Can and Metal Coil Surface Coating	Incineration	VOC	0	0	0	0	0	35	26	25	30	0	0	0	0	0	0	0
Nonpoint S NP - 48	0	NP - 48	Metal Furniture Surface Coating	Reduced Solvent Utilization	VOC	16	1	0	0	5.9E-01	4	3	3	12	0	9	10	10	1	2	0

Nonpoint S NP - 49	-	NP - 49	Metal Furniture, Appliances, Parts	Reformulation-Process Modification	VOC	7	4.7E-01	0	0	2.5E-01	2	3	1	5	0	4	4	4	1.0E+00	7.8E-01	0
Nonpoint S NP - 50	-	NP - 50	Metal part and Products coating	Reformulation-Process Modification	VOC	0	0	0	2	0	0	2.0E-01	1	2.0E-02	0	8.4E-01	0	0	5.1E-01	0	0
Nonpoint S NP - 51	-	NP - 51	Mobile Equipment Repair and Refinishing	Ozone Transport Commission (OTC) Model Rule	VOC	8.5E-01	9.4E-01	13	5	1	13	26	15	36	3.6E-01	2	5.3E-01	1	8	1	9.7E-01
Nonpoint S NP - 52	-	NP - 52	Mobile Equipment Repair and Refinishing	California Air Resources Board - Suggested Control Measures for Automotive Coatings	VOC	2	2	30	11	3	30	62	34	84	8.4E-01	5	1	3	20	3	2
Nonpoint S NP - 53	-	NP - 53	Rubber/Plastics Coating	Reformulation-Process Modification	VOC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Nonpoint S NP - 54	-	NP - 54	Shipbuilding and Ship Repair (Surface Coating)	Incineration	VOC	3	0	0	0	1.3E-01	0	0	0	2	6	4.1E-01	4.9E-01	4.8E-01	5.5E-01	0	0
Nonpoint S NP - 55	-	NP - 55	Wood Furniture Surface Coating	Control Technology Guidelines	VOC	0	1.8E-01	0	0	0	4	10	3	3	0	0	8.0E-01	8.9E-02	3	2	0
Nonpoint S NP - 56	-	NP - 56	Wood Furniture Surface Coating	Add-On Controls	VOC	0	4.9E-01	0	0	0	10	28	8	7	0	0	2	2.4E-01	7	5	0
Nonpoint S NP - 57	-	NP - 57	Wood Product Surface Coating	Reformulation	VOC	1.1E-01	5.4E-02	0	1.6E-01	0	1.6E-01	4.6E-01	5.5E-01	8.2E-01	0	9.3E-01	0	5.4E-02	0	0	0
Nonpoint S NP - 58	-	NP - 58	Wood Product Surface Coating	Incineration	VOC	2.7E-01	1.3E-01	0	3.9E-01	0	3.9E-01	1	1	2	0	2	0	1.3E-01	0	0	0
Nonpoint S NP - 59	0	NP - 59	Miscellaneous Industrial Adhesives	Solvent substitution	VOC	2.7E-01	9.1E-02	7	0	0	6.3E-01	3	3	33	0	0	1.8E-01	7.3E-01	1	8.5E-01	6.7E-02
Nonpoint S NP - 60	-	NP - 60	Miscellaneous Metal and Plastic Parts Coatings	Coating Reformulation	VOC	1.5E-01	5.0E-02	4	0	0	3.5E-01	2	2	18	0	0	9.8E-02	4.0E-01	5.8E-01	4.6E-01	3.7E-02
Nonpoint S NP - 61	0	NP - 61	Miscellaneous Industrial Adhesives	Low VOC Adhesives and Improved Application Methods	VOC	2.7E-01	9.1E-02	7	0	0	6.3E-01	3	3	33	0	0	1.8E-01	7.3E-01	1	8.5E-01	6.7E-02
Nonpoint S NP - 62	0	NP - 62	Industrial Cleaning Solvents	Work practice standards, solvent substitution, and add-on controls	VOC	1	7.2E-01	11	3.9E-01	4.1E-04	4	9.1E-01	3.9E-01	14	0	0	2	9.2E-01	8	8.3E-01	2
Nonpoint S NP - 63	-	NP - 63	Industrial Cleaning Solvents - Other Non-Halogenated Solvent Cleaning Operations	Low VOC Cleaning Materials and Improved Work Practices	VOC	9.2E-01	6.5E-01	10	3.6E-01	3.7E-04	3	8.3E-01	3.5E-01	13	0	0	2	8.3E-01	7	7.5E-01	2
Nonpoint S NP - 64	-	NP - 64	Industrial Cleaning Solvents - Other Non-Halogenated Solvent Cleaning Operations	Refrigerated Condensers	VOC	5.3E-01	4	0	3	0	8	10	7	50	0	1	0	3	19	5	0
Nonpoint S Oil and Gas		**Oil and Gas**																			
Nonpoint S NP - 65	-	NP - 65	Fugitive Emissions	Improved/Expanded Leak Detection Programs	VOC	1	0	9.9E-02	0	0	0	2	4.1E-01	1	0	0	0	5.7E-02	0	0	5
Nonpoint S NP - 66	-	NP - 66	Thermally Enhanced Oil Recovery Wells	Steam Drive Well Emissions Restrictions	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nonpoint S NP - 67	-	NP - 67	Oil and Gas Production Wells	Oil and Gas Production Wells Emissions Reductions	VOC	1	0	9.9E-02	0	0	0	2	4.1E-01	1	0	0	0	5.7E-02	0	0	5
Nonpoint S Petroleum Product Stor		**Petroleum Product Storage, Transport, Processing**																			
Nonpoint S NP - 68	-	NP - 68	Storage Tank and Pipeline Cleaning and Degassing	Storage Tank and Pipeline Cleaning and Degassing Emission Reductions	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nonpoint S NP - 69	-	NP - 69	Liquefied Petroleum Gas Transfer and Dispensing	Liquefied Petroleum Gas Transfer and Dispensing Emissions Reductions	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nonpoint S NP - 70	-	NP - 70	Storage Tanks at Petroleum Facilities; Transfer of Petroleum Products	Refrigerated Condensers	VOC	5.3E-01	4	0	3	0	8	10	7	50	0	1	0	3	19	5	0
Nonpoint S NP - 71	-	NP - 71	Storage Tanks at Petroleum Facilities	Storage Tanks at Petroleum Facilities Emissions Reductions SCAQMD Rule 1178	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nonpoint S NP - 72	0	NP - 72	Petroleum Refinery Fugitives	Process Modification	VOC	0	0	16	18	0	1	0	0	16	0	0	0	0	0	0	41
Nonpoint S NP - 73	-	NP - 73	Stage II Service Stations - Underground Tanks (Breathing and Emptying)	LPV Relief Valve	VOC	10	17	126	13	3	31	50	32	164	1	5	2	14	16	2	13
Nonpoint S NP - 74	-	NP - 74	Gasoline Service Stations	Vapor Recovery Systems	VOC	13	22	164	17	4	41	65	42	214	1	7	2	19	21	3	17
Nonpoint S NP - 75	-	NP - 75	Gasoline Service Stations	CARB Vapor Recovery Rules	VOC	13	22	164	17	4	41	65	42	214	1	7	2	19	21	3	17
Nonpoint S Other Stationary Source		**Other Stationary Sources (<0.5% contribution to NOx/VOC inventory)**																			
Nonpoint S NP - 76	-	NP - 76	Emulsified Asphalt	Organic Compound Restrictions	VOC	2	8	1	6	2	11	19	12	14	1.8E-01	2	1	7	11	1	2.3E-01
Nonpoint S NP - 77	0	NP - 77	Cutback Asphalt	Reformulation-Process Modification	VOC	3	0	1	1	8	16	28	18	48	8.2E-01	4.2E-01	5	5.0E-01	51	6	2.1E-01
Nonpoint S NP - 78	0	NP - 78	Green-waste Composting	Organic Waste Processing Technology and Restriction on the Use of Uncomposed Greenwaste	VOC	0	9.4E-01	30	7.6E-01	9.5E-01	15	10	6	25	0	0	9.5E-01	9.4E-01	6	9.5E-01	7
Nonpoint S NP - 79	-	NP - 79	Composting	Emission Reductions from Co-composting Operations	VOC	0	2	58	1	2	28	20	12	47	0	0	2	2	11	2	13
Nonpoint S NP - 80	-	NP - 80	Construction and Demolition Debris	Construction and Demolition Debris Recycling	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Nonpoint S NP - 81	0	NP - 81	Municipal Solid Waste Landfill	Gas Recovery	VOC	0	2	0	0	0	0	0	0	23	0	0	0	9.7E-02	0	0	0
Nonpoint S NP - 82	-	NP - 82	General Stationary Sources	Weatherization and other Efficiency Measures on Existing Residential and Commercial Buildings	NOx	3	3	173	9	3	23	54	28	111	7.9E-01	3	2	4	19	2	11
Nonpoint S NP - 82	-	NP - 82	General Stationary Sources	Weatherization and other Efficiency Measures on Existing Residential and Commercial Buildings	VOC	3	3	36	5	2	13	24	14	43	1	4	2	3	5	2	5
Nonpoint S NP - 83	0	NP - 83	General Stationary Sources	Weatherization and Smart Grid Electricity Usage	NOx	17	25	1,367	60	22	188	415	234	839	5	19	12	29	157	18	80
Nonpoint S NP - 83	0	NP - 83	General Stationary Sources	Weatherization and Smart Grid Electricity Usage	VOC	18	16	219	25	12	73	133	82	245	6	21	10	17	30	11	25
Nonpoint S NP - 84	0	NP - 84	General Stationary Sources	Financial Incentive Programs: Transition to Zero and Near-Zero Emission Technologies for Stationary Sources	VOC	18	16	220	25	12	74	133	82	246	6	21	10	17	30	11	25
Nonpoint S NP - 84	0	NP - 84	General Stationary Sources	Financial Incentive Programs: Transition to Zero and Near-Zero Emission Technologies for Stationary Sources	NOX	18	25	1,378	61	22	189	418	236	846	5	19	12	29	158	18	81
		Measures suggested by LADCO/states																			
Nonpoint S NP - 85	-	NP - 85	Coal-fueled Boilers and IC Engines	SCR	NOx	2	2	3	0	0	3	2	4	51	0	0	0	2	0	0	1.5E-01

NOTES: Please note that estimated reductions by control option are approximations based on

1) the percent penetration assumed

2) the percent of emissions sources affected (SCCs selection will be refined for those measures that are reviewed in more detail during white paper stage).

Therefore, control options will accrue lower or higher reductions than shown in the screening analysis based on refined analysis (such as analysis that will be performed to develop the white papers for a limited number of measures).

In addition to screening level emission reductions, we recommend using qualitative markers as well as cost effectiveness (C-E) to evaluate which control options are best fits for more detailed analysis.

Shortlist	Measure #	Source Category	Emission Reduction Measure Name	Pollutant	Absolute Reductions (TPY) *point sources*															
					Allegan, MI	Berrien, MI	Chicago, IL	Chicago, IN	Chicago, WI	Cincinnati, OH	Cleveland, OH	Columbus, OH	Detroit, MI	Door, WI	Louisville, IN	Manitowoc County, WI	Muskegon, MI	Northern Milwaukee/ Ozaukee, WI	Sheboygan, WI	St. Louis, IL
0	P - 1	External Combustion Boilers - Electricity Generation- Anthracite Coal or Subbituminous/ Bituminous Coal	Selective Non-Catalytic Reduction	NOx	0	0	0	0	0	555	44	0	0	0	0	0	0	0	0	144
0	P - 2	Utility Boiler - Bituminous Coal Wall Fired	Low NOx Burner and Over Fire Air	NOx	0	0	0	0	0	997	78	0	0	0	0	0	0	0	0	258
0	P - 3	Utility Boiler - Bituminous Coal/ Wall Fired	Low NOx Burner	NOx	0	0	0	0	0	788	62	0	0	0	0	0	0	0	0	204
-	P - 4	Utility Boiler - Coal/ Wall Fired	Natural Gas Reburn	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 5	Utility Boiler - Coal/ Tangential	Low NOx Coal-and-Air Nozzles with Cross-Coupled and Separated Overfire Air	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	51	0	0
-	P - 6	Utility Boiler - Coal/ Tangential	Low NOx Coal-and-Air Nozzles with Cross-Coupled Overfire Air	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	35	0	0
-	P - 7	Utility Boiler - Coal/ Tangential	Low NOx Coal-and-Air Nozzles with Separated Overfire Air	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	39	0	0
-	P - 8	Utility Boiler - Coal/ Tangential	Natural Gas Reburn	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 9	Utility Boiler - Coal/ Tangential	Selective Catalytic Reduction	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 10	Utility Boiler - Coal/ Tangential	Selective Non-Catalytic Reduction	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	P - 11	Utility Boiler - Coal/ Wall Fired	Selective Catalytic Reduction	NOx	0	0	0	0	0	1,180	93	0	0	0	0	0	0	0	0	305
0	P - 12	Utility Boiler - Coal/ Wall Fired	Selective Non-Catalytic Reduction	NOx	0	0	0	0	0	521	41	0	0	0	0	0	0	0	0	135
0	P - 13	Utility Boiler - Subbituminous Coal -Wall Fired	Low NOx Burner and Over Fire Air	NOx	0	0	0	0	0	0	0	0	540	0	0	0	0	229	0	0
-	P - 14	Utility Boiler - Subbituminous Coal/ Wall Fired	Low NOx Burner	NOx	0	0	0	0	0	0	0	0	428	0	0	0	0	181	0	0
0	P - 15	Coal Fired EGU	Non-Thermal Plasma	NOx	0	0	0	0	0	1,249	98	0	675	0	0	0	0	287	0	323
-	P - 16	External Combustion Boilers - Natural Gas (Tangential or Non-Tangential Firing)	Natural Gas Reburn	NOx	0	0	12	77	5.9E-01	2	8.7E-01	2	18	0	0	1.4E-01	0	5	0	0
-	P - 17	Natural Gas Fired EGU	Non-Thermal Plasma	NOx	0	0	22	139	1	3	2	3	32	0	0	2.5E-01	0	10	0	0
0	P - 18	Cement Kilns	Biosolid Injection Technology	NOx	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0
0	P - 19	Cement Kilns	Changing feed composition	NOx	0	0	0	0	0	0	0	0	0	0	13	0	0	0	0	0
-	P - 20	Cement Kilns	Process Control Systems	NOx	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0
-	P - 21	Cement Manufacturing - Dry Process	Selective Non-Catalytic Reduction - Ammonia	NOx	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0
-	P - 22	Cement Manufacturing - Dry Process	Selective Non-Catalytic Reduction - Urea	NOx	0	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0
0	P - 23	Cement Manufacturing - Dry Process or Wet Process	Low NOx Burner	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	P - 24	Cement Manufacturing - Dry Process or Wet Process	Mid-Kiln Firing	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	P - 25	Cement Manufacturing - Wet Process	Selective Catalytic Reduction	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 26	In-Process - Bituminous Coal - Cement Kilns or Lime Kilns	Selective Catalytic Reduction	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 27	In-Process - Bituminous Coal - Cement Kilns or Lime Kilns	Selective Non-Catalytic Reduction - Urea	NOx	0	0	1.6E-02	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 28	Cement Kilns	Non-Thermal Plasma	NOx	0	0	3.3E-02	0	0	0	0	0	0	0	17	0	0	0	0	0
-	P - 29	Cement Kilns	Transition to zero and near-zero emission technologies for stationary sources	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
-	P - 30	Iron & Steel - In-Process Combustion - Bituminous Coal	Selective Catalytic Reduction	NOx	0	0	0	30	0	7.9E-01	3	0	1	0	0	0	4.3E-03	0	0	1.3E-01
-	P - 31	Iron & Steel - In-Process Combustion - Natural Gas and Process Gas - Coke Oven Gas	Low NOx Burner	NOx	0	0	0	18	0	4.6E-01	2	0	7.5E-01	0	0	0	2.6E-03	0	0	7.9E-02
-	P - 32	Iron & Steel - In-Process Combustion - Natural Gas and Process Gas - Coke Oven Gas	Selective Catalytic Reduction	NOx	0	0	0	30	0	7.9E-01	3	0	1	0	0	0	4.3E-03	0	0	1.3E-01
-	P - 33	Iron & Steel - In-Process Combustion - Process Gas -Coke Oven/ Blast Furnace	Low NOx Burner and Flue Gas Recirculation	NOx	0	0	0	20	0	5.1E-01	2	0	8.3E-01	0	0	0	2.8E-03	0	0	8.7E-02
-	P - 34	Iron & Steel - In-Process Combustion - Residual Oil	Selective Catalytic Reduction	NOx	0	0	0	30	0	7.9E-01	3	0	1	0	0	0	4.3E-03	0	0	1.3E-01
-	P - 35	Iron & Steel Mills - Annealing	Low NOx Burner	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 36	Iron & Steel Mills - Annealing	Low NOx Burner and Flue Gas Recirculation	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 37	Iron & Steel Mills - Annealing	Low NOx Burner and Selective Catalytic Reduction	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 38	Iron & Steel Mills - Annealing	Low NOx Burner and Selective Non Catalytic Reduction	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 39	Iron & Steel Mills - Annealing	Selective Catalytic Reduction	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 40	Iron & Steel Mills - Annealing	Selective Non Catalytic Reduction	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 41	Iron & Steel Mills - Cupola Melt Furnaces	Selective Catalytic Reduction	NOx	0	0	0	0	0	0	0	0	0	0	0	0	3.7E-01	0	0	0
-	P - 42	Iron & Steel Mills - Galvanizing	Low NOx Burner	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 43	Iron & Steel Mills - Galvanizing	Low NOx Burner and Flue Gas Recirculation	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 44	Iron & Steel Mills - Reheating	Low Excess Air	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	P - 45	Iron & Steel Mills - Reheating	Low NOx Burner	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 46	Iron & Steel Mills - Reheating	Low NOx Burner and Flue Gas Recirculation	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

-	P - 47	Iron Production - Blast Furnace - Blast Heating Stoves	Low NOx Burner and Flue Gas Recirculation	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 48	Taconite Iron Ore Processing - Induration - Coal or Gas	Selective Catalytic Reduction	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 49	Steel Foundries - Heat Treating Furnaces	Low NOx Burner	NOx	0	0	1.9E-01	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 50	Steel Production - Soaking Pits	Low NOx Burner and Flue Gas Recirculation	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 51	Iron & Steel Mills/Foundries	Non-Thermal Plasma	NOx	0	0	0	32	0	8.4E-01	4	0	1	0	0	0	4.6E-03	0	0	1.4E-01
-	P - 52	Iron & Steel Mills/Foundries	Transition to zero and near-zero emission technologies for stationary sources	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
-	P - 53	Industrial Natural Gas Internal Combustion Engines - 2cycle (lean)	Low Emission Combustion	NOx	4.2E-03	4.7E-04	8	2.2E-01	0	54	0	18	62	0	0	0	2	1.3E-01	0	0
0	P - 54	Industrial Natural Gas Internal Combustion Engines - 4cycle (rich)	Non-Selective Catalytic Reduction	NOx	2	0	4.0E-02	0	0	0	7.3E-01	0	2	0	0	0	0	1.4E-04	0	0
-	P - 55	Internal Combustion Engines - Natural Gas	Low Emissions Combustion (Low Speed)	NOx	41	55	3.1E-01	10	0	1	7	88	62	0	0	4	0	1.3E-04	0	0
0	P - 56	Internal Combustion Engines - Natural Gas	Low Emissions Combustion (Medium Speed)	NOx	41	55	27	11	0	64	7	107	127	0	0	4	2	1.3E-01	9.2E-01	5.6E-02
0	P - 57	Internal Combustion Engines - Natural Gas	Non-Selective Catalytic Reduction	NOx	42	57	3.2E-01	10	0	1	7	91	64	0	0	5	0	1.4E-04	0	0
0	P - 58	Internal Combustion Engines - Natural Gas	Selective Catalytic Reduction	NOx	40	54	27	11	0	64	7	104	124	0	0	4	2	1.3E-01	9.0E-01	5.5E-02
-	P - 59	Natural Gas Production - Compressors	Selective Catalytic Reduction	NOx	0	0	1	0	0	0	3.0E-02	1.5E-01	0	0	0	0	0	0	0	8.4E-03
-	P - 60	Natural Gas Pipelines	Non-Thermal Plasma	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	P - 61	Natural Gas Pipelines	Transition to zero and near-zero emission technologies for stationary sources	NOx	56	63	64	12	0	13	8	112	148	0	0	0	2	4.9E-01	3	2
-	P - 62	Process Heaters - Distillate Oil, Residual Oil, or Other Fuel	Low NOx Burner and Selective Noncatalytic Reduction	NOx	0	0	5	0	0	0	1	0	85	0	0	0	4.5E-01	3.5E-01	0	1
-	P - 63	Process Heaters	Low NOx Burner and Flue Gas Recirculation	NOx	3.8E-01	0	86	37	0	9	4	5.5E-01	20	0	0	1	1	6	2	57
-	P - 64	Process Heaters - Distillate Oil	Low NOx Burner and Selective Catalytic Reduction	NOx	0	7.6E-01	4	6.7E-01	0	2.0E-02	2	8.3E-01	6.9E-01	0	0	0	8.3E-01	0	0	2
-	P - 65	Process Heaters - Distillate Oil	Selective Catalytic Reduction	NOx	0	0	65	0	0	2.4E-01	1.4E-01	4.8E-01	5	0	0	8.5E-03	0	0	0	2
-	P - 66	Process Heaters - Distillate Oil or LPG	Low NOx Burner	NOx	0	0	9.0E-01	0	0	0	0	0	0	0	0	0	0	2.7E-03	0	0
-	P - 67	Process Heaters - Distillate Oil or LPG	Low NOx Burner and Flue Gas Recirculation	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	2.9E-03	0	0
-	P - 68	Process Heaters - Distillate Oil or LPG	Low NOx Burner and Selective Noncatalytic Reduction	NOx	0	0	2	0	0	0	0	0	0	0	0	0	0	4.7E-03	0	0
-	P - 69	Process Heaters - Distillate Oil or LPG	Selective Non-Catalytic Reduction	NOx	0	0	1	0	0	0	0	0	0	0	0	0	0	3.6E-03	0	0
-	P - 70	Process Heaters - Distillate Oil or LPG	Ultra-Low NOx Burner	NOx	0	0	1	0	0	0	0	0	0	0	0	0	0	3.4E-03	0	0
-	P - 71	Process Heaters - LPG	Low NOx Burner	NOx	0	0	1.2E-02	0	0	0	0	0	3.0E-01	0	0	0	0	0	0	5.4E-01
-	P - 72	Process Heaters - LPG	Low NOx Burner and Flue Gas Recirculation	NOx	0	0	8.7E-01	0	0	0	8.4E-02	0	1.9E-01	0	0	0	0	0	0	0
-	P - 73	Process Heaters - LPG	Low NOx Burner and Selective Catalytic Reduction	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 74	Process Heaters - Natural Gas	Low NOx Burner and Selective Catalytic Reduction	NOx	0	6.7E-01	9	5.9E-01	0	1.8E-02	3	7.4E-01	92	0	0	0	1	3.8E-01	0	2
-	P - 75	Process Heaters - Natural Gas or Process Gas	Low NOx Burner	NOx	3.8E-01	4.2E-01	15	3.7E-01	0	2	2	7.8E-01	61	0	0	5.5E-03	7.6E-01	2.4E-01	0	2
-	P - 76	Process Heaters - Natural Gas or Process Gas	Low NOx Burner and Selective Catalytic Reduction	NOx	6.9E-01	7.6E-01	27	6.7E-01	0	4	3	1	110	0	0	9.9E-03	1	4.2E-01	0	3
-	P - 77	Process Heaters - Natural Gas or Process Gas	Low NOx Burner and Selective Noncatalytic Reduction	NOx	0	0	64	58	0	6.6E-01	4	3.7E-01	20	0	0	2	2	10	3	89
-	P - 78	Process Heaters - Natural Gas or Process Gas	Selective Non-Catalytic Reduction	NOx	3.8E-01	0	28	28	0	2	2	3.1E-01	15	0	0	1.6E-01	1	7.9E-02	0	56
-	P - 79	Process Heaters - Natural Gas or Process Gas	Ultra-Low NOx Burner	NOx	5.7E-01	0	43	42	0	4	2	4.7E-01	23	0	0	2.4E-01	2	1.2E-01	0	84
-	P - 80	Process Heaters - Natural Gas, Process Gas or LPG	Low NOx Burner and Flue Gas Recirculation	NOx	4.2E-01	0	86	9	0	3	4	7.7E-01	80	0	0	2	2	7	2	8
-	P - 81	Process Heaters - Other Fuel	Low NOx Burner and Selective Catalytic Reduction	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 82	Process Heaters - Process Gas	Low NOx Burner and Flue Gas Recirculation	NOx	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
-	P - 83	Process Heaters - Process Gas or Natural Gas or LPG	Selective Catalytic Reduction	NOx	0	6.5E-01	72	5.8E-01	0	2.6E-01	3	1	94	0	0	8.5E-03	1	3.7E-01	0	4
-	P - 84	Process Heaters - Residual Oil	Low NOx Burner and Selective Catalytic Reduction	NOx	0	0	22	51	0	0	0	0	14	0	0	0	0	0	0	91
-	P - 85	Process Heaters - Residual Oil or Other Fuel	Low NOx Burner	NOx	0	0	2	0	0	0	5.3E-01	0	42	0	0	0	2.2E-01	1.7E-01	0	5.0E-01
-	P - 86	Process Heaters - Residual Oil or Other Fuel	Low NOx Burner and Flue Gas Recirculation	NOx	0	0	2	0	0	0	4.9E-01	0	39	0	0	0	2.0E-01	1.6E-01	0	4.6E-01
-	P - 87	Process Heaters - Residual Oil or Other Fuel	Selective Catalytic Reduction	NOx	0	0	5	0	0	0	1	0	88	0	0	0	4.6E-01	3.7E-01	0	1
-	P - 88	Process Heaters - Residual Oil or Other Fuel	Selective Non-Catalytic Reduction	NOx	0	0	1.2E-02	0	0	0	0	0	3.0E-01	0	0	0	0	0	0	5.4E-01
-	P - 89	Process Heaters - Residual Oil or Other Fuel	Ultra-Low NOx Burner	NOx	0	0	18	41	0	0	0	0	11	0	0	0	0	0	0	74
-	P - 90	Petroleum Refineries	Non-Thermal Plasma	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 91	Petroleum Refineries	Transition to Zero and Near-Zero Emission Technologies for Stationary Sources	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
-	P - 92	Petroleum Refinery Fugitives	Process Modification	VOC	0	0	16	18	0	1	0	0	16	0	0	0	0	0	0	41
-	P - 93	Petroleum Flare	Flare	VOC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 94	Petroleum Wastewater	Wastewater	VOC	0	0	2	8	0	0	0	0	1	0	0	0	0	0	3.3E-02	1.9E-02
-	P - 95	Petroleum Refinery	Thermal Incineration	VOC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
-	P - 96	Petroleum Refinery	Catalytic Incineration/Catalytic oxidation	VOC	0	0	4.2E-04	2.8E-01	0	2.6E-04	0	4.5E-01	5.1E-02	0	0	0	0	0	0	0

-	P - 97	Petroleum Refinery	Incineration - Recuperative Type	VOC	0	0	4.3E-04	2.8E-01	0	2.6E-04	0	4.6E-01	5.1E-02	0	0	0	0	0	0	0
-	P - 98	Petroleum Refinery	Incineration - Regenerative Type	VOC	0	0	4.3E-04	2.8E-01	0	2.6E-04	0	4.6E-01	5.1E-02	0	0	0	0	0	0	0
0	P - 99	Petroleum Refinery	Fiber-Bed Scrubbers	VOC	0	0	3.5E-04	2.3E-01	0	2.1E-04	0	3.7E-01	4.2E-02	0	0	0	0	0	0	0
0	P - 100	Coke By-Product Recovery Operations	Spray-Chamber/Spray-Tower Wet Scrubber	VOC	0	0	0	0	0	7.9E-02	0	0	1.5E-01	0	0	0	0	0	0	0
0	P - 101	Coke By-Product Recovery Operations	Packed-Bed/Packed-Tower Scrubber with Solvent Adsorption	VOC	0	0	0	0	0	9.5E-02	0	0	1.9E-01	0	0	0	0	0	0	0
-	P - 102	Petroleum Refinery - VOC Emissions from Vent Streams	VOC Vent Streams Routed to Combustion Device	VOC	0	0	49	19	3.2E-02	0	0	0	9	0	0	0	0	10	1.0E-01	29
-	P - 103	Petroleum Refinery - VOC Emissions from component leaks	Leak Detection and Repair Program (LDAR)	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
-	P - 104	Petroleum Refinery - VOC Emissions from component leaks	Improved Leak Detection and Repair Program (LDAR)	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
-	P - 105	Petroleum Refineries - VOC Emissions from Tanks	Use of Welded Deck Construction and a Seal Configuration That Includes a Mechanical Hose Primary Seal and a Rim Mounted Secondary Seal	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
-	P - 106	Petroleum Refineries - VOC Emissions from Tanks	Submerge Fill Piping or Bottom Fill Piping and Tank Painted White	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
-	P - 107	Refinery Process	Refinery Process Turnaround Operation Restrictions	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
-	P - 108	Non-Refinery Flares	BACT Flares	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
-	P - 109	Soybean and Oilseed Processing	Good Solvent Recovery Practices - Solvent Loss Factor < 0.25 gal/ton canola oilseed processed on a 12-month rolling sum.	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
-	P - 110	Soybean and Oilseed Processing	Leak Detection and Repair Program	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
-	P - 111	Soybean and Oilseed Processing	Improved Leak Detection and Repair Program	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
-	P - 112	Soybean and Oilseed Processing	Transition to zero and near-zero emission technologies for stationary sources	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
-	P-113	EGUs	Use of AVERT for Energy Efficiency and Renewable Energy (EE/RE) Programs	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
-	P-113	EGUs	Use of AVERT for Energy Efficiency and Renewable Energy (EE/RE) Programs	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

NOTES: Please note that estimated reductions by control option are approximations based on

1) the percent penetration assumed

2) the percent of emissions sources affected (SCCs selection will be refined for those measures that are reviewed in more detail during white paper stage).

Therefore, control options will accrue lower or higher reductions than shown in the screening analysis based on refined analysis (such as analysis that will be performed to develop the white papers for a limited number of measures).

In addition to screening level emission reductions, we recommend using qualitative markers as well as cost effectiveness (C-E) to evaluate which control options are best fits for more detailed analysis.

	Shortlist	Measure #	Source Category	Emission Reduction Measure Name	Pollutant	Absolute Reductions (TPY)															
						Allegan, MI	Berrien, MI	Chicago, IL	Chicago, IN	Chicago, WI	Cincinatti, OH	Cleveland, OH	Columbus, OH	Detroit, MI	Door, WI	Louisville, IN	Manitowoc County, WI	Muskegon, MI	Northern Milwaukee/Ozaukee, WI	Sheboygan, WI	St. Louis, IL
.	**General**																				
Mobile Sc G-1	-	G-1	Several Mobile (Passenger Vehicles, Lawn and Garden)	Ozone Action Days - Education and Promotion Campaigns	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc G-1	-	G-1	Several Mobile (Passenger Vehicles, Lawn and Garden)	Ozone Action Days - Education and Promotion Campaigns	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
0	**Onroad**																				
Mobile Sc G-1	0	O-1	Gasoline Vehicles	Opt into Reformulated Gasoline (RFG) Standards	NOX	7.3E-02	8.7E-02	2	1.6E-01	4.6E-02	5.7E-01	7.3E-01	6.3E-01	1	1.7E-02	8.7E-02	3.2E-02	7.5E-02	1.9E-01	3.6E-02	1.5E-01
Mobile Sc 0	0	O-1	Gasoline Vehicles	Opt into Reformulated Gasoline (RFG) Standards	VOC	4.3E-03	5.3E-03	1.4E-01	1.1E-02	3.4E-03	4.2E-02	5.3E-02	4.5E-02	1.1E-01	1.1E-03	5.8E-03	2.1E-03	5.2E-03	1.5E-02	2.6E-03	1.1E-02
Mobile Sc O-1	-	O-2	Gasoline Vehicles	Low RVP Gasoline	VOC	1.1E-01	1.3E-01	4	2.7E-01	8.5E-02	1	1	1	3	2.7E-02	1.5E-01	5.2E-02	1.3E-01	3.8E-01	6.5E-02	2.6E-01
Mobile Sc O-2	0	O-3	Gasoline Vehicles	Petition EPA to Remove the 1 Psi Allowance for 9-10% Ethanol Blends	VOC	13	16	421	32	10	127	159	135	325	3	17	6	16	45	8	32
Mobile Sc O-3	-	O-4	Light Duty and Medium Duty Gasoline and Diesel Vehicles (<8,500 lbs)	Accelerated Retirement of Older Light Duty and Medium Duty Vehicles	NOx	2.0E-02	2.2E-02	4.1E-01	3.8E-02	1.2E-02	1.5E-01	1.8E-01	1.6E-01	3.6E-01	4.2E-03	2.4E-02	8.0E-03	2.0E-02	4.6E-02	8.8E-03	3.7E-02
Mobile Sc O-4	-	O-4	Light Duty and Medium Duty Gasoline and Diesel Vehicles (<8,500 lbs)	Accelerated Retirement of Older Light Duty and Medium Duty Vehicles	VOC	2.0E-02	2.4E-02	6.5E-01	4.7E-02	1.5E-02	2.0E-01	2.5E-01	2.1E-01	4.9E-01	4.7E-03	2.7E-02	8.9E-03	2.3E-02	6.7E-02	1.1E-02	4.7E-02
Mobile Sc O-4	0	O-5, O-6	Passenger Vehicles and Motorcycles	Accelerated Penetration of Partial Zero (PHEV) Emission and Zero Emission Vehicles	NOx	2	2	44	4	1	16	19	17	39	4.6E-01	3	8.7E-01	2	5	9.7E-01	4
Mobile Sc O-5	0	O-5, O-6	Passenger Vehicles and Motorcycles	Accelerated Penetration of Partial Zero (PHEV) Emission and Zero Emission Vehicles	VOC	3	3	91	7	2	28	34	29	69	7.0E-01	4	1	3	10	2	7
Mobile Sc O-5	-	O-7	Passenger Vehicles	Travel Efficiency Strategies	NOx	1.5E-01	1.6E-01	3	2.8E-01	8.5E-02	1	1	1	3	3.1E-02	1.7E-01	5.9E-02	1.4E-01	3.3E-01	6.5E-02	2.7E-01
Mobile Sc O-7	-	O-7	Passenger Vehicles	Travel Efficiency Strategies	VOC	1.5E-01	1.8E-01	5	3.7E-01	1.2E-01	1	2	2	4	3.8E-02	2.0E-01	7.2E-02	1.8E-01	5.2E-01	9.0E-02	3.6E-01
Mobile Sc O-7	0	O-8	Heavy Duty Vehicles	Inspection and Maintenance Program (Remote sensing)	NOx	4	5	414	33	6	62	97	63	174	2	18	7	1	34	7	39
Mobile Sc O-8	-	O-9	Light Duty Vehicles	Commuter Programs	NOx, VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc O-9	0	O-10	Heavy Duty Diesel Vehicles	Ultra-Low NOx Engine Replacement	NOx	8	9	970	69	11	136	214	141	357	3	38	12	2	60	12	79
Mobile Sc O-10	0	O-11	Heavy Duty Diesel Vehicles and Buses	Accelerated Fleet Turnover / Retrofit Requirements	NOx	18	23	1,559	137	25	233	366	243	700	7	68	25	7	128	25	146
Mobile Sc O-11	0	O-12	Diesel Vehicles	Fuel Composition Requirements (e.g., TxLED)	NOx	9	10	494	43	8	80	119	82	236	3	24	8	4	41	8	47
Mobile Sc O-12	-	O-13	Heavy Duty Vehicles	Alternative Fuel Programs (e.g., biodiesel, CNG, LPG, and E85)	NOx	3.8E-01	4.6E-01	36	3	5.6E-01	5	8	6	15	1.7E-01	2	5.8E-01	1.2E-01	3	5.9E-01	3
Mobile Sc O-13	-	O-13	Heavy Duty Vehicles	Alternative Fuel Programs (e.g., biodiesel, CNG, LPG, and E85)	VOC	9.6E-03	1.1E-02	7.6E-01	6.7E-02	1.3E-02	1.0E-01	1.7E-01	1.3E-01	3.5E-01	4.0E-03	3.5E-02	1.3E-02	3.1E-03	6.7E-02	1.3E-02	7.5E-02
Mobile Sc O-13	-	O-14	Heavy Duty Diesel Vehicles (Class 6 and above)	Diesel Retrofit (Emissions Control Systems[3])	NOx	3.4E-01	4.2E-01	33	3	5.1E-01	5	8	5	14	1.6E-01	1	5.2E-01	1.1E-01	3	5.3E-01	3
Mobile Sc O-14	-	O-15	Heavy Duty Diesel Vehicles (Class 8)	Eliminate Long Duration Idling	NOx	3	3	292	20	3	12	42	28	92	6.5E-02	13	3	2.7E-01	18	2	29
Mobile Sc O-15	0	O-16	Heavy Duty Vehicles (>14,001 lbs)	Accelerated Deployment of Near-zero and Zero-Emission Trucks	NOx	4	5	374	30	6	56	87	57	157	2	16	6	1	30	6	35
Mobile Sc O-16	0	O-17	Diesel Vehicles - Heavy Duty Tractors	Aerodynamic Devices	NOx	3	3	291	21	3	41	64	42	107	8.5E-01	11	4	5.5E-01	18	4	24
Mobile Sc O-17	-	O-18	Diesel Vehicles - Long-Haul class 8 tractor trailers	Low Rolling Resistance Tires and Retread Tire Technologies	NOx	2.8E-02	3.0E-02	3	2.3E-01	3.7E-02	4.5E-01	7.1E-01	4.7E-01	1	9.4E-03	1.3E-01	4.0E-02	6.1E-03	2.0E-01	4.1E-02	2.6E-01
Mobile Sc O-18	-	O-20, O-21	Diesel Vehicles - School Buses	Idling Reduction Technologies	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc O-21	-	O-22, O-26	Port Drayage Trucks	Accelerated Fleet Turnover and Retrofit Requirements	NOx	4.6E-02	4.4E-02	5	5.7E-01	7.0E-02	8.0E-01	1	7.4E-01	2	1.6E-02	2.4E-01	7.7E-02	1.1E-02	4.1E-01	7.9E-02	3.7E-01
Mobile Sc O-22	-	O-23	Port Drayage Trucks	Expansion of Off-Peak Operation Hours	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc O-23	-	O-24	Port Drayage Trucks	Using Rail or Barge instead of Trucking	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc O-24	-	O-25	Port Drayage Trucks	Zero Emissions Fleet	NOx	1.8E-01	1.8E-01	21	2	2.8E-01	3	5	3	7	6.2E-02	9.4E-01	3.1E-01	4.5E-02	2	3.2E-01	1
Mobile Sc O-25	-	O-27	Heavy Duty Vehicles (>14,001 lbs)	Alternative Fuel or Less-Polluting Sweepers Requirements	NOx	3.8E-01	4.6E-01	36	3	5.6E-01	5	8	6	15	1.7E-01	2	5.8E-01	1.2E-01	3	5.9E-01	3
Mobile Sc O-27	-	O-27	Heavy Duty Vehicles (>14,001 lbs)	Alternative Fuel or Less-Polluting Sweepers Requirements	VOC	2.6E-02	3.1E-02	2	1.8E-01	3.4E-02	2.7E-01	4.4E-01	3.4E-01	9.4E-01	1.1E-02	9.5E-02	3.5E-02	8.3E-03	1.8E-01	3.4E-02	2.0E-01
Mobile Sc O-27	-	O-28	Public Fleet Light Duty and Medium Duty Vehicles	Alternative Fuel or Low-Emitting Gasoline Public Fleet Requirements	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc O-28	-	O-28	Public Fleet Light Duty and Medium Duty Vehicles	Alternative Fuel or Low-Emitting Gasoline Public Fleet Requirements	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc O-28	-	O-29	Public Transit Buses	Alternative Fuel Public Transit Fleet Requirements	NOx	3.0E-01	9.2E-01	10	9.6E-01	1.2E-01	5.1E-01	9.6E-01	8.9E-01	7	1.6E-02	3.4E-01	5.2E-02	2.9E-01	4.9E-01	6.5E-02	9.9E-01
Mobile Sc O-29	-	O-30	Refuse Collection Heavy Duty Vehicles	Alternative Fuel Residential and Commercial Refuse Collection Vehicle Fleet Requirements	NOx	1.2E-01	1.6E-01	8	4.6E-01	2.3E-01	8.7E-01	1	8.4E-01	5	5.7E-02	1.8E-01	1.5E-01	6.3E-02	8.2E-01	1.9E-01	2
Mobile Sc O-30	0	O-31	Commercial Airport Ground Access Vehicles	Alternative Fuel or Clean Burning Commercial Airport Ground Access Vehicle Fleet Requirements	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc O-31	0	O-31	Commercial Airport Ground Access Vehicles	Alternative Fuel or Clean Burning Commercial Airport Ground Access Vehicle Fleet Requirements	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc O-31	-	O-32	Public Fleet Heavy Duty Vehicles	Alternative Fuel Public Fleet Requirements	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc 0	**Off-road**																				
Mobile Sc N-1	0	N-1	Off-road Engines	Repowering Engines	NOx	3.0E-01	2.0E-01	10	1.0E+00	2.2E-01	3	4	3	5	5.9E-02	4.0E-01	1.6E-01	1.7E-01	9.7E-01	2.1E-01	8.9E-01
Mobile Sc N-2	-	N-2, N-15	Off-road Engines	Retrofits	NOx	3.0E-01	2.0E-01	10	1.0E+00	2.2E-01	3	4	3	5	5.9E-02	4.0E-01	1.6E-01	1.7E-01	9.7E-01	2.1E-01	8.9E-01
Mobile Sc N-3	-	N-3	Off-road Engines	Tier II Engine Replacement to Tier III or IV	NOx	1	7.1E-01	37	4	7.7E-01	9	15	9	16	2.1E-01	1	5.8E-01	5.9E-01	3	7.4E-01	3
Mobile Sc N-4	-	N-4	Small Off-Road Engines (Sore)	Exchange Existing In-Use Sore for Electrical Equipment, or New Low-Emitting Engines	NOx	1.8E-01	2.3E-01	20	7.6E-01	2.1E-01	3	7	3	8	8.0E-02	3.3E-01	1.2E-01	1.8E-01	2	1.6E-01	8.0E-01
Mobile Sc N-4	-	N-4	Small Off-Road Engines (Sore)	Exchange Existing In-Use Sore for Electrical Equipment, or New Low-Emitting Engines	VOC	9.6E-01	1	104	4	1	17	39	18	42	3.8E-01	2	6.5E-01	9.8E-01	10	9.0E-01	4
Mobile Sc N-5	-	N-5	Nonroad Gasoline Vehicles	Low RVP Gasoline	VOC	4.9E-01	6.4E-01	36	2	4.3E-01	6	14	6	16	2.8E-01	7.7E-01	2.8E-01	6.2E-01	3	4.4E-01	2
Mobile Sc N-6	-	N-6	Nonroad Diesel Vehicles - Agriculture	Autonomous Vehicles Fleet and Smart Farming Technology	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc N-7	-	N-7	Nonroad Diesel Vehicles - Agriculture	Implementing Multi-Tillage Tools	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc N-8	-	N-8	Nonroad Diesel Vehicles - Construction and Agriculture	Alternative Fuels - Biodiesel	VOC	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc N-9	-	N-9	Nonroad Diesel Vehicles - Construction and Agriculture	Contractual Agreements (writing air quality requirements into public contracts)	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc N-10	-	N-10	Nonroad Diesel Vehicles - Construction and Agriculture	Electrification	NOx	1	6.6E-01	28	4	7.5E-01	9	12	10	12	2.2E-01	1	5.7E-01	4.8E-01	2	6.4E-01	4
Mobile Sc N-11	-	N-11	Nonroad Diesel Vehicles - Construction and Agriculture	Engine Preventive Maintenance	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc N-12	-	N-12	Nonroad Diesel Vehicles - Construction and Agriculture	Engine Replacement/Repower or Upgrades	NOx	3.4E-01	1.8E-01	8	1	2.0E-01	2	3	3	3	6.0E-02	4.0E-01	1.5E-01	1.3E-01	5.3E-01	1.7E-01	9.6E-01
Mobile Sc N-13	-	N-13	Nonroad Diesel Vehicles - Construction and Agriculture	Equipment Operator Training	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc N-14	-	N-14	Nonroad Diesel Vehicles - Construction and Agriculture	Idling Reduction and Control	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc N-15	-	N-15	Nonroad Diesel Vehicles - Construction and Agriculture	Retrofit Technologies (various)	NOx	4.7E-01	2.4E-01	10	1	2.8E-01	3	5	4	4	8.3E-02	5.5E-01	2.1E-01	1.8E-01	7.2E-01	2.4E-01	1

