REQUEST FOR REDESIGNATION AND MAINTENANCE PLAN UNDER THE ANNUAL NATIONAL AMBIENT AIR QUALITY STANDARD FOR FINE PARTICLES

For the Indiana Portion
of the

Cincinnati – Hamilton, OH-KY-IN
Nonattainment Area for Fine Particles

Lawrenceburg Township, Dearborn County, Indiana

Prepared By:
The Indiana Department of Environmental Management

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REQUEST FOR REDESIGNATION AND MAINTENANCE PLAN UNDER THE ANNUAL NATIONAL AMBIENT AIR QUALITY STANDARD FOR FINE PARTICLES

CINCINNATI-HAMILTON OH-KY-IN AREA

1.0 INTRODUCTION

This document supports Indiana's request that Lawrenceburg Township in Dearborn County, Indiana, which is part of the Cincinnati-Hamilton OH-KY-IN fine particles nonattainment area (herein referred to as the Cincinnati area), be redesignated from nonattainment to attainment of the 1997 annual standard for fine particles. There are no monitors for fine particles in the Indiana portion of the Cincinnati area. However, because the Cincinnati area has recorded three years of quality assured ambient air quality monitoring data for the years 2007 through 2009, demonstrating attainment with the annual standard for fine particles, the Indiana portion of the Cincinnati area is eligible for redesignation.

Section 107 of the Clean Air Act (CAA) establishes specific requirements to be met in order for an area to be considered for redesignation, including:

(a) A determination that the area has attained the annual standard for fine particles.
(b) An approved State Implementation Plan (SIP) for the area under Section 110(k).
(c) A determination that the improvement in air quality is due to permanent and enforceable reductions in emissions resulting from implementation of the SIP and other federal requirements.
(d) A fully approved maintenance plan under Section 175A.
(e) A determination that all Section 110 and Part D requirements have been met.

A maintenance plan provides for the continued attainment of the air quality standard by an area for a period of ten years after the United States Environmental Protection Agency (U.S. EPA) has formally redesignated the area to attainment. The plan also provides assurances that even if there is a subsequent exceedance of the air quality standard, measures in the maintenance plan will prevent any future occurrences through contingency measures that would be triggered.

This document addresses each of these requirements, and provides additional information to support continued compliance with the annual standard for fine particles.

1.1 Background

The CAA requires states with areas designated nonattainment of the applicable National Ambient Air Quality Standard (NAAQS) for fine particles to develop SIPs to expeditiously attain and maintain the standard. In 1997, U.S. EPA set daily and annual air quality standards for fine particles ($PM_{2.5}$), as shown in Table 1.1. The standards were legally challenged and upheld by the U.S. Supreme Court in February of 2001. In 1999, Indiana began monitoring for fine particle concentrations. The U.S. EPA designated areas in Indiana under the fine particle standards on December 17, 2004, as attainment, nonattainment, or unclassifiable, with an effective date of April 5, 2005.

Table 1.1
National Ambient Air Quality Standards for Fine Particles

	Annual	24-Hour
1997 Fine Particles Standard ($PM_{2.5}$)	**15 µg/m^3** Annual arithmetic mean, averaged over three years	**65 µg/m^3** 24-hour average, 98th percentile, averaged over three years
2006 Fine Particles Standard ($PM_{2.5}$)	**15 µg/m^3** Annual arithmetic mean, averaged over three years	**35 µg/m^3** 24-hour average, 98th percentile, averaged over three years

Note: The Cincinnati area meets the 1997 and 2006 24-hour NAAQS for fine particles. Since this area is solely designated nonattainment under the 1997 annual standard for fine particles, this document only addresses the annual standard.

On December 17, 2004, based on 2001 through 2003 monitoring data, U.S. EPA designated the Cincinnati-Hamilton OH-KY-IN area as nonattainment of the annual standard for fine particles, and subject to CAA, Part D, Title 1, Section 172 of Subpart 1 requirements, including the development of a plan to reduce nitrogen oxides (NO_x), sulfur dioxide (SO_2), and direct $PM_{2.5}$ emissions and a demonstration that the area will meet the annual standard for fine particles by April 5, 2010. In order to satisfy these requirements, Indiana submitted an attainment demonstration to U.S. EPA on April 3, 2008, demonstrating that with the combination of clean air measures and the implementation of local and federally required control measures, air quality in the nonattainment area would meet the annual NAAQS for fine particles by April 5, 2010, and provide for an ample margin of safety. The Cincinnati-Hamilton OH-KY-IN area monitors have met the annual NAAQS for fine particles since the end of 2009.

There were no monitors in the Cincinnati-Hamilton OH-KY-IN fine particles nonattainment area that violated the 1997 24-hour standard for fine particles and or currently violates the 2006 24-hour standard for fine particles. As a result, the Cincinnati-Hamilton OH-KY-IN fine particles nonattainment area was designated nonattainment solely under the 1997 annual standard. Therefore, this document pertains only to the 1997 annual standard for fine particles.

The Cincinnati-Hamilton OH-KY-IN fine particles nonattainment area, as defined in Section 1.2, has not previously been subject to nonattainment area rulemakings for fine particles. However, the area had been subject to nonattainment area rulemakings under the 1-hour and the 8-hour ozone standards. The 1-hour ozone standard was revoked on June 15, 2005, and the Cincinnati area was redesignated to attainment of the 1997 ozone standard on May 11, 2010.

1.2 Geographical Description

The entire Cincinnati fine particles nonattainment area consists of: Lawrenceburg Township in Dearborn County, Indiana; Butler, Clermont, Hamilton, and Warren counties, Ohio; Boone, Campbell, and Kenton counties, Kentucky; and contains such cities as Cincinnati, Hamilton, and

Middletown, all in Ohio. This area is depicted in Figure 3.1.

The agencies responsible for assuring the fine particles nonattainment area complies with the CAA requirements are:

- The Ohio Environmental Protection Agency (Ohio EPA), which is responsible for Butler, Clermont, Clinton, Hamilton, and Warren counties, Ohio.
- The Kentucky Department for Environmental Protection, (KDEP) which is responsible for Boone, Campbell, and Kenton counties, Kentucky.
- The Indiana Department of Environmental Management (IDEM), which is responsible for Lawrenceburg Township, Dearborn County, Indiana.

These three state agencies have worked cooperatively with U.S. EPA Regions IV and V to address attainment planning issues.

Although the three agencies, in the three states, have worked together on a comprehensive plan for the multi-state nonattainment areas, 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. As such, this submittal only covers Lawrenceburg Township in Dearborn County, Indiana.

1.3 Status of Air Quality

Monitoring data for fine particles for the three years, 2007 through 2009, demonstrates that air quality has met the annual NAAQS for fine particles in the Cincinnati area. This fact, accompanied by the permanent and enforceable reductions in emission levels discussed in Section 4.0, justifies a redesignation to attainment for the Indiana portion of the Cincinnati-Hamilton, OH-KY-IN nonattainment area based on Section 107(d)(3)(E) of the CAA.

2.0 REQUIREMENTS FOR REDESIGNATION

2.1 General

Section 110 and Part D of the CAA list a number of requirements that must be met by nonattainment areas prior to consideration for redesignation to attainment. In addition, U.S. EPA has published detailed guidance in a document entitled *Procedures for Processing Requests to Redesignate Areas to Attainment*, issued September 4, 1992, to Regional Air Directors. This document is hereafter referred to as "Redesignation Guidance." This Request for Redesignation and Maintenance Plan is based on the Redesignation Guidance, supplemented with additional guidance received from staff of the Air Planning and Maintenance Section of U.S. EPA Region V. The specific requirements for redesignation are listed below.

2.2 Fine Particles Monitoring

1) A demonstration that the annual standard for fine particles, as published in 40 CFR 50.13, has been attained. Fine particles monitoring data must show that violations of the annual ambient standard are no longer occurring.

2) Ambient monitoring data quality assured in accordance with 40 CFR 58.15, recorded in the U.S. EPA Air Quality System (AQS) database, and available for public view.

3) A showing that the three-year average of annual values, based on data from all monitoring sites in the area or its affected downwind environs, do not exceed 15.0 micrograms per cubic meter ($\mu g/m^3$). This showing must rely on three complete, consecutive calendar years of quality assured data.

4) A commitment that, once redesignated, the state will continue to operate an appropriate monitoring network to verify the maintenance of the standard.

2.3 Emission Inventory

1) A comprehensive emission inventory of direct $PM_{2.5}$ and the precursors of fine particles completed for the base year (2008 in this case).

2) A projection of the emission inventory to a year at least ten years following redesignation.

3) A demonstration that the projected level of emissions is sufficient to maintain the annual standard for fine particles.

4) A demonstration that improvement in air quality between the year violations occurred and the year attainment was achieved is based on permanent and enforceable emission reductions and not on temporary adverse economic conditions or unusually favorable meteorology.

5) Provisions for future annual updates of the inventory to enable tracking of the emission levels, including an annual emission statement from major sources.

2.4 Modeling Demonstration

While no modeling is required for redesignating nonattainment areas, IDEM has evaluated the results of federal control-case modeling to demonstrate that compliance with the standard will be maintained.

2.5 Controls and Regulations

1) A U.S. EPA-approved SIP control strategy that includes Reasonably Available Control Technology (RACT) requirements for existing stationary sources covered by Control Technology Guidelines (CTG) and non-CTG RACT for all major sources.

2) Evidence that control measures required in past SIP revisions have been fully implemented.

3) Acceptable provisions to provide for new source review.

4) Assurances that existing controls will remain in effect after redesignation, unless the state demonstrates through photochemical modeling that the standard can be maintained without one or more controls.

5) If appropriate, a commitment to adopt a requirement that all transportation plans conform with and are consistent with the SIP.

2.6 Corrective Actions for Potential Future Violations of the Fine Particles Standard

1) A commitment to submit a revised plan eight years after redesignation.

2) A commitment to expeditiously enact and implement additional contingency control measures in response to exceeding specified predetermined levels (triggers) or in the event that future violations of the ambient standard occur.

3) A list of potential contingency measures that would be implemented in such an event.

4) A list of Nitrogen Oxides (NO_x), Sulfur Dioxide (SO_2) and direct $PM_{2.5}$ sources potentially subject to future controls.

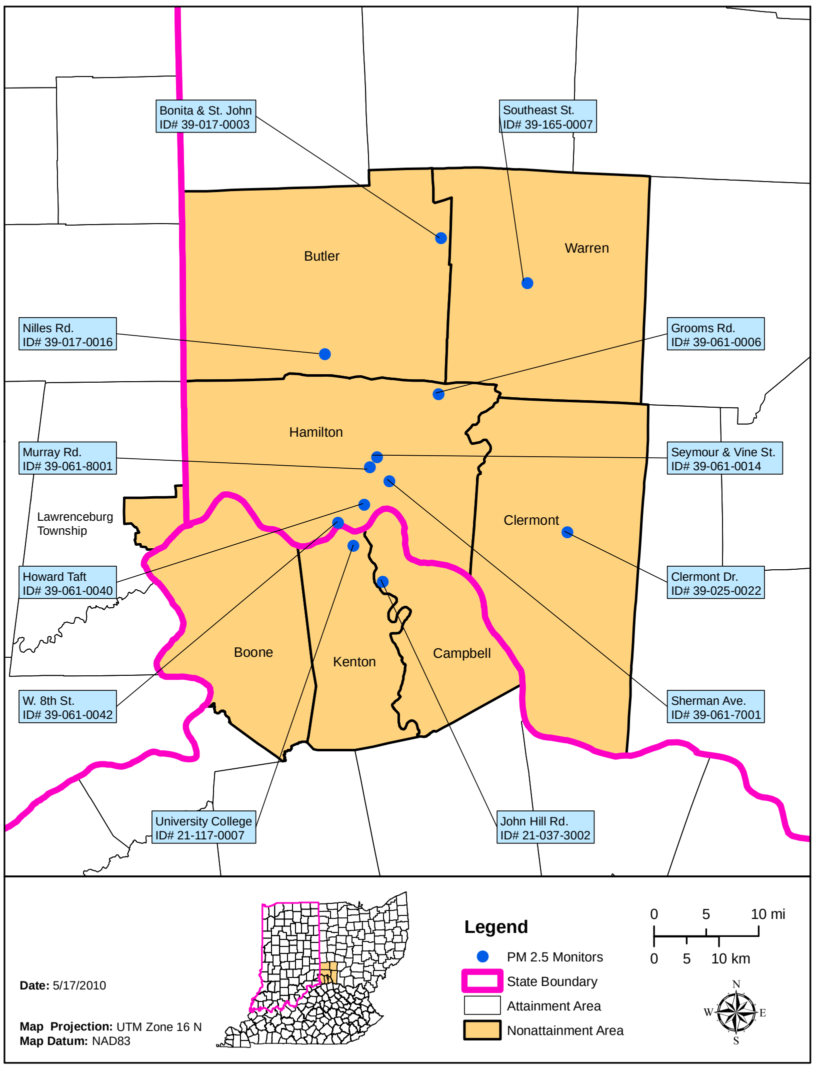
3.0 FINE PARTICLES MONITORING

3.1 Fine Particles Monitoring Network

There are currently 12 Federal Reference Method monitors measuring fine particle concentrations for the Cincinnati area. Fine particle monitors are located in Campbell and Kenton counties in Kentucky and Butler, Clermont, Warren, and Hamilton counties in Ohio. There are no monitors for fine particles in the Indiana portion of the Cincinnati nonattainment area. The highest levels of fine particle concentrations have been typically monitored at the Seymour and Vine Street monitor (39-0061-0014) in Hamilton County, Ohio. The locations of the monitoring sites for the Cincinnati area are shown in Figure 3.1. A listing of the monitor readings from 2007 through 2009, is shown in Table 3.1 and Appendix A. The monitor readings were retrieved from the U.S. EPA's Air Quality System (AQS).

The Wilwood and Winneste Ave. monitors in Ohio were discontinued on December 31, 2005. The Alexandria Park monitor in Kentucky was discontinued on December 31, 2006. The Hook Field Airport monitor in Ohio was discontinued on December 31, 2007. Therefore, these discontinued monitors are not shown in Figure 3.1.

Figure 3.1
Cincinnati Basic Nonattainment Area



3.2 Ambient Fine Particles Monitoring Data

The following information summarizes U.S. EPA's "Guideline on Data Handling Conventions for the annual fine particles NAAQS," U.S. EPA-454/R-99-008, April 1999. Three complete years of fine particles monitoring data are required to demonstrate attainment at a monitoring site. The annual ambient air quality standard for fine particles is met at an ambient air quality monitoring site when the three-year average of the annual average of fine particle concentrations is less than or equal to 15.0 $\mu g/m^3$. When this occurs, the site is said to be in attainment. While calculating design values, three significant digits must be carried in the computations, with final values rounded to the nearest 0.1 $\mu g/m^3$. Decimals 0.05 or greater are rounded up, and those less than 0.05 are rounded down, so that 15.049 $\mu g/m^3$ is the largest concentration that is less than or equal to 15.0 $\mu g/m^3$. Values at or below 15.0 $\mu g/m^3$meet the standard. Values equal to or greater than 15.1 $\mu g/m^3$ exceed the standard.

Data handling procedures are applied on an individual basis at each monitor in the area. An individual site's three-year average of the annual average fine particles concentration is also called the site's *design value*. An area is in compliance with the annual NAAQS for fine particles only if all monitoring sites meet the NAAQS. The air quality design value for the area is the highest design value among all sites in the area. Table 3.1 shows the annual fine particle values by site and the 2007 through 2009 design values for the 12 active fine particle monitoring sites in the Cincinnati area.