Mobile Sc N-15	-	N-15	Nonroad Diesel Vehicles - Construction and Agriculture	Retrofit Technologies (various)	VOC	6.0E-02	3.1E-02	1	1.7E-01	3.4E-02	4.1E-01	5.5E-01	4.5E-01	5.7E-01	9.9E-03	6.5E-02	2.5E-02	2.3E-02	8.7E-02	2.9E-02	1.7E-01
Mobile Sc N-16	0	N-16	Off-Road Diesel-Fueled Construction, Industrial Equipment, Airport Ground Support Equipment, and Drilling Equipment	Accelerated Deployment of Near-zero and Zero-Emission Equipment	NOx	6	5	412	43	9	102	152	99	174	2	16	4	5	40	7	23
Mobile Sc N-17	0	N-17	Off-Road Diesel-Fueled Construction, Industrial Equipment, Airport Ground Support Equipment, and Drilling Equipment	Accelerated Turnover or Retrofit of Older Equipment and Engines (Tier 0 to Tier4)	NOx	5	4	391	41	9	97	144	94	166	2	15	4	5	38	7	22
Mobile Sc	0	**Rail**																			
Mobile Sc R-1	-	R-1	Locomotive Engines (Passenger)	Accelerated Replacement of Existing Locomotive Engines Meeting Tier 4 or Cleaner Exhaust Standards	NOx	0	0	27	0	4.2E-01	0	0	0	0	0	0	0	0	0	0	0
Mobile Source R-2	0	R-2	Locomotives	Idling Reduction	NOx	8.6E-01	3	156	4	1	18	19	10	26	0	0	0	0	6	6.9E-01	35
Mobile Source R-3	-	R-3	Locomotives	Upgrade Engines in Switcher Locomotives - Diesel-Electric Hybrid Locomotives	NOx	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mobile Source R-4	0	R-4	Locomotives	Switcher Idling Reduction, Retrofitting Yard Equipment	NOx	0	0	27	5.4E-01	1.4E-01	3	3	2	5	0	0	0	0	1	1.4E-01	7
Mobile Source R-5	-	R-5	Locomotives	Engine Repowering, Retrofitting and New Engines	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc	0	**Marine**																			
Mobile Sc M-1	-	M-1	Harbor Craft	Repower Engines	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc M-2	-	M-2	Commercial Marine Engines	Alternative Fuel - LNG	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc M-3	-	M-3	Commercial Marine Engines	Alternative Maritime Power (AMP), Shore Power, Cold-Ironing	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc M-4	-	M-4, M-5	Commercial Marine Engines	Marine Engine Control Technology and Upgrades	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc M-6	0	M-6	Commercial Marine Engines	Vessel Speed Reduction	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc M-7	-	M-7	Commercial Marine Engines	Switch to Low Sulfur Content Fuel	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc M-8	-	M-8	Commercial Marine Engines	Selective Catalytic Reduction with Low Sulfur Fuel for Vessel Propulsion Engines	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc M-9	-	M-9	Commercial Marine Engines	Retrofit with Slide Valves	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc M-10	-	M-10	Commercial Marine Engines	Water/Fuel Emulsion Used in Propulsion & Auxiliary Engines	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc M-11	-	M-11	Commercial Marine Engines	Water Injection in Propulsion & Auxiliary Engines	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc	0	**Airports**																			
Mobile Sc A-1	-	A-1	Airports General	Passenger and Overall System Efficiency Increases	NOx	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Mobile Sc A-2	0	A-2	Aircraft Ground Support Equipment	Alternative Fuels - CNG/LPG	NOx	0	0	3	4.1E-04	4.0E-05	1.4E-03	3.0E-01	2.6E-01	1	8.5E-06	0	0	8.2E-04	2.6E-01	1.3E-05	4.4E-03
Mobile Sc A-2	0	A-2	Aircraft Ground Support Equipment	Alternative Fuels - CNG/LPG	VOC	0	0	4.4E-01	5.4E-05	7.0E-06	2.7E-04	4.6E-02	4.0E-02	1.6E-01	1.6E-06	0	0	1.3E-04	3.7E-02	2.4E-06	6.1E-04
Mobile Sc A-3	-	A-3	Aircraft Ground Support Equipment	Electrification	NOx	0	0	5	6.3E-04	6.1E-05	2.2E-03	4.6E-01	4.1E-01	2	1.3E-05	0	0	1.3E-03	3.9E-01	2.0E-05	6.8E-03
Mobile Sc A-3	-	A-3	Aircraft Ground Support Equipment	Electrification	VOC	0	0	1	1.8E-04	2.3E-05	9.0E-04	1.5E-01	1.3E-01	5.2E-01	5.3E-06	0	0	4.4E-04	1.2E-01	8.0E-06	2.0E-03
Mobile Source	**Additional measures suggested by states/LADCO**																				
Mobile Sc O-33	0	O-33	Passenger Cars and LDTs	Encourage Telecommuting and Alternative Work Schedules (TR-6)	NOx	1.1E-01	1.2E-01	2	2.1E-01	6.5E-02	8.3E-01	1	9.0E-01	2	2.3E-02	1.3E-01	4.5E-02	1.1E-01	2.6E-01	4.9E-02	2.1E-01
Mobile Sc O-33	0	O-33	Passenger Cars and LDTs	Encourage Telecommuting and Alternative Work Schedules (TR-6)	VOC	6.6E-02	8.0E-02	2	1.6E-01	5.0E-02	6.8E-01	8.3E-01	7.1E-01	2	1.6E-02	9.0E-02	3.0E-02	7.8E-02	2.2E-01	3.7E-02	1.6E-01
Mobile Sc O-34	0	O-34	Passenger Cars and LDTs	Land Use: Increase Transit Accessibility (LUT-5)	NOx	5.1E-01	5.5E-01	10	9.5E-01	2.9E-01	4	5	4	9	1.0E-01	6.0E-01	2.0E-01	4.9E-01	1	2.2E-01	9.2E-01
Mobile Sc O-34	0	O-34	Passenger Cars and LDTs	Land Use: Increase Transit Accessibility (LUT-5)	VOC	3.0E-01	3.6E-01	10	7.2E-01	2.3E-01	3	4	3	7	7.0E-02	4.0E-01	1.4E-01	3.5E-01	1	1.7E-01	7.1E-01
Mobile Sc O-35	0	O-35	Passenger Cars and LDTs	Land Use: Increase density in Land Use Planning (LUT-1)	NOx	6.4E-01	6.9E-01	13	1	3.7E-01	5	6	5	11	1.3E-01	7.5E-01	2.5E-01	6.1E-01	1	2.8E-01	1
Mobile Sc O-35	0	O-35	Passenger Cars and LDTs	Land Use: Increase density in Land Use Planning (LUT-1)	VOC	3.7E-01	4.5E-01	12	9.0E-01	2.8E-01	4	5	4	9	8.8E-02	5.1E-01	1.7E-01	4.4E-01	1	2.1E-01	8.9E-01
Mobile Sc O-36	0	O-36	Passenger Cars and LDTs	Land Use: Increase Diversity of Urban and Suburban Developments (Mixed Use) LUT-3	NOx	8.0E-01	8.6E-01	16	1	4.5E-01	6	7	6	14	1.6E-01	9.2E-01	3.1E-01	7.6E-01	2	3.4E-01	1
Mobile Sc O-36	0	O-36	Passenger Cars and LDTs	Land Use: Increase Diversity of Urban and Suburban Developments (Mixed Use) LUT-3	VOC	4.6E-01	5.6E-01	15	1	3.5E-01	5	6	5	11	1.1E-01	6.3E-01	2.1E-01	5.5E-01	2	2.6E-01	1
Mobile Sc O-37	-	O-37	Passenger Cars and LDTs	Limit Parking Supply (PDT-1) / Park and Ride	NOx	3.6E-01	3.8E-01	7	6.6E-01	2.0E-01	3	3	3	6	7.3E-02	4.2E-01	1.4E-01	3.4E-01	8.0E-01	1.5E-01	6.4E-01
Mobile Sc O-37	-	O-37	Passenger Cars and LDTs	Limit Parking Supply (PDT-1) / Park and Ride	VOC	2.1E-01	2.5E-01	7	5.0E-01	1.6E-01	2	3	2	5	4.9E-02	2.8E-01	9.4E-02	2.5E-01	7.0E-01	1.2E-01	4.9E-01
Mobile Sc O-38	-	O-38	Passenger Cars and LDTs	Implement Voluntary Commute Trip Reduction Program (TRT-1) Employee Commute Programs (vanpool, carpool, bicycles, transit) - various	NOx	1.5E-01	1.6E-01	3	2.7E-01	8.4E-02	1	1	1	3	3.0E-02	1.7E-01	5.8E-02	1.4E-01	3.3E-01	6.3E-02	2.6E-01
Mobile Sc O-38	-	O-38	Passenger Cars and LDTs	Implement Voluntary Commute Trip Reduction Program (TRT-1) Employee Commute Programs (vanpool, carpool, bicycles, transit) - various	VOC	8.5E-02	1.0E-01	3	2.0E-01	6.5E-02	8.7E-01	1	9.2E-01	2	2.0E-02	1.1E-01	3.8E-02	1.0E-01	2.9E-01	4.7E-02	2.0E-01
Mobile Sc O-39	0	O-39	Passenger Cars and LDTs	Implement Mandatory Commute Trip Reduction Program (TRT-2)	NOx	5.2E-01	5.5E-01	10	9.6E-01	2.9E-01	4	5	4	9	1.0E-01	6.0E-01	2.0E-01	4.9E-01	1	2.2E-01	9.2E-01
Mobile Sc O-39	0	O-39	Passenger Cars and LDTs	Implement Mandatory Commute Trip Reduction Program (TRT-2)	VOC	3.0E-01	3.6E-01	10	7.2E-01	2.3E-01	3	4	3	7	7.0E-02	4.0E-01	1.4E-01	3.5E-01	1	1.7E-01	7.1E-01
Mobile Sc O-40	0	O-40	Heavy Duty Trucks	Last Mile Delivery	NOx	7	8	611	51	10	92	145	95	262	3	27	10	2	51	10	57
Mobile Sc O-40	0	O-40	Heavy Duty Trucks	Last Mile Delivery	VOC	8.5E-01	1	61	7	1	9	15	11	33	5.0E-01	3	1	3.7E-01	7	1	6
Mobile Sc O-41	0	O-41	Commercial Vehicles or Motor Vehicles	Anti-Idling Ordinance	NOx	3	3	203	17	3	32	50	35	95	1	9	3	9.7E-01	17	3	19
Mobile Sc O-41	0	O-41	Commercial Vehicles or Motor Vehicles	Anti-Idling Ordinance	VOC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mobile Sc O-42	0	O-42	Commercial Vehicles (>8,500 lbs)	Idling Prohibition	NOx	2	3	195	16	3	30	46	30	84	1	9	3	6.9E-01	16	3	18
Mobile Sc O-42	0	O-42	Commercial Vehicles (>8,500 lbs)	Idling Prohibition	VOC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mobile Sc O-43	-	O-43	Passenger Cars and LDTs	Ridesharing programs	NOX	4	4	82	8	2	30	37	32	72	8.3E-01	5	2	4	9	2	7
Mobile Sc O-43	-	O-43	Passenger Cars and LDTs	Ridesharing programs	VOC	4	5	130	9	3	41	50	43	98	9.3E-01	5	2	5	13	2	9
Mobile Sc N-18	0	N-18	Lawn and Garden Equipment	Electrification (Zero-Emission Landscaping Equipment Incentive Programs)	NOx	1.8E-01	2.2E-01	20	7.6E-01	2.1E-01	3	7	3	8	7.6E-02	3.3E-01	1.2E-01	1.8E-01	2	1.6E-01	7.9E-01
Mobile Sc N-18	0	N-18	Lawn and Garden Equipment	Electrification (Zero-Emission Landscaping Equipment Incentive Programs)	VOC	9.6E-01	1	104	4	1	17	39	18	42	3.8E-01	2	6.5E-01	9.8E-01	10	9.0E-01	4
Mobile Sc N-19	-	N-19	Recreational Vehicles (ATVs, MCs, Snowmobiles)	Electrification	NOx	1.1E-01	1.1E-01	1	3.6E-02	1.8E-02	1.9E-01	7.2E-01	2.2E-01	7.7E-01	2.3E-01	3.3E-02	8.1E-02	9.7E-02	4.3E-02	9.3E-02	1.1E-01
Mobile Sc N-19	-	N-19	Recreational Vehicles (ATVs, MCs, Snowmobiles)	Electrification	VOC	1	1	10	9.3E-02	1.6E-01	1	7	2	7	2	3.3E-01	6.7E-01	1	2.7E-01	8.0E-01	8.4E-01

NOTES: Please note that estimated reductions by control option are approximations based on
1) the percent penetration assumed

2) the percent of emissions sources affected (SCCs selection will be refined for those measures that are reviewed in more detail during white paper stage).
Therefore, control options will accrue lower or higher reductions than shown in the screening analysis based on refined analysis (such as analysis that will be performed to develop the white papers for a limited number of measures).
In addition to screening level emission reductions, we recommend using qualitative markers as well as cost effectiveness (C-E) to evaluate which control options are best fits for more detailed analysis.
NAA emission reduction estimates were not estimated for marine control options.

Attachment B

Certification of Volatile Organic Compounds (VOCs) Reasonably Available Control Technology (RACT)

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Volatile Organic Compounds (VOCs) Reasonably Available Control Technology (RACT) in Lake and Porter Counties, Indiana

This submittal is intended to fulfill VOC RACT plan provisions under Section 182(b)(2) of the Clean Air Act (CAA) for the 2015 8-hour ozone National Ambient Air Quality Standard (NAAQS).

Section 182(b)(2) of the CAA requires a demonstration that the state has adopted all reasonable and available control measures to demonstrate attainment as expeditiously as practicable and that no additional measures that are reasonably available will advance the attainment date.

Indiana certifies that the Negative Declaration for the Control Techniques Guidelines (CTGs) for Fiberglass Boat Manufacturing Materials, submitted June 5, 2009, and approved by United States Environmental Protection Agency (U.S. EPA) on February 24, 2010[1], is still up-to-date.

Indiana also certifies that the Negative Declaration for the Oil and Natural Gas Industry CTGs submitted October 25, 2018, and approved by U.S. EPA on December 13, 2019[2], is still up-to-date.

As such, Indiana's existing VOC rules found in 326 Indiana Administrative Code (IAC) 8[3] satisfies Indiana's obligation under Section 182(b)(2) of the CAA for the portions of Lake and Porter counties classified as moderate under the 2015 8-hour ozone NAAQS.

[1] https://www.govinfo.gov/content/pkg/FR-2010-02-24/pdf/2010-3523.pdf
[2] https://www.govinfo.gov/content/pkg/FR-2019-12-13/pdf/2019-26792.pdf
[3] http://iac.iga.in.gov/iac//iac_title?iact=326

Applicable Indiana 326-IAC Article 8 - Volatile Organic Compound Rules for Control Technique Guidelines (CTGs) and Alternative Control Technique Guidelines (ACTs)

U.S. Environmental Protection Agency (U.S. EPA) CTGs and ACTs	Applicable Indiana Regulation	Federal Register (FR) Approval of Indiana Regulation
EPA 453/B-16-001 2016/10 Control Techniques Guidelines for the Oil and Natural Gas Industry (PDF 343 pp, 2MB)	Negative Declaration Letter 10/25/2018	**84 FR 68050** Published: 12/13/2019 Effective: 01/13/2020
EPA 453/R-08-004 2008/09 Control Techniques Guidelines for Fiberglass Boat Manufacturing Materials (PDF 41 pp, 336KB)	Negative Declaration Letter 06/05/2009	**75 FR 8246** Published: 02/24/2010 Effective: 03/26/2010
EPA 453/R-08-006 2008/09 Control Techniques Guidelines for Automobile and Light-Duty Truck Assembly Coatings (PDF 44 pp, 2.64MB) *And* EPA 453/R-08-002 2008/09 Protocol for Determining the Daily Volatile Organic Compound Emission Rate of Automobile and Light-Duty Truck Primer-Surfacer and Topcoat Operations (PDF 129 pp, 450KB)	326 IAC 8-2-2 Automobile and Light Duty Truck Coating Operations	
EPA 453/R-07-003 2007/09 Control Techniques Guidelines for Paper, Film, and Foil Coatings (PDF 102 pp, 488KB)	326 IAC 8-2-5 Paper Coating Operations	
EPA 453/R-07-005 2007/09 Control Techniques Guidelines for Metal Furniture Coatings (PDF 100 pp, 293KB)	326 IAC 8-2-6 Metal Furniture Coating Operations	
EPA 453/R-07-004 2007/09 Control Techniques Guidelines for Large Appliance Coatings (PDF 44 pp, 374KB)	326 IAC 8-2-7 Large Appliance Coating Operations	

EPA 453/R-08-003 2008/09 Control Techniques Guidelines for Miscellaneous Metal and Plastic Parts Coatings (PDF 144 pp, 897KB)	326 IAC 8-2-9 Miscellaneous Metal and Plastic Parts Coating Operations	**75 FR 8246** Published: 02/24/10 Effective: 03/26/10 *And* *Revision:* **76 FR 63549** Published: 10/13/2011 Effective: 12/12/2011
EPA-453/R-06-004 2006/09 Control Techniques Guidelines for Flat Wood Paneling Coatings (PDF 27 pp, 212KB)	326 IAC 8-2-10 Flat Wood Panels; Manufacturing Operations	**75 FR 8246** Published: 02/24/10 Effective: 03/26/10
EPA-453/R-06-003 2006/09 Control Techniques Guidelines for Flexible Package Printing (PDF 33 pp, 216KB)	326 IAC 8-5-5 Graphic Arts *And* Graphic Arts Operations	**63 FR 35141** Published: 06/29/1998 Effective: 08/28/1998 *And* **75 FR 8246** Published: 02/24/10 Effective: 03/26/10
Non-CTG	326 IAC 8-7 Specific VOC Reduction Requirements for Lake, Porter, Clark, and Floyd Counties	**60 FR 34856** Published: 07/05/1995 Effective: 09/05/1995
EPA-453/R-06-002 2006/09 Control Techniques Guidelines for Offset Lithographic Printing and Letterpress Printing (PDF 52 pp, 349KB)	326 IAC 8-16 Offset Lithographic Printing and Letterpress Printing	
EPA-453/R-06-001 2006/09 Control Techniques Guidelines for Industrial Cleaning Solvents (PDF 290 pp, 7.6MB)	326 IAC 8-17 Industrial Solvent Cleaning Operations	

EPA-450/3-84-015 1984/12 Control of Volatile Organic Compound Emissions from Air Oxidation Processes in Synthetic Organic Chemical Manufacturing Industry (PDF 259 pp, 9.4MB) *And* EPA-450/4-91-031 1993/08 Control of Volatile Organic Compound Emissions from Reactor Processes and Distillation Operations in Synthetic Organic Chemical Manufacturing Industry (PDF 277 pp, 8.7MB)	326 IAC 8-18 Synthetic Organic Chemical Manufacturing Industry Air Oxidation, Distillation, and Reactor Processes	**75 FR 8246** Published: 02/24/2010 Effective: 03/26/2010
EPA-453/R-93-020 1994/02 Control of Volatile Organic Compound Emissions from Batch Processes ACT (PDF 377 pp, 11.9MB) *Note – Document also released under the Report ID of EPA-453/R-93-017.*	326 IAC 8-19 Control of Volatile Organic Compound Emissions from Process Vents in Batch Operations	
EPA-453/D-93-056 1992/09 Control of Volatile Organic Compound Emissions from Industrial Wastewater CTG (draft) (PDF 234 pp, 9.4MB) *Note – CTG not finalized but issued as ACT in 1994.* (No Report ID) 1994/04 Industrial Wastewater Alternative Control Technology (PDF 266 pp, 9.5MB) *Note – ACT consists of cover memo with option tables + CTG (draft) EPA-453/D-93-056.*	326 IAC 8-20 Industrial Wastewater	*Cont.*
59 FR-29216 6/06/94 1994/06 Aerospace MACT (PDF 37 pp, 5.6MB) *And* EPA-453/R-97-004 1997/12 Aerospace (CTG & MACT) (PDF 62 pp, 288KB)	326 IAC 8-21 Aerospace Manufacturing and Rework Operations	

EPA 453/R-08-005 2008/09 Control Techniques Guidelines for Miscellaneous Industrial Adhesives (PDF 47 pp, 350KB)	326 IAC 8-22 Miscellaneous Industrial Adhesives	

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Attachment C

2023 Fifteen Percent (15%) Rate of Progress Plan and Three Percent (3%) Contingency Measure Plan

Lake (partial) and Porter (partial) Counties, Indiana

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2023 Fifteen Percent (15%) Rate of Progress Plan and Three Percent (3%) Contingency Measure Plan for Indiana's Portion of the Chicago, Illinois-Indiana-Wisconsin (IL-IN-WI), 2015 8-Hour Ozone Nonattainment Area

Calumet, Hobart, North, Ross, and St. John Townships in Lake County

and

Center, Jackson, Liberty, Pine, Portage, Union, Washington, and Westchester Townships in Porter County

Prepared By:
The Indiana Department of Environmental Management

August 2023

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2023 FIFTEEN PERCENT (15%) RATE OF PROGRESS PLAN AND THREE PERCENT (3%) CONTINGENCY PLAN FOR INDIANA'S PORTION OF THE CHICAGO, IL-IN-WI, 2015 8-HOUR OZONE NONATTAINMENT AREA

Lake (partial) and Porter (partial) Counties, Indiana

1.0 INTRODUCTION

Lake (partial) and Porter (partial) counties, Indiana, are part of the Chicago, IL-IN-WI 2015 8-hour ozone nonattainment area (Chicago nonattainment area). On June 4, 2018, effective August 3, 2018, United States Environmental Protection Agency (U.S. EPA) designated the Chicago, IL-IN-WI area, including Calumet, Hobart, North, Ross, and St. John townships in Lake County, Indiana, as nonattainment in 40 Code of Federal Regulations (CFR) 81.315 and classified it as "marginal" under Subpart 2 of Part D, Title I of the Clean Air Act (CAA) (83 FR 25776).

On June 14, 2021, effective July 14, 2021, U.S. EPA revised the Chicago nonattainment area boundary to include Center, Jackson, Liberty, Pine, Portage, Union, Washington, and Westchester townships in Porter County, Indiana (86 FR 31438). This classification provided three years for the area to attain the standard establishing an attainment date of August 3, 2021.

On October 7, 2022, effective November 7, 2022, due to failing to meet the attainment date, the Chicago nonattainment area was re-classified from "marginal" to "moderate" (87 FR 60897). This final rule established a new attainment date of August 3, 2024. Section 182(b)(1) of the CAA, and the final implementation rule titled *Implementation of the 2015 National Ambient Air Quality Standard for Ozone, Nonattainment Area State Implementation Plan Requirements* (83 FR 62998, December 6, 2018), require areas classified moderate or above to develop a plan to demonstrate emission reductions of volatile organic compounds (VOCs) in the amount of fifteen percent from the baseline year of 2017, as well as a plan for an additional three percent as a contingency in the event that the area fails to meet the standard by the revised attainment date. These plans, which Indiana has prepared only for Indiana's portion of the Chicago nonattainment area, are referred to as the 2023 Fifteen Percent (15%) Rate of Progress (ROP) Plan and Three Percent (3%) Contingency Plan. In combination with previous existing ROP plans, this fulfills the requirement for a 15 percent emissions reduction within six (6) years (2017-2023) after the baseline year (2017) and a three (3) percent contingency plan.

2.0 VOLATILE ORGANIC COMPOUND (VOC) and NITROGEN OXIDE (NO_x) EMISSION TRENDS

As shown in the following tables, VOC and NO_x emissions are estimated to decline in Lake (partial) and Porter (partial) counties from 2017 to 2023.

In consultation with U.S. EPA, Indiana has developed an emissions inventory that represents a comprehensive, accurate, and current inventory of emissions from all sources of NO_x and VOCs in Lake (partial) and Porter (partial) counties. Point source (EGU and non-EGU), non-point, and non-road emissions were compiled from the data available on U.S. EPA's Emissions Modeling Clearinghouse website for the Chicago nonattainment area.[1] Indiana used the 2017 emissions modeling platform from the National Emissions Inventory Collaborative as the base year and applied growth factors derived from the 2016v2 Platform[2] that includes a full suite of base year (2016) and projection year (2023) inventories, ancillary emission data, and scripts and software for preparing the emissions for air quality modeling.

On-road values for Lake and Porter counties in 2017 and 2023 were produced by the Northwestern Indiana Planning Commission (NIRPC) using U.S. EPA's MOVES3.1 software program (Appendix A3).

VOC Emissions for all Source Sectors from 2017-2023 in Tons/Summer-day (tpsd)

Sector	2017	2023	Difference (2017-2023)
EGU	0.24	0.13	-0.11
Nonpoint	16.55	16.65	0.10
Non-road	3.32	0.20	-3.12
On-road	2.86	2.53	-0.33
Point	9.99	10.16	0.17
Total	**32.97**	**29.68**	**-3.29**
Percent Reduction			**-9.98**

[1] https://www.epa.gov/air-emissions-modeling/2017-emissions-modeling-platform
[2] https://www.epa.gov/air-emissions-modeling/2016v2-platform

NO_x Emissions for all Source Sectors from 2017-2023 in Tons/Summer-day (tpsd)

Sector	2017	2023	Difference (2017-2023)
EGU	3.79	0.58	-3.21
Nonpoint	8.58	6.94	-1.64
Non-road	5.02	0.22	-4.80
On-road	9.92	6.71	-3.21
Point	55.08	56.44	1.36
Total	**82.39**	**70.88**	**-11.51**
Percent Reduction			**-13.97**

3.0 2023 FIFTEEN PERCENT (15%) RATE OF PROGRESS PLAN and THREE PERCENT (3%) CONTINGENCY PLAN

In order to demonstrate a 15% emissions reduction and 3% contingency, only detailed emission reductions from existing control regulations have been used. Both VOC and NO_x reductions are needed to meet the RFP reduction targets. NO_x substitution is used on a percentage basis to cover any percentage shortfall in VOC emission reductions.

U.S. EPA guidance is to factor the 3% contingency through one year beyond the attainment year, i.e., 2024. However, demonstrating the 3% contingency through the year 2023 is a more conservative analysis. Thus, this analysis demonstrates a 18% rate of progress reduction by the end of 2023.

Demonstration of 15% ROP and 3% Contingency Measure Reduction Requirements (tpsd)

Description	Formula	VOCs	NO_x
A. 2017 RFP Base Year Inventory		32.79	82.39
B. RFP Reductions Totaling 15%		8.0%	7.0%
C. RFP Reductions required between 2017 and 2023	A*B	2.62	5.77
D. RFP Target Level for 2023	A-C	30.17	76.62
E. 2023 Projected Emissions		29.68	70.88
F. Compare RFP with 2023 Projected Emissions to Determine if RFP and Contingency Measure Requirements are Met	E<D?	Yes	Yes
G. Total Surplus Reductions (for 2023)	D-E	0.49	5.74
H. Contingency Percentage Totaling 3%		1.0%	2.0%
I. Contingency Emission Reduction Requirements	A*H	0.33	1.65
J. RFP + Contingency Target Level	D-I	29.84	74.97
K. Compare RFP & Contingency Target with 2023 Projected Emissions to Determine if RFP and Contingency Measure Requirements are Met	E<J?	Yes	Yes
L. Total Surplus Reductions (for 2023)	J-E	0.16	4.09

4.0 EMISSION CONTROL MEASURES

VOC and NO_x emission reductions reflect existing rules and new rules such as the following:

On-road

- All on-road control programs finalized as of the date of the model run, including most recently:
- Revised 2023 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emission Standards: December, 2021
- The Safer Affordable Fuel-Efficient (SAFE) Vehicles Rule for Model Years 2021-2026 Passenger Cars and Trucks: April, 2020
- Greenhouse Gas Emission Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles, Phase 2: October, 2016
- Tier-3 Vehicle Emissions and Fuel Standards Program: March, 2014
- 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards: October, 2012
- Greenhouse Gas Emission Standards and Fuel Efficiency Standards for Medium- and Heavy-Duty Engines and Vehicles, Phase 1: September, 2011
- Regulation of Fuels and Fuel Additives: Modifications to Renewable Fuel Standard Program (RFS2): December, 2010
- Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards; Final Rule for Model-Year 2012-2016: May, 2010
- Final Mobile Source Air Toxics Rule (MSAT2): February, 2007

Non-road

- All non-road control programs finalized as of the date of the model run, including most recently:
- Control of Air Pollution from Aircraft Engines: Emission Standards and Test Procedures: November, 2022
- Emission Standards for New Non-road Spark-Ignition Engines, Equipment, and Vessels: October, 2008
- Growth and control to years 2017 and 2025 from Locomotives and Marine Compression-Ignition Engines Less than 30 Liters per Cylinder: March, 2008
- Clean Air Non-road Diesel Final Rule – Tier 4: May, 2004
- Growth and control to years 2017 and 2025 from Locomotives and Marine Compression-Ignition Engines Less than 30 Liters per Cylinder: March, 2008
- Category 3 marine diesel engines Clean Air Act and International Maritime Organization standards: April, 2010.

Non-EGU Point

- National Emission Standards for Hazardous Air Pollutants (NESHAP): Reciprocating Internal Combustion Engines (RICE) with reconsideration amendments
- New Source Performance Standards (NSPS): oil and gas
- NSPS: RICE
- NSPS: Gas turbines
- NSPS: Process heaters
- Industrial/Commercial/Institutional Boiler Maximum Achievable Control Technology (MACT) with Reconsideration Amendments

Nonpoint

- NESHAP: RICE with reconsideration amendments
- NSPS: Oil and gas
- NSPS: RICE
- NSPS: Gas turbines
- NSPS: Process heaters
- Industrial/Commercial/Institutional Boiler MACT with Reconsideration Amendments

EGU

- Cross-State Air Pollution Rule (CSAPR)
- Cooling Water Intakes (316(b)) Rule
- Combustion Residuals from Electric Utilities (CCR).

5.0 PUBLIC PARTICIPATION

This section will be finalized upon completion of the public hearing, if held, and public comment period.

6.0 CONCLUSION

As shown above, Indiana's 2023 Fifeteen Percent (15%) Rate of Progress Plan and Three Percent (3%) Contingency Plan demonstrates Lake (partial) and Porter (partial) counties, Indiana will achieve a 15% emission reduction within six years (2017-2023) after the baseline year (2017), plus an additional 3% contingency reduction through one year beyond the attainment year, ie. 2024, based on creditable emissions reductions in U.S. EPA's inventory found in the 2017 Modeling Platform Collaborative with applied growth factors derived from the 2016v2 platform. VOC and NO_x emissions are projected to decline by approximately 10% and 14% from 2017 to 2023, respectively. After being able to demonstrate that the area is meeting reduction requirements by achieving the required targets, additional reductions were not required. In total, this analysis demonstrates a 18% rate of progress reduction by the end of 2023.

These Plans in conjunction with the attainment demonstration satisfy Indiana’s obligation under Sections 172 and 182 of the CAA.

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Attachment D

Revised 2017 Base-Year Emissions Inventory

Lake (partial) and Porter (partial) Counties, Indiana

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REVISED 2017 BASE-YEAR EMISSIONS INVENTORY FOR INDIANA'S PORTION OF THE CHICAGO, ILLINOIS-INDIANA-WISCONSIN (IL-IN-WI), 2015 8-HOUR OZONE NONATTAINMENT AREA

Calumet, Hobart, North, Ross, and St. John Townships in Lake County

and

Center, Jackson, Liberty, Pine, Portage, Union, Washington, and Westchester Townships in Porter County

Prepared By:
The Indiana Department of Environmental Management

August 2023

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REVISED 2017 BASE-YEAR EMISSIONS INVENTORY FOR INDIANA'S PORTION OF THE CHICAGO, ILLINOIS-INDIANA-WISCONSIN (IL-IN-WI), 2015 8-HOUR OZONE NONATTAINMENT AREA

Lake (partial) and Porter (partial) Counties, Indiana

1.0 INTRODUCTION

Under Section 107(d)(1)(B) of the Clean Air Act (CAA), on October 7, 2022, (87 FR 60897), United States Environmental Protection Agency (U.S. EPA) reclassified Lake (partial) and Porter (partial) counties as "moderate" nonattainment for the 2015 8-hour ozone National Ambient Air Quality Standard (NAAQS) as a portion of the Chicago, Illinois-Indiana-Wisconsin (IL-IN-WI) nonattainment area.

For areas designated nonattainment for the 2015 ozone NAAQS, Section 182(a)(1) of the CAA requires states to develop a comprehensive, accurate, and current inventory of actual emissions from all sources in the nonattainment area, including periodic revisions as the Administrator may determine necessary to assure that the requirements for this part are met. U.S. EPA guidance requires the submittal of a comprehensive state implementation plan quality emissions inventory of ozone precursor emissions (i.e., oxides of nitrogen (NO_x) and volatile organic compounds (VOCs) representative of the base year. In consultation with U.S. EPA, Illinois, Wisconsin, and other stakeholders, the base-year 2017 was selected for this demonstration.

This revised 2017 base-year emissions inventory for Lake (partial) and Porter (partial) counties is an update to Enclosure 1 of the "Update and Replacement for the January 21, 2021, Clean Air Section 172 and 182 State Implementation Plan for Indiana's Portion of the Chicago, Illinois-Indiana-Wisconsin 2015 8-Hour Ozone Nonattainment Area" submitted September 10, 2021. This revised inventory provides updated onroad emissions data for NO_x and VOCs based on the latest MOVES model (MOVES 3.1). Therefore, these documents fulfill Section 182(a)1 base-year emissions inventory requirements of the CAA.

2.0 BASE-YEAR EMISSIONS INVENTORY

U.S. EPA's rule for the "Implementation of the 2015 National Ambient Air Quality Standards for Ozone: Nonattainment Area State Implementation Plan Requirements" (referred to as the 2015 ozone implementation rule) recommends states use 2017 as the base-year to fulfill the emission inventory requirements. U.S. EPA's 2017 National Emissions Inventory (NEI) is the most recently available triennial NEI year. Based on the 2015 ozone implementation rule and in consultation with U.S. EPA, the Indiana Department of Environmental Management (IDEM) has selected the base-year of 2017 for the inventory.

IDEM has prepared a comprehensive and accurate inventory of ozone precursor emissions (i.e., NO_x and VOCs) for Lake (partial) and Porter (partial) counties, Indiana, organized by anthropogenic source categories: electric-generating units (EGUs), non-EGUs, non-point (area), non-road, and on-road.

Indiana has elected to use U.S. EPA's 2017 NEI for point, non-point (area), and non-road anthropogenic emission sources[1]. On-road values for Lake (partial) and Porter (partial) counties were produced by U.S. EPA's MOVES3.1 software program by the Northwestern Indiana Planning Commission (NIRPC) (Appendix A3).

2.1 Point (EGU and Non-EGU)

IDEM's Office of Air Quality (OAQ) collects data, calculates, and stores emissions for point sources on an annual basis in the Emission Inventory Tracking System (EMITS). These point source emissions are uploaded to the NEI each year using the Emission Inventory System (EIS) and feedback is provided to U.S. EPA on a variety of other estimates. Point source data was collected through Indiana's Emission Statement Program according to Title 326, Article 2, Rule 6 of the Indiana Administrative Code (326 IAC 2-6). All data is collated into the EMITS and submitted to U.S. EPA through the EIS Gateway. U.S. EPA has added to this inventory, incorporating data from various sources such as data submitted to the Clean Air Markets Database. Airport operations are handled as point sources in the database (see Section 3.2 of U.S. EPA's "2017 National Emissions Inventory: January 2021 Updated Release, Technical Support Document").

2.2 Non-Point

Non-point sources were developed by U.S. EPA with comments provided by the states. Section 4 of U.S. EPA's "2017 National Emissions Inventory: January 2021 Updated Release, Technical Support Document", describes in detail the stationary sources included in the non-point source estimations, emission estimation methods, sources of data for inputs, where states provide input, and how controls were taken into account.

2.3 Non-Road

Non-road sources were also developed by U.S. EPA using the National Mobile Inventory Model. See Section 5 of the "2017 National Emissions Inventory: January 2021 Updated Release, Technical Support Document" details the non-road mobile source emissions generated by diverse collection of equipment, ranging from lawns mowers to locomotive support. U.S. EPA MOVES model estimates emissions from non-road mobile sources using a variety of fuel types.

[1] 2017 National Emissions Inventory (NEI) Data | US EPA

2.4 On-Road

On-road values for Lake (partial) and Porter (partial) counties were produced by NIRPC using U.S. EPA's MOVES3.1 software program. 2017 NO_x and VOC on-road ton per summer day emissions data, is shown in Table 3.2. Detailed data and information concerning calculations are provided in (Appendix A3).

3.0 TEMPORAL ALLOCATION OF ANNUAL EMISSIONS

The area, non-road, and point source categories were calculated using the formulation for average season day emissions. Annual base year emissions were compiled from U.S. EPA's 2017 Emission Modeling Platform.[2] The annual emissions provided by this inventory were then used to calculate average summer day emissions using U.S. EPA guidance on how the model estimates daily emissions. The monthly profile percentages for June, July, and August were added together and then divided by the number of days in the season (92). This is applied at the process level using the profiles specified for each source classification code (SCC) that is assigned to the process.[3] Lake (partial) and Porter (partial) counties emission estimates are rounded to two decimal places.

3.1 Summary and Detailed Tables

The following tables contain summaries and detailed data concerning the Lake County (partial) and Porter County (partial) emission inventories. Emission inventories are usually built on a countywide basis. Several steps were taken to adapt full inventories for Lake and Porter counties to a subset that represents the nonattainment townships. Point (EGU and non-EGU) sources for the townships were identified as those above a latitude of 41.435, which marks the appropriate southern boundary of the nonattainment area. Area and non-road source classification codes were assigned ratios representing their percentage of activity within Lake and Porter counties, as shown in Table 4.1. For on-road sources, partial county emissions' data was provided by NIRPC in consultation with IDEM and U.S. EPA. To extract the specific townships designated as nonattainment by U.S. EPA, NIRPC used a two-step approach. For the running emissions, the network links in the NIRPC travel demand model from these townships were applied to the 2017 emission rates. For the nonrunning emissions, it was agreed that NIRPC could multiply the full county nonrunning emissions by the percentage of registered vehicles that reside in the townships designated as nonattainment. The combination of these running and nonrunning emissions are the 2017 on-road emission estimates included in this document.

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[2] 2017 Emissions Modeling Platform | US EPA
[3] Source Classification Codes (epa.gov)

Table 3.1: Lake County (Partial) and Porter County (Partial) Emission Allocation Ratios

County	Ratio	Type	Comment
Lake	0.85	Employment	Represents the fraction of Lake County employment contained within the 5 nonattainment townships.
	0.84	Population	Represents the fraction of Lake County population contained within the 5 nonattainment townships.
	0.15	Agriculture Acreage	Represents the fraction of Lake County agricultural acreage contained within the 5 nonattainment townships.
Porter	0.85	Employment	Represents the fraction of Porter County employment contained within the 8 nonattainment townships.
	0.86	Population	Represents the fraction of Porter County population contained within the 8 nonattainment townships.
	0.37	Agriculture Acreage	Represents the fraction of Porter County agricultural acreage contained within the 8 nonattainment townships.

Sources:

- Employment and population estimates for Lake and Porter counties: Stats Indiana (https://www.stats.indiana.edu/).
- Agricultural acreage estimate for Lake County: State GIS database.
- Agricultural acreage estimate for Porter County: United States Geological Survey (USGS) 2016 National Land Cover Database.

The tables show NO_x and VOC emissions estimates in tons per ozone season day unless otherwise noted.