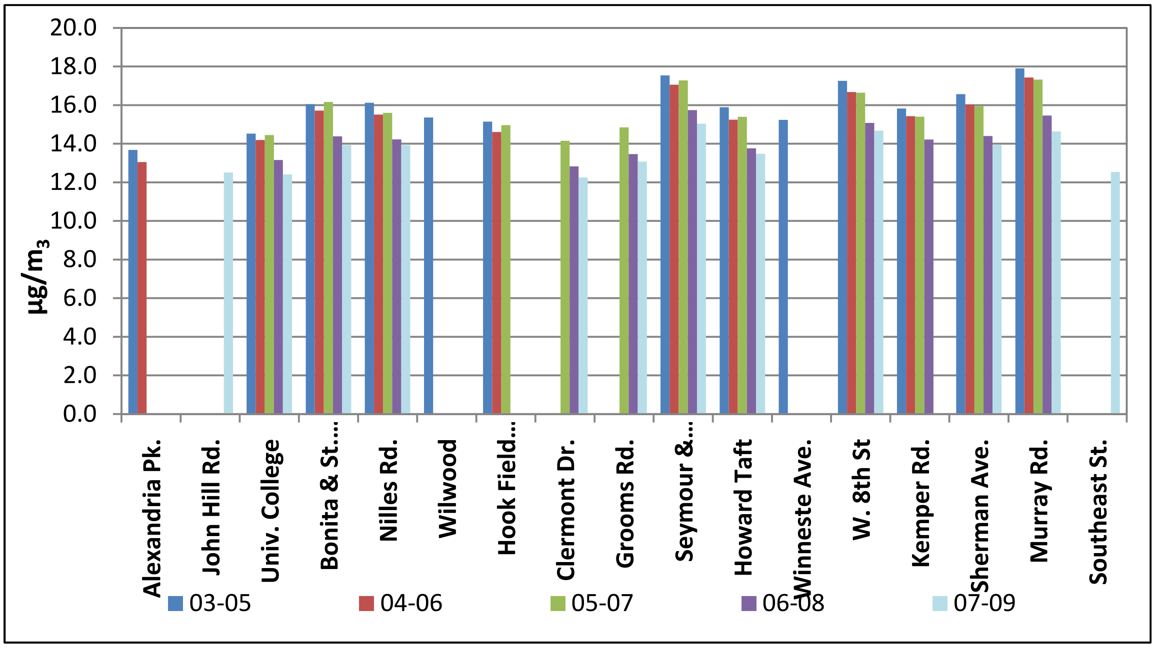
Table 3.1
Monitoring Data for the Cincinnati Area (Annual Average and 2007-2009 Design Values)

SITE ID	STATE	COUNTY	SITE NAME	YEAR	Annual Average ($\mu g/m^3$)	2007-2009 Average ($\mu g/m^3$)
21-037-3002	Kentucky	Campbell	John Hill Rd.	2007	14.36	
21-037-3002	Kentucky	Campbell	John Hill Rd.	2008	11.83	
21-037-3002	Kentucky	Campbell	John Hill Rd.	2009	11.34	**12.51**
21-117-0007	Kentucky	Kenton	Univ. College	2007	14.20	
21-117-0007	Kentucky	Kenton	Univ. College	2008	11.99	
21-117-0007	Kentucky	Kenton	Univ. College	2009	11.04	**12.41**
39-017-0003	Ohio	Butler	Bonita & St. John	2007	15.41	
39-017-0003	Ohio	Butler	Bonita & St. John	2008	13.69	
39-017-0003	Ohio	Butler	Bonita & St. John	2009	12.68	**13.93**
39-017-0016	Ohio	Butler	Niles Rd.	2007	14.94	
39-017-0016	Ohio	Butler	Niles Rd.	2008	13.75	
39-017-0016	Ohio	Butler	Niles Rd.	2009	13.08	**13.92**
39-017-1004	Ohio	Butler	Hook Fld. Airport	2007	14.63	
39-017-1004	Ohio	Butler	Hook Fld. Airport	2008		
39-017-1004	Ohio	Butler	Hook Fld. Airport	2009		**N/A**
39-025-0022	Ohio	Clermont	Clermont Dr.	2007	14.01	
39-025-0022	Ohio	Clermont	Clermont Dr.	2008	11.75	
39-025-0022	Ohio	Clermont	Clermont Dr.	2009	11.01	**12.26**

39-061-0006	Ohio	Hamilton	Grooms Rd.	2007	14.63	
39-061-0006	Ohio	Hamilton	Grooms Rd.	2008	12.48	
39-061-0006	Ohio	Hamilton	Grooms Rd.	2009	12.11	**13.07**
39-061-0014	Ohio	Hamilton	Seymour & Vine St.	2007	16.59	
39-061-0014	Ohio	Hamilton	Seymour & Vine St.	2008	15.12	
39-061-0014	Ohio	Hamilton	Seymour & Vine St.	2009	13.40	**15.04**
39-061-0040	Ohio	Hamilton	Howard Taft	2007	15.09	
39-061-0040	Ohio	Hamilton	Howard Taft	2008	12.62	
39-061-0040	Ohio	Hamilton	Howard Taft	2009	12.73	**13.48**
39-061-0042	Ohio	Hamilton	W. 8th St.	2007	15.90	
39-061-0042	Ohio	Hamilton	W. 8th St.	2008	14.40	
39-061-0042	Ohio	Hamilton	W. 8th St.	2009	13.71	**14.67**
39-061-0043	Ohio	Hamilton	Kemper Rd.	2007	14.85	
39-061-0043	Ohio	Hamilton	Kemper Rd.	2008	13.32	
39-061-0043	Ohio	Hamilton	Kemper Rd.	2009		**N/A**
39-061-7001	Ohio	Hamilton	Sherman Ave.	2007	15.09	
39-061-7001	Ohio	Hamilton	Sherman Ave.	2008	13.74	
39-061-7001	Ohio	Hamilton	Sherman Ave.	2009	12.97	**13.93**
39-061-8001	Ohio	Hamilton	Murray Rd.	2007	16.07	
39-061-8001	Ohio	Hamilton	Murray Rd.	2008	14.40	
39-061-8001	Ohio	Hamilton	Murray Rd.	2009	13.44	**14.64**
39-165-0007	Ohio	Warren	Southeast St.	2007	13.98	
39-165-0007	Ohio	Warren	Southeast St.	2008	11.92	
39-165-0007	Ohio	Warren	Southeast St.	2009	11.70	**12.53**
Value Above the Annual $PM_{2.5}$ Standard						

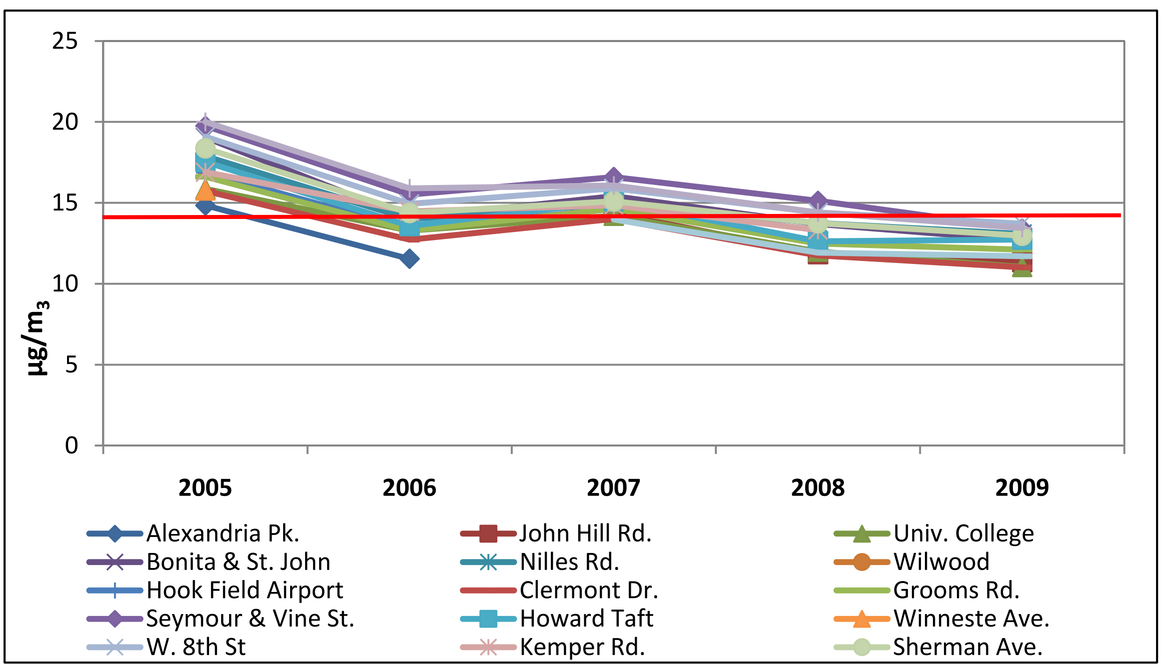
Graph 3.1 visually demonstrates the 2003 through 2009 design values for the Cincinnati area.

Graph 3.1
Design Values for the Cincinnati Area for Fine Particles, 2003 through 2009



Note: The AlexandriaPark monitor in Kentucky was discontinued on December 31, 2006. The Wilwood and Winneste Ave. monitors in Ohio were discontinued on December 31, 2005. The Hook Field Airport monitor in Ohio was discontinued on December 31, 2007.