Table 3.2: Lake County (Partial) and Porter County (Partial) NO_x and VOC Emissions by Source Category, Tons per Ozone Season Day, 2017

County	Source Category	NO_x	VOCs
Lake	EGU	0.30	0.12
Lake	Non-point	5.21	11.40
Lake	Non-road	3.78	2.06
Lake	Point	29.88	8.04
Lake	On-road	6.53	2.02
Porter	EGU	3.49	0.13
Porter	Non-point	3.37	5.16
Porter	Non-road	1.25	1.26
Porter	Point	25.20	1.95
Porter	On-road	3.39	0.84

Table 3.3: Detailed Lake County (Partial) and Porter County (Partial) NO_x and VOC Emissions by SCC Level One Descriptions, Tons per Ozone Season Day, 2017

County	Source Category	SCC Level One	NO_x	VOCs
Lake	EGU	External Combustion Boilers	0.05	0.04
Lake	EGU	Internal Combustion Engines	0.25	0.08
Lake	Non-point	Industrial Processes	0.03	0.16
Lake	Non-point	Miscellaneous Area Sources	0.01	0.04
Lake	Non-point	Mobile Sources	3.30	0.17
Lake	Non-point	Solvent Utilization		9.96
Lake	Non-point	Stationary Source Fuel Combustion	1.81	0.16
Lake	Non-point	Storage and Transport		0.69
Lake	Non-point	Waste Disposal, Treatment, and Recovery	0.06	0.23
Lake	Non-road	Mobile Sources	3.78	2.06
Lake	Point	Chemical Evaporation	0.02	2.56
Lake	Point	External Combustion	0.00	0.00
Lake	Point	External Combustion Boilers	13.92	0.47
Lake	Point	Industrial Processes	15.04	4.92
Lake	Point	Internal Combustion Engines	0.84	0.06
Lake	Point	Mobile Sources	0.04	0.03
Porter	EGU	External Combustion Boilers	3.21	0.11
Porter	EGU	Internal Combustion Engines	0.28	0.01
Porter	Non-point	Industrial Processes		0.03
Porter	Non-point	Miscellaneous Area Sources	0.00	0.03
Porter	Non-point	Mobile Sources	2.60	0.15
Porter	Non-point	Solvent Utilization		3.99
Porter	Non-point	Stationary Source Fuel Combustion	0.71	0.07
Porter	Non-point	Storage and Transport		0.72
Porter	Non-point	Waste Disposal, Treatment, and Recovery	0.05	0.17
Porter	Non-road	Mobile Sources	1.25	1.26

County	Source Category	SCC Level One	NO_x	VOCs
Porter	Point	Chemical Evaporation	0.02	0.29
Porter	Point	External Combustion	0.00	0.00
Porter	Point	External Combustion Boilers	3.17	0.08
Porter	Point	Industrial Processes	21.76	1.55
Porter	Point	Internal Combustion Engines	0.23	0.02
Porter	Point	Mobile Sources	0.02	0.02

Table 3.4: Detailed Lake County (Partial) and Porter County (Partial) NO_x and VOC Emissions by SCC Level One and Two Descriptions, Tons per Ozone Season Day, 2017

County	Source Category	SCC Level One	SCC Level Two	NO_x	VOCs
Lake	EGU	External Combustion Boilers	Electric Generation	0.05	0.04
Lake	EGU	Internal Combustion Engines	Electric Generation	0.25	0.08
Lake	Non-point	Industrial Processes	Food and Kindred Products: SIC 20		0.08
Lake	Non-point	Industrial Processes	Oil and Gas Exploration and Production	0.03	0.08
Lake	Non-point	Miscellaneous Area Sources	Agriculture Production - Livestock		0.00
Lake	Non-point	Miscellaneous Area Sources	Other Combustion	0.01	0.03
Lake	Non-point	Mobile Sources	Marine Vessels, Commercial	0.71	0.05
Lake	Non-point	Mobile Sources	Railroad Equipment	2.59	0.12
Lake	Non-point	Solvent Utilization	Degreasing		1.02
Lake	Non-point	Solvent Utilization	Dry Cleaning		0.00
Lake	Non-point	Solvent Utilization	Graphic Arts		1.10
Lake	Non-point	Solvent Utilization	Miscellaneous Non-industrial: Commercial		0.51
Lake	Non-point	Solvent Utilization	Miscellaneous Non-industrial: Consumer and Commercial		4.92
Lake	Non-point	Solvent Utilization	Surface Coating		2.40
Lake	Non-point	Stationary Source Fuel Combustion	Commercial/Institutional	0.29	0.02
Lake	Non-point	Stationary Source Fuel Combustion	Industrial	1.43	0.08
Lake	Non-point	Stationary Source Fuel Combustion	Residential	0.10	0.06

County	Source Category	SCC Level One	SCC Level Two	NO_x	VOCs
Lake	Non-point	Storage and Transport	Petroleum and Petroleum Product Storage		0.52
Lake	Non-point	Storage and Transport	Petroleum and Petroleum Product Transport		0.17
Lake	Non-point	Waste Disposal, Treatment, and Recovery	Composting		0.05
Lake	Non-point	Waste Disposal, Treatment, and Recovery	Open Burning	0.06	0.15
Lake	Non-point	Waste Disposal, Treatment, and Recovery	Wastewater Treatment		0.03
Lake	Non-road	Mobile Sources	CNG	0.00	0.00
Lake	Non-road	Mobile Sources	Off-highway Vehicle CNG	0.02	0.01
Lake	Non-road	Mobile Sources	Off-highway Vehicle Diesel	3.15	0.28
Lake	Non-road	Mobile Sources	Off-highway Vehicle Gasoline	0.34	1.38
Lake	Non-road	Mobile Sources	Off-highway Vehicle Gasoline, 2-Stroke	0.01	0.25
Lake	Non-road	Mobile Sources	Off-highway Vehicle Gasoline, 4-Stroke	0.02	0.06
Lake	Non-road	Mobile Sources	Off-highway Vehicle LPG	0.16	0.02
Lake	Non-road	Mobile Sources	Pleasure Craft	0.08	0.05
Lake	Non-road	Mobile Sources	Railroad Equipment	0.01	0.00
Lake	Point	Chemical Evaporation	Organic Chemical Storage		0.03
Lake	Point	Chemical Evaporation	Organic Solvent Evaporation	0.01	0.12
Lake	Point	Chemical Evaporation	Petroleum Liquids Storage (non-Refinery)	0.01	1.67
Lake	Point	Chemical Evaporation	Petroleum Product Storage at Refineries		0.56
Lake	Point	Chemical Evaporation	Printing/Publishing		0.00
Lake	Point	Chemical Evaporation	Surface Coating Operations		0.15
Lake	Point	Chemical Evaporation	Transportation and Marketing of Petroleum Products	0.00	0.02
Lake	Point	Chemical Evaporation	unknown		0.01
Lake	Point	External Combustion	Space Heaters	0.00	0.00

County	Source Category	SCC Level One	SCC Level Two	NO_x	VOCs
Lake	Point	External Combustion Boilers	Commercial/Institutional	0.18	0.01
Lake	Point	External Combustion Boilers	Industrial	13.74	0.46
Lake	Point	Industrial Processes	Chemical Manufacturing	0.85	0.06
Lake	Point	Industrial Processes	Fabricated Metal Products	0.02	0.00
Lake	Point	Industrial Processes	Food and Agriculture	0.02	0.30
Lake	Point	Industrial Processes	In-process Fuel Use	2.50	0.10
Lake	Point	Industrial Processes	Mineral Products	2.42	0.02
Lake	Point	Industrial Processes	Miscellaneous Manufacturing Industries	0.49	0.01
Lake	Point	Industrial Processes	Petroleum Industry	2.17	1.26
Lake	Point	Industrial Processes	Primary Metal Production	6.47	2.76
Lake	Point	Industrial Processes	Pulp and Paper and Wood Products		0.17
Lake	Point	Industrial Processes	Secondary Metal Production	0.10	0.23
Lake	Point	Internal Combustion Engines	Commercial/Institutional	0.09	0.01
Lake	Point	Internal Combustion Engines	Industrial	0.06	0.00
Lake	Point	Internal Combustion Engines	Railroad Equipment	0.69	0.05
Lake	Point	Mobile Sources	Aircraft	0.04	0.03
Lake	Point	Mobile Sources	Off-highway Vehicle Diesel	0.00	0.00
Lake	Point	Mobile Sources	Off-highway Vehicle Gasoline, 4-Stroke	0.00	0.00
Porter	EGU	External Combustion Boilers	Electric Generation	3.21	0.11
Porter	EGU	Internal Combustion Engines	Electric Generation	0.28	0.01
Porter	Non-point	Industrial Processes	Food and Kindred Products: SIC 20		0.03
Porter	Non-point	Miscellaneous Area Sources	Agriculture Production - Livestock		0.02
Porter	Non-point	Miscellaneous Area Sources	Other Combustion	0.00	0.01
Porter	Non-point	Mobile Sources	Marine Vessels, Commercial	0.52	0.05
Porter	Non-point	Mobile Sources	Railroad Equipment	2.08	0.10
Porter	Non-point	Solvent Utilization	Degreasing		0.45
Porter	Non-point	Solvent Utilization	Dry Cleaning		0.00

County	Source Category	SCC Level One	SCC Level Two	NO_x	VOCs
Porter	Non-point	Solvent Utilization	Graphic Arts		0.77
Porter	Non-point	Solvent Utilization	Miscellaneous Non-industrial: Commercial		0.25
Porter	Non-point	Solvent Utilization	Miscellaneous Non-industrial: Consumer and Commercial		1.71
Porter	Non-point	Solvent Utilization	Surface Coating		0.82
Porter	Non-point	Stationary Source Fuel Combustion	Commercial/Institutional	0.09	0.01
Porter	Non-point	Stationary Source Fuel Combustion	Industrial	0.59	0.03
Porter	Non-point	Stationary Source Fuel Combustion	Residential	0.03	0.03
Porter	Non-point	Storage and Transport	Petroleum and Petroleum Product Storage		0.62
Porter	Non-point	Storage and Transport	Petroleum and Petroleum Product Transport		0.11
Porter	Non-point	Waste Disposal, Treatment, and Recovery	Composting		0.05
Porter	Non-point	Waste Disposal, Treatment, and Recovery	Open Burning	0.05	0.11
Porter	Non-point	Waste Disposal, Treatment, and Recovery	Wastewater Treatment		0.00
Porter	Non-road	Mobile Sources	CNG	0.00	0.00
Porter	Non-road	Mobile Sources	LPG	0.00	0.00
Porter	Non-road	Mobile Sources	Off-highway Vehicle CNG	0.01	0.00
Porter	Non-road	Mobile Sources	Off-highway Vehicle Diesel	0.93	0.08
Porter	Non-road	Mobile Sources	Off-highway Vehicle Gasoline	0.16	0.94
Porter	Non-road	Mobile Sources	Off-highway Vehicle Gasoline, 2-Stroke	0.00	0.16
Porter	Non-road	Mobile Sources	Off-highway Vehicle Gasoline, 4-Stroke	0.01	0.03
Porter	Non-road	Mobile Sources	Off-highway Vehicle LPG	0.06	0.01
Porter	Non-road	Mobile Sources	Pleasure Craft	0.06	0.04
Porter	Non-road	Mobile Sources	Railroad Equipment	0.01	0.00
Porter	Point	Chemical Evaporation	Organic Solvent Evaporation		0.00
Porter	Point	Chemical Evaporation	Petroleum Liquids Storage (non-Refinery)		0.00
Porter	Point	Chemical Evaporation	Printing/Publishing		
Porter	Point	Chemical Evaporation	Surface Coating Operations	0.02	0.28

County	Source Category	SCC Level One	SCC Level Two	NO_x	VOCs
Porter	Point	Chemical Evaporation	Transportation and Marketing of Petroleum Products		0.00
Porter	Point	External Combustion	Space Heaters	0.00	0.00
Porter	Point	External Combustion Boilers	Commercial/Institutional	0.00	0.00
Porter	Point	External Combustion Boilers	Industrial	3.17	0.08
Porter	Point	Industrial Processes	Chemical Manufacturing		0.00
Porter	Point	Industrial Processes	In-process Fuel Use	0.21	0.01
Porter	Point	Industrial Processes	Mineral Products	0.00	0.00
Porter	Point	Industrial Processes	Miscellaneous Manufacturing Industries	0.01	
Porter	Point	Industrial Processes	Petroleum Industry		0.00
Porter	Point	Industrial Processes	Primary Metal Production	21.54	1.38
Porter	Point	Industrial Processes	Pulp and Paper and Wood Products		0.16
Porter	Point	Industrial Processes	Secondary Metal Production	0.00	0.00
Porter	Point	Internal Combustion Engines	Commercial/Institutional	0.05	0.00
Porter	Point	Internal Combustion Engines	Industrial	0.01	0.00
Porter	Point	Internal Combustion Engines	Railroad Equipment	0.18	0.01
Porter	Point	Mobile Sources	Aircraft	0.02	0.02

Table 3.5: Detailed Lake County (Partial) and Porter County (Partial) NO_x and VOC Emissions by SCC, Tons per Ozone Season Day, 2017

County	Source Category	SCC	NO_x	VOCs
Lake	EGU	10100601	0.02	0.01
Lake	EGU	10100704	0.03	0.03
Lake	EGU	20100201	0.25	0.08
Lake	Non-point	2102001000	0.00	0.00
Lake	Non-point	2102002000	0.00	0.00
Lake	Non-point	2102004001	0.01	0.00
Lake	Non-point	2102004002	0.16	0.01

County	Source Category	SCC	NO_x	VOCs
Lake	Non-point	2102005000	0.00	0.00
Lake	Non-point	2102006000	1.21	0.07
Lake	Non-point	2102007000	0.01	0.00
Lake	Non-point	2102008000	0.04	0.00
Lake	Non-point	2102011000	0.00	0.00
Lake	Non-point	2103001000	0.00	0.00
Lake	Non-point	2103002000	0.00	0.00
Lake	Non-point	2103004001	0.00	0.00
Lake	Non-point	2103004002	0.00	0.00
Lake	Non-point	2103005000	0.00	0.00
Lake	Non-point	2103006000	0.25	0.01
Lake	Non-point	2103007000	0.01	0.00
Lake	Non-point	2103008000	0.02	0.00
Lake	Non-point	2103011000	0.00	0.00
Lake	Non-point	2104001000	0.00	0.00
Lake	Non-point	2104002000	0.00	0.00
Lake	Non-point	2104004000	0.00	0.00
Lake	Non-point	2104006000	0.08	0.00
Lake	Non-point	2104007000	0.00	0.00
Lake	Non-point	2104008100	0.00	0.01
Lake	Non-point	2104008210	0.00	0.00
Lake	Non-point	2104008220	0.00	0.00
Lake	Non-point	2104008230	0.00	0.00
Lake	Non-point	2104008310	0.00	0.01
Lake	Non-point	2104008320	0.00	0.00
Lake	Non-point	2104008330	0.00	0.00
Lake	Non-point	2104008400	0.00	0.00

County	Source Category	SCC	NO_x	VOCs
Lake	Non-point	2104008510	0.00	0.00
Lake	Non-point	2104008530	0.00	0.00
Lake	Non-point	2104008610	0.00	0.01
Lake	Non-point	2104008620	0.00	0.00
Lake	Non-point	2104008630	0.00	0.00
Lake	Non-point	2104008700	0.00	0.01
Lake	Non-point	2104009000	0.00	0.01
Lake	Non-point	2104011000	0.00	0.00
Lake	Non-point	2280002101	0.02	0.00
Lake	Non-point	2280002102	0.07	0.00
Lake	Non-point	2280002103	0.13	0.02
Lake	Non-point	2280002104	0.06	0.00
Lake	Non-point	2280002201	0.14	0.01
Lake	Non-point	2280002202	0.19	0.01
Lake	Non-point	2280002203	0.08	0.01
Lake	Non-point	2280002204	0.03	0.00
Lake	Non-point	2285002006	2.38	0.11
Lake	Non-point	2285002007	0.16	0.01
Lake	Non-point	2285002008	0.06	0.00
Lake	Non-point	2302002100		0.02
Lake	Non-point	2302002200		0.05
Lake	Non-point	2302003000		0.01
Lake	Non-point	2302003100		0.01
Lake	Non-point	2302003200		0.00
Lake	Non-point	2310000551		0.00
Lake	Non-point	2310000552		0.00
Lake	Non-point	2310000553		0.00
Lake	Non-point	2310010100	0.00	0.00

County	Source Category	SCC	NO_x	VOCs
Lake	Non-point	2310010200	0.00	0.00
Lake	Non-point	2310010300		0.04
Lake	Non-point	2310011001	0.00	0.00
Lake	Non-point	2310011201		0.00
Lake	Non-point	2310011501		0.00
Lake	Non-point	2310011502		0.00
Lake	Non-point	2310011503		0.00
Lake	Non-point	2310011505		0.01
Lake	Non-point	2310011600	0.01	0.00
Lake	Non-point	2310021010	0.00	0.00
Lake	Non-point	2310021030		0.00
Lake	Non-point	2310021100	0.00	0.00
Lake	Non-point	2310021102	0.00	0.00
Lake	Non-point	2310021202	0.00	0.00
Lake	Non-point	2310021251	0.00	0.00
Lake	Non-point	2310021300		0.01
Lake	Non-point	2310021302	0.01	0.00
Lake	Non-point	2310021351	0.00	0.00
Lake	Non-point	2310021400	0.00	0.00
Lake	Non-point	2310021501		0.00
Lake	Non-point	2310021502		0.00
Lake	Non-point	2310021503		0.00
Lake	Non-point	2310021505		0.00
Lake	Non-point	2310021506		0.00
Lake	Non-point	2310021603	0.00	0.00
Lake	Non-point	2310023000	0.00	0.00
Lake	Non-point	2310023010	0.00	0.00
Lake	Non-point	2310023030		0.00

County	Source Category	SCC	NO_x	VOCs
Lake	Non-point	2310023100	0.00	0.00
Lake	Non-point	2310023102	0.00	0.00
Lake	Non-point	2310023202	0.00	0.00
Lake	Non-point	2310023251	0.00	0.00
Lake	Non-point	2310023300		0.00
Lake	Non-point	2310023302	0.00	0.00
Lake	Non-point	2310023310		0.00
Lake	Non-point	2310023351	0.00	0.00
Lake	Non-point	2310023400	0.00	0.00
Lake	Non-point	2310023511		0.00
Lake	Non-point	2310023512		0.00
Lake	Non-point	2310023513		0.00
Lake	Non-point	2310023515		0.00
Lake	Non-point	2310023516		0.00
Lake	Non-point	2310023603	0.00	0.00
Lake	Non-point	2310111401		0.00
Lake	Non-point	2310121401		0.00
Lake	Non-point	2401001000		1.34
Lake	Non-point	2401005000		0.25
Lake	Non-point	2401008000		0.17
Lake	Non-point	2401015000		0.01
Lake	Non-point	2401020000		0.11
Lake	Non-point	2401025000		0.00
Lake	Non-point	2401030000		0.05
Lake	Non-point	2401055000		0.00
Lake	Non-point	2401065000		0.00
Lake	Non-point	2401070000		0.18
Lake	Non-point	2401085000		0.09

County	Source Category	SCC	NO_x	VOCs
Lake	Non-point	2401090000		0.00
Lake	Non-point	2401100000		0.21
Lake	Non-point	2401200000		0.00
Lake	Non-point	2415000000		1.02
Lake	Non-point	2420000000		0.00
Lake	Non-point	2425000000		1.10
Lake	Non-point	2460100000		1.10
Lake	Non-point	2460200000		1.12
Lake	Non-point	2460400000		0.11
Lake	Non-point	2460500000		0.53
Lake	Non-point	2460600000		1.02
Lake	Non-point	2460800000		1.00
Lake	Non-point	2460900000		0.04
Lake	Non-point	2461021000		0.03
Lake	Non-point	2461022000		0.38
Lake	Non-point	2461850000		0.10
Lake	Non-point	2501011011		0.04
Lake	Non-point	2501011012		0.04
Lake	Non-point	2501011013		0.05
Lake	Non-point	2501011014		0.01
Lake	Non-point	2501011015		0.00
Lake	Non-point	2501012011		0.00
Lake	Non-point	2501012012		0.00
Lake	Non-point	2501012013		0.06
Lake	Non-point	2501012014		0.02
Lake	Non-point	2501012015		0.00
Lake	Non-point	2501050120		0.02
Lake	Non-point	2501055120		0.00

County	Source Category	SCC	NO_x	VOCs
Lake	Non-point	2501060051		0.04
Lake	Non-point	2501060052		0.00
Lake	Non-point	2501060053		0.08
Lake	Non-point	2501060201		0.09
Lake	Non-point	2501080050		0.05
Lake	Non-point	2501080100		0.00
Lake	Non-point	2505030120		0.00
Lake	Non-point	2505040120		0.17
Lake	Non-point	2610000100	0.00	0.00
Lake	Non-point	2610000400	0.00	0.00
Lake	Non-point	2610000500	0.05	0.13
Lake	Non-point	2610030000	0.01	0.01
Lake	Non-point	2630020000		0.03
Lake	Non-point	2680003000		0.05
Lake	Non-point	2805002000		0.00
Lake	Non-point	2805007100		0.00
Lake	Non-point	2805009100		0.00
Lake	Non-point	2805010100		0.00
Lake	Non-point	2805018000		0.00
Lake	Non-point	2805025000		0.00
Lake	Non-point	2805035000		0.00
Lake	Non-point	2805040000		0.00
Lake	Non-point	2805045000		0.00
Lake	Non-point	2810025000	0.01	0.03
Lake	Non-point	2810060100	0.00	0.00
Lake	Non-point	2810060200	0.00	0.00
Lake	Non-road	2260002022	0.00	0.14
Lake	Non-road	2260003022	0.00	0.00

County	Source Category	SCC	NO_x	VOCs
Lake	Non-road	2260004020	0.00	0.05
Lake	Non-road	2260004021	0.00	0.13
Lake	Non-road	2260004022	0.00	0.00
Lake	Non-road	2260004033	0.00	0.08
Lake	Non-road	2260004035	0.00	0.00
Lake	Non-road	2260004036	0.00	0.07
Lake	Non-road	2260004044	0.01	0.14
Lake	Non-road	2260005022	0.00	0.00
Lake	Non-road	2260006022	0.00	0.04
Lake	Non-road	2260007022	0.00	0.00
Lake	Non-road	2265001050	0.01	0.03
Lake	Non-road	2265002022	0.03	0.06
Lake	Non-road	2265003022	0.04	0.03
Lake	Non-road	2265003060	0.00	0.00
Lake	Non-road	2265004022	0.05	0.11
Lake	Non-road	2265004033	0.08	0.32
Lake	Non-road	2265004035	0.00	0.02
Lake	Non-road	2265004036	0.00	0.02
Lake	Non-road	2265004044	0.02	0.09
Lake	Non-road	2265005022	0.00	0.00
Lake	Non-road	2265006022	0.09	0.22
Lake	Non-road	2265007022	0.00	0.00
Lake	Non-road	2267002022	0.00	0.00
Lake	Non-road	2267003022	0.14	0.02
Lake	Non-road	2267004044	0.00	0.00
Lake	Non-road	2267005022	0.00	0.00
Lake	Non-road	2267006022	0.01	0.00
Lake	Non-road	2268002022	0.00	0.00

County	Source Category	SCC	NO_x	VOCs
Lake	Non-road	2268003022	0.01	0.01
Lake	Non-road	2268003060	0.00	0.00
Lake	Non-road	2268005022	0.00	0.00
Lake	Non-road	2268006022	0.01	0.00
Lake	Non-road	2270002022	2.43	0.22
Lake	Non-road	2270003022	0.22	0.01
Lake	Non-road	2270003060	0.11	0.01
Lake	Non-road	2270004022	0.01	0.00
Lake	Non-road	2270004036	0.00	0.00
Lake	Non-road	2270004044	0.04	0.00
Lake	Non-road	2270005022	0.08	0.01
Lake	Non-road	2270006022	0.19	0.02
Lake	Non-road	2270007022	0.00	0.00
Lake	Non-road	2282005022	0.03	0.15
Lake	Non-road	2282010005	0.08	0.05
Lake	Non-road	2282020022	0.06	0.00
Lake	Non-road	2285002015	0.01	0.00
Lake	Non-road	2285004015	0.00	0.00
Lake	Non-road	2285006015	0.00	0.00
Lake	Point	10200401	0.17	0.00
Lake	Point	10200501	0.04	0.00
Lake	Point	10200601	9.18	0.20
Lake	Point	10200602	0.78	0.04
Lake	Point	10200603	0.08	0.00
Lake	Point	10200701	1.38	0.13
Lake	Point	10200704	2.11	0.08
Lake	Point	10200799	0.00	0.00
Lake	Point	10201002	0.00	0.00

County	Source Category	SCC	NO_x	VOCs
Lake	Point	10300602	0.01	0.00
Lake	Point	10300799	0.17	0.01
Lake	Point	10500106	0.00	0.00
Lake	Point	20200102	0.01	0.00
Lake	Point	20200104	0.03	0.00
Lake	Point	20200201	0.00	0.00
Lake	Point	20200202	0.00	0.00
Lake	Point	20200401	0.02	0.00
Lake	Point	20300101	0.09	0.01
Lake	Point	2265008005	0.00	0.00
Lake	Point	2270008005	0.00	0.00
Lake	Point	2275001000	0.03	0.01
Lake	Point	2275020000	0.01	0.00
Lake	Point	2275050011	0.00	0.00
Lake	Point	2275050012	0.00	0.01
Lake	Point	2275060011	0.00	0.00
Lake	Point	2275060012	0.00	0.00
Lake	Point	2275070000	0.00	0.00
Lake	Point	28500201	0.69	0.05
Lake	Point	30102320		0.01
Lake	Point	30102322		0.00
Lake	Point	30102399	0.07	0.01
Lake	Point	30103204	0.08	0.00
Lake	Point	30107002	0.00	0.02
Lake	Point	30107101	0.22	0.01
Lake	Point	30187097		0.00
Lake	Point	30187098		0.00
Lake	Point	30188801		0.00

County	Source Category	SCC	NO_x	VOCs
Lake	Point	30190003	0.49	0.00
Lake	Point	30190023	0.00	0.00
Lake	Point	30200754	0.02	0.00
Lake	Point	30201401		0.00
Lake	Point	30201403		0.07
Lake	Point	30201407		0.00
Lake	Point	30201410		0.03
Lake	Point	30201412		0.00
Lake	Point	30201899		0.19
Lake	Point	30299998		0.01
Lake	Point	30300305	0.00	0.00
Lake	Point	30300336		0.00
Lake	Point	30300371	0.03	0.00
Lake	Point	30300372	0.00	0.00
Lake	Point	30300375	0.01	0.00
Lake	Point	30300376	1.75	0.00
Lake	Point	30300399	0.15	0.00
Lake	Point	30301503	0.55	0.48
Lake	Point	30301511		0.00
Lake	Point	30301513	0.45	0.10
Lake	Point	30301515	0.00	0.02
Lake	Point	30301517	0.01	0.01
Lake	Point	30301518	0.00	0.00
Lake	Point	30301526	2.13	0.04
Lake	Point	30301527	0.08	0.00
Lake	Point	30301528	0.08	0.02
Lake	Point	30301532	0.02	
Lake	Point	30301540		0.00

County	Source Category	SCC	NO_x	VOCs
Lake	Point	30301542	0.00	0.00
Lake	Point	30301565	0.03	0.00
Lake	Point	30301573		0.24
Lake	Point	30301574		0.23
Lake	Point	30301575	0.00	0.00
Lake	Point	30301577		0.00
Lake	Point	30301581	0.02	0.00
Lake	Point	30301587		0.04
Lake	Point	30301598	0.00	0.00
Lake	Point	30301599	1.11	1.51
Lake	Point	30390024	0.06	0.05
Lake	Point	30399999	0.00	0.00
Lake	Point	30400112		0.00
Lake	Point	30400131		0.01
Lake	Point	30400138		0.02
Lake	Point	30400150		0.15
Lake	Point	30400199		0.04
Lake	Point	30402201	0.08	0.01
Lake	Point	30490033	0.02	0.00
Lake	Point	30501620	2.42	0.01
Lake	Point	30501699		0.00
Lake	Point	30599999		0.01
Lake	Point	30600106	1.70	0.02
Lake	Point	30600201	0.39	0.01
Lake	Point	30600503		0.21
Lake	Point	30600602		0.01
Lake	Point	30600701		0.09
Lake	Point	30600801		0.25

County	Source Category	SCC	NO_x	VOCs
Lake	Point	30600802		0.02
Lake	Point	30600812		0.00
Lake	Point	30600816		0.00
Lake	Point	30600817		0.00
Lake	Point	30600904	0.08	0.22
Lake	Point	30601301		0.40
Lake	Point	30609904		0.01
Lake	Point	30688801		0.00
Lake	Point	30700499		0.17
Lake	Point	30988801		0.00
Lake	Point	30990003	0.02	0.00
Lake	Point	39000699	1.63	0.05
Lake	Point	39000701	0.87	0.05
Lake	Point	39000797	0.00	0.00
Lake	Point	39990023	0.03	0.00
Lake	Point	39990024	0.37	0.00
Lake	Point	39999999	0.08	0.00
Lake	Point	40100251		0.00
Lake	Point	40100335		0.00
Lake	Point	40200101		0.07
Lake	Point	40200201		0.01
Lake	Point	40201801		0.05
Lake	Point	40201803		0.02
Lake	Point	40201805		0.00
Lake	Point	40301016		0.02
Lake	Point	40301017		0.00
Lake	Point	40301018		0.00
Lake	Point	40301021		0.18

County	Source Category	SCC	NO_x	VOCs
Lake	Point	40301024		0.00
Lake	Point	40301099		0.00
Lake	Point	40301107		0.23
Lake	Point	40301115		0.02
Lake	Point	40301119		0.01
Lake	Point	40301120		0.00
Lake	Point	40301197		0.06
Lake	Point	40301299		0.04
Lake	Point	40400101		0.00
Lake	Point	40400106		0.01
Lake	Point	40400107		0.00
Lake	Point	40400108		0.00
Lake	Point	40400109		0.00
Lake	Point	40400116		0.13
Lake	Point	40400117		0.00
Lake	Point	40400121		0.02
Lake	Point	40400122		0.04
Lake	Point	40400140		0.04
Lake	Point	40400141		0.00
Lake	Point	40400148		0.06
Lake	Point	40400149		0.05
Lake	Point	40400150	0.01	0.02
Lake	Point	40400151		0.03
Lake	Point	40400152		0.00
Lake	Point	40400153		0.04
Lake	Point	40400154		0.04
Lake	Point	40400160		0.01
Lake	Point	40400161		0.10

County	Source Category	SCC	NO_x	VOCs
Lake	Point	40400170		0.50
Lake	Point	40400171		0.00
Lake	Point	40400172		0.05
Lake	Point	40400178		0.17
Lake	Point	40400179		0.16
Lake	Point	40400199		0.00
Lake	Point	40400205		0.02
Lake	Point	40400250	0.00	0.00
Lake	Point	40400261		0.11
Lake	Point	40400301		0.00
Lake	Point	40400302		0.00
Lake	Point	40400304		0.05
Lake	Point	40400306		0.02
Lake	Point	40400322		0.00
Lake	Point	40500516		0.00
Lake	Point	40600130		0.00
Lake	Point	40600131		0.01
Lake	Point	40600133		0.00
Lake	Point	40600134		0.00
Lake	Point	40600135	0.00	0.00
Lake	Point	40600140		0.00
Lake	Point	40600141	0.00	0.00
Lake	Point	40600166		0.00
Lake	Point	40688801		0.00
Lake	Point	40714697		0.00
Lake	Point	40714698		0.01
Lake	Point	40715809		0.00
Lake	Point	40715810		0.00

County	Source Category	SCC	NO_x	VOCs
Lake	Point	40799999		0.01
Lake	Point	42500202		0.00
Lake	Point	42500301		0.01
Lake	Point	49000206		0.00
Lake	Point	49000299	0.01	0.12
Porter	EGU	10100203	3.00	0.11
Porter	EGU	10100601	0.24	0.00
Porter	EGU	20100101	0.00	0.00
Porter	EGU	20100201	0.25	0.01
Porter	Non-point	2102001000	0.00	0.00
Porter	Non-point	2102002000	0.00	0.00
Porter	Non-point	2102004001	0.00	0.00
Porter	Non-point	2102004002	0.06	0.00
Porter	Non-point	2102005000	0.00	0.00
Porter	Non-point	2102006000	0.50	0.03
Porter	Non-point	2102007000	0.00	0.00
Porter	Non-point	2102008000	0.02	0.00
Porter	Non-point	2102011000	0.00	0.00
Porter	Non-point	2103001000	0.00	0.00
Porter	Non-point	2103002000	0.00	0.00
Porter	Non-point	2103004001	0.00	0.00
Porter	Non-point	2103004002	0.00	0.00
Porter	Non-point	2103005000	0.00	0.00
Porter	Non-point	2103006000	0.08	0.00
Porter	Non-point	2103007000	0.00	0.00
Porter	Non-point	2103008000	0.01	0.00
Porter	Non-point	2103011000	0.00	0.00
Porter	Non-point	2104001000	0.00	0.00

County	Source Category	SCC	NO_x	VOCs
Porter	Non-point	2104002000	0.00	0.00
Porter	Non-point	2104004000	0.00	0.00
Porter	Non-point	2104006000	0.03	0.00
Porter	Non-point	2104007000	0.00	0.00
Porter	Non-point	2104008100	0.00	0.00
Porter	Non-point	2104008210	0.00	0.00
Porter	Non-point	2104008220	0.00	0.00
Porter	Non-point	2104008230	0.00	0.00
Porter	Non-point	2104008310	0.00	0.00
Porter	Non-point	2104008320	0.00	0.00
Porter	Non-point	2104008330	0.00	0.00
Porter	Non-point	2104008400	0.00	0.00
Porter	Non-point	2104008510	0.00	0.00
Porter	Non-point	2104008530	0.00	0.00
Porter	Non-point	2104008610	0.00	0.00
Porter	Non-point	2104008620	0.00	0.00
Porter	Non-point	2104008630	0.00	0.00
Porter	Non-point	2104008700	0.00	0.00
Porter	Non-point	2104009000	0.00	0.00
Porter	Non-point	2104011000	0.00	0.00
Porter	Non-point	2280002101	0.01	0.00
Porter	Non-point	2280002102	0.02	0.00
Porter	Non-point	2280002103	0.19	0.04
Porter	Non-point	2280002104	0.06	0.00
Porter	Non-point	2280002201	0.02	0.00
Porter	Non-point	2280002202	0.06	0.00
Porter	Non-point	2280002203	0.15	0.01
Porter	Non-point	2280002204	0.01	0.00

County	Source Category	SCC	NO_x	VOCs
Porter	Non-point	2285002006	1.96	0.09
Porter	Non-point	2285002007	0.07	0.00
Porter	Non-point	2285002008	0.04	0.00
Porter	Non-point	2302002100		0.01
Porter	Non-point	2302002200		0.02
Porter	Non-point	2302003000		0.00
Porter	Non-point	2302003100		0.00
Porter	Non-point	2302003200		0.00
Porter	Non-point	2401001000		0.47
Porter	Non-point	2401005000		0.07
Porter	Non-point	2401008000		0.06
Porter	Non-point	2401015000		0.00
Porter	Non-point	2401020000		0.01
Porter	Non-point	2401040000		
Porter	Non-point	2401055000		0.00
Porter	Non-point	2401065000		0.00
Porter	Non-point	2401070000		0.13
Porter	Non-point	2401090000		0.00
Porter	Non-point	2401100000		0.07
Porter	Non-point	2401200000		0.00
Porter	Non-point	2415000000		0.45
Porter	Non-point	2420000000		0.00
Porter	Non-point	2425000000		0.77
Porter	Non-point	2460100000		0.38
Porter	Non-point	2460200000		0.39
Porter	Non-point	2460400000		0.04
Porter	Non-point	2460500000		0.18
Porter	Non-point	2460600000		0.35

County	Source Category	SCC	NO_x	VOCs
Porter	Non-point	2460800000		0.35
Porter	Non-point	2460900000		0.01
Porter	Non-point	2461021000		0.01
Porter	Non-point	2461022000		0.12
Porter	Non-point	2461850000		0.12
Porter	Non-point	2501011011		0.02
Porter	Non-point	2501011012		0.02
Porter	Non-point	2501011013		0.02
Porter	Non-point	2501011014		0.00
Porter	Non-point	2501011015		0.00
Porter	Non-point	2501012011		0.00
Porter	Non-point	2501012012		0.00
Porter	Non-point	2501012013		0.03
Porter	Non-point	2501012014		0.01
Porter	Non-point	2501012015		0.00
Porter	Non-point	2501050120		0.34
Porter	Non-point	2501055120		0.00
Porter	Non-point	2501060051		0.02
Porter	Non-point	2501060052		0.00
Porter	Non-point	2501060053		0.03
Porter	Non-point	2501060201		0.04
Porter	Non-point	2501080050		0.06
Porter	Non-point	2501080100		0.00
Porter	Non-point	2505030120		0.00
Porter	Non-point	2505040120		0.10
Porter	Non-point	2610000100	0.00	0.00
Porter	Non-point	2610000400	0.00	0.00
Porter	Non-point	2610000500	0.03	0.08

County	Source Category	SCC	NO_x	VOCs
Porter	Non-point	2610030000	0.02	0.03
Porter	Non-point	2630020000		0.00
Porter	Non-point	2680003000		0.05
Porter	Non-point	2805002000		0.00
Porter	Non-point	2805007100		0.00
Porter	Non-point	2805009100		0.00
Porter	Non-point	2805010100		0.00
Porter	Non-point	2805018000		0.01
Porter	Non-point	2805025000		0.01
Porter	Non-point	2805035000		0.00
Porter	Non-point	2805040000		0.00
Porter	Non-point	2805045000		0.00
Porter	Non-point	2810025000	0.00	0.01
Porter	Non-point	2810060100	0.00	0.00
Porter	Non-point	2810060200	0.00	0.00
Porter	Non-road	2260001022	0.00	0.25
Porter	Non-road	2260001060	0.00	0.00
Porter	Non-road	2260002022	0.00	0.02
Porter	Non-road	2260003022	0.00	0.00
Porter	Non-road	2260004020	0.00	0.01
Porter	Non-road	2260004021	0.00	0.09
Porter	Non-road	2260004022	0.00	0.00
Porter	Non-road	2260004033	0.00	0.03
Porter	Non-road	2260004035	0.00	0.00
Porter	Non-road	2260004036	0.00	0.05
Porter	Non-road	2260004044	0.00	0.10
Porter	Non-road	2260005022	0.00	0.00
Porter	Non-road	2260006022	0.00	0.01

County	Source Category	SCC	NO_x	VOCs
Porter	Non-road	2260007022	0.00	0.00
Porter	Non-road	2265001022	0.01	0.09
Porter	Non-road	2265001050	0.00	0.01
Porter	Non-road	2265001060	0.00	0.00
Porter	Non-road	2265002022	0.01	0.01
Porter	Non-road	2265003022	0.01	0.01
Porter	Non-road	2265003060	0.00	0.00
Porter	Non-road	2265004022	0.03	0.08
Porter	Non-road	2265004033	0.02	0.10
Porter	Non-road	2265004035	0.00	0.01
Porter	Non-road	2265004036	0.00	0.01
Porter	Non-road	2265004044	0.02	0.06
Porter	Non-road	2265005022	0.00	0.00
Porter	Non-road	2265006022	0.03	0.08
Porter	Non-road	2265007022	0.00	0.00
Porter	Non-road	2267001060	0.00	0.00
Porter	Non-road	2267002022	0.00	0.00
Porter	Non-road	2267003022	0.06	0.01
Porter	Non-road	2267004044	0.00	0.00
Porter	Non-road	2267005022	0.00	0.00
Porter	Non-road	2267006022	0.01	0.00
Porter	Non-road	2268002022	0.00	0.00
Porter	Non-road	2268003022	0.00	0.00
Porter	Non-road	2268003060	0.00	0.00
Porter	Non-road	2268005022	0.00	0.00
Porter	Non-road	2268006022	0.00	0.00
Porter	Non-road	2270001060	0.00	0.00
Porter	Non-road	2270002022	0.43	0.04

County	Source Category	SCC	NO_x	VOCs
Porter	Non-road	2270003022	0.09	0.01
Porter	Non-road	2270003060	0.04	0.00
Porter	Non-road	2270004022	0.00	0.00
Porter	Non-road	2270004036	0.00	0.00
Porter	Non-road	2270004044	0.03	0.00
Porter	Non-road	2270005022	0.22	0.02
Porter	Non-road	2270006022	0.07	0.01
Porter	Non-road	2270007022	0.00	0.00
Porter	Non-road	2282005022	0.02	0.08
Porter	Non-road	2282010005	0.06	0.04
Porter	Non-road	2282020022	0.04	0.00
Porter	Non-road	2285002015	0.01	0.00
Porter	Non-road	2285004015	0.00	0.00
Porter	Non-road	2285006015	0.00	0.00
Porter	Point	10200401	0.00	0.00
Porter	Point	10200402	0.00	0.00
Porter	Point	10200601	1.06	0.04
Porter	Point	10200602	0.14	0.02
Porter	Point	10200603	0.00	0.00
Porter	Point	10200704	0.54	0.00
Porter	Point	10200707	1.42	0.02
Porter	Point	10201002	0.00	0.00
Porter	Point	10300602	0.00	0.00
Porter	Point	10301002	0.00	0.00
Porter	Point	10500106	0.00	0.00
Porter	Point	20200102	0.01	0.00
Porter	Point	20200401	0.00	0.00
Porter	Point	20300101	0.05	0.00

County	Source Category	SCC	NO_x	VOCs
Porter	Point	2275001000	0.01	0.01
Porter	Point	2275050011	0.00	0.01
Porter	Point	2275050012	0.00	0.01
Porter	Point	2275060011	0.00	0.00
Porter	Point	2275060012	0.00	0.00
Porter	Point	28500201	0.18	0.01
Porter	Point	30100799		0.00
Porter	Point	30101199		0.00
Porter	Point	30300302	0.00	0.16
Porter	Point	30300303	0.06	0.26
Porter	Point	30300308	0.00	0.02
Porter	Point	30300314	0.00	0.03
Porter	Point	30300315		0.00
Porter	Point	30300317	8.89	0.02
Porter	Point	30300318	1.11	
Porter	Point	30301503	2.37	0.22
Porter	Point	30301513	0.18	
Porter	Point	30301518	0.01	
Porter	Point	30301521		0.00
Porter	Point	30301522	0.38	0.00
Porter	Point	30301532	0.10	0.06
Porter	Point	30301573		0.29
Porter	Point	30301574		0.01
Porter	Point	30301599	0.33	0.20
Porter	Point	30390001	0.00	0.00
Porter	Point	30390002	0.00	0.00
Porter	Point	30390003	2.96	0.10
Porter	Point	30390004	1.10	0.01

County	Source Category	SCC	NO_x	VOCs
Porter	Point	30390024	4.04	
Porter	Point	30400768	0.00	0.00
Porter	Point	30599999	0.00	0.00
Porter	Point	30600602		0.00
Porter	Point	30799998		0.16
Porter	Point	39000699	0.21	0.01
Porter	Point	39999999	0.01	
Porter	Point	40201001	0.02	0.00
Porter	Point	40201726		0.00
Porter	Point	40201801		0.00
Porter	Point	40201805		0.00
Porter	Point	40201806		0.00
Porter	Point	40201899		0.11
Porter	Point	40290013	0.01	0.00
Porter	Point	40299998		0.17
Porter	Point	40400301		0.00
Porter	Point	40400302		0.00
Porter	Point	40500309		
Porter	Point	40600140		0.00
Porter	Point	49099998		0.00

Table 3.6: Lake County (Partial) and Porter County (Partial) Point Source NO_x and VOC Emissions, Tons per Year and Tons per Ozone Season Day, 2017

County	Agency Facility ID	Site Name	NO_x (tons per year)	VOCs (tons per year)	NO_x (tons per ozone season day)	VOCs (tons per ozone season day)
Lake		COLEHOUR	26.41	1.73	0.07	0.00
Lake		COMMUNITY HOSPITAL	0.01	0.01	0.00	0.00
Lake		EAST CHICAGO	18.12	1.19	0.05	0.00
Lake		ESCC	0.01	0.01	0.00	0.00
Lake		Gary/Chicago	12.32	6.87	0.04	0.02
Lake		GIBSON	1.44	0.09	0.00	0.00
Lake		Griffith-Merrillville	1.20	2.59	0.00	0.01
Lake		HOBART SKY RANCH	0.16	0.35	0.00	0.00
Lake		HORSESHOE CASINO	0.01	0.01	0.00	0.00
Lake		IVANHOE	4.79	0.31	0.01	0.00
Lake		JOHNSONS STRAWBERRY FARM	0.00	0.01	0.00	0.00
Lake		KIRK	204.22	13.39	0.55	0.04
Lake		NIPSCO SOUTHLAKE COMPLEX	0.01	0.01	0.00	0.00
Lake		NORTHWEST FAMILY HOSP	0.01	0.01	0.00	0.00
Lake		POLICE	0.01	0.01	0.00	0.00
Lake		ST MARGARET MERCY	0.01	0.01	0.00	0.00
Lake		ST MARGARET MERCY HOSPITAL	0.01	0.01	0.00	0.00
Lake		ST MARY MEDICAL CENTER	0.01	0.01	0.00	0.00
Lake	00003	BP Products North America Inc Whiting R	1439.96	659.08	3.81	1.78
Lake	00006	Albanese Confectionery Group Inc	4.55	68.81	0.01	0.19
Lake	00062	CCL Design		0.57		0.00
Lake	00072	Marathon Pipe Line, LLC		50.64		0.14
Lake	00081	Enbridge Energy Limited Partnership Ha		23.98		0.07
Lake	00112	CARMEUSE LIME INC	888.73	5.15	2.42	0.01
Lake	00118	ArcelorMittal Plate, LLC (Gary Plate)	8.89	0.99	0.02	0.00
Lake	00121	US STEEL GARY WORKS	3089.13	226.25	8.42	0.62
Lake	00133	South Shore Slag LLC contractor of USS	3.79	0.31	0.01	0.00
Lake	00161	Industrial Steel Construction Inc		24.33		0.07

County	Agency Facility ID	Site Name	NO_x (tons per year)	VOCs (tons per year)	NO_x (tons per ozone season day)	VOCs (tons per ozone season day)
Lake	00171	Oil Technology Inc contractor of USS Ga		1.02		0.00
Lake	00172	USS Central Teaming Company Inc	1.57	0.13	0.00	0.00
Lake	00173	Mid Continent Coal & Coke contractor of	0.00	0.00	0.00	0.00
Lake	00174	Tube City IMS LLC contractor of USS Gar	0.19	0.01	0.00	0.00
Lake	00176	USS BRANDENBURG INDUSTRIAL SERVICE CO	0.00	1.65	0.00	0.00
Lake	00201	JUPITER ALUMINUM CORPORATION	24.50	86.99	0.06	0.24
Lake	00202	Silgan Containers Manufacturing Corpora	5.53	23.91	0.02	0.07
Lake	00203	CARGILL INC	71.25	47.83	0.19	0.13
Lake	00204	Armsted Rail Company Inc	38.08	5.08	0.10	0.01
Lake	00209	Premcor Pipeline Company		15.20		0.04
Lake	00214	EXPLORER PIPELINE COMP		94.55		0.26
Lake	00220	Niagara LaSalle Corporation	11.69	2.19	0.03	0.01
Lake	00227	DOVER CHEMICAL HAMMOND WORKS	8.21	8.70	0.02	0.02
Lake	00228	Huhtamaki Inc.	13.29	64.20	0.04	0.17
Lake	00230	WOLF LAKE TERMINALS INC	25.42	4.57	0.07	0.01
Lake	00231	MPLX Terminals LLC	0.00	56.94	0.00	0.16
Lake	00233	ExxonMobil Pipeline Company		34.58		0.09
Lake	00239	Buckeye Terminals LLC	0.30	58.31	0.00	0.16
Lake	00242	Eco Services Operations Corp	29.07	8.98	0.08	0.02
Lake	00291	Buckeye Terminals, LLC., Hartsdale Stat	0.00	24.72	0.00	0.07
Lake	00300	US STEEL EAST CHICAGO	24.06	0.74	0.07	0.00
Lake	00301	Safety Kleen Oil Recovery Company Incor	87.27	6.85	0.23	0.02
Lake	00307	CITGO East Chicago Terminal		190.93		0.52
Lake	00310	W.R. Grace & Co. - Conn.	193.68	1.31	0.52	0.00
Lake	00316	ARCELORMITTAL USA LLC	2868.45	829.38	7.81	2.25
Lake	00318	ArcelorMittal USA LLC	1056.28	103.93	2.88	0.28
Lake	00320	BUCKEYE TERMINALS LLC East Chicago Term	3.47	82.86	0.01	0.23
Lake	00345	Tradebe Treatment and Recycling LLC	11.80	48.63	0.03	0.13

County	Agency Facility ID	Site Name	NO_x (tons per year)	VOCs (tons per year)	NO_x (tons per ozone season day)	VOCs (tons per ozone season day)
Lake	00356	Beemsterboer Slag Corp contractor of Ar	20.32	1.19	0.06	0.00
Lake	00358	Harsco Metals Americas - contractor of	3.89	3.48	0.01	0.01
Lake	00369	Oil Technology Incorporated - contracto		0.71		0.00
Lake	00375	Oil Technology Inc - contractor of Acel		3.60		0.01
Lake	00382	Indiana Harbor Coke Company LP contract	713.74	1.40	1.94	0.00
Lake	00384	NATIONAL PROCESSING COMPANY		1.49		0.00
Lake	00435	PRAXAIR INC	63.45	4.94	0.17	0.01
Lake	00448	Ironside Energy LLC contractor of Acelo	17.35	14.44	0.05	0.04
Lake	00449	Whiting Clean Energy Inc	84.80	25.80	0.25	0.08
Lake	00458	Holcim US Incorporated	9.28	0.90	0.03	0.00
Lake	00465	Fritz Enterprises, Inc. - contractor of	17.74	1.42	0.05	0.00
Lake	00497	Enbridge Energy Limited Partnership Gr		46.90		0.13
Lake	00505	AKJ Industries Inc contractor of USS Ga		0.38		0.00
Lake	00537	Beemsterboer Slag Corporation A Contrac	0.00	0.00	0.00	0.00
Lake	00538	Phoenix Services LLC A Contractor of Ar	0.11	0.01	0.00	0.00
Lake	00578	Fritz Enterprises Incorporated	10.31	0.83	0.03	0.00
Lake	05057	MID CONTINENT COAL & COKE COMPANY	3.97	0.32	0.01	0.00
Porter		BODIN	0.00	0.00	0.00	0.00
Porter		BURNS HARBOR	66.01	4.32	0.18	0.01
Porter		BURNS INTL HARBOR	0.01	0.01	0.00	0.00
Porter		CARLSON FARM	0.00	0.01	0.00	0.00
Porter		FLYING M	0.00	0.00	0.00	0.00
Porter		MIDWEST STEEL	0.01	0.01	0.00	0.00
Porter		PORTAGE COMMUNITY HOSPITAL	0.01	0.01	0.00	0.00
Porter		Porter County Muni	6.50	7.38	0.02	0.02
Porter		PORTER MEMORIAL HOSPITAL	0.01	0.01	0.00	0.00
Porter		WYCKOFF AIRSTRIP	0.00	0.01	0.00	0.00
Porter	00001	ArcelorMittal Burns Harbor LLC	9000.89	500.58	24.39	1.36

County	Agency Facility ID	Site Name	NO_x (tons per year)	VOCs (tons per year)	NO_x (tons per ozone season day)	VOCs (tons per ozone season day)
Porter	00002	Northern Indiana Public Service Company	1169.39	41.69	3.22	0.11
Porter	00005	PRECOAT METALS DIVISION SEQUA COATINGS	10.12	43.71	0.03	0.12
Porter	00009	U S STEEL MIDWEST PLANT	73.94	2.42	0.20	0.01
Porter	00021	Powder Processing Technology LLC	7.37	0.24	0.02	0.00
Porter	00024	Calumite Company LLC contractor of Arce	0.32	0.02	0.00	0.00
Porter	00026	Metal Services LLC dba Phoenix Services	0.86	0.07	0.00	0.00
Porter	00030	Ardagh Metal Beverage USA Incorporated		61.60		0.17
Porter	00036	NLMK Indiana	60.66	27.67	0.16	0.08
Porter	00039	PVS Steel Services Inc	10.40	0.57	0.03	0.00
Porter	00067	PORTSIDE ENERGY LLC	93.50	4.50	0.27	0.01
Porter	00074	Oil Technology Inc contractor of Arcelo		0.56		0.00
Porter	00076	SMS Mill Services LLC contractor of Ace	0.00	0.05	0.00	0.00
Porter	00085	PVS Steel Services Inc	21.25	1.17	0.06	0.00
Porter	00094	Jet Corr Inc/Pratt Paper (IN) LLC	20.80	65.47	0.06	0.17
Porter	00098	Indiana Flame Service - contractor of A	1.18	0.06	0.00	0.00
Porter	00104	Tube City IMS LLC contractor of NLMK In	0.02	0.00	0.00	0.00
Porter	00108	Mid Continent Coal & Coke contractor of	0.00	0.00	0.00	0.00
Porter	00116	Beemsterboer Slag Corporation a Contrac	2.43	0.20	0.01	0.00
Porter	00117	Mid Continent Coal and Coke a Contracto	4.10	0.33	0.01	0.00
Porter	00118	PSC Metals Inc - Contractor of ArcelorM	0.00	0.00	0.00	0.00
Porter	00123	Fritz Enterprises Incorporated	12.84	1.02	0.03	0.00

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Attachment E

Certification of Nonattainment New Source Review (NNSR) for Ozone

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Certification of Indiana's Moderate Nonattainment New Source Review (NNSR) Plan for the 2015 8-Hour Ozone National Ambient Air Quality Standard (NAAQS)

Pursuant to the requirements of Title 40, Part 51.165 in the Code of Federal Regulations (40 CFR 51.165) and Section 172(c)(5) of the Clean Air Act (CAA), Indiana has thoroughly reviewed its nonattainment new source review (NNSR) rules and certifies that they are at least as stringent as the NNSR state implementation plan (SIP) requirements of 40 CFR 51.165 as amended by the rule, *Implementation of the 2015 National Ambient Air Quality Standards (NAAQS) for Ozone: State Implementation Plan Requirements* (83 FR 62998, December 6, 2018) (referred to hereafter as the 2015 ozone implementation rule).

Indiana's nonattainment new source review (NNSR) rules are established in Title 326 of the Indiana Administrative Code, Article 2, Rule 3 (326 IAC 2-3) and have been fully approved by United States Environmental Protection Agency (U.S. EPA) as part of Indiana's SIP following all requirements for public participation. U.S. EPA approved the initial rules (94 FR 24837, October 7, 1994).[1] U.S. EPA approved amendments affecting 326 IAC 2-3-1, 326 IAC 2-3-2, and 326 IAC 2-3-3 to comply with federal rules for NSR Reform (67 FR 80186, December 31, 2002) (76 FR 40242, July 8, 2011) [2], which have not been subsequently amended. Table 1 provides a summary of the requirements in 40 CFR 51.165 and Indiana's applicable rules at 326 IAC 2-3. Complete rules are contained in Indiana's air permit rules at 326 IAC 2. The rules can be viewed in their entirety online at: http://iac.iga.in.gov/iac//iac_title?iact=326.

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[1] https://www.gpo.gov/fdsys/pkg/FR-1994-10-07/html/94-24837.htm.
[2] https://www.gpo.gov/fdsys/pkg/FR-2011-07-08/pdf/2011-17036.pdf.

Table 1: 40 CFR 51.165 Requirements and Applicable NNSR Rules at 326 IAC 2-3

<table>
<tr><th>40 CFR 51.165</th><th>Applicable Indiana Regulation: 326 IAC 2-3</th><th>FR Approval of Indiana Regulation</th></tr>
<tr><td>1. (a)(1)(iv)(A)(1)(i)-(iv) and (2): Major source thresholds for ozone – VOC and NO_x.

Note: Indiana has never had a nonattainment area classified as Extreme for ground-level ozone. Therefore, (a)(1)(iv)(A)(1)(iv) and 2(vi) do not apply in Indiana.</td><td>326 IAC 2-3-1(z)(1) and (2) p.70</td><td rowspan="3">94 FR 24837
Approved: 8/25/1994,
Published: 10/7/1994,
Effective: 12/6/1994
And
76 FR 40242
Approved: 6/28/2011,
Published: 7/8/2011,
Effective: 9/6/2011</td></tr>
<tr><td>2. (a)(1)(iv)(A)(3): Change constitutes a major source by itself.</td><td>326 IAC 2-3-1(z)(5) p.71</td></tr>
<tr><td>3. (a)(1)(v)(E): Significant net emissions increase of NO_x is significant for ozone.</td><td>326 IAC 2-3-1(y)(1) p.70</td></tr>
<tr><td>4. (a)(1)(v)(F): Any emissions change of VOC in Extreme area triggers NNSR.</td><td>Indiana has never had a nonattainment area classified as Extreme for ground-level ozone.</td><td>N/A</td></tr>
<tr><td>5. (a)(1)(x)(A)-(C) and (E): Significant emissions rates for VOC and NO_x as ozone precursors.

Note: Indiana has never had a nonattainment area classified as Extreme for ground-level ozone. Therefore, (a)(1)(x)(E) does not apply in Indiana.</td><td>326 IAC 2-3-1(pp) p.73</td><td>94 FR 24837
Approved: 8/25/1994,
Published: 10/7/1994,
Effective: 12/6/1994
And
76 FR 40242
Approved: 6/28/2011,
Published: 7/8/2011,
Effective: 9/6/2011</td></tr>
<tr><td>6. (a)(3)(ii)(C)(1)-(2): Provisions for emissions reduction credits.</td><td>326 IAC 2-3-3(b)(5) p.78</td><td>94 FR 24837
Approved: 8/25/1994,
Published: 10/7/1994,
Effective: 12/6/1994</td></tr>
</table>

<table>
<tr><th>40 CFR 51.165</th><th>Applicable Indiana Regulation: 326 IAC 2-3</th><th>FR Approval of Indiana Regulation</th></tr>
<tr><td>7. (a)(8): Requirements for VOC apply to NO_x as ozone precursors.</td><td>326 IAC 2-3-1(y) p.70
326 IAC 2-3-2(a) and (b) p.74</td><td rowspan="2">94 FR 24837
Approved: 8/25/1994,
Published: 10/7/1994,
Effective: 12/6/1994
And
76 FR 40242
Approved: 6/28/2011,
Published: 7/8/2011,
Effective: 9/6/2011</td></tr>
<tr><td>8. (a)(9)(i)-(iii): Offset ratios for VOC and NO_x for ozone nonattainment areas.

Note: Subparagraphs (a)(9)(i)-(iii) were changed to (a)(9)(ii)-(iv) when U.S. EPA added new subparagraph (a)(9)(i) under the 2008 $PM_{2.5}$ NSR Implementation Rule).</td><td>326 IAC 2-3-3(a)(5)(B) p.78</td></tr>
<tr><td colspan="3">9. a(12): Anti-backsliding provision(s), where applicable.

40 CFR 51.165(a)(12) requires anti-backsliding requirements at 40 CFR 51.1105 to apply in any area designated nonattainment for the 2008 ozone NAAQS and designated nonattainment for the 1997 ozone NAAQS. Effective April 6, 2015, U.S. EPA revoked the 1997 8-hour ozone standard (80 FR 12264, March 6, 2015). There were no remaining nonattainment areas in Indiana under the standard at that time. Therefore, anti-backsliding requirements do not apply to Indiana for the 1997 8-hour ozone standard.

In accordance with the 2015 ozone implementation rule, U.S. EPA intends to address any revocation of the 2008 8-hour ozone NAAQS, and any potential anti-backsliding requirements in a separate future rulemaking, which has yet to occur.

Indiana's nonattainment NSR rules, codified at 326 IAC 2-3, remain consistent with federal ozone nonattainment NSR rules codified at 40 CFR 51.165 and CAA sections 172(c)(5), 173, 110(a)(2), 182(a)(4), 182(b)(5), and 182(c)(6), (7), (8), and (10). For a list of areas in Indiana that were designated nonattainment under the 1997 and 2008 8-hour ozone NAAQS and dates associated with these classifications, please visit the Indiana Department of Environmental Management’s (IDEM’s) website: IDEM: State Implementation Plans: Nonattainment Status for Indiana’s Counties</td></tr>
</table>

Based on a review of requirements in Indiana’s rules at 326 IAC 2-3 and requirements of 40 CFR 51.165, Indiana’s long standing and fully implemented NNSR program meets requirements for the implementation of the 2015 8-hour ozone NAAQS. As such, IDEM certifies that state rules at 326 IAC 2-3 comply with NNSR SIP requirements in 40 CFR 51.165 and requests U.S. EPA’s review and approval of this NNSR plan as an amendment to Indiana’s SIP.

Attachment F

Enhanced Vehicle Emissions Inspection and Maintenance (I/M) Testing Program Assessment

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Enhanced Vehicle Emissions Inspection and Maintenance (I/M) Testing Program Assessment for the Indiana Portion of the Chicago, Illinois-Indiana-Wisconsin (IL-IN-WI), 2015 8-Hour Nonattainment Area

Background

Indiana's I/M testing program was first initiated in Lake and Porter counties in 1984 and was augmented in 1997 to a fully enhanced I/M program. The program received final approval from United States Environmental Protection Agency (U.S. EPA) and became effective on May 20, 1996, as part of Indiana's 1-hour ozone state implementation plan (SIP). The program is authorized by state statute Indiana Code 13-17-5, paid through the general funds, and implemented through rules promulgated by the Indiana Environmental Rules Board at 326 Indiana Administrative Code 13.

Although the 1-hour ozone standard was revoked on June 15, 2005, Indiana has not requested U.S. EPA to approve a revision to its SIP to discontinue the I/M program. The requirements for the I/M program in Lake and Porter counties remain in place in Indiana's ozone SIP.

Introduction

This document provides a mobile source emissions modeling demonstration that Indiana's enhanced I/M testing program in Lake and Porter counties, Indiana meets the requirements of U.S. EPA's *enhanced performance standard for areas designated and classified under the 8-hour ozone standard*, as specified in 40 Code of Federal Regulation (CFR) 51.351(i). This section of the CFR specifies a model program which is to be compared by emissions modeling with the state I/M testing program being assessed. The requirements for the program being assessed are specified in 40 CFR 51.351(i)(13), as follows:

"*Evaluation Date*. Enhanced I/M program areas subject to the provisions of this paragraph (i) shall be shown to obtain the same or lower emission levels for HC (hydrocarbon) and NO_x (oxides of nitrogen) as the model program described in this paragraph assuming an evaluation data set 6 years after the effective date of designation and classification under the 8-hour ozone standard (rounded to the nearest July) to within ±0.02 gpm (grams per mile). Subject programs shall demonstrate through modeling the ability to maintain this percent level of emission reduction (or better) through their applicable attainment date for the 8-hour ozone standard, also rounded to the nearest July."

Since U.S. EPA reclassified Lake (partial) and Porter (partial) counties as "moderate" nonattainment for the 2015 8-hour ozone National Ambient Air Quality Standards (NAAQS) on October 7, 2022, effective November 7, 2022, the evaluation date under 40 CFR 51.352(e)(13) is the attainment date (i.e., August 3, 2024). Since the attainment date is in the middle of the ozone monitoring season, the monitoring season where attainment must be demonstrated is the year before rounded to the nearest July (i.e., July 2023). Additional years do not need to be modeled under 40 CFR 51.352(e)(13).

1. Description of the Modeling Demonstration

The Northwest Indiana Regional Planning Commission (NIRPC) conducted this modeling demonstration on behalf of the Indiana Department of Environmental Management (IDEM) using U.S. EPA's Motor Vehicle Emission Simulator (MOVES3.1) software program. This modeling was conducted in accordance with the following U.S. EPA technical guidance:

Performance Standard Modeling for New and Existing Vehicle Inspection and Maintenance (I/M) Programs Using the MOVES Mobile Source Emissions Model, EPA-420-B-22-034, October 2022.

The compliance demonstration involves a comparison of emissions reductions from U.S EPA's model program specified in 40 CFR 51.351(i) and the actual I/M program in Lake and Porter counties, as it is approved into Indiana's SIP. Three separate MOVES3.1 runs were conducted to support this demonstration:

1 - 2023 with no I/M parameters
2 - 2023 with I/M parameters for U.S. EPA's model program
3 - 2023 with Indiana SIP-approved I/M parameters.

The focal point of this demonstration is on the difference between runs 2 and 3. If the results of these two runs are within 0.02 gpm of each other for both NO_x and HC, Indiana's SIP-approved I/M program demonstrates equivalency to U.S. EPA's performance standards for an enhanced I/M program, thus supporting Indiana's Section 182(b)(4) certification.

The following tables summarize the MOVES3.1 modeling assumptions.

Table 1: Assumptions, other than I/M Program Parameters, Associated with MOVES3.1 I/M Performance Standard Modeling

Calendar Year	2023
Month	July
Day Type	Weekday
Age Distribution	2022 Indiana BMV for motorcycles, passenger cars, passenger trucks, and light commercial trucks, MOVES default for all others
Vehicle Miles of Travel	2022 INDOT traffic count data (HPMS and other)
Vehicle Population	NIRPC long-range plan socio-economic forecast
Fuel Inputs	MOVES3.1 default for reformulated gasoline

Road Type Distribution	2022 HPMS
Average Speed Distribution	2022 HPMS
Daily Temperature Range	62.5 to 83.4 °F
Daily Humidity Range	50.9% to 100%

Table 2: I/M Program Parameters Associated with MOVES3.1 I/M Performance Standard Modeling

Category	I/M Program		
	Enhanced I/M Performance Standard	Indiana <u>NO</u> I/M Program	Indiana <u>WITH</u> I/M Program
Evaluation Date	July 2023	N/A	July 2023
Test Type		N/A	
Unloaded Idle Test	MYs 1968 to 2000	N/A	MYs 1976 to 1995
Evaporative System OBD Check	MYs 2001 to 2023	N/A	MYs 1996 to 2019
Exhaust OBD Check	MYs 2001 to 2023	N/A	MYs 1996 to 2019
Test Frequency	Annual	N/A	Biennial
Fuel Types Tested for: Passenger Cars Passenger Trucks Light Commercial Trucks	Gasoline and E-85	N/A	Gasoline and E-85
Waiver Rate	3.00%	N/A	
Compliance Rate	96.0%	N/A	95.0%
Failure Rate	4.21%	N/A	5.00%
Maximum GVWR Tested for MYs 2006 and Older	8,500 pounds	N/A	
Maximum GVWR Tested for MYs 2007 and Newer	8,500 pounds	N/A	

2. Modeling Results

Tables 3 and 4 provide a summary of the modeling results showing NO_x and HC emission rates by vehicle type for Lake and Porter counties. The results verify that NO_x and HC emissions reductions from Indiana's SIP-approved I/M program are within the 0.02 gpm buffer of the emission reductions from U.S EPA's model program under 40 CFR 51.351(i). The difference between the two scenarios are: 0.0023 gpm for NO_x, and 0.00020 gpm for HC. Therefore, Indiana's current I/M program in Lake and Porter counties meets the applicable enhanced I/M performance requirements in 40 CFR 51.3.

Table 3: Modeling Results for NO_x

Vehicle Type	Enhanced I/M Base	Indiana I/M SIP-Approved
Motorcycle	0.007043695	0.007043695
Passenger Car	0.016672614	0.015683645
Passenger Truck	0.011592208	0.011258401
Light Commercial Truck	0.016474033	0.015495202
Intercity Bus	0.002110415	0.002110415
Transit Bus	0.000970461	0.000970461
School Bus	0.008428039	0.00842804
Refuse Truck	0.000401648	0.000401648
Single Unit Short-haul Truck	0.008336651	0.008336651
Single Unit Long-haul Truck	0.000815078	0.000815078
Motor Home	0.002571216	0.002571216
Combination Short-haul Truck	0.041015701	0.041015701
Combination Long-haul Truck	0.051032956	0.051032956
Lake and Porter Avg Emission Rate	0.167464716	0.165163109
Difference		0.002301607

Table 4: Modeling Results for HC

Vehicle Type	Enhanced I/M Base	Indiana I/M SIP-Approved
Motorcycle	0.007343138	0.007343138
Passenger Car	0.006941115	0.006883597
Passenger Truck	0.002834214	0.002811025
Light Commercial Truck	0.002293729	0.002173186
Intercity Bus	5.29942E-05	5.29942E-05
Transit Bus	2.17882E-05	2.17882E-05
School Bus	0.000243726	0.000243726
Refuse Truck	6.07289E-06	6.07289E-06
Single Unit Short-haul Truck	0.000218506	0.000218506
Single Unit Long-haul Truck	1.59168E-05	1.59168E-05
Motor Home	0.000155656	0.000155656
Combination Short-haul Truck	0.000437356	0.000437356
Combination Long-haul Truck	0.000910979	0.000910979

Lake and Porter Avg Emission Rate	0.021475192	0.021273943
Difference		0.00020125

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Attachment G

Certificate of Indiana's Emissions Reporting Rule 326 IAC 2-6, for the 2015 8-Hour Ozone National Ambient Air Quality Standard (NAAQS)

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Indiana’s Emission Reporting Rule

This submittal is intended to fulfill the annual emissions statement State Implementation Plan (SIP) requirement under Section 182(a)(3)(B) of the federal Clean Air Act (CAA) for the 2015 8-hour ozone National Ambient Air Quality Standard (NAAQS).

Under Section 182(a)(3)(B) of the CAA, states must submit SIP revisions for nonattainment areas classified as marginal and above requiring that the owner or operator of each stationary source of oxides of nitrogen (NO_x) or volatile organic compounds (VOCs) “provide the State with a statement, in such form as the Administrator may prescribe (or accept an equivalent alternative developed by the State), for classes or categories of sources, showing the actual emissions of oxides of nitrogen and volatile organic compounds from that source. The first such statement shall be submitted within 3 years after November 15, 1990. Subsequent statements shall be submitted at least every year thereafter. The statement shall contain a certification that the information contained in the statement is accurate to the best knowledge of the individual certifying the statement.”[1]

Under Section 107(d)(1)(B) of the CAA, on October 7, 2022, (87FR 60897), United States Environmental Protection Agency (U.S. EPA) reclassified Calumet, Hobart, North, Ross, and, Saint John townships in Lake County and Center, Jackson, Liberty, Pine, Portage, Union, Washington, and Westchester townships in Porter County as moderate nonattainment for the 2015 8-hour ozone NAAQS and as a portion of the Chicago, Illinois-Indiana-Wisconsin nonattainment area (40 Code of Federal Regulation 81.315). Under Section 182(a)(3)(B) of the CAA, and as a prerequisite for redesignation of a nonattainment area to attainment, each state with an ozone nonattainment area is required to revise its SIP with an annual emissions statement. This statement is to include a requirement that the owner or operator of each stationary source of NO_x or VOCs provide the state with a statement showing actual emissions of NO_x and VOCs from the source.

Indiana has a long-standing Emissions Reporting Rule at 326 Indiana Administrative Code (IAC) 2-6. U.S. EPA initially determined that 326 IAC 2-6 satisfied CAA requirements and approved it into Indiana’s SIP (59 FR 29953, June 10, 1994). Since then, Indiana has continued to satisfy CAA Section 182(a)(3)(B) requirements by appropriately applying 326 IAC 2-6 to affected ozone nonattainment areas.

Indiana’s current Emissions Reporting Rule requires sources located in Lake and Porter counties that emit either NO_x or VOCs equal to or greater than 25 tons per year to annually report their actual emissions to the Indiana Department of Environmental Management. As such, the current Emissions Reporting Rule, 326 IAC 2-6 satisfies Indiana’s obligation under Section 182(a)(3)(B) of the CAA for the portions of Lake and Porter counties classified as moderate under the 2015 8-hour ozone NAAQS.

[1] https://www.govinfo.gov/content/pkg/USCODE-2013-title42/html/USCODE-2013-title42-chap85-subchapI-partD-subpart2-sec7511a.htm.

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Attachment H

EJ Screen Reporting Results

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Table: 9.1 Results of EJ Screen Reports

	Lake/Porter Partial	Lake – IITRI (5 km)	Porter – Ogden Dunes (5 km)
EJ Indexes:			
EJ Index for Particulate Matter 2.5	78	94	74
EJ Index for Ozone	75	93	77
EJ Index for Diesel Particulate Matter	74	92	69
EJ Index for Air Toxics Cancer Risk	61	88	67
EJ Index for Air Toxics Respiratory HI	57	78	52
EJ Index for Traffic Proximity	68	86	57
EJ Index for Lead Paint	76	96	74
EJ Index for Superfund Proximity	79	95	68
EJ Index for RMP Facility Proximity	71	91	62
EJ Index for Hazardous Waste Proximity	71	77	61
EJ Index for Underground Storage Tanks	73	88	68
EJ Index for Wastewater Discharge	65	93	66
Environmental Indicators:			
Particulate Matter 2.5 (μg/m^3)	78	78	70
Ozone (ppb)	65	67	69
Diesel Particulate Matter* (μg/m3)	70-80th	70-80th	60-70th
Air Toxics Cancer Risk (lifetime risk per million)	60-70th	70-80th	80-90th
Air Toxics Respiratory HI*	50-60th	50-60th	<50th
Traffic Proximity (daily traffic count/distance to road)	75	76	64
Lead Paint (% Pre-1960 Housing)	66	82	64
Superfund Proximity (site count/km distance)	92	81	53
RMP Facility Proximity (facility count/km distance)	78	81	55
Hazardous Waste Proximity (facility count/km distance)	74	43	65
Underground Storage Tanks (county/km 2)	79	80	72
Wastewater Discharge (toxicity-weighted concentration/m distance	85	81	81
Demographic Indicators:			
Demographic Index	62	92	61
People of Color	62	87	60
Low Income	57	89	60
Unemployment Rate	70	87	80
Limited English Speaking Households	63	0	0
Less Than High School Education	58	71	52
Under Age 5	58	69	55
Over Age 64	54	63	56

Yellow highlighted cells indicate criteria above national average (>50th percentile)
Red Highlighted cells indicate criteria above EJ Screen Screening Criteria (>80th percentile)

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EJScreen Report (Version 2.1)

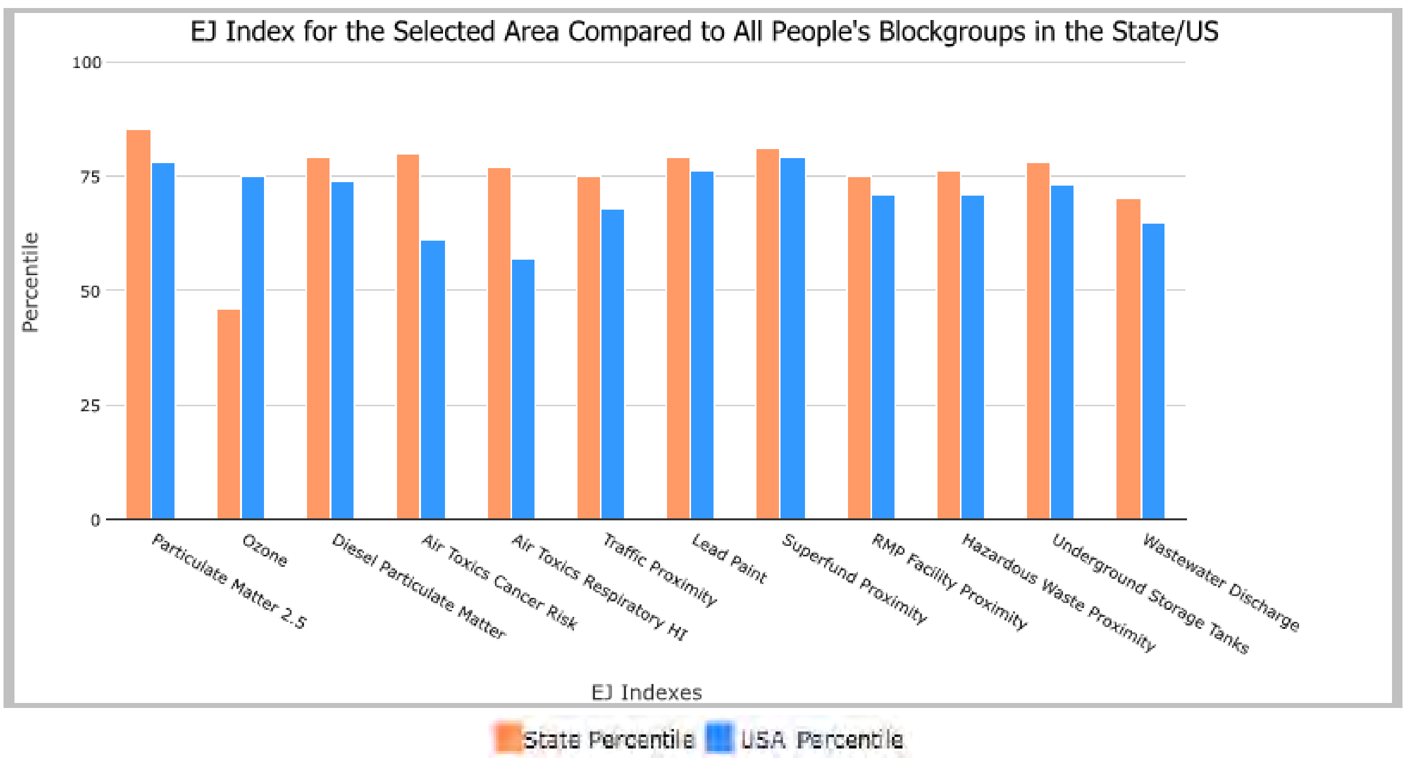
the User Specified Area, INDIANA, EPA Region 5

Approximate Population: 552,523

Input Area (sq. miles): 466.62

Lake & Porter County EJ Report (The study area contains 2 blockgroup(s) with zero population.)

Selected Variables	State Percentile	USA Percentile
Environmental Justice Indexes		
EJ Index for Particulate Matter 2.5	85	78
EJ Index for Ozone	46	75
EJ Index for Diesel Particulate Matter*	79	74
EJ Index for Air Toxics Cancer Risk*	80	61
EJ Index for Air Toxics Respiratory HI*	77	57
EJ Index for Traffic Proximity	75	68
EJ Index for Lead Paint	79	76
EJ Index for Superfund Proximity	81	79
EJ Index for RMP Facility Proximity	75	71
EJ Index for Hazardous Waste Proximity	76	71
EJ Index for Underground Storage Tanks	78	73
EJ Index for Wastewater Discharge	70	65



This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

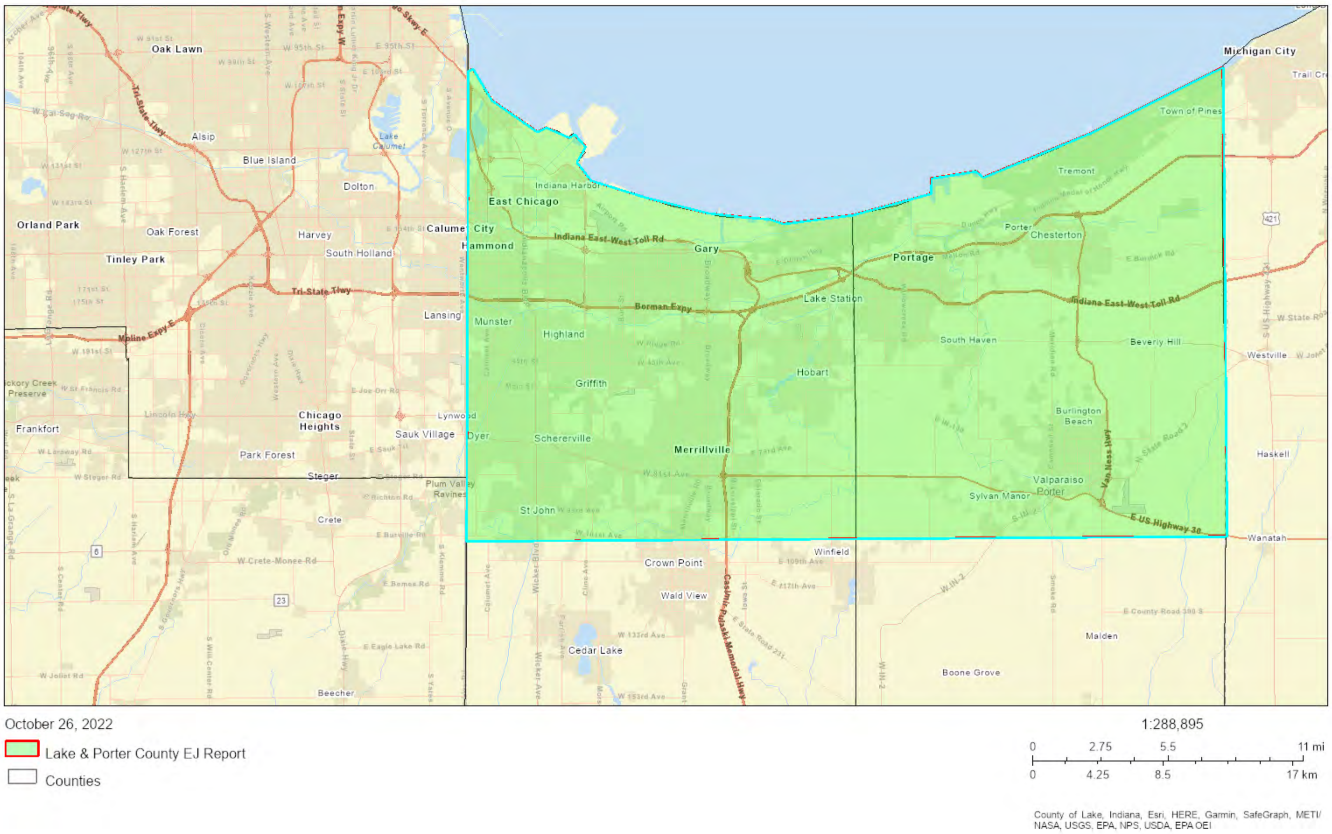
EJScreen Report (Version 2.1)

the User Specified Area, INDIANA, EPA Region 5

Approximate Population: 552,523

Input Area (sq. miles): 466.62

Lake & Porter County EJ Report (The study area contains 2 blockgroup(s) with zero population.)



Sites reporting to EPA	
Superfund NPL	7
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	65

EJScreen Report (Version 2.1)

the User Specified Area, INDIANA, EPA Region 5

Approximate Population: 552,523

Input Area (sq. miles): 466.62

Lake & Porter County EJ Report (The study area contains 2 blockgroup(s) with zero population.)

Selected Variables	Value	State Avg.	%ile in State	USA Avg.	%ile in USA
Pollution and Sources					
Particulate Matter 2.5 ($\mu g/m^3$)	9.62	9.19	76	8.67	78
Ozone (ppb)	43.7	44.1	25	42.5	65
Diesel Particulate Matter* ($\mu g/m^3$)	0.349	0.28	71	0.294	70-80th
Air Toxics Cancer Risk* (lifetime risk per million)	26	23	86	28	60-70th
Air Toxics Respiratory HI*	0.32	0.29	88	0.36	50-60th
Traffic Proximity (daily traffic count/distance to road)	710	590	76	760	75
Lead Paint (% Pre-1960 Housing)	0.4	0.33	56	0.27	66
Superfund Proximity (site count/km distance)	0.36	0.17	90	0.13	92
RMP Facility Proximity (facility count/km distance)	1.2	0.92	73	0.77	78
Hazardous Waste Proximity (facility count/km distance)	2.5	1.6	75	2.2	74
Underground Storage Tanks (count/km^2)	5.5	3.2	78	3.9	79
Wastewater Discharge (toxicity-weighted concentration/m distance)	0.1	0.37	82	12	85
Socioeconomic Indicators					
Demographic Index	38%	27%	77	35%	62
People of Color	44%	22%	84	40%	62
Low Income	32%	31%	54	30%	57
Unemployment Rate	7%	5%	73	5%	70
Limited English Speaking Households	2%	2%	80	5%	63
Less Than High School Education	10%	11%	57	12%	58
Under Age 5	6%	6%	54	6%	58
Over Age 64	16%	16%	56	16%	54

*Diesel particular matter, air toxics cancer risk, and air toxics respiratory hazard index are from the EPA's Air Toxics Data Update, which is the Agency's ongoing, comprehensive evaluation of air toxics in the United States. This effort aims to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that the air toxics data presented here provide broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. Cancer risks and hazard indices from the Air Toxics Data Update are reported to one significant figure and any additional significant figures here are due to rounding. More information on the Air Toxics Data Update can be found at: https://www.epa.gov/haps/air-toxics-data-update.