Graph 3.2
Cincinnati Area Annual Fine Particles Trends, 2005 through 2009



Note: The Alexandria Park monitor in Kentucky was discontinued on December 31, 2006. The Wilwood and Winneste Ave. monitors in Ohio were discontinued on December 31, 2005. The Hook Field Airport monitor in Ohio was discontinued on December 31, 2007.

The design values for the Cincinnati area demonstrate that the annual NAAQS for fine particles has been attained. Refer to Appendix A for the complete fine particles monitoring data summary for the years 2000 to 2009.

Graph 3.1 shows the trend in design values, while Graph 3.2 shows the trend for annual fine particles. A comprehensive list of the fine particles monitoring sites' design values over this period is outlined in Appendix A. The area's design values have recently trended downward, as emissions have declined due to programs such as the Acid Rain program and cleaner automobiles and fuels both regionally and locally. U.S. EPA's rule to control nitrogen oxides from specific source categories (40 CFR Parts 51, 72, 75 and 96, published on October 17, 1998 and referred to as the "NO_x SIP Call") has significantly reduced emissions from large electric generating units (EGUs), industrial boilers, and cement kilns. Indiana's NO_x SIP Call Rule was adopted into the Indiana Administrative Code on June 6, 2001 at 326 IAC 10-3 and 326 ICA 10-4. The elevated fine particle values for 2005 are considered an abnormal occurrence. An analysis of meteorological conditions and monitoring values is included in Section 7.0 and supports the conclusion that attainment of the standard as of 2009 is not the result of unusually favorable meteorological conditions. It is expected that this downward trend will continue as the above programs continue and the U.S. EPA's proposed Transport Rule is implemented.

3.3 <u>Quality Assurance</u>

Kentucky and Ohio have quality assured all data shown in Appendix A in accordance with 40 CFR 58.10 and recorded the data in the AQS database and, thus, the data is available to the public.

3.4 <u>Continued Monitoring</u>

Ohio and Kentucky commit to continue monitoring concentrations of fine particles at the active sites indicated in Table 3.1 and Appendix A. There are no monitors in the Indiana portion of the Cincinnati-Hamilton, OH-KY-IN nonattainment area, however, IDEM will consult with U.S. EPA Region V staff should changes to the existing Indiana monitoring network become necessary in the future.

4.0 EMISSION INVENTORY

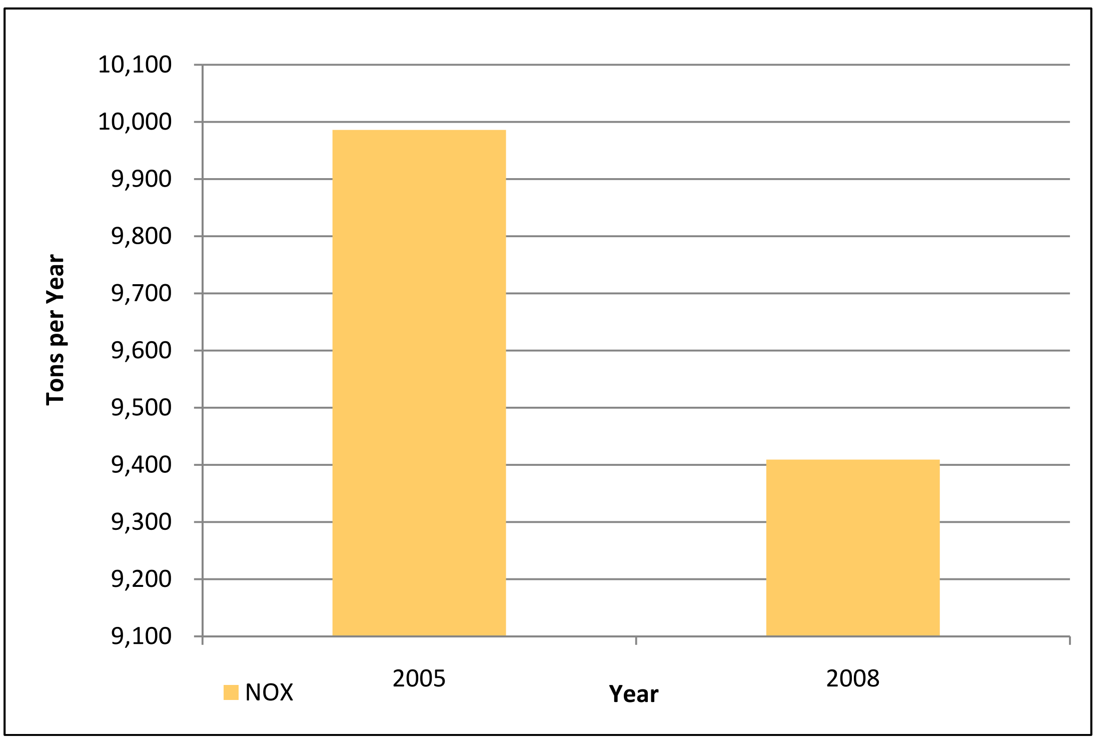
U.S. EPA Redesignation Guidance and Implementation Rules require the submittal of a comprehensive inventory of precursor emissions for fine particles (NO_x, SO_2, and direct $PM_{2.5}$) representative of the year when the area achieved attainment of the annual NAAQS for fine particles (base year). IDEM is using 2008 as the base year. IDEM must also demonstrate that the improvement in air quality between the year that violations occurred and the year that attainment was achieved is based on permanent and enforceable emission reductions. Other requirements related to the emissions inventory include: a projection of the emission inventory to a year at least ten years following redesignation; a demonstration that the projected level of emissions is sufficient to maintain the annual standard for fine particles; and, a commitment to provide future updates of the inventory to enable tracking of emission levels during the ten year maintenance period. Consistent with the implementation rule for fine particles, IDEM and U.S. EPA do not consider volatile organic compounds (VOCs) or ammonia (NH_3) to be significant contributors to fine particles. The following subsections address each of these requirements.