For additional information, see: www.epa.gov/environmentaljustice

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EJScreen Report (Version 2.1)

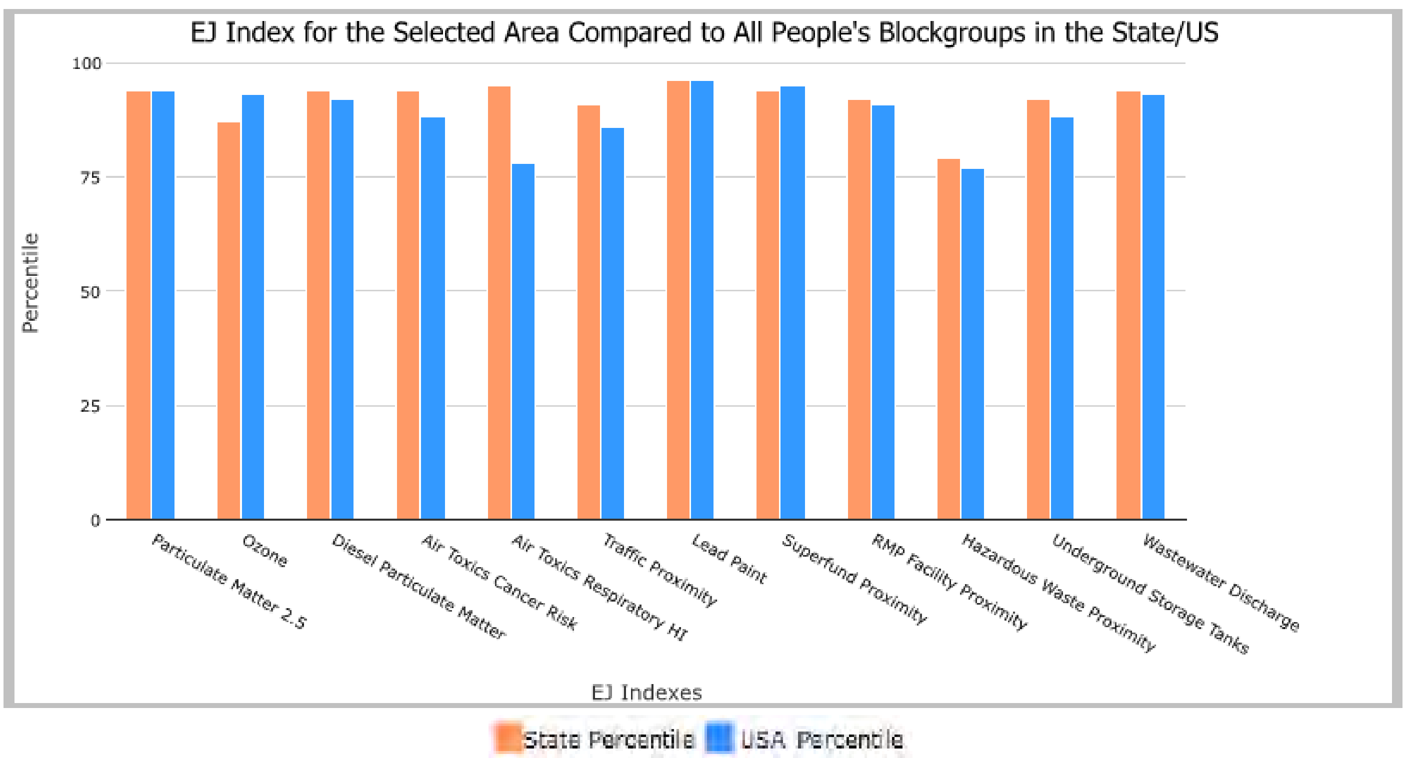
5 kilometers Ring Centered at 41.609722,-87.297999, INDIANA, EPA Region 5

Approximate Population: 25,406

Input Area (sq. miles): 30.32

Gary IITRI Monitor Report

Selected Variables	State Percentile	USA Percentile
Environmental Justice Indexes		
EJ Index for Particulate Matter 2.5	94	94
EJ Index for Ozone	87	93
EJ Index for Diesel Particulate Matter*	94	92
EJ Index for Air Toxics Cancer Risk*	94	88
EJ Index for Air Toxics Respiratory HI*	95	78
EJ Index for Traffic Proximity	91	86
EJ Index for Lead Paint	96	96
EJ Index for Superfund Proximity	94	95
EJ Index for RMP Facility Proximity	92	91
EJ Index for Hazardous Waste Proximity	79	77
EJ Index for Underground Storage Tanks	92	88
EJ Index for Wastewater Discharge	94	93



This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

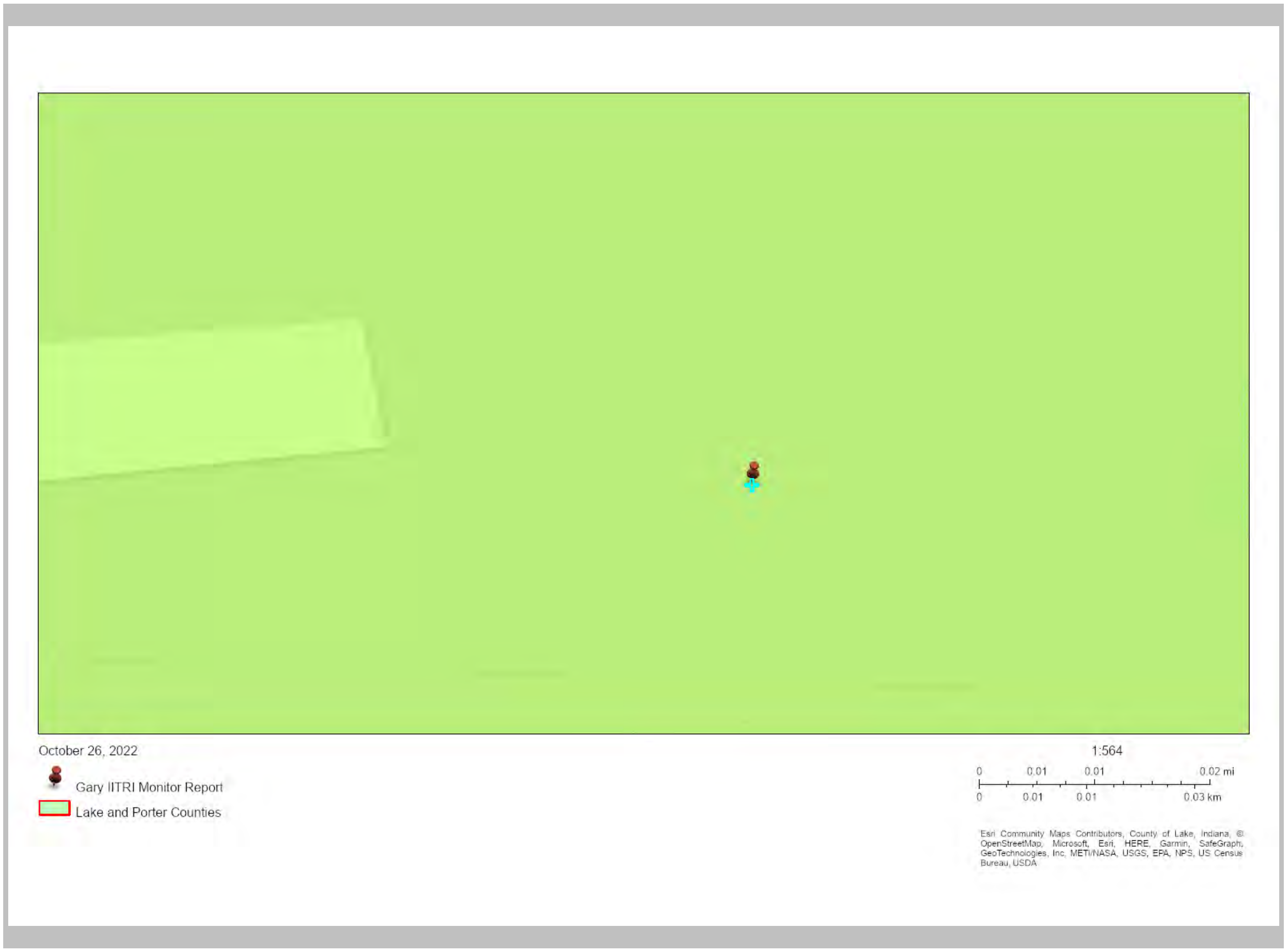
EJScreen Report (Version 2.1)

5 kilometers Ring Centered at 41.609722,-87.297999, INDIANA, EPA Region 5

Approximate Population: 25,406

Input Area (sq. miles): 30.32

Gary IITRI Monitor Report



Sites reporting to EPA	
Superfund NPL	0
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	1

EJScreen Report (Version 2.1)

5 kilometers Ring Centered at 41.609722,-87.297999, INDIANA, EPA Region 5

Approximate Population: 25,406

Input Area (sq. miles): 30.32

Gary IITRI Monitor Report

Selected Variables	Value	State Avg.	%ile in State	USA Avg.	%ile in USA
Pollution and Sources					
Particulate Matter 2.5 ($\mu g/m^3$)	9.59	9.19	74	8.67	78
Ozone (ppb)	43.9	44.1	37	42.5	67
Diesel Particulate Matter* ($\mu g/m^3$)	0.369	0.28	75	0.294	70-80th
Air Toxics Cancer Risk* (lifetime risk per million)	29	23	95	28	70-80th
Air Toxics Respiratory HI*	0.31	0.29	87	0.36	50-60th
Traffic Proximity (daily traffic count/distance to road)	760	590	77	760	76
Lead Paint (% Pre-1960 Housing)	0.64	0.33	77	0.27	82
Superfund Proximity (site count/km distance)	0.17	0.17	75	0.13	81
RMP Facility Proximity (facility count/km distance)	1.3	0.92	77	0.77	81
Hazardous Waste Proximity (facility count/km distance)	0.46	1.6	38	2.2	43
Underground Storage Tanks (count/km^2)	5.8	3.2	80	3.9	80
Wastewater Discharge (toxicity-weighted concentration/m distance)	0.054	0.37	78	12	81
Socioeconomic Indicators					
Demographic Index	74%	27%	96	35%	92
People of Color	86%	22%	95	40%	87
Low Income	62%	31%	89	30%	89
Unemployment Rate	12%	5%	89	5%	87
Limited English Speaking Households	0%	2%	75	5%	0
Less Than High School Education	15%	11%	73	12%	71
Under Age 5	7%	6%	66	6%	69
Over Age 64	19%	16%	65	16%	63

*Diesel particular matter, air toxics cancer risk, and air toxics respiratory hazard index are from the EPA's Air Toxics Data Update, which is the Agency's ongoing, comprehensive evaluation of air toxics in the United States. This effort aims to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that the air toxics data presented here provide broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. Cancer risks and hazard indices from the Air Toxics Data Update are reported to one significant figure and any additional significant figures here are due to rounding. More information on the Air Toxics Data Update can be found at: https://www.epa.gov/haps/air-toxics-data-update.

For additional information, see: www.epa.gov/environmentaljustice

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EJScreen Report (Version 2.1)

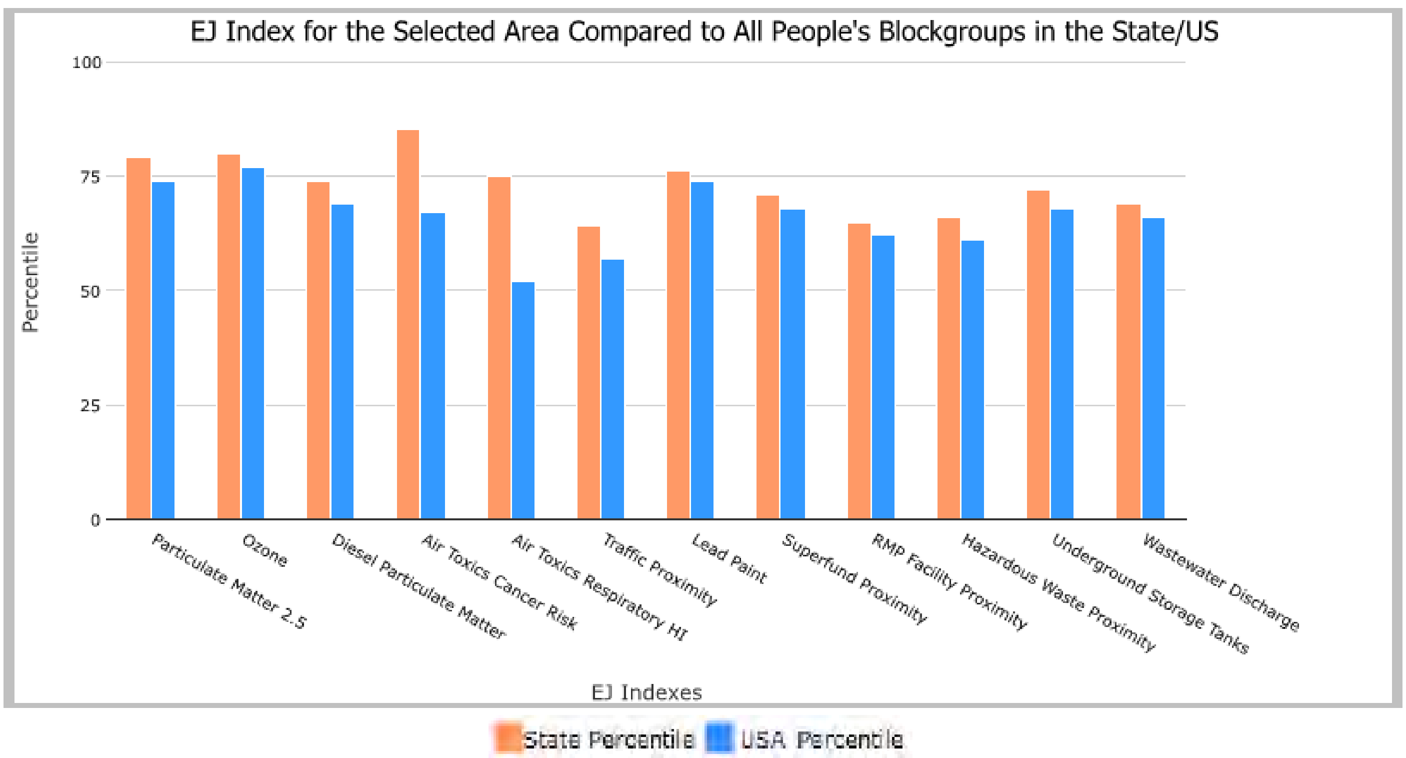
5 kilometers Ring Centered at 41.617568,-87.199121, INDIANA, EPA Region 5

Approximate Population: 20,202

Input Area (sq. miles): 30.32

Ogden Dunes Monitor Report (The study area contains 2 blockgroup(s) with zero population.)

Selected Variables	State Percentile	USA Percentile
Environmental Justice Indexes		
EJ Index for Particulate Matter 2.5	79	74
EJ Index for Ozone	80	77
EJ Index for Diesel Particulate Matter*	74	69
EJ Index for Air Toxics Cancer Risk*	85	67
EJ Index for Air Toxics Respiratory HI*	75	52
EJ Index for Traffic Proximity	64	57
EJ Index for Lead Paint	76	74
EJ Index for Superfund Proximity	71	68
EJ Index for RMP Facility Proximity	65	62
EJ Index for Hazardous Waste Proximity	66	61
EJ Index for Underground Storage Tanks	72	68
EJ Index for Wastewater Discharge	69	66



This report shows the values for environmental and demographic indicators and EJSCREEN indexes. It shows environmental and demographic raw data (e.g., the estimated concentration of ozone in the air), and also shows what percentile each raw data value represents. These percentiles provide perspective on how the selected block group or buffer area compares to the entire state, EPA region, or nation. For example, if a given location is at the 95th percentile nationwide, this means that only 5 percent of the US population has a higher block group value than the average person in the location being analyzed. The years for which the data are available, and the methods used, vary across these indicators. Important caveats and uncertainties apply to this screening-level information, so it is essential to understand the limitations on appropriate interpretations and applications of these indicators. Please see EJSCREEN documentation for discussion of these issues before using reports.

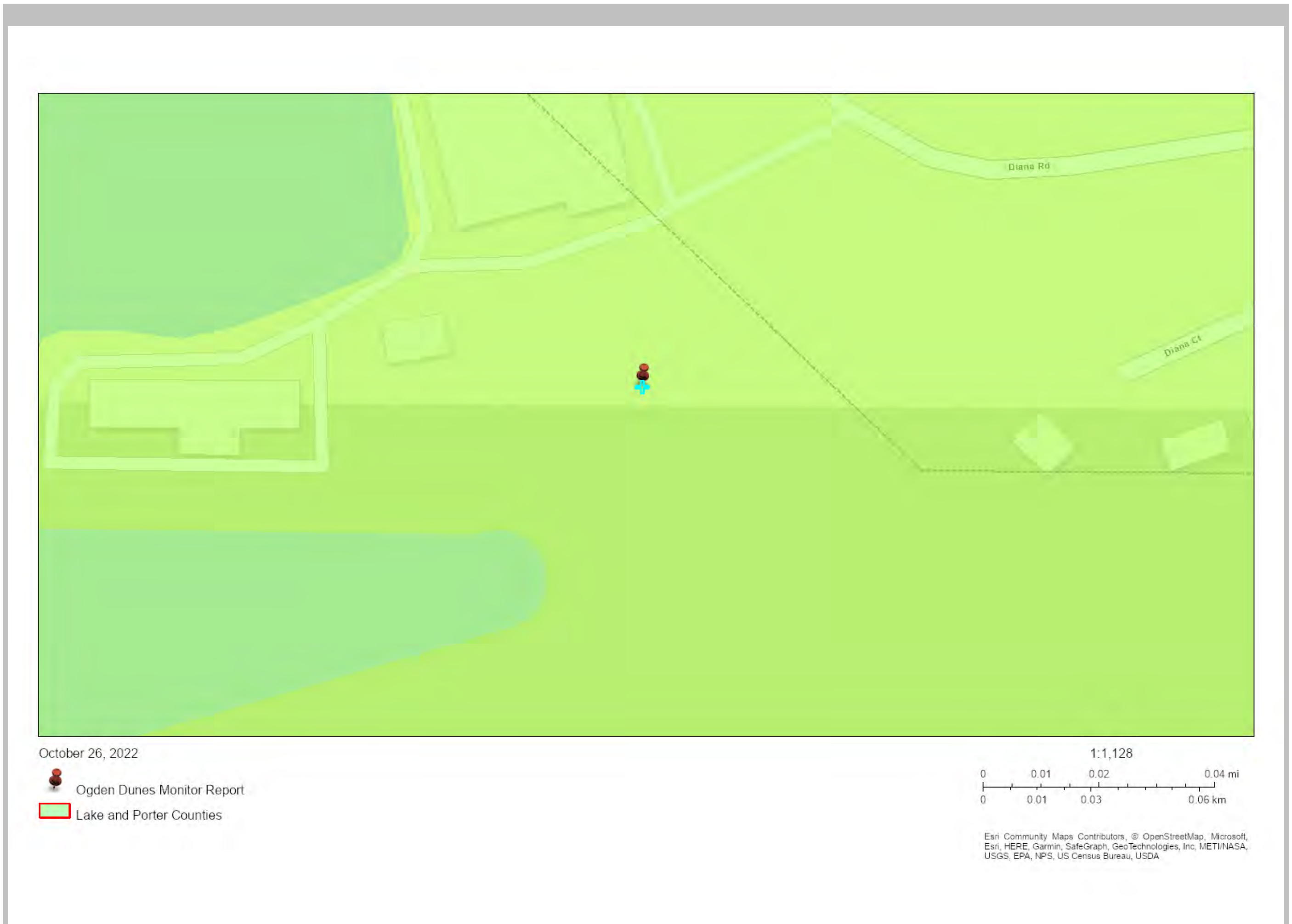
EJScreen Report (Version 2.1)

5 kilometers Ring Centered at 41.617568,-87.199121, INDIANA, EPA Region 5

Approximate Population: 20,202

Input Area (sq. miles): 30.32

Ogden Dunes Monitor Report (The study area contains 2 blockgroup(s) with zero population.)



Sites reporting to EPA	
Superfund NPL	0
Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF)	6

EJScreen Report (Version 2.1)

5 kilometers Ring Centered at 41.617568,-87.199121, INDIANA, EPA Region 5

Approximate Population: 20,202

Input Area (sq. miles): 30.32

Ogden Dunes Monitor Report (The study area contains 2 blockgroup(s) with zero population.)

Selected Variables	Value	State Avg.	%ile in State	USA Avg.	%ile in USA
Pollution and Sources					
Particulate Matter 2.5 ($\mu g/m^3$)	9.28	9.19	61	8.67	70
Ozone (ppb)	44.2	44.1	62	42.5	69
Diesel Particulate Matter* ($\mu g/m^3$)	0.308	0.28	62	0.294	60-70th
Air Toxics Cancer Risk* (lifetime risk per million)	30	23	98	28	80-90th
Air Toxics Respiratory HI*	0.3	0.29	86	0.36	<50th
Traffic Proximity (daily traffic count/distance to road)	450	590	64	760	64
Lead Paint (% Pre-1960 Housing)	0.38	0.33	54	0.27	64
Superfund Proximity (site count/km distance)	0.067	0.17	48	0.13	53
RMP Facility Proximity (facility count/km distance)	0.43	0.92	49	0.77	55
Hazardous Waste Proximity (facility count/km distance)	1.6	1.6	64	2.2	65
Underground Storage Tanks (count/km^2)	3.9	3.2	71	3.9	72
Wastewater Discharge (toxicity-weighted concentration/m distance)	0.057	0.37	78	12	81
Socioeconomic Indicators					
Demographic Index	37%	27%	76	35%	61
People of Color	41%	22%	82	40%	60
Low Income	34%	31%	57	30%	60
Unemployment Rate	9%	5%	83	5%	80
Limited English Speaking Households	0%	2%	0	5%	0
Less Than High School Education	9%	11%	49	12%	52
Under Age 5	5%	6%	51	6%	55
Over Age 64	17%	16%	58	16%	56

*Diesel particular matter, air toxics cancer risk, and air toxics respiratory hazard index are from the EPA's Air Toxics Data Update, which is the Agency's ongoing, comprehensive evaluation of air toxics in the United States. This effort aims to prioritize air toxics, emission sources, and locations of interest for further study. It is important to remember that the air toxics data presented here provide broad estimates of health risks over geographic areas of the country, not definitive risks to specific individuals or locations. Cancer risks and hazard indices from the Air Toxics Data Update are reported to one significant figure and any additional significant figures here are due to rounding. More information on the Air Toxics Data Update can be found at: https://www.epa.gov/haps/air-toxics-data-update.

For additional information, see: www.epa.gov/environmentaljustice

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Attachment I

Public Process Participation
Documentation

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LEGAL NOTICE OF PUBLIC HEARING

Attainment Demonstration and Technical Support Document, Revised 2017 Base-Year Emissions Inventory, 2023 Fifteen Percent Rate of Progress and Three Percent Contingency Measure Plans, and Certifications of Indiana's VOC RACT, New Source Review, Vehicle Inspection and Maintenance, and Emissions Reporting Programs for Indiana's Portion of the Chicago, Illinois-Indiana-Wisconsin (IL-IN-WI) 2015 8-Hour Ozone National Ambient Air Quality Standards (NAAQS) "Moderate" Nonattainment Area

Note: Legal notices for public hearings are no longer published in newspapers, but can be found on the Indiana Department of Environmental Management's web site at: IDEM: Public Notices: Northwest Indiana

Notice is hereby given under 40 Code of Federal Regulations (CFR) 51.102 that the Indiana Department of Environmental Management (IDEM) is accepting written comment and providing an opportunity for a public hearing regarding the *Attainment Demonstration and Technical Support Document, Revised 2017 Base-Year Emissions Inventory, 2023 Fifteen Percent Rate of Progress and Three Percent Contingency Measure Plans, and Certifications of Indiana's VOC RACT, New Source Review , Vehicle Inspection and Maintenance, and Emissions Reporting Programs for Indiana's Portion of the Chicago, Illinois-Indiana-Wisconsin (IL-IN-WI) 2015 8-Hour Ozone National Ambient Air Quality Standards (NAAQS) "Moderate" Nonattainment Area*. All interested persons are invited and will be given reasonable opportunity to express their views concerning this submittal.

Nonattainment areas designated by United States Environmental Protection Agency (U.S. EPA) under the 2015 8-hour ozone NAAQS include Lake (partial) and Porter (partial) counties, Indiana as part of the Chicago, IL-IN-WI Nonattainment Area. These areas have been classified as "Moderate" nonattainment areas and are subject to the requirements of Sections 172 and 182 of the Clean Air Act (CAA). As such, the above documents are being drafted and submitted consistent with U.S. EPA guidance.

The draft documents will be available for review on or before May 25, 2023 on the following web page:

IDEM: State Implementation Plans: Ozone (O3) Attainment Demonstrations

Copies of the draft documents will be made available on or before May 25, 2023, to any person upon request at the following locations:

- IDEM Office of Air Quality, Indiana Government Center North, 100 North Senate Avenue, Room N1003, Indianapolis, Indiana

- IDEM Northwest Regional Office, 330 West U.S. Highway 30, Suite F, Valparaiso, Indiana
- Crown Point Community Library, 122 North Main Street, Crown Point, Indiana
- Gary Public Library, 220 West 5th Avenue, Gary, Indiana
- Hammond Public Library, 564 State Street, Hammond, Indiana
- Lake County Public Library-Highland Branch, 2841 Jewett Street, Highland, Indiana
- Lake Station-New Chicago Branch Public Library, 2007 Central Avenue, Lake Station, Indiana
- Valparaiso Public Library, 103 Jefferson Street, Valparaiso, Indiana
- Whiting Public Library, 1735 Oliver Street, Whiting, Indiana

Any person may submit written comments on the *Attainment Demonstration and Technical Support Document, Revised 2017 Base-Year Emissions Inventory, 2023 Fifteen Percent Rate of Progress and Three Percent Contingency Measure Plans, and Certifications of Indiana's VOC RACT, New Source Review, Vehicle Inspection and Maintenance, and Emissions Reporting Programs for Indiana's Portion of the Chicago, Illinois-Indiana-Wisconsin (IL-IN-WI) 2015 8-Hour Ozone National Ambient Air Quality Standards (NAAQS) "Moderate" Nonattainment Area*. Written comments should be directed to: Ms. Michele Boner, IDEM Office of Air Quality, Room 1003, 100 North Senate Avenue, Indianapolis, Indiana 46204. Written comments can also be submitted via fax (317) 233-5967 or email at mboner@idem.in.gov. Written comments must be submitted by June 26, 2023.

A public hearing on the *Attainment Demonstration and Technical Support Document, Revised 2017 Base-Year Emissions Inventory, 2023 Fifteen Percent Rate of Progress and Three Percent Contingency Measure Plans, and Certifications of Indiana's VOC RACT, New Source Review, Vehicle Inspection and Maintenance, and Emissions Reporting Programs for Indiana's Portion of the Chicago, Illinois-Indiana-Wisconsin (IL-IN-WI) 2015 8-Hour Ozone National Ambient Air Quality Standards (NAAQS) "Moderate" Nonattainment Area* will be held if a request is received by June 26, 2023. If requested, the hearing will be held on June 28, 2023, and the comment period will be extended to July 5, 2023. If held, the hearing will convene at 6:00 p.m. local time at the Lake Station-New Chicago Branch Public Library, located at 2007 Central Avenue, Lake Station, Indiana 46405. Interested parties may present oral or written comments at the public hearing, if held. If a hearing is held, oral statements will be heard, but for the accuracy of the record, a written copy of the statements should be submitted. If a request is not received by June 26, 2023, the public hearing will be cancelled.

Interested parties can check the online IDEM calendar at IDEM Calendar - State of Indiana or contact Ms. Michele Boner (317) 233-6844 or mboner@idem.in.gov after June 26, 2023 to see if the public hearing has been cancelled.

If a public hearing is held, a transcript of the public hearing and all written submissions provided as part of the public hearing shall be open to public inspection at IDEM and copies may be made available to any person upon payment of reproduction costs. Any person heard or represented at the hearing or requesting notice shall be given written notice of actions resulting from the hearing.

For additional information, contact Ms. Michele Boner via U.S. Mail at IDEM Office of Air Quality, Room N1003, Indiana Government Center North, 100 North Senate Avenue, Indianapolis, IN 46204, via e-mail at mboner@idem.in.gov, or via telephone at (317) 233-6844 (direct) or (800) 451-6027 (toll free in Indiana).

Speech and hearing impaired callers may contact the agency via the Indiana Relay Service at 1-800-743-3333. Individuals requiring reasonable accommodations for participation in this hearing should contact the IDEM Americans with Disabilities Act (ADA) coordinator at: Attn: ADA Coordinator, Indiana Department of Environmental Management – Mail Code 50-10, 100 North Senate Avenue, Indianapolis, IN 46204-2251, o*r call (317) 233-1785 (voice) or (317) 233-6565 (TDD). Please provide a minimum of 72 hours notification.*

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Public Hearing Information

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SPEAKER'S FORM

PLEASE PRINT

Hearing Location & Date: IGCS, Conference Room C, 10-28-2021

Name: BRIDGETTE MURRAY

Organization/Company:

Email address: geogiraffe1@yahoo.com

Address: 7305 Oak Ave

City: Gary **State:** IN **Zip:** 46403

Representing what interest? Gary citizens

Do you wish to present an oral testimony? [X] Yes [ ] No

Has a written testimony been submitted? [ ] Yes [X] No

Will a written testimony be submitted? [X] Yes [ ] No

Do you want to be informed of future actions on this matter? [X] Yes [ ] No

SPEAKER'S FORM

PLEASE PRINT

Hearing Location & Date: IGCS, Conference Room C, 10-28-2021

Name:

Organization/Company:

Email address:

Address:

City: **State:** **Zip:**

Representing what interest?

Do you wish to present an oral testimony? [ ] Yes [ ] No

Has a written testimony been submitted? [ ] Yes [ ] No

Will a written testimony be submitted? [ ] Yes [ ] No

Do you want to be informed of future actions on this matter? [ ] Yes [ ] No

SPEAKER'S FORM

PLEASE PRINT

Hearing Location & Date: IGCS, Conference Room C, 10-28-2021

Name:

Organization/Company:

Email address:

Address:

City: **State:** **Zip:**

Representing what interest?

Do you wish to present an oral testimony? [ ] Yes [ ] No

Has a written testimony been submitted? [ ] Yes [ ] No

Will a written testimony be submitted? [ ] Yes [ ] No

Do you want to be informed of future actions on this matter? [ ] Yes [ ] No

SPEAKER'S FORM

PLEASE PRINT

Hearing Location & Date: IGCS, Conference Room C, 10-28-2021

Name: Linda Buchanan

Organization/Company:

Email address: buchanandesign@gmail.com

Address: 95 Diana Rd, Portage IN

City: **State:** **Zip:** 46368

Representing what interest? Self

Do you wish to present an oral testimony? [X] Yes [ ] No — Question maybe

Has a written testimony been submitted? [ ] Yes [X] No

Will a written testimony be submitted? [ ] Yes [X] No

Do you want to be informed of future actions on this matter? [X] Yes [ ] No

SPEAKER'S FORM

PLEASE PRINT

Hearing Location & Date: IGCS, Conference Room C, 10-28-2021

Name: Mary L. Stewart-Pelleper

Organization/Company: Citizen

Email address: Equitycheck44@gmail.com

Address: P.O. Box 2588

City: Gary **State:** IN **Zip:** 46403

Representing what interest?

Do you wish to present an oral testimony? ☑ Yes ☐ No

Has a written testimony been submitted? ☐ Yes ☑ No

Will a written testimony be submitted? ☐ Yes ☐ No ?

Do you want to be informed of future actions on this matter? ☑ Yes ☐ No

SPEAKER'S FORM

PLEASE PRINT

Hearing Location & Date: IGCS, Conference Room C, 10-28-2021

Name: [illegible]

Organization/Company: [illegible]

Email address: [illegible]

Address: [illegible]

City: [illegible] **State:** [illegible] **Zip:** [illegible]

Representing what interest? [illegible]

Do you wish to present an oral testimony? ☑ Yes ☐ No

Has a written testimony been submitted? ☐ Yes ☑ No

Will a written testimony be submitted? ☐ Yes ☐ No

Do you want to be informed of future actions on this matter? ☑ Yes ☐ No

SPEAKER'S FORM

PLEASE PRINT

Hearing Location & Date: IGCS, Conference Room C, 10-28-2021

Name: Carolyn McCrady

Organization/Company: GARD

Email address: ryg5@comcast.net

Address: 0841 Locust

City: Gary **State:** IN **Zip:**

Representing what interest? Pollution

Do you wish to present an oral testimony? ☒ Yes ☐ No

Has a written testimony been submitted? ☐ Yes ☒ No

Will a written testimony be submitted? ☐ Yes ☒ No

Do you want to be informed of future actions on this matter? ☒ Yes ☐ No

SPEAKER'S FORM

PLEASE PRINT

Hearing Location & Date: IGCS, Conference Room C, 10-28-2021

Name: Joel Cavallo

Organization/Company: none

Email address: joel.s.cavallo@gmail.com

Address: 7901 Maple Ave

City: GARY **State:** IN **Zip:** 46403

Representing what interest? Pollution

Do you wish to present an oral testimony? ☑ Yes ☐ No

Has a written testimony been submitted? ☐ Yes ☑ No

Will a written testimony be submitted? ☐ Yes ☑ No

Do you want to be informed of future actions on this matter? ☑ Yes ☐ No

SPEAKER'S FORM

PLEASE PRINT

Hearing Location & Date: IGCS, Conference Room C, 10-28-2021

Name: [illegible]

Organization/Company: [illegible]

Email address: [illegible]

Address: [illegible]

City: [illegible] **State:** **Zip:** [illegible]

Representing what interest?

Do you wish to present an oral testimony? ☐ Yes ☐ No

Has a written testimony been submitted? ☐ Yes ☐ No

Will a written testimony be submitted? ☐ Yes ☐ No

Do you want to be informed of future actions on this matter? ☐ Yes ☐ No

SPEAKER'S FORM

PLEASE PRINT

Hearing Location & Date: IGCS, Conference Room C, 10-28-2021

Name: [illegible] Simpson, MD

Organization/Company:

Email address: [illegible]@gmail.com

Address: 1015 N. Shelby St. [illegible]

City: Gary **State:** IN **Zip:** [illegible]

Representing what interest? [illegible]

Do you wish to present an oral testimony? ☒ Yes ☐ No

Has a written testimony been submitted? ☐ Yes ☒ No

Will a written testimony be submitted? ☐ Yes ☒ No

Do you want to be informed of future actions on this matter? ☒ Yes ☐ No

SPEAKER'S FORM

PLEASE PRINT

Hearing Location & Date: IGCS, Conference Room C, 10-28-2021

Name: [illegible]

Organization/Company: [illegible]

Email address: [illegible]

Address: [illegible]

City: [illegible] **State:** IN **Zip:** [illegible]

Representing what interest?

Do you wish to present an oral testimony? ☒ Yes ☐ No

Has a written testimony been submitted? ☐ Yes ☒ No

Will a written testimony be submitted? ☐ Yes ☒ No

Do you want to be informed of future actions on this matter? ☒ Yes ☐ No

SPEAKER'S FORM

PLEASE PRINT

Hearing Location & Date: IGCS, Conference Room C, 10-28-2021

Name: Rev. Michael Cooper

Organization/Company:

Email address: michael@nwigreenparty.org

Address: 5455 Elm Rd #1

City: Portage **State:** IN **Zip:** 46368

Representing what interest? Self

Do you wish to present an oral testimony? ☒ Yes ☐ No

Has a written testimony been submitted? ☐ Yes ☒ No

Will a written testimony be submitted? ☒ Yes ☐ No

Do you want to be informed of future actions on this matter? ☒ Yes ☐ No

SPEAKER'S FORM

PLEASE PRINT

Hearing Location & Date: IGCS, Conference Room C, 10-28-2021

Name: Freida Gray

Organization/Company: ~~Far~~

Email address: freida-gray[illegible]@yahoo.com

Address: [illegible] Locust Cir

City: Gary **State:** IN **Zip:** 46402

Representing what interest? Res. Chicago [illegible]

Do you wish to present an oral testimony? ☑ Yes ☐ No

Has a written testimony been submitted? ☐ Yes ☐ No

Will a written testimony be submitted? ☐ Yes ☐ No

Do you want to be informed of future actions on this matter? ☐ Yes ☐ No

SPEAKER'S FORM

PLEASE PRINT

Hearing Location & Date: IGCS, Conference Room C, 10-28-2021

Name: SYLVESTRE WAGUESPACK

Organization/Company:

Email address: SWAGUESPACK2@gmail.com

Address: 95 DIANA ROAD

City: Ogden Dunes **State:** IN **Zip:** 46368

Representing what interest? HUMAN

Do you wish to present an oral testimony? ☐ Yes ☐ No

Has a written testimony been submitted? ☐ Yes ☐ No

Will a written testimony be submitted? ☐ Yes ☐ No

Do you want to be informed of future actions on this matter? ☑ Yes ☐ No

SPEAKER'S FORM

PLEASE PRINT

Hearing Location & Date: IGCS, Conference Room C, 10-28-2021

Name: [illegible]

Organization/Company:

Email address: [illegible]

Address: [illegible]

City: [illegible] **State:** [illegible] **Zip:** [illegible]

Representing what interest?

Do you wish to present an oral testimony? ☑ Yes ☐ No

Has a written testimony been submitted? ☐ Yes ☐ No

Will a written testimony be submitted? ☐ Yes ☐ No

Do you want to be informed of future actions on this matter? ☐ Yes ☐ No

SPEAKER'S FORM

PLEASE PRINT

Hearing Location & Date: IGCS, Conference Room C, 10-28-2021

Name: LINDA ANGUIANO

Organization/Company: Progressive Democrats of America

Email address: Linda.Anguiano0720@gmail.com

Address: 3732-173rd St

City: Hammond **State:** IN **Zip:** 46323

Representing what interest? CLEAN AIR & Environmental Justice

Do you wish to present an oral testimony? ☑ Yes ☐ No

Has a written testimony been submitted? ☐ Yes ☑ No

Will a written testimony be submitted? ☑ Yes ☐ No

Do you want to be informed of future actions on this matter? ☑ Yes ☐ No

SPEAKER'S FORM

PLEASE PRINT

Hearing Location & Date: IGCS, Conference Room C, 10-28-2021

Name: Mike Zoeller

Organization/Company: ELPC

Email address: mzoeller@elpc.org

Address: 35 E. Wacker Drive

City: Chicago, **State:** IL **Zip:** 60601

Representing what interest? ______

Do you wish to present an oral testimony? ☒ Yes ☐ No

Has a written testimony been submitted? ☑ Yes ☐ No

Will a written testimony be submitted? ☐ Yes ☐ No

Do you want to be informed of future actions on this matter? ☑ Yes ☐ No

Mike Zoeller
Senior Attorney

Environmental Law & Policy Center
(202) 244-2338
mzoeller@elpc.org
www.elpc.org

IDEM

Indiana Department of Environmental Management

Protecting Hoosiers and Our Environment Since 1986

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ATTENDANCE SHEET

Title of Public Hearing: Public Hearing re: "Draft Attainment SIP for IN's Portion of Chicago, IL-IN-WI 2015 8-Hr Ozone Nonattainment Area"

Date: 06-28-2023

Public Hearing Location: Lake Station-New Chicago Branch Public Library, 2007 Central Avenue, Lake Station, Indiana 46405, Lake County

NAME	ORGANIZATION/COMPANY	E-MAIL	PHONE NUMBER	ADDRESS, CITY, ZIP
Thomas Miller	Environmental Law & Policy Cntr	smiller20@tulane.edu	802-989-5824	427 E Seegers Rd, 60005
Kerri Gefeke	ELPC	kgefeke@elpc.org	515-333-9058	Oak Park, IL 60304
Jade Williams	ELPC	willj19@wfu.edu	678)542-7030	4800 S Chicago Beach Dr
Mike Zoeller	ELPC	mzoeller@elpc.org	(202)244-2338	35 E. Wacker Dr. Chicago
Mary Stewart-Pellegrini	Citizen	Equityclark44@gmail.com	708 846-1209	P.O. Box 2588 Gary, IN
[illegible] Simpson		ssimpsonmd@gmail.com		1015 Shelby St, Gary, IN
Doreen Carey	GARD	mbdcarey@aol.com		7304 Indian Boundary, IN
Gary Lee		mikiisc@aol.com	219-670-2657	5557 W 26th Ave, Gary 46406
BERYL C. FITZPATRICK	CANCER SURVIVOR	bFitzpatRICK@chn-indiana.org	219-718-2360	330 W. 43RD AVE, GARY 46408
Rev Michael Cooper	citizen	michael@nw.greenparty.org	219-771022	5455 Clem Rd #1, Portage IN 46368
Rolando Gonzalez	COG AQC	rgonzalez@gary.gov	219-882-3000	401 Broadway Suite 304 Gary, IND
Bridgette Murray		geogiraffe1@yahoo.com		7305 Oak Ave Gary IN 46403

Page _______ of _______

Indiana Department of Environmental Management

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ATTENDANCE SHEET

Title of Public Hearing: Public Hearing re: "Draft Attainment SIP for IN's Portion of Chicago, IL-IN-WI 2015 8-Hr Ozone Nonattainment Area"

Date: 06-28-2023

Public Hearing Location: Lake Station-New Chicago Branch Public Library, 2007 Central Avenue, Lake Station, Indiana 46405, Lake County

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I am Rev. Michael Cooper, 5455 Clem Road #1, Portage IN 46368.

Chicago is hosting a NASCAR race through downtown this coming holiday weekend – releasing in excess of one hundred and twenty thousand pounds of carbon dioxide into the region in just one day. Everyday we receive from IDEM air quality warnings, ozone warnings, warnings to limit outside activities, warnings to our elderly, sickly and other vulnerable pollutions. Our legacy industries along the Lake are releasing more and more pollutants into our air due to system failures. At the same time you are approving more and more air permits for industries like the new Amazon Data Warehouse in Portage's Ameriplex that be installing 8 large diesel generators capable of producing over fifty thousand kilowatts next to our National Park. I find it absurd that you are saying that Indiana is doing enough. Northwest Indiana is here to tell you that you need to do more.

The state of Indiana imposes a registration surcharge on hybrid and electric vehicles that owners like myself have to pay each year. While the legislature's rational is to offset the reduction in the gas tax from these more efficient hybrid and fully electric cars, this policy creates a burden on conscious Hoosiers like myself who seek to reduce our contribution to the air quality problem in our region. I feel that IDEM's plan for improving our air quality should include substantial incentives for hybrid and electric cars for residents in the non-attainment area. Indiana is sitting on around a $4 billion gas tax surplus. The addition of incentives for hybrid and electric vehicles within the non-attainment area would have minimal effect on the road construction budget while having a significant effect on Indiana improving our air quality targets.

The incentives I wish IDEM to consider for inclusion is the draft plan are the following:

- Removal of the annual hybrid and electric vehicle surcharge on the vehicle registrations for residents in Indiana who live within the defined non-attainment area.
- An Indiana Eclectic Vehicle Tax Credit of up to $7,500 (as defined under Internal Revenue Code Section 30D) for residents in Indiana who live within the define non-attainment area.
- Grants for local municipalities within the non-attainment area to transition their car and truck fleets to fully electric vehicles

I would like to see IDEM do more as it relates to auto emissions here in the Crossroad of America. The Indiana legislature has long held a penalizing attitude towards owner of hybrid and electric vehicles, I ask the IDEM to change that to one of incentivizing cleaner cars and trucks in Northwest Indiana.

Public Hearing Transcript

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BEFORE THE INDIANA DEPARTMENT
OF ENVIRONMENTAL MANAGEMENT

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PUBLIC HEARING REGARDING
DRAFT STATE IMPLEMENTATION PLAN
FOR INDIANA'S PORTION OF THE
CHICAGO, ILLINOIS-INDIANA-WISCONSIN
2015 8-HOUR OZONE NATIONAL AMBIENT
AIR QUALITY STANDARDS MODERATE
NONATTAINMENT AREA

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PROCEEDINGS

in the above-captioned matter, before the Hearing Officer Michele Boner, taken before me, Lindy L. Meyer, Jr., a Notary Public in and for the State of Indiana, County of Shelby, at the Lake County Public Library, Lake Station-New Chicago Branch, 2007 Central Avenue, Lake Station, Indiana, on Wednesday, June 28, 2023 at 6:05 o'clock p.m.

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APPEARANCES:

ON BEHALF OF IDEM:
Michele Boner, Hearing Officer
Brian Callahan

SPEAKERS PRESENT:
Rev. Michael Cooper
Freida Graves
Steve Simpson, M.D.
Jennie Rudderham
Dorreen Carey
Joel Cavallo
Carolyn McCrady
Beryl Fitzpatrick
Mary Stewart-Pellegrini
Linda Buchanan
Kimmie Gordon
Joseph Conn
Bridgette Murray
Linda Anguiano
Sandy O'Brien
Mike Zoeller

\- - -

6:05 o'clock p.m.
June 28, 2023

- - -

THE HEARING OFFICER: Good evening. My name is Michelle Boner. I am an environmental manager with the Air Quality Standards and Implementation Section of the Indiana Department of Environmental Management's Office of Air Quality. I have been appointed to act as the Hearing Officer for the public hearing. Also here from the Department of Environmental Management is Brian Callahan, Section Chief of the Air Quality Standards and Implementation Section.

This is a public hearing to receive comments concerning the Draft State Implementation Plan, or SIP, for Indiana's portion of the Chicago, Illinois-Indiana-Wisconsin 2015 Eight-Hour Ozone National Ambient Air Quality Standards Moderate Nonattainment Area. The draft SIP is comprised of the following documents: An Attainment Demonstration and Technical Support Document, a Revised 2017 Base-Year Emissions Inventory, a 2023 Fifteen

Percent Rate of Progress and Three Percent Contingency Measure Plan, and certifications of Indiana's VOC RACT, Nonattainment New Source Review, Vehicle Inspection and Maintenance and Emissions Reporting programs.

This hearing is being held to conform to the provisions of 40 CFR Part 51 regarding public hearing for State Implementation Plan submittals.

Notice of the time and location of the hearing was given as provided by law by publication on IDEM's Public Notices Web page for a period of at least 30 days.

The purpose of this public hearing is to provide interested parties an opportunity to offer comments to the state regarding the previously mentioned draft documents for Indiana's portion of the Chicago, Illinois-Indiana-Wisconsin 2015 Eight-Hour Ozone Moderate Nonattainment Area.

Appearance cards have been distributed in the hearing room for all those desiring to be shown appearing on the record in this cause. If you have not already filled out a form, please do so and indicate if you are appearing for yourself or on behalf of a group or organization, and identify such group or organization. Also note the capacity in which you appear, such as an attorney or authorized spokesperson.

Oral statements will be heard, but written statements may be handed to me or mailed to me at the Office of Air Quality on or before the close of business on July the 5th, 2023.

A written transcript of this hearing is being made. The transcript will be open for public inspection and a copy of the transcript will be made available to any person upon request. After the conclusion of this public hearing, we will prepare a written report summarizing the comments received at this hearing and the agency's response to the comments, including any changes to the documents, if applicable.

I would like to introduce the following documents into the record. First, a notice of public hearing, a Draft Attainment Demonstration and Technical Support Document for the Indiana portion of the Nonattainment Area, a Revised 2017 Base-Year Emissions Inventory, a 2023 Fifteen Percent Rate of Progress and Three Percent Contingency Measure Plans, certification of Indiana's VOC RACT, a Certification New Source Review, a Certification for the Vehicle Inspection and Maintenance, and a Certification for the Emissions Reporting Programs for Indiana's portion of the Chicago, Illinois-Indiana-Wisconsin 2015 Eight-Hour Ozone National Ambient Air Quality Standards Moderate Nonattainment Area.

Before we get to the draft documents, I would like to discuss ozone in general terms and briefly describe why these documents were developed.

Ozone is one of the six criteria air pollutants that scientists have identified as being particularly harmful to human health and the environment. National Ambient Air Quality Standards, NAAQS, have been developed for these six pollutants and are used as measurements of ambient air quality. Ozone is a gas that is not emitted directly into the air, but is created by a chemical reaction between oxides and nitrogen, NOx, and volatile organic compounds, VOC's, in the presence of sunlight and heat.