4.1 Emission Trends

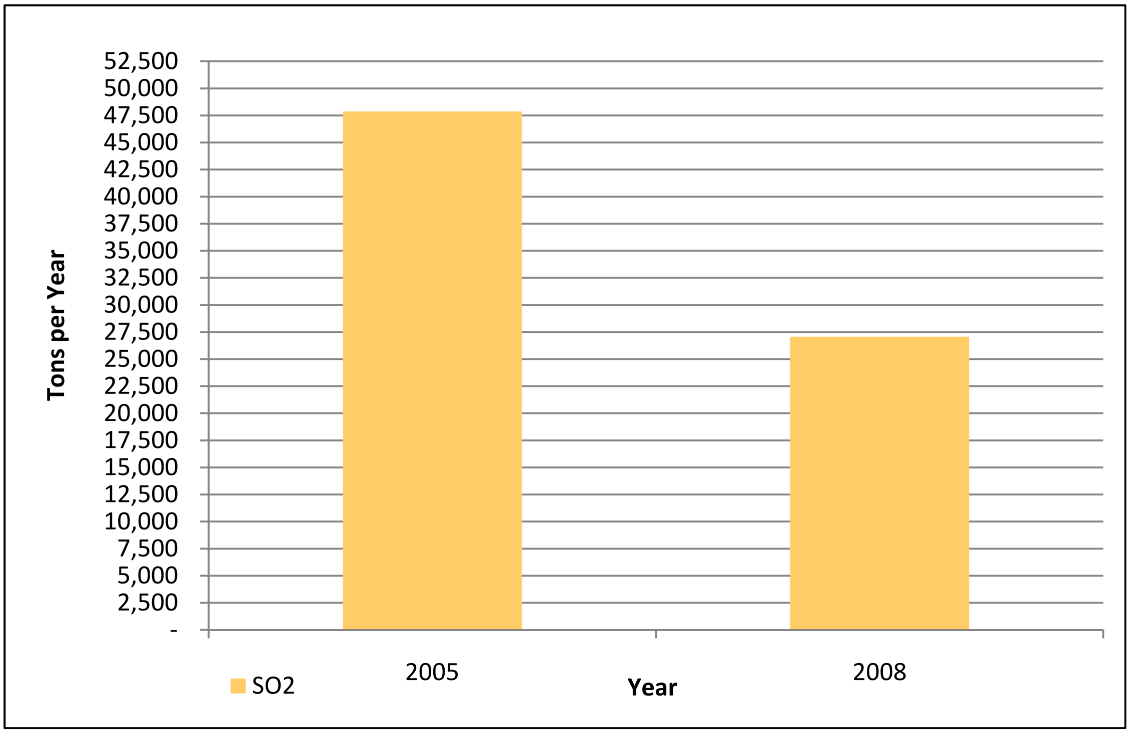
Point Sources

Graphs 4.1, 4.2 and 4.3 show that the trend in point source emissions of NO_x, SO_2, and direct $PM_{2.5}$ respectively for Lawrenceburg Township, Dearborn County, Indiana, generally correspond to the years of monitored values used in this redesignation petition. The point source data are taken from Indiana's emissions reporting program. While an increase in direct $PM_{2.5}$ point source emissions for Lawrenceburg Township in Dearborn County, Indiana is noted, the increase in direct $PM_{2.5}$ emissions from 2005 to 2008 is due to previously unreported emissions from companies that did not submit their direct $PM_{2.5}$ emissions data in 2005, but did submit direct $PM_{2.5}$ data in the 2008 emissions inventory. Graphs 4.4, 4.5 and 4.6 show the trend in point source emissions for the entire Cincinnati-Hamilton, OH-KY-IN nonattainment area. The entire Cincinnati area had a 14.6% reduction in NO_x point source emissions, a 52.1% reduction in SO_2 point source emissions, and a 9.5% reduction in direct $PM_{2.5}$ point source emissions. Point source data for the entire Cincinnati area is the combination of data from Indiana, Kentucky, and Ohio's annual emissions reporting program. Graphs and data tables of emissions for the point source category can be found in Appendix B.

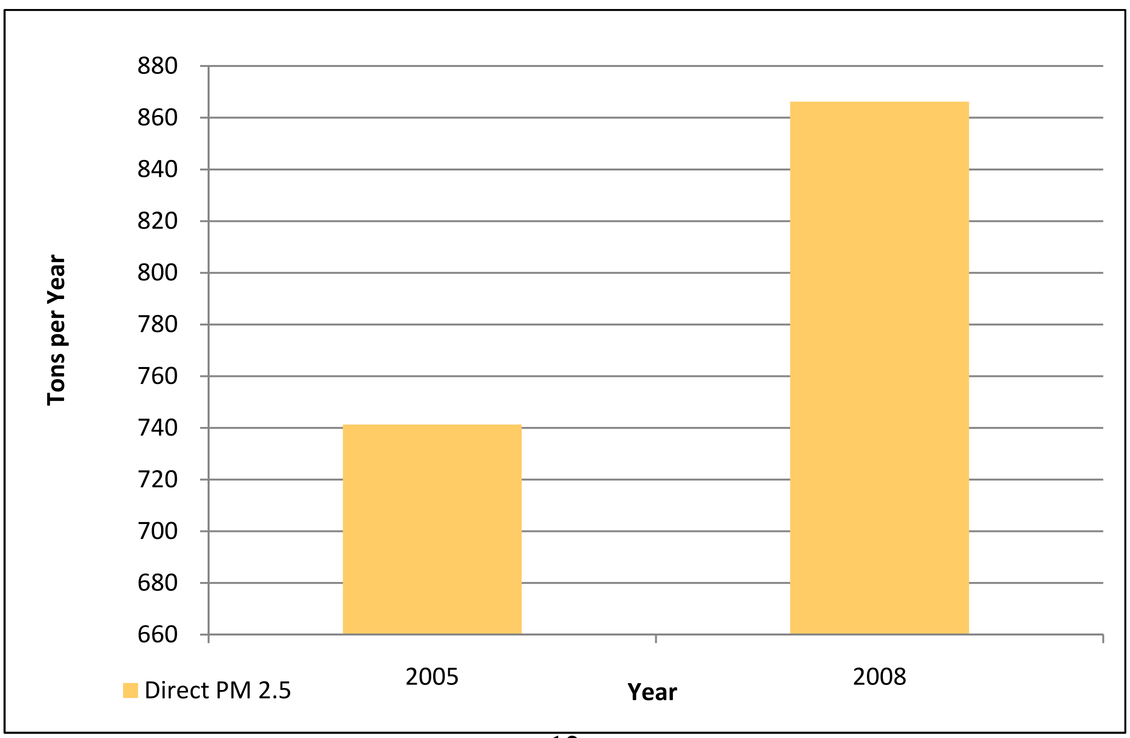
Graph 4.1
Dearborn County, IN NO_x Point Source Emission Trends, 2005 and 2008



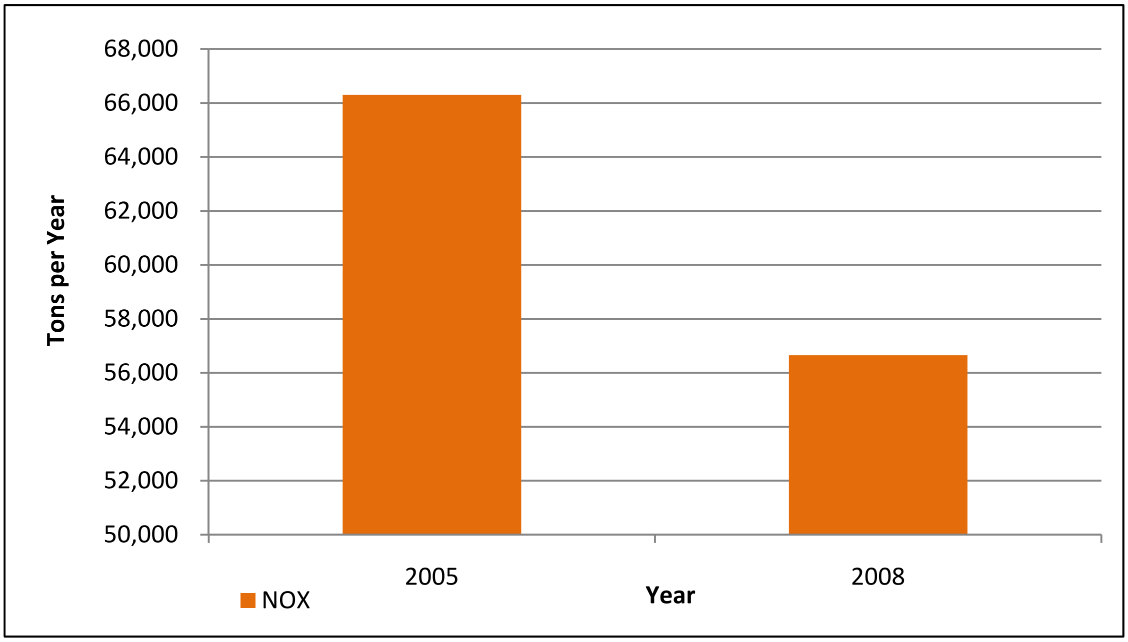
Graph 4.2
Dearborn County, IN SO_2 Point Source Emission Trends, 2005 and 2008



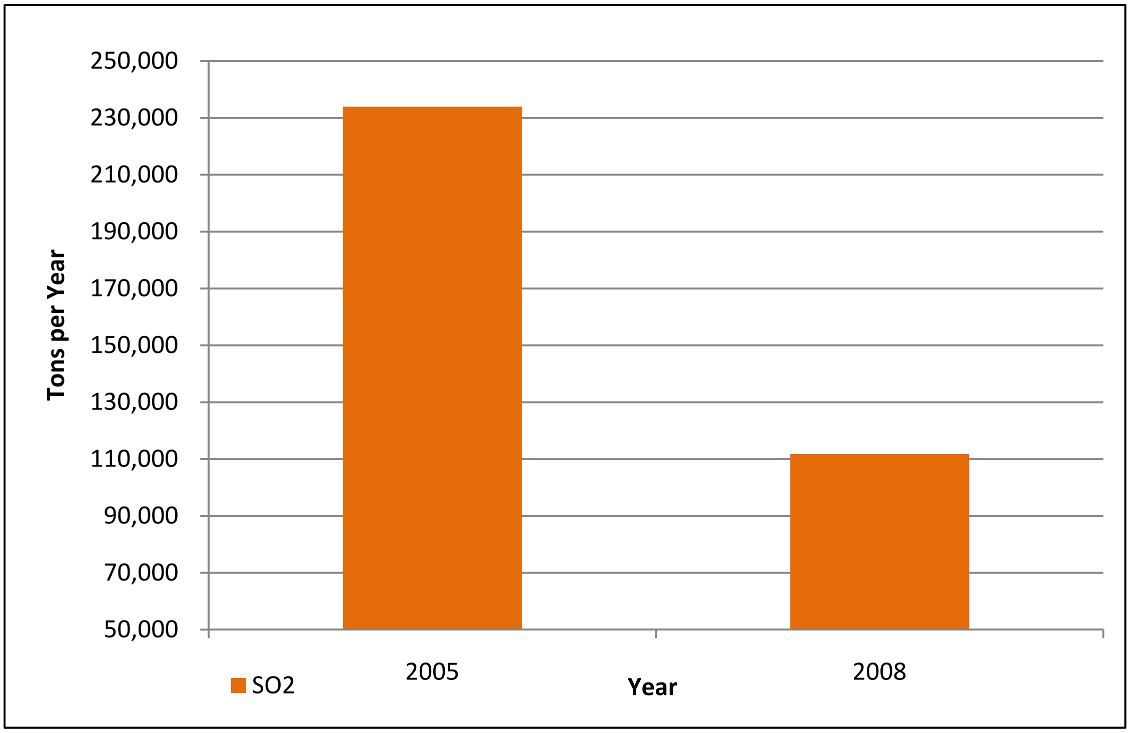
Graph 4.3
Dearborn County, IN Direct $PM_{2.5}$ Point Source Emission Trends, 2005 and 2008



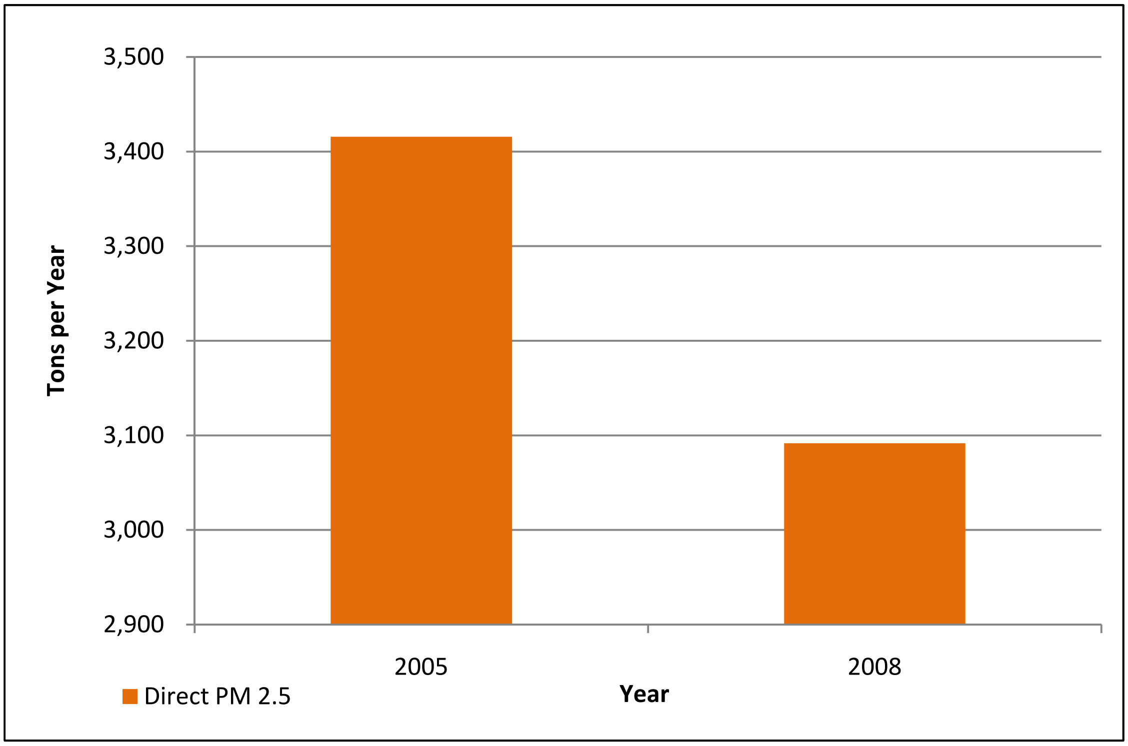
Graph 4.4
Entire Cincinnati-Hamilton, OH-KY-IN Nonattainment Area NO_x Point Source Emission Trends, 2005 and 2008



Graph 4.5
Entire Cincinnati-Hamilton, OH-KY-IN Nonattainment Area SO_2 Point Source Emission Trends, 2005 and 2008



Graph 4.6
Entire Cincinnati-Hamilton, OH-KY-IN Nonattainment Area Direct $PM_{2.5}$ Point Source Emission Trends, 2005 and 2008



All Anthropogenic Sources

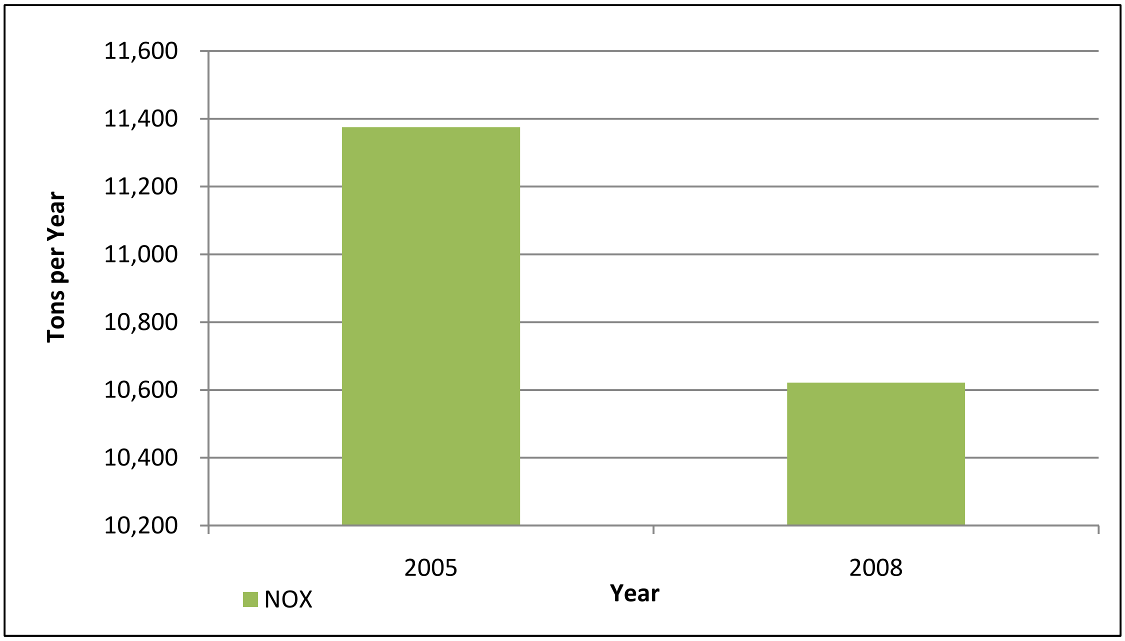
Periodic inventories, which include emissions from all sectors (mobile, area, nonroad, and point source), were prepared for 2005 and 2008. The 2008 data was extrapolated from the 2005 emission inventory. Graphs 4.7, 4.8, and 4.9 show the trends for total NO_x, SO_2, and direct $PM_{2.5}$ emissions for all anthropogenic source categories in Lawrenceburg Township in Dearborn County, Indiana for 2005 and 2008. While an increase in direct $PM_{2.5}$ anthropogenic source emissions for Lawrenceburg Township in Dearborn County, Indiana is noted, the increase in direct $PM_{2.5}$ emissions from 2005 to 2008 is due to previously unreported emissions from companies that did not submit their direct $PM_{2.5}$ emissions data in 2005, but did submit direct $PM_{2.5}$ data in the 2008 emissions inventory. Graphs 4.10, 4.11, and 4.12 show the trends for total NO_x, SO_2, and direct $PM_{2.5}$ emissions for all anthropogenic source categories for the entire Cincinnati-Hamilton, OH-KY-IN nonattainment area for 2005 and 2008. These emissions trends roughly follow the years of monitored trends discussed in Section 3.0. There is a downward trend in NO_x and SO_2 emissions from 2005 to 2008. The decrease in NO_x can be largely attributed to the impact of the NO_x SIP Call. As can be seen by Graph 4.12, overall the direct $PM_{2.5}$ anthropogenic source emissions for the entire Cincinnati-Hamilton, OH-KY-IN nonattainment area have substantially decreased. Graphs and data tables of emissions from each source category are available in Appendix C.