On October 1st, 2015, U.S. EPA strengthened the eight-hour ozone standard to a legal of 0.070 parts per million. On June 4th, 2018, effective August the 3rd, 2018, U.S. EPA designated the Chicago, Illinois-Indiana-Wisconsin area, include Calumet, Hobart, North, Ross, and St. John's Townships in Lake County, Indiana as nonattainment and classified it "marginal" under Subpart 2 of Part D, Title I of the CAA.

On June 14th, 2021, U.S. EPA revised the Chicago nonattainment area boundary to include Center, Jackson, Liberty, Pine, Portage, Union, Washington, and Westchester Townships in Porter County, Indiana. This classification provided three years, or until August the 3rd, 2021, for the area to attain the standard.

On October 7, 2022, due to failing to meet the attainment date, the Chicago nonattainment area was reclassified from "marginal" to "moderate." This final rule established a new attainment date of August the 3rd, 2024. The bump-up to the moderate classification required Indiana, under Sections 172(c) and 182(c)(2) of the Clean Air Act, to develop make -- to develop, make available for public inspection, and submit to the U.S. Environmental Protection Agency the previously mentioned documents.

Each document is described as follows:

A draft attainment plan, which outlines Indiana's plan to attain the ozone standard.

A revised 2017 base-year emissions inventory, which is an inventory of actual emissions for when the area was designated nonattainment.

A 2023 Fifteen Percent Rate of Progress Plan and Three Percent Contingency Measure Plan, which demonstrates the required VOC and NOx emissions reductions.

Results from U.S. EPA's Environmental Justice Screening Tool.

And the following certifications:

A certificate of Volatile Organic Compounds Reasonable Available Control Technology.

A certification of nonattainment new source review for ozone.

A certification and assessment of Indiana's enhanced Vehicle Emissions Inspection and Maintenance Testing Program demonstrating that Indiana's enhanced I/M testing program in Lake and Porter Counties meets the requirements of U.S. EPA's enhanced performance standard for areas designated and classified under the eight-hour ozone standard.

A certification of Indiana Emissions Reporting Rule, 326 IAC 2-6, which requires sources located in Lake and Porter Counties that emit either NOx or VOC's equal to or greater than 25 tons per year to annually report their actually emissions to IDEM.

This concludes my comments regarding the draft revisions to the State Implementation Plan.

The public hearing is now open for public comment. Okay. It looks like we have 11 comments. First up would be Rev. Michael Cooper.

REV. COOPER: I'm Rev. Michael Cooper. I am a resident of Portage. As many people know, Chicago's hosting a NASCAR race through downtown this coming weekend. That's going to mess up my plans for the Wrigley Field for the Cubs game, but it is going to be releasing in excess of 120,000 pounds of carbon dioxide into the region in just one day.

Every day we receive from IDEM air quality warnings, ozone warnings, warnings to limit outside activities, warnings to elderly, sickly and other vulnerable populations. Our legacy industries along the lake are releasing more and more pollutants into our air due to system failures.

At the same time, you are approving more and more air permits for industries, just this last month, like the new Amazon Data Warehouse in Portage's Ameriplex that will be installing eight large diesel generators capable of producing over fifty thousand kilowatts per hour next to our National Park. I find it absurd that you are saying that Indiana is doing enough. Northwest Indiana is here to tell you that we need to do more.

The State of Indiana imposes a registration surcharge on hybrid and electric vehicles that owners like myself have to pay each year. While the legislators' rationale is to offset the reduction in the gas tax from these more efficient hybrid and fully electric cars, this policy creates a burden on conscious Hoosiers like myself who seek to reduce our contribution to the -- to reduce our contribution to the low air quality problem here in our region.

I feel that IDEM's plan for improving our air quality should include substantial incentives for hybrid and electric cars for residents in the nonattainment area. Indiana is sitting on around four billion dollars in gas tax surplus. The addition of incentives for hybrid and electric vehicles within the nonattainment area would have minimal effect on the road construction budget while having a significant effect on Indiana improving our air quality targets.

The incentives I wish IDEM to consider for inclusion in the draft plans are the following: Removal of the annual hybrid and electric vehicle surcharge on vehicle registrations for residents in Indiana who live within the defined nonattainment area; an Indiana electric vehicle tax credit of up to $7500, as defined by Internal Revenue Code Section 30D for residents in Indiana who live within the defined nonattainment area; grants for local municipalities within the nonattainment area to transition their car and struck fleets to fully electric vehicles.

I would like to see IDEM do more as relates to auto emissions here in the Crossroads of America. The Indiana legislature has long held a penalizing attitude towards owners of hybrid and electric vehicles who are trying to do better for our environment. I ask IDEM to just take a step to change that, and that is by incentivizing cleaner cars and trucks here in Northwest Indiana.

Thank you.

THE HEARING OFFICER: Thank you for your comment.

Next up is Freida Graves.

MS. GRAVES: Good evening, and thank you for having me. I am here tonight not in numbers, but concerns. I'm concerned about the children with asthma, respiratory diagnoses, and urgent anomalies, all of the diagnoses that we see every day that makes them more immune to everything that comes into their system, RSV.

I just want you to know, I'm not pointing fingers, I'm not throwing anything out. I'm an asthmatic myself. I understand that the air quality there is from the wood burning and the burning of the -- whatever, the wind blowing. But I just want to know how we can work together to do what the things -- what are the things that we can do in our community to make it -- these children's [sic] are coming up every day with asthma, and they're just sick, hospitalization after hospitalization.

So, I just want to know if there's anything that we can do, that you guys can point to us and tell us how we can do -- what we can do for our air quality. I understand that we have the mill and all of these kind of things going on, but we don't need anything else to make our air quality worse, any more companies come in to make our air quality worse.

So, my concern tonight is for the children, for the asthmatics, for the respiratory diagnoses, and that's all I have to say. I don't have numbers and all of that kind of thing, but I do have life events that I see every day as a nurse in our community.

Thank you for listening to me.

THE HEARING OFFICER: Thank you for your comments.

Next up is Steve Simpson, M.D.

DR. SIMPSON: I think you have -- I'm a pediatrician in Gary. I've been here for 41 years, and asthma is a major concern to me. It's not just the ozone. I think there are other things in the environment precipitating many of these kids having problems with asthma and other respiratory disease.

Our prematurity rate is very high in this county and in this area, and associated with the child maternal health problems that the State of Indiana have experienced. The kids have chronic lung disease in association with being premature. To be exposed to all of the ozone as well as sulfur dioxide, the sulfur compounds that's released from landfills, the burning of methane coming from the various factories around here, are accentuating the problems that the kids have.

You have the numbers, you know what the numbers are, because you've already researched it, and you know what the -- Lake County and the State of Indiana know where we stand with the lung disease and asthma as well as prematurity. The American Academy of Pediatrics points out that urban kids who have asthma more likely will be hospitalized than other kids, and we -- would be more likely to have asthma than kids who do not live in urban areas.

Now, with all of the factories, the steel mills, the trucks, it's hard for me to understand why we're just focusing on ozone when we can focus on all of the particulate matters as well as a few other gases that are being released in our community from various sources.

I have no stats at this point, but I think that it's obvious we can go to the American Academy of Pediatrics asthma protocol and see what the problem is, as well as the CDC, but I'm concerned about the kids in this area, Lake Station, Gary, East Chicago, Whiting, Hammond, as far away as Jasper County, wherever I-65 runs you probably have the same problems, as well as the farmland problems that are there.

Thank you.

THE HEARING OFFICER: Thank you.

DR. SIMPSON: What are we going to do? What are we going to do about it? We know what's there, but what are we going to do?

THE HEARING OFFICER: Jennie Rudderham?

MS. RUDDERHAM: Good evening. Thank you for hearing my --

AUDIENCE MEMBER: Jennie, we can't hear you at all.

MS. RUDDERHAM: Yeah, there isn't actually a microphone here.

AUDIENCE MEMBER: Use your outside voice.

MS. RUDDERHAM: Outside voice; all right.

Thank you for hearing my comments. I am here as an adult who suffers from asthma, I'm here as a member of Gary Advocates for Responsible Development, and first and foremost, I'm here as a parent of a child who has had a hellish week. We've had an unexplained flare-up from BP at the beginning of the week, we've had ozone and particulate matter warnings every day this week, and here I am driving him to Whiting to a sports camp, where they're stuck inside.

They tried to go outside today. One kid immediately gets a bloody nose from the air, my son gets irritated eyes and starts coughing, and they have to immediately bring the kids back inside. Like this should be not our normal. It is becoming our normal. I did not count up how many ozone action days we've had so far this summer, but it certainly seems like we've had far more earlier in the year than we have ever had before.

So, what you guys have put together here, which I'm not a technical expert, I am deferring to ELPC for having combed through this, but it's clear it does not go far enough. It is not doing enough to make those who are emitting the pollutants that create the ozone to regulate themselves.

And I know, you know, Freida doesn't want to point fingers, but I'm going to point fingers. Like we have major polluters in Lake County, and we have these issues in Lake County, and, you know, I've been to many hearings now, and it's -- IDEM is -- you guys are the ones who can help us. Like you've got -- we're counting on you guys to do the job of managing the polluters.

And so, you can do more. You can do more in this document to put in more implementation, more regulations, hold them to higher standards. I believe it is in your power to do it, and I am like humbly beseeching that you guys do the utmost that you guys can do, because our new normal is hurting our kids, it's really harming our kids, and I can't imagine -- if you guys don't do something now when we have this renewal opportunity, I don't know when the next time it gets renewed, but, you know, five more years of summers like this, our kids are going to be so unhealthy. They can't go outside, they can't play.

I don't know how many people aren't here tonight because they didn't feel safe going outside to even come here, or we're getting alerts telling us not to drive anywhere if you don't have to. I mean this week alone should be enough to make you guys go back and see what you can to do to make this document more stringent, to reduce emissions more than it is currently written.

Thank you.

THE HEARING OFFICER: Thank you.

Dorreen Carey?

MS. CAREY: Thank you for the opportunity to speak today. I'm really happy to see all of those people who came out to speak on behalf of the environment and community health here in the northern part of Lake and Porter County.

My name is Dorreen Carey. I live in Gary. I'm also a member of Gary Advocates for Responsible Development, and I'm here today to speak on my own behalf, but also in support of the comments that were provided by the Environmental Law and Policy Center, which we greatly appreciate, to help us understand in clear English what the issues are that we're trying to deal with today.

So, our area, particularly our urban environmental area, are environmental justice areas. We have suffered from -- we suffer from current and legacy pollution, and we are overburdened by that pollution. What are we going to do to not be an environmental justice community? What is IDEM going to do to help us be relieved of that burden?

Some of the things that were suggested in the ELPC, Environmental Law and Policy Center, comments were that it would be good to convene an advisory group with industry subject matter experts and local community representatives to help deliver implementation and results more quickly.

This is something that has gone on for years. We're not meeting the required levels, and what are we going to do to meet the required levels? Clearly, bringing industry agencies and community together is one way that we can work on something where everybody does their part. However, considering that heavy industry is the single largest source of high ozone concentrations and not residents, we believe that industry needs to play a bigger role.

We cannot continue to accept the status quo. There are things that can be done that do not require changing regulations or changing laws that will definitely improve the health and the sustainability and the quality of life of our community. We are asking you to do that and to make those changes. Do not accept the status quo. Things have got to change here, things have got to get better, so that our civil rights for clean air, land and water are respected.

Thank you.

THE HEARING OFFICER: Thank you.

Joel Cavallo?

MR. CAVALLO: Hello, everyone. Thank you for having me this evening. I'm kind of a new person to this forum, so I appreciate your attention, and also all of the work that you're doing. I still need to learn more about it.

The comment I wanted to make tonight is essentially twofold. One is the quantity of pollution in Northwest Indiana. So, I have an eight-month-year-old [sic] baby, and to the Doctor's point, she was born ten weeks early, and now she is very sensitive to pollutants, and now this raised my awareness to the issues of Northwest Indiana, and it's pretty disgusting the quantity of pollution.

And I realize that you are working hard with your documents to reduce pollution, which I very much appreciate, but my main comment in that regard is: Is it enough? Because essentially one large belch from BP that releases, you know, a large amount of hydrogen sulfide that can span three counties, if we reduce things for one year of 15 percent, but you have a massive amount of pollution released in one fell go, I mean how many of us smelt [sic] that earlier this week? It was disgusting. It was burning our nostrils.

So, what must the concentration have been? It's staggering to me. So, one, I see it as just a quantity problem, and I really urge our politicians and all of our groups here to do more, as was just said a moment ago, because this is -- it can't be sustainable. Our bodies can't withstand this.

Secondly, I see one of awareness. So, one early in the week, when we had this hydrogen sulfide leak, apparently, apparently -- I'm finding my information out through Facebook, but apparently it happened early in the morning, and I was walking around all day like an idiot with my infant outside.

Why weren't we made aware of this environmental incident, right, earlier in the day? If there are issues that are significant that are affecting our population, there should be some statewide mechanism for all of us to be aware of it, for at least, God sakes, we can stay inside our homes and have our air purifiers hope to mitigate some of this, you know, issue.

So, I'm really urging perhaps someone who is listening to this transcript that there has to be some element of awareness for our population besides Facebook. That can't be. There must be a way for our population to understand when environmental disasters, I'll say, quote/unquote, occur.

So, thank you very much for your attention. Thank you.

THE HEARING OFFICER: Thank you.

Carolyn McCrady?

MS. MCCRADY: Good evening. Good evening, everyone.

And I just want to say there's so much wisdom in this room, it just, it breaks my heart to hear it, because this should not be going on. This report -- and I'm no technical expert, but this report basically says we're making incremental change and that should be enough. How can it be enough when we are the fourth most polluted city in the entire country?

And your EJScreen shows that we're at 80th percentile in all of our city, and sometimes even higher in certain parts of our city. So, why is it okay with IDEM to make incremental change every five years, but we're getting sicker and sicker and sicker?

You know, as the young man said, I have -- well, I have a radio show, and I was kind of like walking around thinking, "Well, you know, we're used to all of this." But when I got to my radio show, I found myself having to drink water the whole time just so I could talk, and I'm still kind of hoarse. And my boyfriend was out playing golf in Hobart, and he had to come home because he couldn't handle it, you know, and he's still sick today.

So, we're talking about a crisis here. We're not talking about managing and making incremental change that makes you all feel good.

That's not enough, and it's not right, and you're being complicit in the harm that's being done to the people of Northwest Indiana. You're taking a paycheck every month, and you're being complicit. I don't know if you even know that, but that's the way it seems to me.

You know, any new polluting industry comes here and, you know, we have public hearings and we -- we explain, you know, what our -- what our opposition is, and then IDEM just goes back and bureaucratically says, "Sure, go ahead, go ahead, go ahead, go ahead." What is that about? Don't you people understand what is happening here? You can't read your own EJScreen?

I have five stepchildren. Dr. Simpson took care of two of them. One of them, our oldest boy, we had to rush to the hospital all of the time because he was so sick. He's still sick. He's in his late 40's and he's still arguing with the State of Indiana about getting enough, you know, HIPAA money to be able to buy his medication that literally keeps him alive.

You know, I watched all of my children be sick all of the time: Allergies, asthma, coughing. My stepdaughter is still sick, and then now her son is sick. When does it end? You all are part of the problem. You're not part of the solution. Nobody sees you like that. We would like to see you like that. We would like to see you be part of the solution, but right now you're not, because all you do is make excuses for industry and allow them to continue to do what they do.

And your standards are way, way, way too low. Your parts per million or whatever it is that, you know, was in your report that you find acceptable is not. If it were acceptable, you would not have so many people getting sick here. You wouldn't have -- you know, this room, you take this room and you multiply it by a hundred, and that's what you would hear.

You're lucky that everybody didn't know about this meeting. You know, only the people who are looking for this meeting knew about it. The public doesn't, and certainly the public could never understand that report that you did.

It boggles the mind, and even you reading, my eyes were glazing over, because, you know, we're not technicians, we're not engineers. We're people living in this toxic stew.

And honestly, I don't know how you sleep at night. I really don't. I really don't know how you sleep at night. I'm sure that -- you know, that you're good people, but then why do you do this? Why do you do this kind of work where you end up harming people, and then justifying it by saying you're doing the right thing? That's wrong.

I hope you learn something from this. I -- like someone else said, you know, we just keep going to more and more and more hearings, more and more hearings, and you all sit there and you look at us and act like you're interested, you know, and then you go back and you do the same thing again. We're tired of that, and it's got to change, and you are part of the solution. Stop being part of the problem.

Thank you.

THE HEARING OFFICER: Beryl

Fitzpatrick?

MS. FITZPATRICK: Good evening to the officials and everyone in the room. I have learned a lot listening to people talk today. I stand before you as a cancer survivor. I'm at Rush University Cancer Institute since 2016. Since 2016, I have had 12 surgeries. I just recently had two surgeries to remove additional cancerous tumors from my body in November of '22.

I think Indiana can do better. I grew up in Gary, Indiana. I've been here, I own a home here. I know that my mother and father loved me, and they would not have moved to Gary, Indiana if they knew the outcome was that I would have cancer in different parts of my body. My first tumor, the surgery to remove that tumor was 15 and a half hours, 15 and a half hours. I spent 27 days in ICU.

I want to tell you a little bit about my experience since 2016, because I feel like I've been blessed with the medical team. Methodist referred me, sent me, room handoff, to Rush University Medical Center. They said, "For the type of cancer you're presenting with, your best team is at Rush University." I feel very fortunate that that happened to me. A lot of people have been involved in my -- with the entire cancer surveillance and recovery treatment.

In my history since 2016, one of the things that the oncology -- I have a team of people that I'm working with, because those 12 surgeries took out cancerous tumors out of different parts of my body. One of the tumors was in my tongue, and it was a sizable tumor. My tumors have been sent to Rush University Cancer Center, what they call the tumor bureau.

And I'm the recipient owner of a voluminous report from all of these pathology -- review of the different tumors that have been taken out of my body, and that report said that my cause of my cancer -- I still looked at the papers -- the cause of my cancer is environmental. It's environmental.

I didn't just get involved in environmental justice when I was diagnosed with cancer. I read, I travel, I have different experiences, as all of the people in the room are my friends who have influenced my advocacy for environmental justice. But something happened to me when I read that report about my body, the causes of my tumors, and I'm still under cancer surveillance, will probably be under cancer surveillance, as I understand it, from Rush's Cancer Institute the rest of my life.

Environmental justice. I did nothing to the environment to be -- to have the pollution in Northwest Indiana and Lake County affect me and my life and my lifestyle. Actually, I'm appalled at how we do business, the government's partnership with business in this state. It makes me angry, because I know Indiana can do better. Indiana can do better.

And yeah, could I have moved? Yes. Could I have bought my house in another state and another town? Probably so. But as an advocate, I'm not trying to run away as much as I am for the generations after me, are coming behind me. I want to impact their life so they'll never get a report like I did.

And there are updates on my report that "Your cancer --" I'm not predisposed to cancer. I live in a polluted environment. I live in a polluted environment. And it's appalling, as a lot of the speakers have said, that our state government is complicit in partnership with companies that disregard communities of people.

And as a black woman, there is a lot of evidence-based data that says when the population of a particular city has 25 percent of black people of color, they're more likely to have pollution in the soil, using contaminated products.

The EPA -- we have a proliferation of truckers in this area that -- and sometimes -- I drive a lot to do my job, and sometimes I see out of the tailpipe, and, you know, the -- in some of the smoke, I'm often wondering, "What's in that? Is that going to trigger a cancer cell that they intended to take out of my body."

But I stand before you. I know that there are a lot of people, because I advocate, work with cancer survivors, and I'm very fortunate. Some of the people that I've been working with have already died of a cancer-related health issue. And I feel fortunate, and I feel responsible to stand up and say to you, and say to those responsible, "Please do better." Do better, because my life depends on your doing better.

I want to leave you with one of my surgeries -- I didn't used to talk or sound like this. I'm not sure how I sound, because I'm -- but my tongue -- I was told I have two options when they took that tumor out of my tongue, that "We'll either need to take your tongue completely and you won't be able to speak again, or the other option is, based on where the tumor is and our precision, we may be able to reconstruct your tongue," which your hearing from me and my voice is that I have a reconstructed tongue, and I feel blessed. My mother and father told me I've been talking since I was six months old.

(Laughter.)

MS. FITZPATRICK: So, I'm very happy

to still be talking today, but Indiana can do better. Indiana can do better.

Thank you.

THE HEARING OFFICER: Thank you.

Mary Stewart -- I'm not sure about your last name.

MS. STEWART-PELLEGRINI: Pellegrini.

THE HEARING OFFICER: Pellegrini.

MS. STEWART-PELLEGRINI: I'm really pleased to be here and to be engaged in this discussion. It was not my intention to come to speak, I just checked the wrong box, but since --

(Laughter.)

MS. STEWART-PELLEGRINI: -- since I did, I'll say a few words.

I'm coming directly to this meeting from having had a meeting with my pulmonologist, who advised me to stay inside, keep the air conditioning on and the house closed, because the air quality was so poor. We've been in Indiana now about ten years -- or probably fifteen years, and for the last three years I've had a pulmonology -- pulmonology kind of infection problem. I have a strain of pneumonia in my right lung. So, one of the things we're thinking about now is whether we need to stay here not, or is it time to move?

Indiana has enormous will to do those things that are also very, very important to our community. My question is: Do we have the will after all of these years to do this, to provide the money and the resources -- a part of it is my tax dollars -- to make sure that we're advocating for healthy communities?

I volunteer and work with the AARP's Healthy Communities Project, and I know how important it is for every community in Northwest Indiana not only to have good mental health, but good physical health. And physical health and mental health are tied together, and if I cannot breathe, as I couldn't yesterday, which took me to the hospital, or to the doctor's office, then how can I mentally be available to do the work that's required for me to do as a professional and as a person who's interested and concerned about the well being of our community?

I grew up in Southern Indiana, in a little town called Madison, upon a river. It was a riverfront community, and it was a tiny community, and it was a closed community by virtue of lots of issues there, but one of the things the community gathered together to focus on was to create the will to live up to the statement of the power of community and taking care of all of us.

I have noticed here these last few years that we had more truckers going across Northwest Indiana and south and east -- east and west and north and south -- than we've had since I moved here. I have more truckers in my neighborhood and nearby -- we live in the Miller area. There are more trucks going back and forth there than I've seen since I've been here.

And there's enormous pollution. The fact that I can look to the sky and see that the air is orange is unacceptable. I not only am hopeful, I am -- and I'm not just prayerful. It is my intention to continue to be advocating for social justice that takes care of every person.

If we were living in a wealthy community, if I was living in downtown Chicago, where I have a condominium, we would not be having this discussion. I would go to the condominium, I would make a complaint, and the condominium associates, who are linked to people who have money and resources, would make sure that those things are taken care of.

So, although I would love to stay in Indiana, it's the place of my birth, it will -- certainly not going to be the place of my death. I encourage you to do all that you can to support the health and well being of the community in which I currently live, as well as any other community that's disenfranchised, because why would you not?

THE HEARING OFFICER: Thank you.

Linda Buchanan?

MS. BUCHANAN: Okay. I actually signed that because I wanted to ask a question, but now I understand that this is not really the forum for that, but I will raise the issue, because someone else mentioned it already. The lack of information about what is going on is amazing to me. I've only lived here about four years. I moved from Chicago, where I got emergency notices, and then I got explanations about what happened.

Sunday night I did get an emergency notice on my phone, as did everyone in my family. I think it came from the Porter County Emergency Management people, and then there was no explanation, no further explanation, no -- you know, no notice of what -- that it was from BP. At that time it was an unknown quantity, and I found out in the middle of the night from ABC News in Chicago what had actually happened.

And I've never to this day gotten another notice from that same emergency group that sent me the original notice as to what actually happened, or from any other source in Indiana. I only know this from following Facebook crumbs, next-door crumbs, and finally looking on the news and seeing Chicago news, to give me that information. I have not received it from any organization in Indiana yet.

So, again, I'm just kind of, you know, mentioning, because someone else did, this issue of -- and if you know who that organization should be, please tell me. I know it's not your place to answer questions today, but -- and if anybody else in the room knows, I'd be happy to know. But there just does seem to be a disconnect about giving people actual information from a reliable source.

So, that's all I wanted to say.

THE HEARING OFFICER: Thank you.

Is it Kimmre Gordon, last name Gordon?

MS. GORDON: Yeah. I don't even know what I want to say today, but I did know I needed to let you know that my son plays baseball, it's his favorite sport, he plays about three or four sports, but that's his sport that he looks to every year to be on the all-star team.

So, they had all-star games -- they had all-star games Saturday, Sunday, Monday and today, and instead of being in his game he looks forward to at the end of every season, he's at home right now sitting by his nebulizer --

sitting by his nebulizer.

And I'm exhausted because I've been up all night, just making sure when I hear that first croak or cough, that I'm in there, because he won't get up and do it for himself. He'll sleep and not know he's not breathing properly. And so, during the time when Caleb was incubated in my belly, I lived over in my old childhood home on Seventh and Burr Street, a few blocks down from the landfill.

So, I grew up with having issues, everybody in the block, you know, kind of having little issues here and there with breathing when it got too hot outside, because of the smell. Today the seniors that I grew up with on that same block are no longer alive from various illnesses and cancers. I remember watching my best friend's mom die of cancer in her 50's. My mom died when she was 59.

And so, last July -- so, last July I had my appointment, you know, my annual girly appointment -- if this gets to be too much for anybody, please excuse -- having issues and abnormalities with menstrual cycles and fibroids and such, but luckily, COVID -- I had no appointments come July after COVID. I go in for my annual and I find out that I have beginning stage cervical cancer.

Now, I've got it, partly, but we speak of pulling a person's body all together. They can cut me open and take it out. I've got a ten-inch incision right here on my belly where they took my womanhood out of my body. You ought to see that; okay? And then I have to pop two pills every night before I go to sleep to make sure it doesn't come back and I'm okay.

And I can't say I attest this to anything that I've been personally. I take care of myself, I eat good. I eat a lot, but I eat good.

(Laughter.)

MS. GORDON: But these past two days just got me thinking really about all of this work that we're doing in Gary with these fine men and women and our supporters, that we -- we speak the language that nobody understands. Sometimes we talk on deaf ears. It's emotional to me.

Past couple of days, one, I'm exhausted, I'm tired. I have had to have some kind of treatment for hives that I got Sunday night, hives all over my body, itching in my head. That night we woke up with the smell, my throat closed up.

So, this has gotten to a point where it's affecting our well being, because I've got a lot of work to do. We all have a lot of work to do, but I am the single parent of a teenage son who depends on me and solely depends on me, and I'm not getting up in the morning and feeling well, and I've still got to do it.

And so, that's what makes me agitated at some of the things that continue to happen. How do we not know -- as Ms. Buchanan said, how do we not know what's going on, waking up to a smell with a lump in my throat and an alert from an emergency medical system from La Porte and Lake Counties, and us hearing nothing else?

And I know that our team, Dorreen and Carolyn and Julie Peller, have been looking to find more information. It's terribly difficult to find. We do know that contaminants are in our air more so than any other part of this country, and in being proactive, I belong to a group that's gone around and collected soil samples and water samples from 50 hotspots, locations in this city, one of them being that Prairie Lake right by PB Oil.

So, if you don't tell us, we're going to find out. You know, we're going to find out what's happening, what's going on, whether we get transparency IDEM or whether we get it ourselves and it come out of our own pockets and spend nights and days sleepless and doing what we have to do to get what we know we deserve, and that's quality of life and clean air, clean water, and happy kids, happy, healthy kids. Happy, healthy kids.

And it's emotional for me, because I had to -- I had to watch all night and then be here today, as exhausted as I am on some medicine that my doctor gave me for hives. I have no clue where they came from, but I know that they were triggered from a chemical reaction or something I was smelling.

So, you know, I'm not asking -- I'm not even begging, but I'm asking you to understand that we are people, we are human beings, and that our children -- you love your children, you love your grandchildren, they're your families, even your pets. I know my dogs kept sneezing Sunday and Monday. We love our families and our people, and you would protect them at all costs, and I think that's why we keep showing up.

And so, I just needed to share that personal story with you today, because I walk around acting like I'm just okay, and I'm not. I've got a lot of work to do, and I can't do work when I'm sick. Thanks for being here and listening to us, and I hope you take this into account and approve the EPA's attainment demonstration and get this together for us finally, because we cannot breathe. We can't breathe; okay?

THE HEARING OFFICER: Thank you.

Joseph Conn?

MR. CONN: Hi. Welcome to Northwest Indiana. Thank you for coming. I appreciate you coming up here and listening to us.

I don't think Northwest Indiana is all that different than a lot of places in America with industrial development. I was at a similar public hearing just this morning, where the EPA was holding a hearing on coal ash, you know, and their new rules on coal ash, and they had representatives there from 23 states, from as far as New Mexico to North Carolina and two Native American reservations.

And there's tons of coal ash all over, I know, that can go into the air as well as pollute groundwater. The instant case was trying to get a rule honed down that would be -- actually be effective to get rid of this coal ash as a public health threat.

And we have three former coal-ash-burning electrical power plants here owned by NIPSCO, one of them still in operation in Michigan City, and one of them is out in the -- on the lakefront on the far west side of Lake County and is closed, but my understanding is it's not been cleaned completely. That is a community of color.

In the middle is a -- the Bailey plant that's been closed but hasn't been completely cleaned, and that's in probably arguably the wealthiest two communities in Northwest Indiana, Ogden Dunes on one side and Dune Acres on the other.

Then you go farther east to Michigan City and there's one still in operation there, and piles of coal there out in the open air. But this happens all across the country. Like I said, there's tons of coal ash over the -- everywhere.

We have this problem that we're discussing here is about air pollution and things that are in the air, and there's not going to be, as you well know -- we wish there were -- there's not a silver bullet. There's just no way we can make this all go away. We have to achieve a balance between, you know, jobs, the tax base and the economics, and trying to maintain a healthy environment, and it's a tough balance.

I'm representing the Green Party of Northwest Indiana and our three-county area, the

Lake Michigan counties of Northwest Indiana. I'm running for City Council in Hobart, and our community's roiled right now with an environmental issue where the city, to get a tax base, has given approval for 157 acres of land in the center of the city that had been farmland to be converted into six giant concrete warehouse terminals that will draw somewhere between 400 and 600 truck trips a day.

That's not bad enough. The master plan calls for 660 acres to be developed there, with 2100 truck trips a day. It's caused such a stir that there have been nine or ten candidates run, having publicly pledged to overturn that, and right now we have seven council seats, and six of them have candidates running against that have publicly pledged to overturn that rezoning and take that out of the master plan. I think it's going to be probably the litmus test issue in the election coming up on November 7th. I hope so.

Two of the other issues I want to bring up that affect us here and affect us in Hobart, and by the way, Hobart's just two miles south of here. If you go a mile east, you'll hit State Road 51, and if you turn right and go south, you'll come -- about two miles away, you'll come to the intersection with Indiana 130 and 51.

And they're going to put a roundabout in there, and I saw in your list of things that could be done if we don't make attainment, of traffic improvements and stuff that will mitigate against air pollution, and roundabouts are not a real popular thing up here, but you get used to them, and that's one way of mitigating it, and I would encourage this.

But I want to draw your attention to one thing: We had a railroad come through here in the 18 -- late 1800's, and we successfully converted a lot of it to a bicycle trail, and it's been a benefit. Part of our bicycle trail in Hobart has been incorporated into the Indiana Dunes National Park. We have 350 acres in Hobart of the Indiana Dunes National Park.

And right at that intersection, the railroad tracks went through the intersection at a diagonal. So, you have 51 coming north, you have 130 coming -- 51 going up north, and then it goes -- excuse me -- it goes this way and then turns north, 130 comes up from the south. And so, you have an intersection there with a four-way. It's kind of complicated, because the railroad track is going right through it on a diagonal like that.

We're going to put this roundabout in there, and we're told that INDOT doesn't finance -- doesn't finance bike trails. So, we're going to have a roundabout, which is something that people have a hard time getting used to in cars, and now you're going to have people coming up to this roundabout and going around the roundabout on bicycles.

Other places, there are bridges up and over on our bike trail, over the major thoroughfares, one in Portage going across U.S. 6, others farther west in Gary. You could get on a bike if you drive south here and take -- to that intersection I was telling you about, get on a bike and you can go all of the way to Indiana Dunes State Park, most of it on the bike trail, all sheltered.

We want to encourage that. That is something that we're going to need to have to do to get our arms around this climate change and global warming. We're going to have to get people more on bikes, and -- but if we're told by one arm of state government, "Well, we're not interested in funding or helping you do that," how is that in keeping with what your goals are, is to help us achieve attainment in air quality? They're at odds with one another.

And I think that we're going to have to have an all-hands-on-deck approach here. We're not going to have a silver bullet, but this is a tiny little bullet that we can be firing to make sure that the bike paths that we do have and we've developed over the course of a long period of time and invested in and are quite popular and very useful -- I can ride from my house -- the bike path is half a block from my house. I can get on and I can ride to the Dunes, or I can ride it all of the way up into Hammond on the bicycle.

We're going to need a lot more of those as we go by, so we want to encourage that sort of thing, and I think one of the things that I would suggest that you go home with is, added to this list of things you can do if we don't make the attainment, is communicate with -- particularly with INDOT on communications and promoting bike paths to get the VOC's and stuff out of the air and getting the carbon out of the air, CO_2 out of the air. It would be a big help, and I think we're going to have to go that way.

Is it going to solve the problem? No, it won't solve the problem, but the other thing is you've heard a lot of people here talk about too many times the corporations win, and it's hard to deny. We have 45 miles of Lake Michigan shoreline here, and I think U.S. Steel has -- Carolyn, how much; seven, seven miles of U.S. Steel on the Gary shoreline? Pretty much all of it except for Miller. Yeah.

MS. MCCRADY: Yeah.

MR. CONN: East Chicago, Hammond, huge chunks of it are taken up, in Ogden Dunes, and a big chunk of it is now -- what used to be

Bethlehem Steel is now Cleveland-Cliffs, Michigan City, the plant I was telling you about, the coal-fired plant. So, we've had this sort of like arrangement between industry and our environmental resources here.

A hundred years ago, when this stuff was built, these dunes were considered wastelands by almost everyone, and now, our consciousness has been raised and we understand what wonderful jewels we have in these dunes. And in 1927, we got to keep part of it, in the Indiana Dunes National Park.

And then after a hundred-year fight, we got a National Park. The only one in Indiana is here, and it's well deserved. I invite you to come back up and see it. Is it the Grand Canyon? No, but if you pay attention and look, you'll see this is a real wonder, it is a natural wonder, and we're really, really proud of having it, but it look a lot of work.

There is a photograph that I shared with a friend just yesterday of Richard Lieber. If you've ever been to Richard Lieber State Park, it's between Terre Haute and Indianapolis, named for the first park director for the State of Indiana, and there's a photograph from 1916, walking the dunes.

Standing right behind him was Stephen Mather, and if you watched the Ken Burns series on, you know, America's best idea about the national parks, you'll know that Stephen Mather was the first director of the National Park Service.

And there he is, 2016 [sic], talking with Lieber. Lieber's trying to talk him into making the Indiana Dunes a National Park, and Mather says, "No, no, it's just not going to happen. We need to have Grand Canyons. You know, we can't focus down on something this small, and it's got to be way out west where, you know, it's grandiose and everything. You can't have it in an urban area like this. But why don't you try and make it a State Park?"

And so, you know, Lieber took Mather's advice and went and pushed real hard, and after McCormick's Creek and Turkey Run, we became -- I think we were third, with Indiana Dunes State Park.

So, the point I want to make with that is, is that we have had, just like with the National Parks, and if you saw that series, that beautiful series from Ken Burns, there was always a battle. He set it up as like a morality play between good and evil. He simplified it, pretty much.

So, there was this guy who was going to dam up the Grand Canyon so he could get electricity for his gold mines, and he was going to throw -- let arsenic run down into the Colorado River and pollute the Grand Canyon, and that was on one side. And then you had all of the other people who looked in awe at the Grand Canyon and understood what they had and fought like hell to preserve it.

And if you look at every one of those park stories when he's talking about it, that happened. And we had that here in Northwest Indiana. We had to fight off NIPSCO to build a nuclear power plant just upwind from Indiana Dunes State Park. And fortunately, the contractor they hired didn't know how to pour concrete, and so, the footings of the reactor were defective, and so, that killed -- eventually killed the plant.

But it took effort, and the people -- there was lawyers in Dune Acres, I -- and it was mentioned to you -- that did pro bono work to fight and fight and fight to keep that NIPSCO power plant from being built, and they fought and fought and fought for a hundred years to get us a National Park. So, there is this balance that's always been going on as part of our history, this rich history. It's a history of Indiana. It's a history of America.

And what I'm suggesting to you, you're doing a very important -- you have an extremely important role, as everybody has mentioned. You're doing God's work here, whether you know it or not. Your role is to help find -- strike that balance between what we need to preserve and maintain and what we need to kind of let go and provide for the jobs and the tax base. And it's a tough -- it's a tough thing to have to do.

So, I, again, want to thank you for coming up. I pray that you have wisdom in your choices, but I would just make that suggestion that you consider having bicycles and stuff and working with INDOT to make sure that they don't tell other communities, "Well, we don't -- we don't do bicycles," because you have a portfolio that says, "We're supposed to keep our air clean," and this is a way of doing it.

And so, maybe you need to adjust your thinking, and we have an intersection with a bike trail. Maybe you ought to have some funds for that when you're planning everything else, because that's going to help us keep the air quality high.

Thank you very much. I appreciate your time.

THE HEARING OFFICER: Thank you.

Bridgette Murray?

MS. MURRAY: Hi. Good evening. My name's Bridgette Murray. I live in Gary. I grew up in Portage.

I appreciate your position here. My

husband is a former Assistant Commissioner of the Office of Air Quality for IDEM, so I understand your position here. I understand that you're bound by regulations, and I also understand that little of what we say here tonight matters.

The stories of people's health, especially the children, are heartbreaking, but what matters to the EPA and to IDEM is numbers and data, and we're here tonight about the ground-level ozone standard. We're not here about the particulate matter from the Canadian fires or the BP flaring or coal ash. We're here about the ozone standard and trying to designate our area as an attainment area instead of a nonattainment area, which it is now.

A little clarity about ground-level ozone. It's not coming out of tailpipes of cars, it's not coming from factories. Ozone is created. It's formed when nitrous oxide emissions and VOC, volatile organic compound emissions, are emitted from industry, from cars, from various sources, and it reacts with sunlight, and then it forms ozone at our ground level, where we have to breathe it.

So, the EPA, in March, I believe, said that our area, EPA Region V, which includes us, the Chicagoland area, has now met the standards and that our air is healthy enough for ozone and that it's okay. And they determined that from numbers, from data. And I believe them, and I believe that the reason they came to this conclusion is because the three years of air quality data that was used was from 2019 through 2021.

And I think we all know what happened during that time. We had a worldwide pandemic, everything came to a grinding halt, we had hardly any cars on the road, factories slowed down all of their production. So, two of the three years that they're basing this decision on, the air quality data is coming from the pandemic time. This is not a mistake. This is deceptive.

And for then EPA to go on and say -- and I'm quoting here from EPA Region Administrator Debra Shore -- "People in Northwest Indiana are breathing cleaner, healthier air due to EPA's partnership with the State of Indiana," based on this air monitoring data from 2019 to 2021. It's deceptive, and for the EPA to take credit for us supposedly breathing healthier air is unconscionable. We're not breathing healthier air.

AUDIENCE MEMBER: No.

MS. MURRAY: These air quality standards, this data, needs to be relooked at going from 2022 onward. You cannot count the pandemic years when we had barely any cars on the road and much less industry pollution than is normal to put us into an attainment status for ozone instead of nonattainment status. This is -- it is just -- it's deceptive, it's wrong, and it needs to be changed.

So, I'm asking two things: That data from non-COVID years be considered. You cannot put the COVID years into that data when you're trying to decide that we're going to go to an attainment status. And also, in the opening remarks there was reasonable achievable control technology mentioned. In our area, there should be no industry that is only held to a reasonable achievable control technology standard. They should all be held to a maximum achievable control technology standard.

So, those are my two asks: All industry be held to the maximum achievable control technology standards in this area; and that the air quality data that is used to make this decision not come from the years of COVID, when it cannot be argued about the -- I mean it's plain that there was much less pollution during those years than during normal years.

Thank you.

THE HEARING OFFICER: Thank you.

Linda Anguiano? Okay.

MS. ANGUIANO: Hello. I've seen a couple of you before.

I think you can tell from people's comments we're very passionate about our children, our loved ones, our seniors, our elders, and I think people mentioned the coal ash and the landfills, because this area is bombarded with all kinds of pollution.

I'm the current Chairperson of Progressive Democrats of America, and every year we vote on our priority, and for the last seven years, the environment has been our top priority, because we have children, we have loved ones, we have spouses, we have pets. I myself developed seasonal asthma after I moved back here. I grew up in Indiana, but I was so sick all of the time that when I went to college, I moved as far as I could, and I came back for brief visits.

I recently returned, and I was one of the founders of Just Transition, which is trying to improve the environment and make it more green friendly, make it using less fossil fuels. And they've been working with EPA and the pro bono attorneys, as Joe Conn said, but it's a fight, it's a struggle. I think that there's such a high level of ill health that this area, the insurance companies call it "Cancer Row," and so, we need all of the help we can get.

I understand that before I moved back to Indiana, that IDEM's budget was cut significantly. I don't know that data, but I understand these are very challenging times, and when we had a Republican President and a Republican-dominated Senate and Republican-dominated House, a lot of these protections that EPA is supposed to be imposing, they got undercut. They got their budgets pulled out from them. So, we really need a working partnership.

When I heard all of these stories, the mom with her son, and Beryl with her tongue, I mean it's heartbreaking. And so, I know you don't have the resources of the big industry, but Indiana has billions of dollars in surplus, and they're making deals with businesses to come. Indiana's voted one of the most business-friendly states. We are a right-to-work state. That means, "We have a right to let you work and we can fire you for no reason." It's like, "Who is standing up for the citizenry?"

Yeah, other people brought up other issues, and this is about the ozone, but they all have a cumulative effect, and we need help, and if there's a partnership that all of these active citizens -- I means some of these people put in hours and hours and weeks, and we do all we can.

I just happened to stop in here -- maybe it's too much information -- just to use the restroom.

(Laughter.)

MS. ANGUIANO: And I said, "Sandy?"

She goes, "Well, it's so good you came all this way."

And I said, "For what?"

And she says, "Because there's an IDEM hearing."

"An IDEM hearing? I didn't hear about the IDEM hearing."

You know, we need more communication from you all. We need a partnership with you all. We know you don't have millions and billions of bucks like BP.

I had some friends who were out in the back yard, I didn't join them, and there was like six adults, and they swore that they saw flying UFO's. I think it was -- I think it was -- what's today; Wednesday? Like Saturday night, and not all of them were drinking.

And so, my landlady -- yeah, some were smoking.

(Laughter.)

MS. ANGUIANO: My landlady got scared. She said, "What if it's those UFO's? What if it's those, you know, aliens, and they're spreading this toxic?" And I thought, "Oh, boy," you know, paranoia, ignorance of science and ignorance of this, paranoia.

And then I was trying to read about what happened at BP, and they said unexplainable disturbance.

AUDIENCE MEMBER: Yeah.

MS. ANGUIANO: An unexplainable disturbance. Well, maybe my crazy landlady wasn't crazy about this thing.

You know, people are going through really rough times with the economy, not being able to afford health insurance, having to choose, but we need you to be our advocates. You're like our last stand. And we don't have money. Almost all of us are working with, starting nonprofits. Do you think if Joe gets elected mayor, he's suddenly going to be a millionaire? You know --

MR. CONN: I hope.

MS. ANGUIANO: -- we do -- what?