Mobile emissions inventories and projections for all counties were prepared by the Ohio-Kentucky-Indiana Regional Council of Governments (OKI) and is explained in further detail in Section 5.0. All 2005 data for the entire Cincinnati-Hamilton, OH-KY-IN nonattainment area is from the 2005 periodic inventory which has been identified as one of the preferred databases for SIP development. For the 2008 attainment year, emissions were extrapolated from the 2005 Lake Michigan Air Directors Consortium (LADCO) modeling inventory, using LADCO's growth factors, for all sections except point sources (electrical generating units and non-electrical generating units). Point source emissions for 2008 were compiled from Indiana, Kentucky, and Ohio's annual emissions inventory databases.

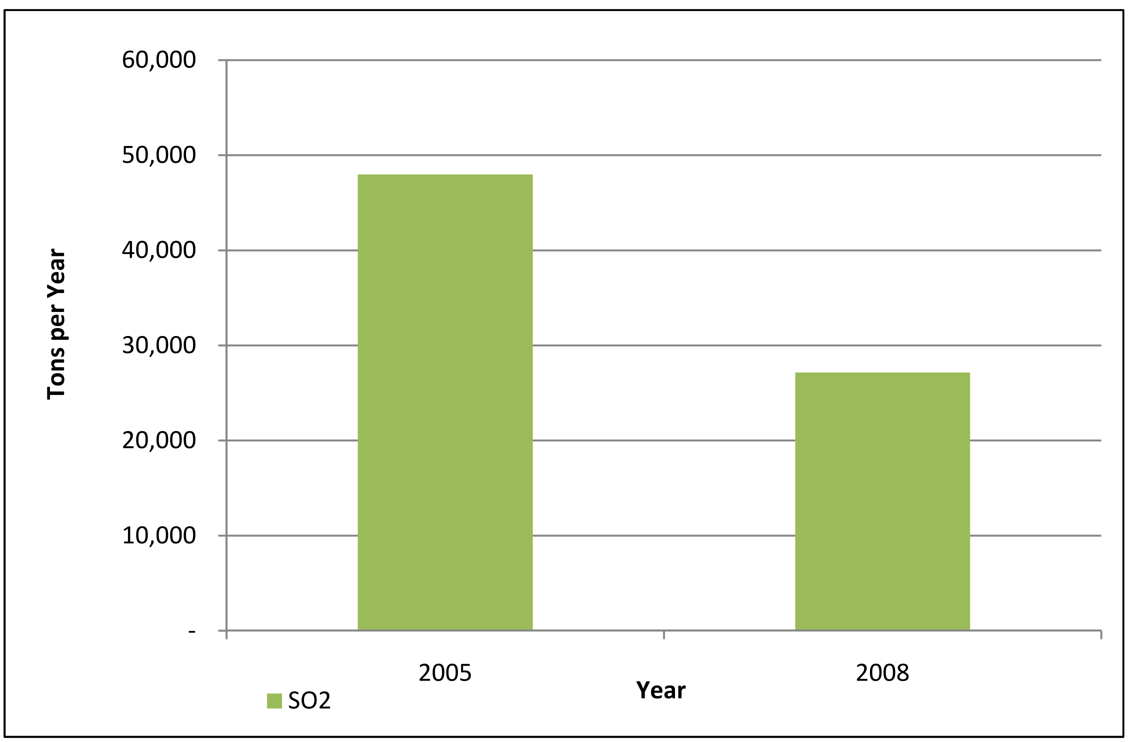
The emissions inventory development and emissions projection discussion below, with the exception of the mobile emissions inventory and projections, identify procedures used by Ohio EPA and LADCO regarding emissions from Ohio's portion of the counties in the Cincinnati-Hamilton, OH-KY-IN nonattainment area that differ from procedures used by Kentucky and Indiana. Indiana and Kentucky emissions data were obtained through the LADCO emission inventory and projections which were prepared using similar methodologies.

For Ohio, the 2005 and 2008 actual $PM_{2.5}$ emissions data below generally contains filterable fraction emissions only and not the condensable fractions, because Ohio EPA did not have a consistent reporting requirement in those years. U.S. EPA Integrated Planning Model(IPM) modeling was used to generate future year EGU emissions with the Clean Air Interstate Rule (CAIR) program. The IPM modeling added additional $PM_{2.5}$ condensible emissions into future years. Therefore, comparing base and attainment year emissions with the future year predictions is not accurate in the IPM CAIR modeling. This step leads to a false perception of significant $PM_{2.5}$ emissions increase. Modeling performed by LADCO, without CAIR, did not incorporate added condensable fraction emissions. Although Ohio EPA has stated that it is most appropriate to evaluate future year emissions that include the CAIR program, because of this flaw, it is more accurate and appropriate for the purposes of $PM_{2.5}$ to evaluate future year emissions without the CAIR program. Therefore all numbers for Ohio for $PM_{2.5}$ in this document are without CAIR, while all numbers for Ohio for NO_x and SO_2 are with CAIR. Both Indiana and Kentucky have used numbers for NO_x, SO_2, and $PM_{2.5}$ with CAIR. Emissions tables and charts in this document are labeled accordingly and can also be found in Appendix C.

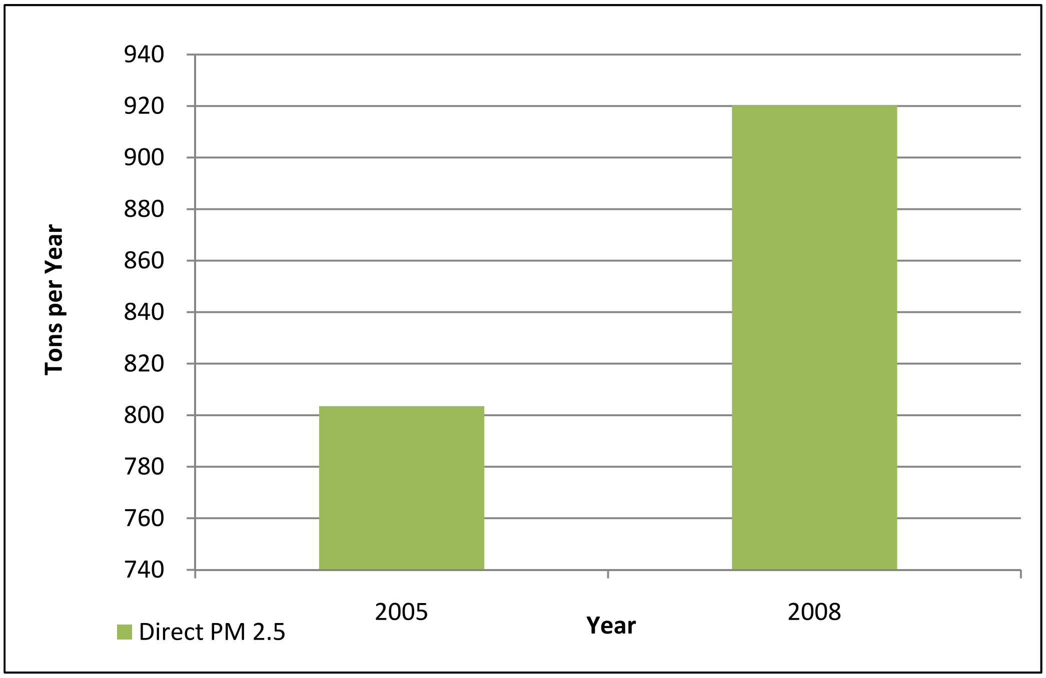
Graph 4.7
NO_x Emission Trends, All Sources in Dearborn County, IN, 2005 and 2008-With CAIR