MR. CONN: I hope.

MS. ANGUIANO: Oh, you're raising the salary?

When the gentleman talked about being outside with his baby, I started crying. And I'm just so tired. It's like, "How hard do we citizens have to fight?" You know, and all of these things are connected. Okay. Today we're talking about the ozone, but, you know, maybe if I stop at the Portage Library or the Hammond Library, or I -- that's where I grew up. That's where I live.

We need your help and we need a partnership, and I know it's not your decisions on budgets and all, but maybe -- you came and had a meeting with the people who were trying to save the last dunes in Hammond, and because of that, there was an EPA-sponsored hearing, and about 200 people showed up. So, people care about the environment, and we need -- we need assistance from those in the positions of power.

Thank you.

THE HEARING OFFICER: Thank you.

I have Sandy O'Brien. Did you want to say anything?

MS. O'BRIEN: Yeah, sure. I think I forgot to check the box. I was wondering why I got left to the last speaker. It's because I forgot to check the box; right?

AUDIENCE MEMBER: You have to talk louder.

MS. O'BRIEN: Okay. Sandy O'Brien. I am a member of Sierra Club. I was a Sierra Club leader for many years, and I am here to support GARD and everybody else here who is very interested in clean air, and I support the Environmental Law and Policy Center's report, which is, you know, more than a layperson can do, but we think that you should take it into account.

AUDIENCE MEMBER: Sandy.

AUDIENCE MEMBER: Louder.

MS. O'BRIEN: Oh.

Please take the Environmental Law and Policy Center's report into account, because they speak for us. They're the experts that we need to give you the numbers and the technical information. You've heard plenty about how it affects everybody's lives, the pollution. It seems like -- it seems like the state is giving the ozone thing -- it's like kicking the can down the road.

You know, I think I read something about -- in the report -- about how it's too late, even if we have some regulations put in place right away, it'd still be too late to have the ozone decrease by 2024, so -- so, so, so, you know, we're not going to do anything, I guess.

It doesn't sound good, and we could at least get a start for the next period of, I don't know, renewal or whatever. It doesn't hurt to get an early start on this, if we start now, and then maybe be ready in five years for an actual redesignation as attainment and not a moderate impairment that we have now. It seems like we're just continuing the same problem we had before, and not considering the major industrial sources of our pollution.

Thanks.

THE HEARING OFFICER: Thank you.

We have one last person, Sylvestre --

MR. WAGUESPACK: Yeah.

THE HEARING OFFICER: Would you like to speak?

MR. WAGUESPACK: No, I just asked for --

THE HEARING OFFICER: Okay.

MR. WAGUESPACK: -- information.

THE HEARING OFFICER: All right.

(Discussion off the record.)

THE HEARING OFFICER: Does anyone else wish to make any formal statements for the record concerning this draft DIP?

MR. ZOELLER: I did turn in a slip --

THE HEARING OFFICER: Oh.

MR. ZOELLER: -- and I didn't want to have my comments -- you know, don't feel like you've got to respond to these. I've put in 14 pages single spaced. That's plenty enough. I'm Mike Zoeller. I'm a senior attorney with the Environmental Law and Policy Center, representing its members in Indiana here.

I really appreciate you all coming up here and visiting with the folks in Lake and Porter Counties and hearing just really some of the concerns that people have, particularly -- particularly this week, but it's -- this is an ongoing issue for folks.

I think it says a lot about IDEM that all of these people came out to speak with you this evening, because they know that you all do have the authority, the expertise, and, you know, the commitment to the environment of Indiana. If they thought that you all couldn't do the job, they wouldn't be here.

There are, I believe, about 375,000 people in the townships of Lake County that are part of this nonattainment zone -- area. This is a small fraction of them, but there are a lot of other people. You know, I want to impress upon you that a lot of people are counting on IDEM.

So, it's good to come up every once in while and hear from some of them, because I know you hear from the lawyers for industry groups and API and, you know, the -- whatever. You know, lots of folks are in Indianapolis, and I know that you hear from them regularly, as you should.

But it's also good to hear from the regular folks who are suffering from asthma and respiratory illnesses that are the target of ozone. That's why we want to get ozone down. So, it's really important that you kind of have that background. I really appreciate you all being here tonight.

Thanks.

THE HEARING OFFICER: Thank you.

If there's no one else, thank you for your time, and the hearing is closed.

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Thereupon, the proceedings of June 28, 2023 were concluded at 7:36 o'clock p.m.

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CERTIFICATE

I, Lindy L. Meyer, Jr., the undersigned Court Reporter and Notary Public residing in the City of Shelbyville, Shelby County, Indiana, do hereby certify that the foregoing is a true and correct transcript of the proceedings taken by me on Wednesday, June 28, 2023 in this matter and transcribed by me.

Lindy L. Meyer Jr.

Lindy L. Meyer, Jr.,
Notary Public in and
for the State of Indiana.

My Commission expires August 26, 2024.
Commission No. NP0690003

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Written Comments Received at Public Hearing on June 28, 2023

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ENVIRONMENTAL LAW & POLICY CENTER

June 26, 2023

<u>BY EMAIL ONLY</u>
Ms. Michele Boner
IDEM Office of Air Quality
100 North Senate Avenue, Room 1003
Indianapolis, Indiana 46204-2551
mboner@idem.in.gov

Re: Comments on IDEM's Draft Documents in Compliance with the Redesignation of <u>Chicago (WI-IL-IN) as "Moderate" Nonattainment for 2015 8-Hour Ozone NAAQS</u>

Dear Ms. Boner:

The Clean Air Act required the Indiana Department of Environmental Management ("IDEM") to reduce ground-level ozone in northern Lake and Porter Counties below health-based limits by August 3, 2021. IDEM failed to meet that deadline. As a result, EPA re-designated northern Lake and Porter Counties from "marginal nonattainment" to the more serious "moderate nonattainment." As such, the Clean Air Act requires IDEM to prepare and obtain EPA's approval of a plan to attain the ozone standard no later than August 3, 2024. But IDEM's draft *Attainment Demonstration and Technical Support Document* ("*Attainment Demonstration*") proposes <u>no additional measures</u> to reduce ozone. This does not satisfy the goals of the Clean Air Act and fails to address a serious public health problem facing the overburdened residents of Northwest Indiana.

The Environmental Law & Policy Center ("ELPC"), on behalf of itself and its members, submits these comments on IDEM's draft *Attainment Demonstration* to encourage IDEM to impose additional control measures to expeditiously attain and maintain the 2015 8-hour ozone National Ambient Air Quality Standard ("NAAQS") for northern Lake and Porter Counties. After summarizing the regulatory background and clarifying that ozone levels are increasing, we discuss each of the four requests IDEM makes of EPA to approve its *Attainment Demonstration*. Finally, we recommend that IDEM revise its *Attainment Demonstration* to reduce emissions from the largest polluters along the lakeshore – the integrated steel mills and their co-dependent industries. IDEM can achieve these reductions through increased inspections and enforcement, and in revisions to the facilities' Part 70 permits upon renewal. IDEM's *Attainment Demonstration* should assure improved air quality for local residents and visitors to Indiana's Lake Michigan lakeshore. ELPC's comments also seek to increase public awareness of IDEM's efforts to attain Clean Air Act air quality standards. To promote this awareness, ELPC requests that IDEM hold a public hearing on June 28, 2023.

ELPC is the Midwest's leading public interest environmental legal advocacy organization and works to protect the environment and public health. ELPC's work includes a focus on industrial and other major sources of pollution affecting the health and welfare of residents along Lake Michigan's southern shoreline in Northwest Indiana. As part of this work, ELPC tracks air emissions reports from major industries along the Indiana lakeshore, including their compliance with federal and state environmental regulations. In doing so, ELPC seeks to clean up, not close, the industrial facilities – which have long been drivers of the regional economy – requiring industry to play by the rules and implement the latest emissions control technologies to reduce pollution and improve the landscape where people live, work, and play.

Background

The NAAQS are health-based air quality limits that serve as the foundation of the Clean Air Act. Each State must adopt regulations for the implementation, maintenance, and enforcement of the NAAQS. 42 U.S.C. § 7410(a). These state regulations, referred to collectively as a State Implementation Plan ("SIP"), must be approved by EPA before a state can issue air permits and carry out the other functions of the Clean Air Act. Indiana submitted its initial implementation plan in 1972 and it is regularly revised and approved by EPA.[1]

At issue here is EPA's current NAAQS for ground-level ozone as measured on an 8-hour average. EPA had previously adopted a NAAQS for ozone on a 1-hour and 8-hour average, but lowered the 8-hour concentration limit to 0.070 parts per million in 2015.[2] EPA established this lower limit in part to "protect the large majority of the population, including children and people with asthma." *Id.* Ozone, however, is not emitted but is formed in the atmosphere on warm, sunny days in the presence of two other pollutants: nitrogen oxides ("NOx") and volatile organic compounds ("VOCs"), sometimes referred to as ozone "precursors." The only way to reduce ozone concentrations is to reduce the emissions of NOx and VOCs.

The health impacts of ozone exposure are well-documented.[3] Studies show that even brief ambient exposure to ozone is associated with asthma exacerbations, emergency room visits, hospital admissions, and deaths, particularly in children, adults who are active outdoors, and those with asthma.[4] Ozone exposure is also associated with increased risk of hospitalization for

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1 37 Fed. Reg. 10863 (May 31, 1972); 40 C.F.R. Part 52, Subpart P (Indiana SIP).

2 EPA revised the 8-hour ozone NAAQS "based on an integrative assessment of an extensive body of new scientific evidence, which substantially strengthens what was known about O_3-related health effects in the last review." 80 Fed. Reg. 65,292, 65,294 (Oct. 26, 2015).

3 See: https://www.epa.gov/ground-level-ozone-pollution/health-effects-ozone-pollution

4 Patrick L. Kinney, *The Pulmonary Effects of Outdoor Ozone and Particle Air Pollution*, 20 Seminars in Respiratory and Critical Care Medicine, 1999 at 601. *See also*, Stephanie M. Holm, *Systematic Review of Ozone Effects on Human Lung Function, 2013 Through 2020*, 161 CHEST, 190-201 (January 2022) (reviewing studies that consistently demonstrate that even short-term low-level ozone exposure decreases children's lung function).

people with acute myocardial infarction, coronary atherosclerosis, and pulmonary heart disease.[5] In addition, life expectancy increases when ozone concentrations are held well below current standards.[6] And those standards may be too high to adequately protect human health. Instead, the "critical threshold where ozone significantly increases respiratory mortality is 31 ppb" – less than half of the current 8-hour limit.[7]

In 2018, EPA designated the Chicago area, which included portions of Wisconsin, Illinois, and the northern half of Lake County, Indiana, as being in "marginal nonattainment" of the 2015 8-hour ozone NAAQS.[8] This lowest nonattainment designation is defined as an 8-hour ozone concentration of between 0.071 and 0.081 ppm. EPA gave the Chicago designated area and other marginal nonattainment areas until August 3, 2021 to reduce ozone concentrations below 0.070 ppm. 40 C.F.R. § 51.1303(a) (Table 1). Each state within the Chicago designated area was required to revise its implementation plan to reduce ozone precursors sufficient to attain air quality below the NAAQS limit as expeditiously as practicable but not later than the deadline.

To determine whether an area has attained the NAAQS, EPA relies on the "design value" – the three-year average of the fourth-highest ozone measurements for an 8-hour period. *See* 40 CFR part 50, Appendix U. The Chicago area's design value, including northern Lake and Porter counties, did not fall below the NAAQS by the August 3, 2021 deadline, but continued (and still continues) to exceed the NAAQS limit. Consequently, on November 7, 2022, U.S. EPA reclassified the northern portions of Lake and Porter Counties from "marginal" to "moderate" nonattainment and gave IDEM three more years to reach attainment – until August 3, 2024.[9]

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5 Petra J.M. Koken, et al., *Temperature, air pollution, and hospitalization for cardiovascular diseases among elderly people in Denver*, 111 Environmental Health Perspectives, 1312, 1316 (August 2003).

6 Joel D. Schwartz, *A Direct Estimate of the Impact of $PM_{2.5}$, NO_2, and O_3 Exposure on Life Expectancy Using Propensity Scores*, 32 Epidemiology, 469-476 (July 2021) (estimating a 0.15 year increase in life expectancy over a decade by reducing O_3 emissions from 45 to 35 ppb).

7 Ziheng Liu, Xi Chen and Qinan Lu, *Blowin' in the Wind of an Invisible Killer: Long-Term Exposure to Ozone and Respiratory Mortality in the United States*, IZA Discussion Paper No. 15981, (March 7, 2023) at 3. *See also* Sverre Vedal et al., *Air Pollution and Daily Mortality in a City with Low Levels of Pollution*, 111 Environmental Health Perspectives, (January 2003) at 45 (finding that even low concentrations of air pollutants such as ozone are associated with adverse effects on mortality); Francesca Dominici, et al., *Assessing Adverse Health Effects of Long-Term Exposure to Low Levels of Ambient Air Pollution: Implementation of Causal Inference Methods*, 211 Research Reports Health Effects Institute, 1-56 (January 2022) (finding increased health risk at O_3 concentrations greater than 0.045 ppm.

8 83 Fed. Reg. 25,776, 25,804 (June 4, 2018). The northern half of Porter County was later added to the Chicago designated area. 86 Fed. Reg. 31,438, 31,440 (June 14, 2021).

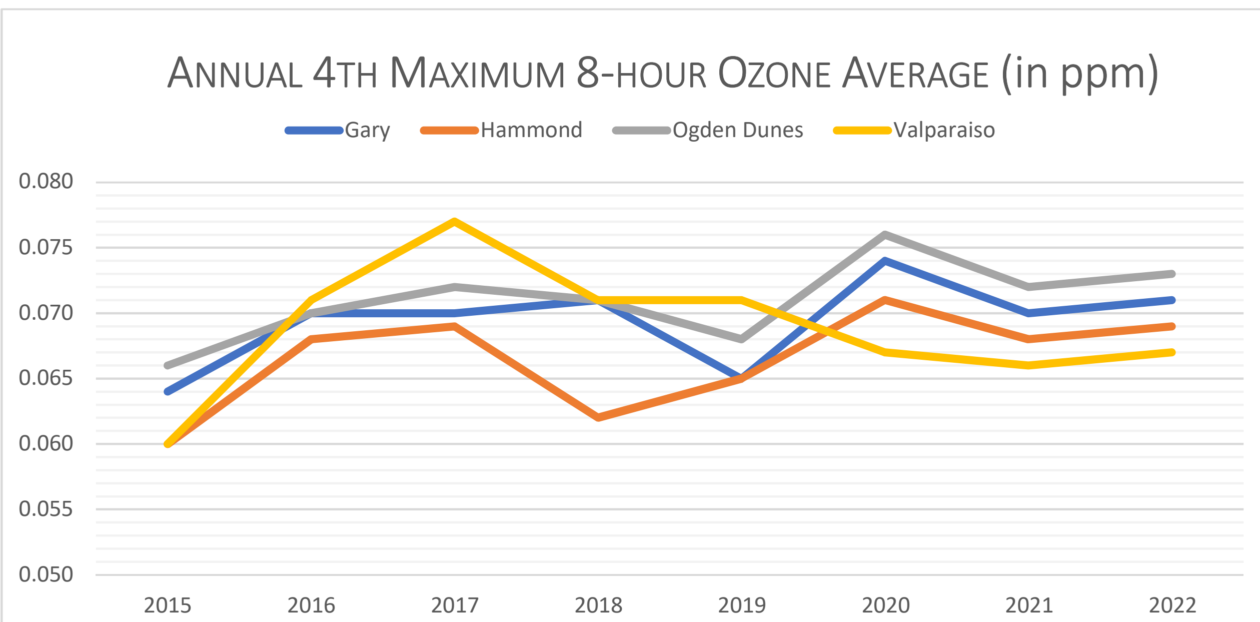
9 87 Fed. Reg. 60,897, 60,918 (Oct. 7, 2022).

<u>Ambient Ozone Levels in Lake and Porter Counties Are Increasing</u>

<u>Comment</u>: IDEM's *Attainment Demonstration* should recognize and address the excess and increasing levels of ozone in Lake and Porter Counties.

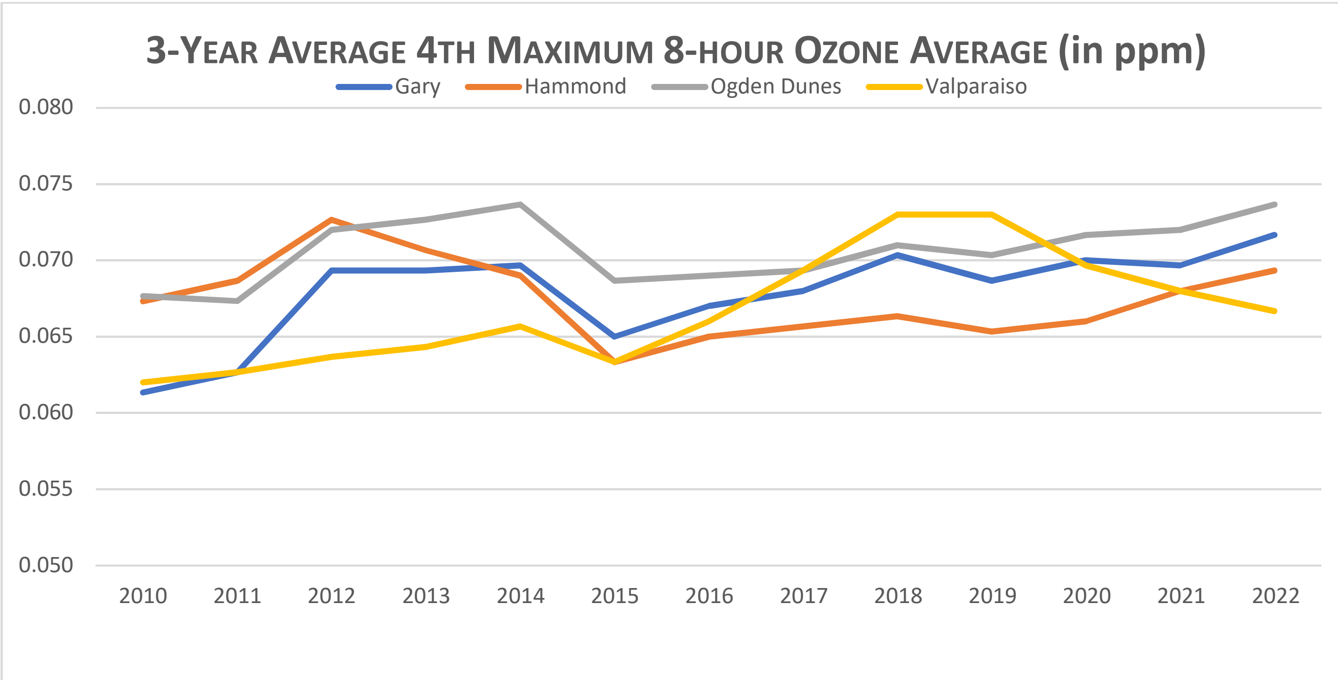
IDEM's *Attainment Demonstration* ignores the significance and trend of the Northwest Indiana ambient air quality measurements in favor of data from the Chicago nonattainment area as a whole, and modeled results prepared by the Lake Michigan Air Directors Consortium ("LADCO"), of which IDEM is a member. IDEM asserts that "[m]onitoring data shows that overall area design values are decreasing, air quality peak values are declining, and the number of exceedances is falling." *Attainment Demonstration*, Section 2.11.3. IDEM, however, is only responsible for attainment of the 8-hour ozone NAAQS for Lake and Porter Counties and the monitors there show that air quality peak values are increasing. *Id.*, Chart 4.1, at 29.

Ambient measurements of ozone are taken by EPA-approved monitors – two in Lake County (in Hammond and Gary) and two in Porter County (in Ogden Dunes and Valparaiso). The general location of these four monitors is shown in Figure 4.1 in the *Attainment Demonstration*. Every summer, one or more of these monitors records 8-hour average ozone concentrations in excess of the NAAQS limit of 0.070 ppm. By graphing the 4th-highest 8-hour ozone concentration measured at each of the Indiana air quality monitors for each year since 2008, the data show an overall <u>increase</u> in 8-hour ozone levels.[10] The monitors in Gary and Ogden Dunes, which are much closer to the lakeshore than those in Hammond and Valparaiso, tend to have higher ozone concentrations. The reason for this difference is discussed below.



10 Data gathered from EPA AirData Air Quality Monitor website: https://epa.maps.arcgis.com/apps/webappviewer/index.html?id=5f239fd3e72f424f98ef3d5def547eb5&extent=-146.2334,13.1913,-46.3896,56.5319

Using this same data to plot the 3-year average used as the design value screening tool by EPA to satisfy its attainment standard, we see a similar increase over the same time period:



IDEM's Proposed SIP Revisions

States with areas in moderate nonattainment of the NAAQS must revise their implementation plans to make reasonable further progress toward attaining the NAAQS in compliance with Sections 172 and 182 of the Clean Air Act.[11] IDEM drafted this *Attainment Demonstration* to comply with Sections 172 and 182. In it, IDEM asks EPA to approve of its SIP revisions that adopt no additional control measures to attain the 2015 8-hour ozone standard. In doing so, IDEM seeks EPA approval of four SIP revisions, each of which ignores Indiana's responsibility to protect public health.

I. IDEM asks EPA to certify that it has adopted all reasonably available control measures to demonstrate attainment as expeditiously as practicable and that no additional measures that are reasonably available will advance the attainment date, in compliance with CAA Sections 172(c)(1) and 182(b)(2). *Attainment Demonstration*, Section 2.1.

Comment: By overlooking measures to control emissions from point sources, IDEM has not established that it has adopted all reasonably available control measures and its hyper-technical reading of the regulations abdicates IDEM's responsibility to attain the NAAQS as expeditiously as practicable to protect human health.

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[11] 42 U.S.C. §§ 7502(b) and 7511a(b).

IDEM asserts that it has complied with Sections 172(c)(1) and 182(b)(2) because it "has adopted all reasonable and available control measures to demonstrate attainment as expeditiously as practicable and that no additional measures that are reasonably available will advance the attainment date." *Attainment Demonstration*, Section 2.1, at 5. In support of this assertion, IDEM relies on a study prepared for LADCO intended to identify and evaluate NOx and VOC emission controls to reduce ozone concentrations throughout the Chicago area.[12] Although IDEM touted this study as a "comprehensive assessment of candidate control options," the study did not consider point sources, such as the large lakeshore industries with Part 70 air emission permits, "because point source emission control analyses are expected to be performed on an as-needed basis by state/region specific agency staff."[13] As discussed below, point sources are some of the largest sources of ozone precursors. Without identifying and evaluating NOx and VOC emission controls from large point sources, IDEM cannot demonstrate that it has adopted all reasonably available control measures (the Clean Air Act requirement sometimes referred to as "RACM.")

IDEM, however, concludes that such RACM demonstration is irrelevant because no further control measures can achieve attainment of the NAAQS by August 3, 2024:

> Additional control measures are required for RACM if they can advance the attainment date by a year or more. Any measure(s) advancing the attainment date by a year would have had to be in place by January 1, 2022. Even though some of the identified measures may provide NOx or VOC emissions reductions beyond what is currently required, they cannot advance the attainment date, as it has already passed. Therefore, no additional emissions control measures or reduction requirements are applicable for RACM for Indiana's portion of the Chicago nonattainment area under the 2015 ozone standard.

Attainment Demonstration, Section 2.1, at 7.

Admittedly, there is little time left to demonstrate attainment before the deadline of August 3, 2024, particularly since the ozone season runs through the end of August requiring attainment to be demonstrated this year. But given the increasing ozone concentrations in northern Lake and Porter Counties, IDEM must implement additional control measures if it is to <u>ever</u> reduce ozone concentrations below the NAAQS. Simply saying that any new control measures would not achieve attainment by August 3, 2024 does not satisfy the goal of the Clean Air Act.

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12 *Attainment Demonstration*, Section 2.1, at 6 (citing https://www.ladco.org/technical/projects/ramboll-o3-%20precursors-contract-2020/).

13 Ramboll US Consulting, Inc. *Final Report: Control of Ozone Precursor Emissions in the Great Lakes Region* (March 2021), at 1.

II. IDEM asks EPA to certify its emissions reporting rule, 326 IAC 2-6, as in compliance with CAA Section 182(a)(3)(B)(ii). ***Attainment Demonstration*, Section 2.4; *Certification of Indiana's Emissions Reporting Rule 326 IAC 2-6 for the 2015 Ozone NAAQS* (Attachment G).**

Comment: IDEM's emissions reporting rule satisfies Section 182(a)(3)(B), but IDEM fails to adequately enforce 326 IAC 2-6.

In order to identify where emission reductions could be made, states must submit "a comprehensive, ***accurate***, current inventory of ***actual emissions*** from all sources." 42 U.S.C. § 7511a(a)(1) (emphasis added). To do so, each state must provide a means for collecting and reporting these emissions. EPA initially certified IDEM's emissions reporting rule in 1994 and then approved IDEM's subsequent amendments to its emissions reporting rule.[14] Indiana's current emissions reporting rule would appear to continue to comply with CAA Section 182(a)(3)(B). The problem, however, is that IDEM is failing to properly apply and enforce its reporting rule.

EPA has long accepted estimated emissions using an approved estimation method, such as an emissions factor (an estimate of the rate at which a pollutant is released) divided by the production rate or throughput and factoring the control efficiency of any pollution controls. *See* 326 IAC 2-6-4(c)(5)(A)(ii). In some cases, this estimation may be as close to "actual emissions" as reasonably possible, but there are at least three circumstances in which these estimates may be inaccurate and should be corrected:

1) Facilities that track NOx and/or VOCs with continuous emissions monitoring systems ("CEMS") still appear to report total emissions using estimations based solely on throughput multiplied by an emissions factor rather than the actual emissions measured by the CEMs. For example, the Sinter Plant windbox scrubber stack at the Cleveland-Cliffs Burns Harbor steel mill is required to measure its VOC emissions using a CEMS. *See* Part 70 Permit T127-40675-00001, § D.4.5(a). Yet the annual emissions it reports on State Form 52052 in compliance with 326 IAC 2-6-4 continues to report its annual VOC emissions from this source (80.45 tons in 2021) based upon a site-specific emission factor and not CEMS data.[15]

2) Part 70 permittees are required to estimate actual emissions to "include upsets, downtime, and fugitive emissions." 326 IAC 2-6-4(c)(5)(A)(i). The term "upset" is undefined, and it is unclear how such emissions would be reported on State Form 52052. A review of facilities that experienced excess emissions did not appear to report such exceedances in their annual emissions reports. Some of these exceedances may be reported in the permittees' quarterly reports and others are identified through periodic stack tests. In either case, the facility is aware of the exceedance but may still

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[14] 59 Fed. Reg. 29,953 (June 10, 1994); 86 Fed. Reg. 31922 (June 16, 2021).

[15] Data from the quarterly CEMS reports for 2021 appeared to be consistent with the annual emissions report. We did not evaluate other years or other facilities with CEMS data.

be in negotiations with IDEM over any penalty or other enforcement. IDEM has no requirement in 326 IAC 2-6 to correct or amend their annual emissions statement after resolving enforcement actions involving exceedances.

3) The total emissions reported by each stationary source may not capture all emission sources or may simply miscalculate them, as demonstrated by subsequent inspections and enforcement actions that identify additional emissions. For example, BP's Whiting Refinery reported its 2021 total VOC emissions as being 419.7 tpy. In October 2019, EPA and IDEM conducted an inspection of the Whiting Refinery that identified significant and previously unreported benzene emissions. EPA estimated that its recently proposed Consent Decree with BP will reduce VOC emissions by 372 tpy.[16] It is unclear how much of this reduction BP previously reported to IDEM, but it seems unlikely that going forward BP will emit less than 50 tons of VOCs annually.

The purpose of IDEM's emissions reporting rule, 326 IAC 2-6, is to create an accurate inventory of actual emissions. While the rule itself satisfies the requirements of CAA Section 182(a)(3)(B), IDEM will not have an accurate inventory of actual emissions if facilities are allowed to estimate emissions from sources that measure emissions with CEMS, fail to report upsets and exceedances, or fail to identify all emissions sources. IDEM should improve its inspections and enforcement to ensure that all emissions are being reported.

To further improve the accuracy of emissions reports, IDEM should consider requiring all large sources of NOx and VOCs to install CEMS. In addition, IDEM should consider requiring installation of fence line monitors to confirm that all emissions from large stationary sources are being reported.

III. IDEM asks EPA to approve its updated base-year emissions inventory, submitted on September 10, 2021, with mobile emissions modeling updated to utilize EPA's most current model (MOVES 3.1), in compliance with CAA Section 182(a)(1). ***Attainment Demonstration*****, Section 2.3;** ***Revised 2017 Base-Year Emissions Inventory*** **(Attachment D).**

Comment: IDEM's base-year emissions inventory satisfies Section 182(a)(1), but may lack accuracy as discussed above. Based on this inventory, IDEM should consider reducing NOx and VOC emissions from the most significant sources that cause high ozone concentrations.

IDEM's *Revised 2017 Base-Year Emissions Inventory*, in Attachment D, identifies all major source of NOx and VOC emissions in northern Lake and Porter Counties. According to Table 3.2 of the *Revised 2017 Base-Year Emissions Inventory*, point source emissions are the single largest source of NOx in both Lake and Porter Counties, contributing 65.4% and 68.7% respectively – and they are increasing. IDEM's Emissions Inventory Tracking System (EMITS) identifies 63 major sources of air pollution requiring a Part 70 air permit in Lake County and

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16 *See* https://www.justice.gov/opa/pr/justice-department-and-epa-announce-settlement-reduce-hazardous-air-emissions-bp-products

another 20 in Porter County. These are not just any stationary point sources, but include six facilities in the top 20 of the highest-emitting NOx sources in Indiana.[17] According to IDEM's EMITS summary data, the top ten (of 83) point source emitters in Lake and Porter Counties emit 96% of all NOx from point sources.[18]

Table 1: Top ten point sources of NOx emissions in Lake and Porter Counties (in tons per year)

Cleveland-Cliffs Burns Harbor LLC	8,270.0
US Steel Corporation Gary Works	3,395.3
Cleveland-Cliffs Steel LLC (Indiana Harbor West)	3,025.8
BP Products North America Inc Whiting Refinery	1,270.3
Carmeuse Lime Inc	1,015.4
Cleveland-Cliffs Steel LLC (Indiana Harbor East)	998.1
Indiana Harbor Coke Company LP contract	721.1
W.R. Grace & Co. - Conn.	158.4
NLMK Indiana	114.8
Portside Energy LLC	110.8

Total: 19,080 (96%)

The contribution of VOCs from large point sources is slightly lower. According to Table 3.2 of the *Revised 2017 Base-Year Emissions Inventory*, point source emissions are the second highest contributor to VOC emissions in Lake and Porter Counties, contributing 35.5% and 10.2% respectively. According to IDEM's EMITS summary data, the top ten (of 83) point source emitters in Lake and Porter Counties 71% of VOCs from point sources.

Table 2: Top ten point sources of VOC emissions in Lake and Porter Counties (in tons per year)

Cleveland-Cliffs Steel LLC (Indiana Harbor West)	625.2
Cleveland-Cliffs Burns Harbor LLC	468.6
BP Products North America Inc Whiting Refinery	419.7
CITGO East Chicago Terminal	194.6
US Steel Corporation Gary Works	192.8
Buckeye Terminals LLC East Chicago Term	101.3
Ardagh Metal Beverage USA Incorporated	85.2
Buckeye Terminals LLC	83.7
Huhtamaki Incorporated	81.0
Cleveland-Cliffs Steel LLC (Indiana Harbor East)	70.0

Total: 2,322.1 – (71%)

[17] Of the remaining 14 in the top-20, 11 facilities are electric generating units.

[18] *See* https://www.in.gov/idem/airquality/reporting/emissions-summary-data/

Based on IDEM's own emissions inventory, the single largest contributors to NOx and VOC emissions are the Region's three integrated steel mills, the mills' associated facilities (including Carmeuse Lime, Indiana Harbor Coke, and Portside Energy), and the BP Whiting Refinery. Each of these facilities is located on or very close to the Lake Michigan shoreline. As a result of Lake Michigan's influence on the formation of ozone, these industries are the most significant cause of high ozone concentrations in northern Lake and Porter Counties. IDEM's *Attainment Demonstration* explains how this works:

> A natural lake-land breeze circulation pattern is a major cause of the high ozone concentrations observed along the lakeshore. This pattern is driven by surface temperature gradients between the lake and the land. At night and in the early morning a land breeze forms when the lake surface is warmer than the land surface. The land breeze transports ozone precursors from industrial and mobile sources on land out over the lake. When the sun rises, the ozone precursors over the lake begin to rapidly react to form ozone, and high over-lake concentrations are often observed during the summer. A lake breeze forms when the land surface becomes warmer than the lake, typically in the early afternoon during the summer. The lake breeze transports the concentrated ozone and precursors from the lake, inland to a narrow band along the lakeshore. The ozone concentrations observed along the lakeshore that violate the 2015 ozone standard are often associated with lake-land breeze patterns. ***Areas in closer proximity to the lake shoreline display the most frequent and most elevated ozone concentrations***.[19]

Lake Michigan's influence on the formation of ozone is likely the cause for the higher ozone concentrations measured at the Gary and Ogden Dunes monitors that are closer to the lake. Unless IDEM reduces NOx and VOC emissions from the largest sources along the lakeshore, it will fail to bring Lake and Porter Counties into attainment with the 8-hour ozone NAAQS.

IV. IDEM asks EPA to approve its 2023 Fifteen Percent and Three Percent Contingency Plans, in compliance with CAA Sections 172(c)(2) and 182(b)(1). *Attainment Demonstration*, Section 2.2.

Comment: IDEM's refusal to propose any new control measures will not result in NOx or VOC emissions reductions of at least 15%.

The Clean Air Act requires states with areas in moderate nonattainment to submit SIP revisions that provide for emissions reductions of at least 15% from baseline emissions. 42 U.S.C. § 7511a(b)(1)(A). IDEM's plan to do this, for which it seeks EPA's approval, is a six-page document that relies exclusively on existing regulations. *See 2023 15% Rate-of-Progress Plan and 3% Contingency Measure Plan* (Attachment C). In other words, IDEM's plan is to take no new control measures to reduce the increasing ozone levels in Lake and Porter Counties.

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19 *Attainment Demonstration*, Section 4.1, at 31 (emphasis added). *See also* LADCO, *Conceptual Model of Surface Ozone Formation in Chicago*, Attachment A, Appendix A4.

In proposing no new control measures, IDEM relies in part on reductions in emissions from non-road and on-road mobile sources. According to its estimates, EPA-mandated future reductions from these sources more than make up for increases in NOx and VOCs from point sources. In effect, IDEM is relying on the health benefits of federal mobile source regulations to allow local industry to pollute more. This proposal is inconsistent with the Clean Air Act.

IDEM also relies on modeling results to project a decline in VOC and NOx emissions of approximately 10% and 14% from 2017 to 2023, respectively. Attachment C, at C-6. Considering that air quality measurements from 2017 to 2022 reflect an increase concentration of ozone during this period, IDEM's modeled results appear unreliable. To further obfuscate reality, IDEM points to ozone precursor emissions in Illinois and EPA's "Good Neighbor Plan" for the 2015 ozone NAAQS as further justifying its plan to impose no new control measures. All of this has real life public health consequences. Further reductions are needed and, even if they were not, reducing ozone below the NAAQS would benefit lakeshore communities already facing disproportionately high impacts from industrial pollution.

Many factors influence ozone concentrations, but only a few are within IDEM's control. Meteorological factors fluctuate each year and many ozone precursor sources are beyond IDEM's jurisdiction, such as traffic on the numerous highways that are laced throughout Lake and Porter Counties. As such, IDEM must take additional action to reduce NOx and VOC emissions from those sources over which it has regulatory authority if it seeks to expeditiously attain the 2015 8-hour ozone NAAQS.

Recommendations for Specific Additional Control Measures

IDEM should act to significantly reduce NOx and VOC emissions from the largest source of NOx and VOCs along the lakeshore: the iron and steel mills and oil refining industries. Some of these actions would require no new regulations or permitting requirements, such as increased inspections of those sources within those industries that produce the greatest amount of NOx and VOC emissions. For example, based upon its 2021 annual emissions report (VFC# 83341277), over 80% of the 3,026 tons of NOx emitted by the Cleveland-Cliffs Indiana Harbor East mill was generated from just seven processes within the facility, the largest of which were its two lime kilns, the No. 7 blast furnace, and the No. 5 boiler house.

In addition, EPA has identified additional control measures that appear cost-effective in reducing emissions of ozone precursors, such as installing low-NOx burners for reheat furnaces in iron and steel manufacturing.[20] According to EPA, low-NOx burners can provide significant

[20] *See* EPA Technical Memo (March 15, 2023) (available at: https://www.epa.gov/system/files/documents/2023-03/Memo%20to%20Docket_Non-EGU%20Applicability%20Requirements%20and%20Estimate%20Emissions%20Reductions%20and%20Costs_Final.pdf); EPA Menu of Control Measures (Sept. 22, 2022) (available at: https://www.epa.gov/air-quality-implementation-plans/menu-control-measures-naaqs-implementation).

reductions in NOx emissions from various sources within the steel industry at a relatively low-cost per ton of emissions. LADCO reached similar conclusions last year.[21]

EPA's recommended control measures, however, even for specific industries, may not be the most effective means of reducing emissions. Northwest Indiana's largest emission sources include large integrated steel mills and their related facilities, some of which were built more than a century ago. IDEM and the lakeshore industries are in the best position to identify the most cost-effective and least disruptive control measures to significantly reduce NOx and VOC emissions. These efforts may be aided by government support, such as the Inflation Reduction Act and the Bipartisan Infrastructure Law. There is also increasing pressure from corporate shareholders to be more sustainable and less carbon-intensive. And there are even industry groups, such as Responsible Steel, promoting socially and environmentally responsible steel production.[22] Building on these supports, IDEM could convene an advisory group with industry, subject matter experts, and local community representatives to help deliver implementation and results more quickly.

Some control measures will necessarily take time to procure and install. But facilities could immediately take operational measures to reduce NOx and VOC emissions on IDEM-declared Air Quality Action Days for Northwest Indiana. Currently, IDEM's Air Quality Action Day notifications encourage "everyone to help reduce ozone by making changes to daily habits." On many summer days, IDEM calls on residents of Northwest Indiana to:

- Drive less: carpool, use public transportation, walk, bike, or work from home when possible
- Combine errands into one trip
- Avoid refueling your vehicle or using gasoline-powered lawn equipment until after 7 pm
- Keep your engine tuned, and don't let your engine idle (e.g., at a bank or restaurant drive-thru)
- Conserve energy by turning off lights and setting the thermostat to 75 degrees or above

Considering that heavy industry is the single largest source of high ozone concentrations and not residents, IDEM should do even more to encourage industry to help reduce ozone. And the lakeshore industries, who have long had a significant hand in the economy of local communities, should look for ways to reduce their environmental impact on their neighbors.

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21 LADCO, *White Paper: NOx Emission Controls for Stationary Sources in the LADCO Region* (Feb. 2022), Section 9.0 (Iron & Steel Sources) (available at: https://www.ladco.org/wp-content/uploads/Projects/Emissions-Controls/Ramboll-Stationary-NOx-2021/Final_LADCO_WhitePaper_25Feb2022.pdf).

22 https://www.responsiblesteel.org/

Additional Comments

Comment: The known health disparities of communities in northern Lake and Porter Counties further supports taking additional action to reduce ozone concentrations.

Section 9.0 of the draft *Attainment Demonstration* details the extent that communities in northern Lake and Porter Counties are overburdened with pollution exposure. Using EPA's EJScreen indexes, IDEM's own analysis highlighted those communities with an Environmental Indicator above the 80th percentile. Nearly all of the indicators for all of the locations were above the national average and most of the indicators for Gary were above 80% of the national average. Not only are the people of Gary exposed to high amounts of air pollution, but the city has sensitive populations that are more susceptible to its adverse effects.[23] And statistics show that the communities of color in Northern Lake County are forced to bear a disproportionate burden of Indiana's air pollution and have the health disparities to show for it.[24] Data from 2009 indicated that Lake County had the highest hospitalization rate for asthma in Indiana, while residents of color have the highest rates of asthma. *Id*. at 21, 24.

IDEM's plan to achieve ozone attainment should reflect an urgency to protect the health of a community particularly susceptible to ozone pollution. Instead, IDEM intends to "conduct outreach, as appropriate, in order to assure they are aware of the revised ozone classification as well as efforts to address ozone in the area." *Attainment Demonstration*, Section 9.0, at 64. Rather than merely contacting residents to inform them about dangerous ozone pollution, IDEM needs to take effective steps to reduce it.

Historically, IDEM has relied on EPA regulations and taken other actions to reduce ozone levels that have targeted the residents of northern Lake and Porter Counties as if local residents were primarily responsible for NOx and VOC emissions. These measures include enhanced vehicle inspections and maintenance programs, 326 IAC 13-1.1; vapor recovery equipment at gas stations, 326 IAC 8-4-6; and a residential open burning ban, 326 IAC 4-1. While these are all valuable regulations, there have been few such restrictions on heavy industry.

Comment: IDEM should make more of an effort to write its documents in plain English. And where material is simply too complicated to be presented in an understandable fashion, IDEM

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[23] The number of people in Gary and East Chicago under the age of 5 is greater than the state and national average. Due to their undeveloped anatomy, young children incur greater damage from pollution.

[24] *See* Pramod Dwivedi, Hesam Lahsaee, *Burden of Asthma in Indiana*, Indiana State Department of Health (2011) https://www.in.gov/health/cdpc/files/BR_Asthma_5-11-11gw.pdf. (finding that Black people were hospitalized three times more often than white people and have a significantly higher mortality rate for asthma); See also Indiana Department of Public Health, *Asthma's Impact in Indiana*, (May 2022) https://www.in.gov/health/cdpc/files/2021 GeneralAsthma FactSheet.pdf ("[I]t would be irresponsible to not highlight the health disparities seen in Asthma…these disparities are caused by complex factors that include systemic and structural racism.").

should provide an executive summary to explain why the public should care about this material – particularly if it is serious about obtaining comments from the public beyond those who own and operate sources of significant air pollutants.

Beyond Section 1.0 (Overview), IDEM's *Attainment Demonstration* is mired in technical jargon and regulatory minutia. Due to the intersection of science and law, reducing ozone concentrations can seem complicated, but it's not. If we want to reduce unhealthy ozone levels, we need to reduce the amount of NOx and VOCs being emitted, particularly in the summer. What is complicated are the regulatory gymnastics that IDEM relies upon to explain why doing nothing complies with the Clean Air Act.

Thank you for considering ELPC's comments.

Respectfully submitted,

____

Michael J. Zoeller
Ellis Walton
Kerri Gefeke
Environmental Law & Policy Center
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Chicago, IL 60601
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(312) 673-6500 (o)
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cc: John Mooney, Director, Air & Radiation Division, EPA Region 5
Alan Walts, Director, Tribal and Multi-media Programs Office, EPA Region 5

Northern Lake County Environmental Partnership
https://facebook.com/northern.lake.environment

BY EMAIL ONLY July 3, 2023

Ms. Michele Boner
IDEM Office of Air Quality
100 North Senate Avenue, Room 1003
Indianapolis, Indiana 46204-2551
mboner@idem.in.gov

Re: Comments on IDEM's Draft Documents in Compliance with the Redesignation of Chicago (WI-IL-IN) as "Moderate" Nonattainment for 2015 8-Hour Ozone NAAQS

Dear Ms. Boner:

After the Indiana Department of Environmental Management (IDEM) failed to reduce ground level ozone in northern Lake and Porter Counties according to the Clean Air Act by August 3, 2021, these Counties were designated by the EPA as "moderate nonattainment" instead of the previous "maginal nonattainment." Now, according to the Clean Air Act, IDEM must formulate a plan to attain the ozone standard and with EPA's approval by August 3, 2024. We agree with other organizations and individuals that the draft plan *Attainment Demonstration and Technical Support Document* does not involve enough measures to reduce ozone and that additional pollution control measures, especially for the largest emitters, are required to reduce the unhealthy burden of air for residents of these Counties.

Since ozone is a secondary pollutant formed under conditions where primary air pollutants react in the atmosphere, the primary pollutants (namely, volatile organic compounds (VOCs), nitrogen oxides (NOx)) must be reduced. Unhealthy levels of ozone, those above the regulated limites, are harmful to humans and the greater environment. In 2018, northern Lake and Porter Counties and the broader Chicago area were designated "marginal nonattainment" for 8-hour ozone NAAQS and were directed to reduce ozone by August 3, 2021. Later measurements of ozone led to the EPA reclassification of these counties to "moderate nonattainment." IDEM did not work to improve conditions for the residents of these Counties and it is imperative that the new plan address the primary pollution that leads to unhealthy ozone levels.

The data from the EPA AirData Air Qulity Monitor website shows that ozone has been rising over the past several years.We ask that IDEM improve their plan (*Attainment Demonstration and Technical Support Document*) to ensure that ozone levels will drop and include additional monitors in the area to address the area more comprehensively.

In the *Attainment Demonstration* plan, IDEM asks EPA to approve of its revisions that include <u>no additional control measures</u> to attain the 2015 8-hour ozone standard, which are necessary to protect public health. This is simply not acceptable. Since ozone is a secondary pollutant, it is upon the state to carefully assess the primary air pollutants and implement plans to reduce these emissions. We believe that more comprehensive air monitoring in northern Lake and Porter Counties is needed to accurately assess emissions. Further, a review of facilities that emitted excess pollution appears incomplete. The recent unplanned burning of gas by the BP Whiting Refinery is an example of enormous excess emissions.

The major industries are responsible for significant amounts of the VOCs and NOx emissions. According to the Revised 2017 Base-Year Emissions Inventory, point source emissions of NOx are the greatest contributors in both Lake and Porter Counties, 65.4% and 68.7% respectively, and the data indicate they are increasing. IDEM's EMITS summary data also shows the top ten (of 83) point source emitters of VOCs in Lake and Porter Counties contribute 71% of the point source pollution load.

As an organization of scientists partnered with communities in these counties, we support the recommendations of the Environmental Law and Policy Center:

"Northwest Indiana's largest emission sources include large integrated steel mills and their related facilities, some of which were built more than a century ago. IDEM and the lakeshore industries are in the best position to identify the most cost-effective and least disruptive control measures to significantly reduce NOx and VOC emissions. These efforts may be aided by government support, such as the Inflation Reduction Act and the Bipartisan Infrastructure Law. There is also increasing pressure from corporate shareholders to be more sustainable and less carbon-intensive. And there are even industry groups, such as Responsible Steel, promoting socially and environmentally responsible steel production. Building on these supports, IDEM could convene an advisory group with industry, subject matter experts, and local community representatives to help deliver implementation and results more quickly."

"Some control measures will necessarily take time to procure and install. But facilities could immediately take operational measures to reduce NOx and VOC emissions on IDEMdeclared Air Quality Action Days for Northwest Indiana. Currently, IDEM's Air Quality Action Day notifications encourage "everyone to help reduce ozone by making changes to daily habits." On many summer days, IDEM calls on residents of Northwest Indiana to:

- Drive less: carpool, use public transportation, walk, bike, or work from home when possible
- Combine errands into one trip
- Avoid refueling your vehicle or using gasoline-powered lawn equipment until after 7 pm
- Keep your engine tuned, and don't let your engine idle (e.g., at a bank or restaurant drivethru)
- Conserve energy by turning off lights and setting the thermostat to 75 degrees or above

Considering that heavy industry is the single largest source of high ozone concentrations and not residents, IDEM should do even more to encourage industry to help reduce ozone. And the lakeshore industries, who have long had a significant hand in the economy of local communities, should look for ways to reduce their environmental impact on their neighbors."

"The known health disparities of communities in northern Lake and Porter Counties further supports taking additional action to reduce ozone concentrations."

Sincerely,

Ellen Wells, PhD, Purdue University
Jodi Allen, DNP, RN, Purdue University Northwest
Chris Iceman, PhD, Valparaiso University
Julie Peller, PhD, Valparaiso University
Kenneth Brown, PhD, Hope College
Graham Peaslee, PhD, University of Notre Dame

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Save the Dunes

Ms. Michele Boner
IDEM Office of Air Quality
100 North Senate Avenue, Room 1003
Indianapolis, Indiana 46204-2551
mboner@idem.in.gov

Comments on IDEM's Draft Documents in Compliance with the Redesignation of Chicago (WI-IL-IN) as "Moderate" Nonattainment for 2015 8-Hour Ozone NAAQS

Dear Ms. Boner:

Save the Dunes, on behalf of its members, would like to submit this letter in support of Environmental Law and Policy Center's comments on IDEM's draft Attainment Demonstration to encourage IDEM to impose additional control measures to expeditiously attain and maintain the 2015 8-hour ozone National Ambient Air Quality Standard ("NAAQS") for northern Lake and Porter Counties. Save the Dunes is extremely concerned that IDEM's draft Attainment Demonstration and Technical Support Document ("Attainment Demonstration") proposes no additional measures to reduce ozone. In consideration of the frequent air quality action days in recent weeks, and the prevalence of industrial emissions and potential for exceedances such as the BP gas release in late June, we believe that this proposition needs immediate reassessment to address the public health concerns that affect our organization and our membership who live, work, and recreate in Northwest Indiana.

If you have any questions, please contact Executive Director Betsy Maher at 219-879-3564 ext. 122 or betsy@savedunes.org.

Sincerely,

Betsy Maher
Executive Director
Save the Dunes

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Summary and Response to Comments Received at the June 28, 2023, Public Hearing/During the Public Comment Period

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Attainment Demonstration and Technical Support Document, Revised 2017 Base-Year Emissions Inventory, 2023 Fifteen Percent Rate of Progress and Three Percent Contingency Measure Plans, and Certifications of Indiana's VOC RACT, New Source Review, Vehicle Inspection and Maintenance, and Emissions Reporting Programs for Indiana's Portion of the Chicago, Illinois-Indiana-Wisconsin (IL-IN-WI) 2015 8-Hour Ozone National Ambient Air Quality Standards (NAAQS) "Moderate" Nonattainment Area

Summary/Response to Comments Received

The Indiana Department of Environmental Management (IDEM) requested public comment on the draft attainment demonstration and supporting technical documents for Indiana's portion of the Chicago-IL-IN-WI 2015 8-hour ozone moderate nonattainment area herein referred to as the "Northwest Indiana Area" from May 25, 2023, to July 5, 2023. A public hearing was also held on June 28, 2023. IDEM received comments from the following parties:

Name	Organization	Abbreviation
Michael J. Zoeller Ellis Walton Kerri Gefeke	Environmental Law & Policy Center	ELPC
Reverend Michael Cooper	Concerned Citizen	Cooper
Ellen Wells, PhD, Purdue University Jodi Allen, RN, Purdue University - NW Chris Iceman, PhD Valparaiso University Kenneth Brown, PhD, Hope College Graham Peaslee, PhD, U. Notre Dame	Northern Lake County Environmental Partnership	NLCEP
Betsy Maher, Executive Director	Save the Dunes	Maher
Freida Graves	Concerned Citizen	Graves
Steve Simpson, M.D.	Concerned Citizen	Simpson
Jennie Rudderham	Gary Advocates for Responsible Growth	Rudderham
Dorreen Carey	Gary Advocates for Responsible Growth	Carey
Joel Cavallo	Concerned Citizen	Cavallo
Carolyn McCrady	Gary Advocates for Responsible Growth	McCrady
Beryl Fitzpatrick	Concerned Citizen	Fitzpatrick
Mary Stewart-Pellegrini	Concerned Citizen	Stewart-Pellegrini

Name	Organization	Abbreviation
Linda Buchanan	Concerned Citizen	Buchanan
Kimmre Gordon	Gary Advocates for Responsible Growth	Gordon
Joseph Conn	Northwest Indiana Green Party	Conn
Bridgette Murray	Concerned Citizen	Murray
Linda Anguiano	Concerned Citizen	Anguiano
Sandy O'Brien	Concerned Citizen	O'Brien

Following is a summary of the comments received and IDEM's responses thereto:

General

Comment: IDEM should make more of an effort to write its documents in plain English. Where material is simply too complicated to be presented in an understandable fashion, IDEM should provide an executive summary to explain why the public should care about this material, particularly if it is serious about obtaining comments from the public beyond those who own and operate sources of significant air pollutants. (ELPC)

Response: IDEM acknowledges the comments provided and recognizes that the subject of NAAQS attainment and SIP implementation can be challenging. IDEM staff are committed to communicating with the public in an open and transparent way in order to keep citizens informed of ongoing activities in their area

Comment: Due to the intersection of science and law, reducing ozone concentrations can seem complicated, but it's not. In order to reduce unhealthy ozone levels, nitrogen oxides (NO_x) and volatile organic compounds (VOC) emissions need to be reduced particularly in the summer. (ELPC)

Response: IDEM agrees with the commenter on the potential adverse health effects and economic impacts associated with exposure to elevated levels of ozone and strives to assure that communities in Indiana comply with the health-based standards as expeditiously as possible. Indiana performed an analysis that shows air quality improvements in the Chicago nonattainment area are due to permanent and enforceable emission control measures which have resulted in significant regional NO_x and VOC emission reductions. IDEM will continue to monitor ozone levels and precursor emissions (NO_x and VOCs) and take appropriate action when necessary. IDEM intends to continue ensuring Air Quality Action Days (AQADs) are issued whenever necessary to protect citizens of Northwest Indiana from harmful levels of ground-level ozone.

Comment: IDEM's plan to improve Northwest Indiana's air quality should include substantial incentives for hybrid and electric vehicles for residents living in the non-attainment area. Incentives to consider for inclusion in the draft plan are: (1) Removal of the annual hybrid and electric surcharge on vehicle registrations; (2) An Indiana Electric Vehicle Tax Credit of up to $7,500; and (3) Grants for local municipalities to transition their vehicle fleets to be fully electric. The addition of incentives would have a minimal effect on the road construction budget while having a significant impact on improving Northwest Indiana's air quality. (Cooper)

Response: IDEM acknowledges comments provided. IDEM will ensure that the incentives mentioned by the commenter will be brought up in the appropriate transportation forums with transportation planning partners across state, local, and/or regional governments.

Comment: There has been a large increase in the number of trucks traveling through Northwest Indiana in the last few years. These trucks are releasing a large amount of air pollutants and significantly contributing to the area's poor air quality. (Stewart-Pellegrini)

Response: According to United States Environmental Protection Agency (U.S. EPA), heavy-duty vehicles are the largest contributor (approximately 32%) to mobile source emissions of NO_x, which react in the atmosphere to form ozone and particulate matter. These pollutants are linked to adverse health impacts. While states can address emissions from stationary sources like factories and power plants, they largely lack the authority to regulate emissions from these types of vehicles as they fall under the purview of U.S. EPA. Many state and local agencies across the country have asked U.S. EPA to do more to reduce NO_x emissions from heavy-duty trucks in order to protect the health of their communities. Such reductions are a critical part of many areas' strategies to attain and maintain the health-based air quality standards, and to ensure that all communities benefit from improvements in air quality.

Comment: It says a lot about IDEM that all of these people came out to speak with you this evening, because they know you have the authority, the expertise, and commitment to protect human health and the environment. I want to impress upon you that a lot of people are counting on IDEM. So, it's good to come up every once in a while and hear from regular folks who are suffering from asthma and respiratory illnesses and see why it is essential that ozone concentrations be lowered in Northwest Indiana and the area attains the 2015 8-hour ozone standard as expeditiously as possible. It's really important IDEM has that kind of background information. I really appreciate you all being here tonight. (Zoeller)

Response: IDEM appreciates your comments. Thank you for your support.

Comment: With all the factories, steel mills, and trucks, it's hard to understand why IDEM is just focusing on ozone and not particulate matter and a few other gases that are being released from various sources in our community. What is going to be done about this? (Simpson)

Response: The Clean Air Act (CAA) requires that states submit attainment demonstrations for nonattainment areas designated moderate or higher to show how the area will attain and continue to maintain compliance with the NAAQS for which it was designated nonattainment. This attainment plan and supporting technical documents satisfies Indiana's obligation under Sections 172 and 182 of the CAA to demonstrate how the area will specifically attain the 2015 8-hour ozone standard. Northwest Indiana is not currently designated nonattainment for any other air quality standards.

Emission Control Measures

Comment: The attainment demonstration does not propose any additional emission control measures to reduce ozone. This does not satisfy the goals of the CAA and fails to address a serious public health problem facing the overburdened residents of Northwest Indiana. We encourage IDEM to impose additional control measures to expeditiously attain and maintain the 2015 8-hour ozone standard in Northwest Indiana. (ELPC)

Comment: We agree with other organizations and individuals that the draft attainment demonstration does not include enough measures to reduce ozone and that additional pollution control measures, especially for the largest emitters, are required to reduce the unhealthy burden of air for residents in Northwest Indiana. (NLCEP)

Comment: IDEM is requesting U.S. EPA approve its plan to attain the 2015 8-hour ozone standard. This plan does not include any additional control measures to reduce ozone precursor emissions. This is simply not acceptable as these measures are necessary to protect public health. Since ozone is a secondary pollutant, it is Indiana's responsibility to carefully assess the primary air pollutants and implement plans to reduce these emissions. Further, a review of facilities that emitted excess pollution appears incomplete. The operational disruption that triggered unplanned flaring of gases at the BP Whiting Refinery is a recent example. (NLCEP)

Comment: Save the Dunes, on behalf of its members, supports the Environmental Law and Policy Center's comments regarding the draft attainment demonstration. We encourage IDEM to impose additional emission control measures to expeditiously attain and maintain the 2015 8-hour ozone standard in northern Lake and Porter counties. In consideration of the frequent AQADs in recent weeks, and the prevalence of industrial emissions and potential for exceedances such as the recent unplanned flaring of gases at the BP Whiting Refinery, we believe that the draft attainment demonstration needs immediate reassessment to address the public health concerns that affect our organization and our membership who live, work, and recreate in Northwest Indiana. (Maher)

Comment: BP experienced an unexplained flare-up early this week and the children at my son's sports camp had to staying inside. This is becoming our new normal. I am deferring to ELPC for having combed through the attainment demonstration, but it's clear the SIP does not adequately regulate sources that are emitting ozone precursor emissions in Northwest Indiana. We are relying on IDEM to ensure the attainment demonstration adequately regulates sources to protect our children's health and well-being. (Rudderham)

Comment: BP recently released a large amount of hydrogen sulfide into the air that spanned three counties and caused resident to experience health problems. I urge politicians and all of our advocacy groups here to do more. Residents of Northwest Indiana weren't made aware of the BP environmental incident promptly in order to take precautions to avoid/minimize exposure. A statewide mechanism should be put into place that promptly notifies the public of environmental incidents in order to allow the public to take necessary precautions. (Cavallo)

Comment: I am concerned with the lack of information provided to the public regarding the environmental incident experienced at BP. (Gordon)

Comment: I am a member of the Sierra Club and am here to support everybody else and ELPC's report. I believe IDEM should take this report into account when finalizing the attainment demonstration. Air pollution affects everybody's lives in Northwest Indiana. The attainment demonstration mentions that it is too late to implementation additional regulations before the moderate attainment date (i.e., August 3, 2024). It seems like Indiana is kicking the can down the road with this attainment demonstration. It doesn't hurt to get an early start on this, if we start now, then IDEM may be ready in five years to request the area be redesignated to attainment for the 2015 8-hour ozone standard. It seems we just continue having the same problem we had before by not fully considering ozone precursor emissions emitted by local major industrial sources.

Response: Lake and Porter counties are subject to the most stringent group of emission controls within the State of Indiana. This collection of permanent and enforceable controls is as equally stringent as those that apply elsewhere within the nonattainment area, and in some cases, more stringent. Indiana has performed an analysis that shows air quality improvements have occurred in the Chicago nonattainment area as a result of significant regional NO_x and VOC emission reductions from these permanent and enforceable emission control measures.

Indiana commits to maintain all emission control measures that have been implemented in Lake and Porter counties, including the vehicle inspection and maintenance program. IDEM also intends to continue working cooperatively with the Lake Michigan Air Directors Consortium (LADCO) and the other LADCO states to address regional air quality issues, and that cooperation is not dependent in the specific designations of Lake and Porter counties.

It should be noted that IDEM is in the process of initiating a rulemaking to require major stationary sources of NO_x in Northwest Indiana, as defined in Section 302 and Subsections 182(c) and (d), of the CAA, to install and operate NO_x Reasonably Available Control Technology (RACT) as provided under Section 182(f) of the CAA. NO_x RACT, along with the sustained national, regional, and local control measures, and any future measures that will be phased-in or implemented, air quality in the area will meet photochemical model predictions.

Comment: I see traffic flow improvements are included in the list of potential contingency measures in the attainment demonstration. Roundabouts and bike trails are potentially effective means of obtaining significant ozone precursor emissions reductions should contingency measures ever be necessary. (Conn)

Response: IDEM appreciates your recommendations concerning potential control measures if they should ever be necessary.

Comment: Due to the level of industrial activity/air pollution in Northwest Indiana, affected sources should be required to install maximum achievable control technology (MACT) standards rather than RACT. (Murray)

Response: MACT standards are associated with hazardous air pollutants, i.e., not with ozone precursors NO_x and VOCs. Sections 172(c)(1) and 182(b)(2) of the CAA require states to implement RACT for certain sources of NO_x and VOCs located in areas classified as moderate (and higher) nonattainment for ozone. Indiana promulgated rules requiring RACT for emissions of VOCs in the mid-1990s. Local control measures, including RACT rules specific to Lake and Porter counties, have helped reduce VOC emissions and other types of emissions in Northwest Indiana. Indiana certifies that existing VOC rules found in 326 IAC 8 fulfill VOC RACT CAA requirements. Indiana is seeking U.S. EPA approval of this certification request.

IDEM is also in the process of initiating a rulemaking to require major stationary sources of NO_x in Northwest Indiana to install and operate NO_x RACT as provided under Section 182(f) of the CAA. NO_x RACT, along with the sustained national, regional, and local control measures, and any future measures that will be phased-in or implemented, air quality in the area will meet photochemical model predictions. This attainment plan and supporting technical documents satisfies Indiana's obligation under Sections 172 and 182 of the CAA to demonstrate how the area will attain the air quality standard for ozone, and, as a result, realize cleaner air.

Point Source Emissions

Comment: IDEM's base-year emissions inventory satisfies Section 182(a)(1) but may lack accuracy. IDEM should consider reducing NO_x and VOC emissions from the most significant sources that cause high ozone concentrations. On September 10, 2021, IDEM submitted its revised 2017 base-year emissions inventory to U.S. EPA for review/approval. According to this inventory, point source emissions are the single largest source of NO_x and second largest source of VOC emissions in both Lake and Porter counties, contributing approximately 65.4% and 68.7% and 35.5% and 10.2%, respectively. According to IDEM's Emission Inventory Tracking System summary data, the top ten (of 83) point source emitters in Lake and Porter counties emit 96% and 71% of all NO_x and VOCs emissions in these counties. The largest contributors of NO_x and VOC emissions in the region are integrated steel mills along with the BP Whiting Refinery, the mills' associated facilities include Carmeuse Lime, Indiana Harbor Coke, and Portside Energy. Each of these facilities is located on or very close to the Lake Michigan shoreline. As a result of Lake Michigan's influence on the formation of ozone, these industries are the most significant cause of high ozone concentrations in Northwest Indiana. Unless IDEM reduces NO_x and VOC emissions from the largest sources along the lakeshore, it will fail to bring Northwest Indiana into attainment with the 2015 8-hour ozone NAAQS. (ELPC) (NLCEP)

Comment: IDEM should act to significantly reduce NO_x and VOC emissions from the largest emitters along the lakeshore (i.e., the iron and steel mills and oil refining industries). Some of these actions would require no new regulations or permitting requirements, such as increased inspections of those sources within those industries. (ELPC)

Comment: U.S. EPA has identified additional control measures that appear cost-effective in reducing ozone precursor emissions, such as installing low-NO_x burners for reheat furnaces in iron and steel manufacturing. According to U.S. EPA, low-NO_x burners can provide significant NO_x emissions reductions from various sources within the steel industry at a relatively low cost per ton of emissions. LADCO reached similar conclusions last year. (ELPC)

Comment: U.S. EPA's recommended control measures, for specific industries, may not be the most effective means of reducing emissions. Northwest Indiana's largest emission sources include large integrated steel mills and their related facilities, some of which were built more than a century ago. IDEM and the lakeshore industries are in the best position to identify the most cost-effective and least disruptive control measures to significantly reduce NO_x and VOC emissions. These efforts may be aided by government support, such as the Inflation Reduction Act and the Bipartisan Infrastructure Law. There is also increasing pressure from corporate shareholders to be more sustainable and less carbon intensive. And there are even industry groups, such as Responsible Steel, promoting socially and environmentally responsible steel production. Building on these supports, IDEM could convene an advisory group with industry, subject matter experts, and local community representatives to help deliver implementation and results more quickly. (ELPC) (NLCEP)

Comment: Some emission control measures will take time to procure and install. However, facilities could immediately take operational measures to reduce NO_x and VOC emissions on IDEM declared AQADs in Northwest Indiana. (ELPC) (NLCEP)

Comment: Considering that heavy industry is the single largest source of high ozone concentrations and not residents, IDEM should do even more to encourage industry to help reduce ozone. The lakeshore industries, which have long had a significant hand in the economy of local communities, should look for ways to reduce their environmental impact on their neighbors. (ELPC) (NLCEP)

Comment: IDEM's plan to achieve ozone attainment should reflect an urgency to protect the health of a community particularly susceptible to ozone pollution. Instead, IDEM intends to "conduct outreach, as appropriate, in order to assure they are aware of the revised ozone classification as well as efforts to address ozone in the area." Rather than merely contacting residents to inform them about dangerous ozone pollution, IDEM needs to take effective steps to reduce it. Historically, IDEM has relied on U.S. EPA regulations and taken other actions to reduce ozone levels that have targeted the residents of Northwest Indiana as if local residents were primarily responsible for NO_x and VOC emissions. These measures include enhanced vehicle inspections and maintenance programs, 326 Indiana Administrative Code (IAC) 13-1.1; vapor recovery equipment at gas stations, 326 IAC 8-4-6; and a residential open burning ban, 326 IAC 4-1. While these are all valuable regulations, there have been few such restrictions on heavy industry. (ELPC)

Comment: Since ozone is a secondary pollutant formed under conditions where primary air pollutants react in the atmosphere, NO_x and VOC emissions must be reduced. Unhealthy levels of ozone, those above the regulated limits, are harmful to humans and the greater environment. It is imperative that the attainment demonstration address the primary pollution that leads to unhealthy ozone levels. (NLCEP)

Comment: Every day we receive air quality warnings, ozone warnings, warnings to limit outdoor activities, warnings to our elderly, sickly, and other vulnerable populations. Our legacy industries along Lake Michigan are releasing more and more pollutants into our air due to system failures. At the same time, IDEM is approving more and more air permits for industries like the new Amazon Data Warehouse in Portage's Ameriplex which is planning to install eight large diesel generators. I find it absurd that IDEM is saying Indiana is doing enough. Northwest Indiana is here to tell you that you need to do more. (Cooper)

Comment: We don't need any more companies to come into our community and make our air quality worse (Graves)

Response: Indiana, through IDEM's Office of Air Quality and its Compliance and Enforcement Branch, has the legal authority and necessary resources to actively enforce any violations of its rules or permit provisions. IDEM intends to continue enforcing all rules that relate to the emission of ozone precursors in Northwest Indiana.

Large projects that may represent emissions increases beyond normal expected growth would be subject to the new source review permitting program for attainment areas known as Prevention of Significant Deterioration (PSD). New major sources or major modifications of existing sources must install best available control technology and demonstrate that the resulting emissions would not cause or contribute to a violation of any national ambient air quality standard. These permits are subject to public review, comment, and the opportunity for a public hearing to help ensure that these requirements are satisfied.

IDEM intends to continue cooperating and working with other states through LADCO on regional planning initiatives.

It should be noted that IDEM is in the process of initiating a rulemaking to require major stationary sources of NO_x in Northwest Indiana, as defined in Section 302 and Subsections 182(c) and (d), of the CAA, to install and operate NO_x RACT as provided under Section 182(f) of the CAA. Indiana anticipates it will take approximately two years to complete the rulemaking process. NO_x RACT, along with the sustained national, regional, and local control measures, and any future measures that will be phased-in or implemented, air quality in the area will meet photochemical model predictions.

Air Quality

Comment: Ambient air quality monitoring data available on U.S. EPA's Air Quality System website shows ozone concentrations have been increasing in Northwest Indiana over the past several years. IDEM should improve the attainment demonstration to ensure ozone levels will decline in the area. Additional air quality monitors are needed in Northwest Indiana to address air quality more comprehensively. (NLCEP)

Response: IDEM conducts an annual review of Indiana's Ambient Air Monitoring Network per 40 Code of Federal Regulations (CFR) 58.10. The review is conducted to assess the current air monitoring network and determine if any changes are necessary to meet monitoring requirements, goals, and projects across the state. All proposed network modifications are approved by U.S. EPA. Prior to submission to U.S. EPA for final approval, the network plan is available for public review and comment. As such, IDEM believes the current ozone monitoring network in Northwest Indiana is adequate and accurately reflects ozone air quality in the area.

Comment: IDEM should recognize and address the excess and increasing levels of ozone in Lake and Porter counties. IDEM currently operates four monitors that measure ambient ozone air quality concentrations in Indiana's portion of the nonattainment area – two in Lake County (Hammond and Gary) and two in Porter County (Ogden Dunes and Valparaiso). Every summer, one or more of these monitors records 8-hour average ozone concentrations in excess of the NAAQS limit of 0.070 parts per million. Graphing the 4th-highest 8-hour ozone concentrations measured at each of these monitoring sites since 2008 shows an overall increase in 8-hour ozone levels. The monitors in Gary and Ogden Dunes, which are much closer to the lakeshore than those in Hammond and Valparaiso, tend to have higher ozone concentrations. Using this same data to plot the 3-year average used as the design value screening tool by U.S. EPA to satisfy its attainment standard, we see a similar increase over the same time-period. The attainment demonstration ignores the significance and trend of the Northwest Indiana ambient air quality measurements in favor of data from the Chicago nonattainment area as a whole, and modeled results prepared by LADCO, of which Indiana is a member. IDEM asserts that monitoring data shows overall area design values are decreasing, air quality peak values are declining, and the number of exceedances is falling, however peak ozone values in Northwest Indiana are increasing (ELPC).

Response: While IDEM agrees that current ambient air quality monitoring data indicates that the area is violating the 2015 8-hour ozone standard, monitored air quality in the Chicago nonattainment area has shown improvement in ozone concentration levels as a result of national and local control strategies implemented since designation. Monitoring data shows that overall area design values are decreasing, air quality peak values are declining, and the number of exceedances is falling. Ozone concentrations observed along the lakeshore that violate the 2015 ozone standard are often associated with lake-land breeze patterns. Areas in closer proximity to the lake shoreline display the most frequent and most elevated ozone concentrations.

Synoptic weather patterns can be a large driver of ozone concentrations. Despite a trend in of increased summertime temperatures, ozone has trended downward with spikes in ozone occurring with summer temperatures hotter than normal. Linear regression of ozone design values over time show distinct overall ozone design values decreases with spikes in certain years. These fluctuations in yearly data should not distract from the continued trend of lower ozone concentrations.

NO_x RACT, along with sustained national, regional, and local control measures, and any future measures that will be phased-in or implemented, will result in additional significant regional emission reductions ensuring air quality in the Northwest Indiana area will meet photochemical model predictions.

Comment: Ozone ambient air quality monitoring data for the years 2020 and 2021 should be reevaluated going from 2022 onward. This data cannot be relied on as we were experiencing a worldwide pandemic and everything came to a grinding halt, few vehicles were on the road, and business and industry closed or significantly slowed their activities. Using 2020 and/or 2021 ozone monitoring data is deceptive as the level of air pollutants released were significantly lower than other non-covid years. These years should not be relied on when determining whether an area has attained NAAQS (Murray).

Response: IDEM appreciates your comment but stands by its position that monitoring data from 2019 – 2021 is an accurate reflection of ozone in the Chicago area. Of the three years used to assess the design value to compare to the standard (2019 – 2021), for most monitors, the highest ozone was during the 2020 and 2021 ozone seasons. Lake and Porter counties are subject to the most stringent group of emissions controls within the State of Indiana. This collection of permanent and enforceable controls is as equally stringent as those that apply elsewhere within the nonattainment area, and in some cases, more stringent. Indiana has performed an analysis that shows air quality improvements have occurred in the Chicago nonattainment area as a result of significant regional NO_x and VOC emissions reductions from these permanent and enforceable emission control measures, and not unusually favorable meteorology or temporary adverse economic impacts.

Comment: I'm concerned about the children with asthma, respiratory diagnoses, and other health anomalies that we see every day which makes them more susceptible to other illnesses. What are things we can do in our community to help improve the area's air quality? (Graves)

Response: There are many simple actions citizens can take to reduce their contribution or exposure to ozone. These include:

• Carpool, walk, bike, or use public transportation when possible.

• Avoid idling by turning off the engine while waiting in drive-thru lanes (banks and restaurants) or when picking up children from school. Combine errands when possible and avoid fast-starts.

• In the summer, wait until after 7 p.m. to use gasoline-powered lawn equipment and refuel vehicles.

• Reduce home energy consumption by turning off lights, televisions, and appliances when not in use, to reduce emissions from energy production. Set your thermostat lower in the winter and higher in the summer. Insulate your home as best you can. Use energy efficient lighting and appliances, such as those with the ENERGY STAR® label.

• Recycle to reduce the emissions related to producing paper, plastic, glass bottles, aluminum cans, and cardboard.

Reasonably Available Control Measures

Comment: IDEM asserts that it has complied with Sections 172(c)(1) and 182(b)(2) of the CAA because it "has adopted all reasonable and available control measures to demonstrate attainment as expeditiously as practicable and that no additional measures that are reasonably available will advance the attainment date." In support of this assertion, IDEM relies on a study prepared by LADCO intended to identify and evaluate NO_x and VOC emission controls to reduce ozone concentrations throughout the Chicago area. Although IDEM touted this study as a "comprehensive assessment of candidate control options," the study did not consider point sources, such as the large lakeshore industries with Part 70 air emission permits, "because point source emission control analyses are expected to be performed on an as-needed basis by state/region specific agency staff." Without identifying and evaluating NO_x and VOC emission controls from large point sources, IDEM cannot demonstrate that it has adopted all reasonably available control measures (RACM). However, IDEM concludes that such a demonstration is irrelevant because no further control measures can achieve attainment of the NAAQS by August 3, 2024. Admittedly, there is little time left to demonstrate attainment before the deadline, particularly since the ozone season runs through the end of August requiring attainment to be demonstrated this year but given the increasing ozone concentrations in Northwest Indiana, IDEM must implement additional control measures if it is to ever reduce ozone concentrations below the standard. Simply saying that any new control measures would not achieve attainment by August 3, 2024, does not satisfy the goal of the CAA. (ELPC)

Comment: By overlooking measures to control emissions from point sources, IDEM has not established that it has adopted RACM and its hyper-technical reading of the regulations abdicates IDEM's responsibility to attain the NAAQS as expeditiously as practicable to protect human health. (ELPC)

Response: Additional control measures are required for RACM if they can advance the attainment date by a year or more. Any measure(s) advancing the attainment date by a year would have had to be in place by January 1, 2022. Even though some of the identified measures may provide NO_x or VOC emissions reductions beyond what is currently required, they cannot advance the attainment date, as it has already passed. Therefore, no additional emissions control measures or reduction requirements are applicable for RACM for Northwest Indiana under the 2015 ozone standard.

However, NO_x RACT, when implemented, along with sustained national, regional, and local control measures, and any future measures that will be phased-in or implemented, will result in additional significant regional emission reductions ensuring air quality in the Northwest Indiana area will meet photochemical model predictions.

Emissions Reporting Rule

Comment: IDEM's emissions reporting rule satisfies Section 182(a)(3)(B), but IDEM fails to adequately enforce 326 IAC 2-6. The purpose of IDEM's emissions reporting rule, 326 IAC 2-6, is to create an accurate inventory of actual emissions. While the rule itself satisfies the requirements of Section 182(a)(3)(B) of the CAA, IDEM will not have an accurate inventory of actual emissions if facilities are allowed to estimate emissions from sources that measure emissions with continuous emissions monitoring systems (CEMS), fail to report upsets and exceedances, or fail to identify all emissions sources. IDEM should improve its inspections and enforcement to ensure that all emissions are being reported. To further improve the accuracy of emissions reports, IDEM should consider requiring all large sources of NO_x and VOCs to install CEMS. In addition, IDEM should consider requiring installation of fence line monitors to confirm that all emissions from large stationary sources are being reported. IDEM should require the largest polluters along the lakeshore (i.e., integrated steel mills and their co-dependent industries) to reduce their ozone precursor emissions. IDEM can achieve these reductions through increased inspections and enforcement, and in revisions to the facilities' Part 70 permits upon renewal. (ELPC)

Response: IDEM's Office of Air Quality collects data, calculates, and stores emissions for point sources on an annual basis in the Emission Inventory Tracking System. These point source emissions are uploaded to the National Emissions Inventory each year. Section 182(a)(3)(B)(ii) of the CAA requires states to submit certification documentation for this Emissions Statement requirement. Indiana is seeking U.S. EPA approval of this certification request as part of this state implementation plan (SIP) submittal.

Air permits are required for many businesses that have the potential to release waste gasses or particles into the air. An air permit includes all air pollution regulations and requirements needed to protect human health and the environment, including whether the facility needs to install and operate CEMS.

Indiana, through IDEM's Office of Air Quality and its Compliance and Enforcement Branch, has the legal authority and necessary resources to actively enforce any violations of its rules or permit provisions. IDEM intends to continue enforcing all rules that relate to the emission of ozone precursors in Northwest Indiana.

Rate of Progress Plan

Comment: IDEM's refusal to propose any new control measures will not result in NO_x and VOC emissions reductions of at least 15%. The CAA requires states with areas in moderate nonattainment to submit SIP revisions that provide for NO_x and/or VOC emission reductions of at least 15% from baseline emissions. IDEM's plan to do this, for which it seeks U.S. EPA's approval, relies exclusively on existing regulations to reduce the increasing ozone levels in Lake and Porter counties. In proposing no new control measures, IDEM relies in part on reductions in emissions from non-road and on-road mobile sources. According to its estimates, U.S. EPA-mandated future reductions from these sources more than make up for increases in NO_x and VOC emissions from point sources. In effect, IDEM is relying on the health benefits of federal mobile source regulations to allow local industry to pollute more. This proposal is inconsistent with the CAA. IDEM also relies on modeling results to project a decline in NO_x and VOC emissions of approximately 14% and 10% from 2017 to 2023, respectively. Considering that air quality measurements from 2017 to 2022 reflect an increase concentration of ozone during this period, IDEM's modeled results appear unreliable. IDEM also points to ozone precursor emissions in Illinois and EPA's "Good Neighbor Plan" for the 2015 ozone NAAQS as further justifying of its plan to impose no new control measures. Further reductions are needed and, even if they were not, reducing ozone below the

NAAQS would benefit lakeshore communities already facing disproportionately high impacts from industrial pollution. Many factors influence ozone concentrations, but only a few are within IDEM's control. Meteorological factors fluctuate each year and many ozone precursor sources are beyond IDEM's jurisdiction, such as traffic on the numerous highways that are laced throughout Lake and Porter counties. As such, IDEM must take additional action to reduce NO_x and VOC emissions from those sources over which it has regulatory authority if it seeks to expeditiously attain the 2015 8-hour ozone NAAQS. (ELPC)

Response: In accordance with 40 Code of Federal Regulation (CFR) 51.1110(a)(5), except as specifically provided in CAA section 182(b)(1)(C) and (D), CAA section 182(c)(2)(B), and 40 CFR 51.1110(a)(6), all emission reductions from SIP-approved or federally promulgated measures that occur after the baseline emissions inventory year are creditable for purposes of the RFP requirements section, provided the reductions meet the requirements for creditability, including the need to be enforceable, permanent, quantifiable, and surplus.

Pursuant to Section 182(b)(1) of the CAA, Indiana's 2023 Fifteen Percent (15%) Rate of Progress Plan and Three Percent (3%) Contingency Plan demonstrates Indiana's portion of the nonattainment will achieve a 15% emission reduction within six years (2017-2023) after the baseline year (2017), plus an additional 3% contingency reduction through one year beyond the attainment year, i.e., 2024, based on creditable emissions reductions in U.S. EPA's inventory found in the 2017 Modeling Platform Collaborative with applied growth factors derived from the 2016v2 platform. VOC and NO_x emissions are projected to decline by approximately 10% and 14% from 2017 to 2023, respectively. After being able to demonstrate that the area is meeting reduction requirements by achieving the required targets, additional reductions were not required. In total, this analysis demonstrates a 18% rate of progress reduction by the end of 2023. These Plans in conjunction with the attainment demonstration satisfy Indiana's obligation under Sections 172 and 182 of the CAA.

Environmental Justice

Comment: The known health disparities of communities in northern Lake and Porter counties further support taking additional action to reduce ozone concentrations. Using U.S. EPA's EJScreen indexes, IDEM's own analysis highlighted those communities with an Environmental Indicator above the 80th percentile. Nearly all of the indicators for all of the locations were above the national average and most of the indicators for Gary were above 80% of the national average. Not only are the people of Gary exposed to high amounts of air pollution, but the city has sensitive populations that are more susceptible to its adverse effects. Statistics show that the communities of color in northern Lake County are forced to bear a disproportionate burden of Indiana's air pollution and have the health disparities to show for it. Data from 2009 indicated that Lake County had the highest hospitalization rate for asthma in Indiana, while residents of color have the highest rates of asthma. (ELPC)

Comment: Northwest Indiana suffers from current and legacy pollution and has a number of locations considered environmental justice areas. What is IDEM going to do to relieve us of that burden? I support ELPC's recommendation that it would be a good idea to convene an advisory group with industry, subject matter experts, and local community representatives to help deliver implementation and results more quickly. However, considering heavy industry is the single largest source of ozone precursor emissions not residents, industry needs to play a bigger role. We cannot continue to accept the status quo. There are things that can be done that do not require changing regulations or laws that will improve the health, sustainability, and quality of life for the residents of Northwest Indiana. (Carey)

Comment: It appears the attainment demonstration is making incremental changes. How can that be enough when Gary, Indiana is considered the fourth most polluted city in the country? EJScreen results included as part of the attainment demonstration show all of the environmental indicators in Gary are above 80% of the national percentile. IDEM is being complicit in protecting the health of the residents in Northwest Indiana. IDEM continues to allow additional industrial sources to locate in the area. How can that be? A number of my relatives experience acute and/or chronic health problems, more needs to be done to improve Northwest Indiana's air quality. (McCrady)

Response: IDEM agrees with the commenter on the potential health effects of elevated levels of ozone and strives to assure that communities in Indiana comply with the health-based standards as expeditiously as possible. Because ground-level ozone is a regional pollutant and is the result of secondary urban scale atmospheric formation, efforts to address ozone throughout the region will benefit the general population as well as potentially overburdened communities. IDEM has worked to identify potentially overburdened communities in Northwest Indiana and will conduct outreach, as appropriate, in order to assure they are aware of the revised ozone classification as well as efforts to address ozone in the area. IDEM intends to continue ensuring AQADs are issued whenever necessary to protect citizens of Northwest Indiana from harmful levels of ground-level ozone.

Health Effects

Comment: Asthma is a major concern in Northwest Indiana, not just ozone. There are other things in the environment causing these kids to have problems with asthma and other respiratory diseases. Our prematurity rate is very high in Lake County and Northwest Indiana and is associated with child maternal health problems. Chronic lung disease in children is associated with being born premature. Exposure to ground-level ozone, sulfur dioxide, sulfur compounds released from landfills, and the burning of methane at various sources in the area are accentuating health problems experienced by children in Northwest Indiana. The American Academy of Pediatrics points out that urban kids who have asthma are more likely to be hospitalized than other children. (Simpson)

Comment: I am an adult who suffers from asthma, am a member of Gary Advocates for Responsible Development, and a parent of a child who recently experienced health problems due to poor air quality. Northwest Indiana has had ozone and particulate matter warnings issued every day this week. I didn't count up how many

Ozone Air Quality Action Days have been issued in Northwest Indiana this year, but it seems like we've had far more issued earlier in the year than ever before. (Rudderham)

Comment: I have a young child that was born premature and is very sensitive to pollutants. This has raised my awareness of the air quality issues and the quantity of pollutants released in Northwest Indiana. I realize IDEM is working hard to reduce pollution with this attainment demonstration, but is it enough?

Comment: I am a cancer survivor and resident of Gary, Indiana. IDEM needs to do more to address air pollution and environmental justice in Northwest Indiana. (Fitzpatrick)

Comment: I volunteer and work with the American Association of Retired Persons' (AARPs') Healthy Communities Project and know how important it is for every community in Northwest Indiana not only to have good mental health, but good physical health. Physical health and mental health are tied together, and if I cannot breathe, as I couldn't yesterday, how can I mentally be available to do the work that's required for me to do as a professional and as a person who's interested and concerned about the wellbeing of our community? I encourage Indiana to support the health and well-being of the resident in Northwest Indiana. (Stewart-Pellegrini)

Comment: I am a cancer survivor and am currently experiencing other health problems. I also have a son that experiences breathing problems. I grew up in Gary a few blocks from the landfill and experienced breathing problems along with everybody else on my block when it got hot outside due to the odors coming from the landfill. Today the seniors that I grew up with on that same block are no longer alive due to various illnesses and cancers. I hope you take this information into account when finalizing the attainment demonstration. (Gordon)

Comment: I'm the current Chairperson of Progressive Democrats of America, and every year we vote on our priority, and for the last seven years, the environment has been our top priority. Residents of Northwest Indiana are very passionate about the environment and the health of our loved ones as the area is bombarded with all kinds of pollution. I myself developed asthma after I moved back to Northwest Indiana. We need IDEM's help and partnership to advocate on our behalf. (Anguiano)

Response: IDEM agrees with the commenters on the potential health effects of elevated levels of ozone and strives to assure that communities in Indiana comply with the health-based standards as expeditiously as possible. Because ground-level ozone is a regional pollutant and is the result of secondary urban scale atmospheric formation, efforts to address ozone throughout the region will benefit the general population as well as potentially overburdened communities. IDEM has worked to identify potentially overburdened communities in Northwest Indiana and will conduct outreach, as appropriate, in order to assure they are aware of the revised ozone classification as well as efforts to address ozone in the area. IDEM has created SmogWatch www.smogwatch.in.gov to share air quality forecasts for each day. SmogWatch provides daily information about ground-level ozone and particulate matter air quality forecasts, health information, and monitoring data for the seven regions of Indiana. IDEM intends to continue ensuring AQADs are issued whenever necessary to protect citizens of Northwest Indiana from harmful levels of ground-level ozone. Individuals can sign up for email and text message alerts at: apps.idem.in.gov/smogwatch/SignUp.aspx.