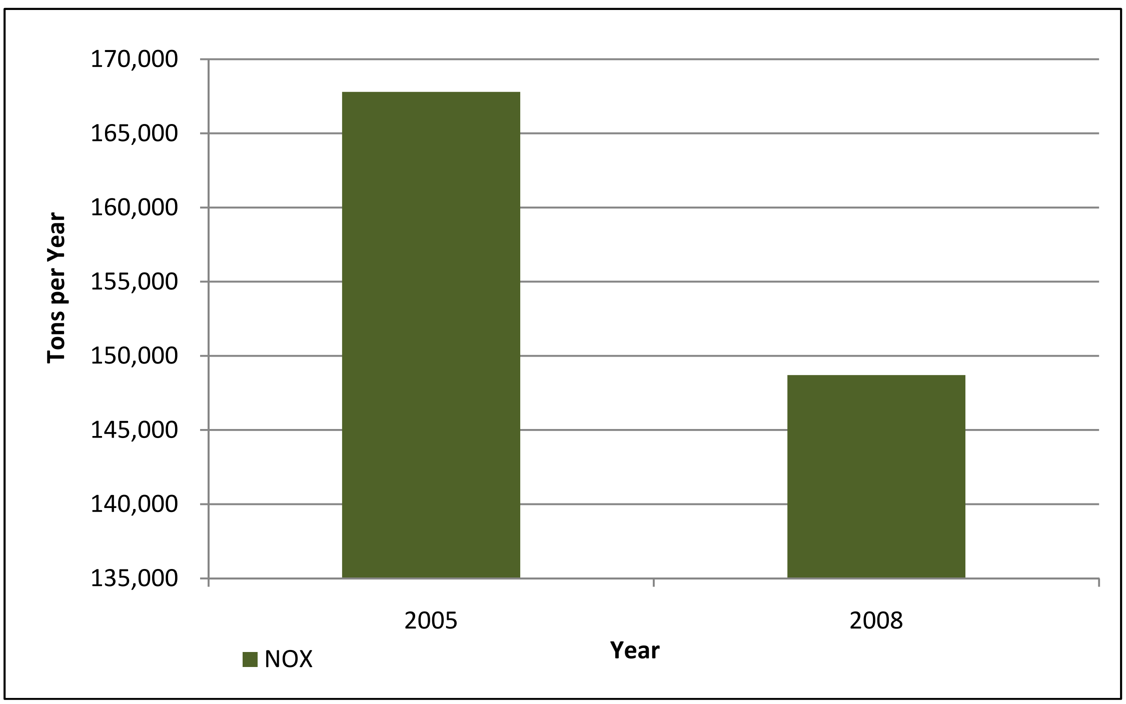
Graph 4.8
SO_2 Emission Trends, All Sources in Dearborn County, IN, 2005 and 2008-With CAIR



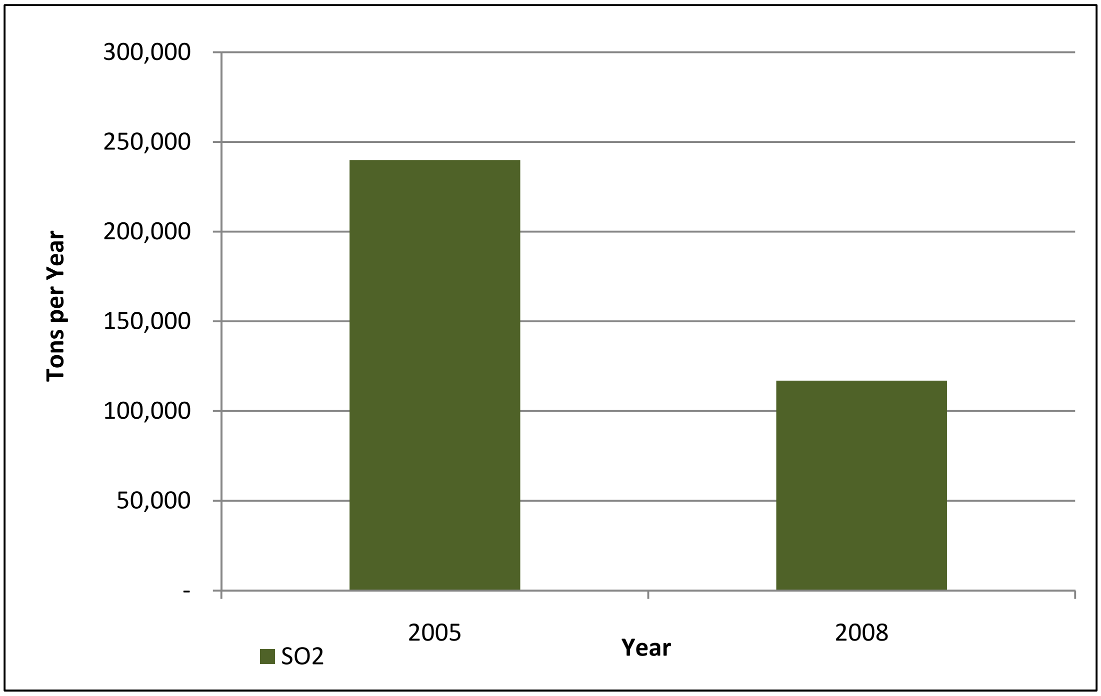
Graph 4.9
Direct $PM_{2.5}$ Emission Trends, All Sources in Dearborn County, IN, 2005 and 2008-With CAIR



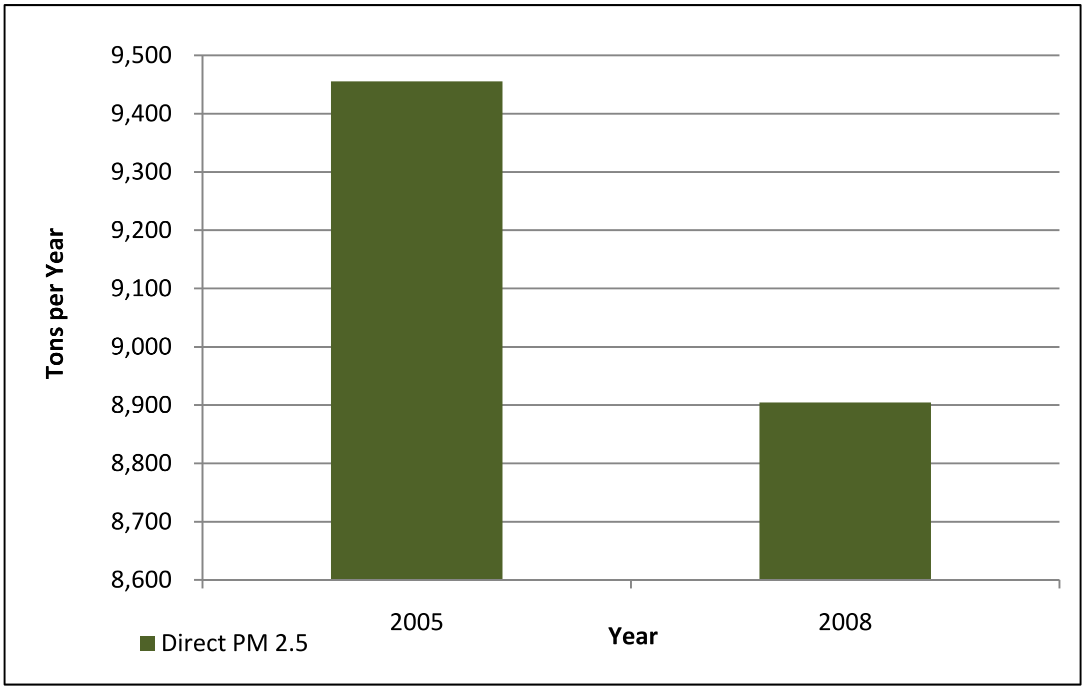
Graph 4.10
NO_x Emission Trends, All Sources in Entire Cincinnati-Hamilton, OH-KY-IN Nonattainment Area, 2005 and 2008-With CAIR



Graph 4.11
SO_2 Emission Trends, All Sources in Entire Cincinnati-Hamilton, OH-KY-IN Nonattainment Area, 2005 and 2008-With CAIR



Graph 4.12
Direct $PM_{2.5}$ Emission Trends, All Sources in Entire Cincinnati-Hamilton, OH-KY-IN Nonattainment Area, 2005 and 2008-Without CAIR



EGU Sources

Both NO_x and SO_2 emissions are decreasing substantially in response to national programs affecting all EGUs such as the Acid Rain program and the NO_x SIP Call. Other sectors of the inventory also impact the formation of fine particles, but large regional sources such as EGUs have a substantial impact on the formation of fine particles.

The data was taken from U.S. EPA's Clean Air Markets database[1]. Data are available sooner for these units than other point sources in the inventory because of the NO_x SIP Call budget and trading requirements. Information from 2003 is significant because some EGUs started operation of their NO_x SIP Call controls in order to generate Early Reduction Credits for their future year NO_x budgets. The first season of the NO_x SIP Call budget period began May 31, 2004.

As part of the NO_x SIP Call, the states were required to adopt into their rules a budget for all large EGUs. Indiana's budget is referenced in 326 IAC 10-4. The budget represents a statewide cap on NO_x emissions. 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 represented on these graphs.

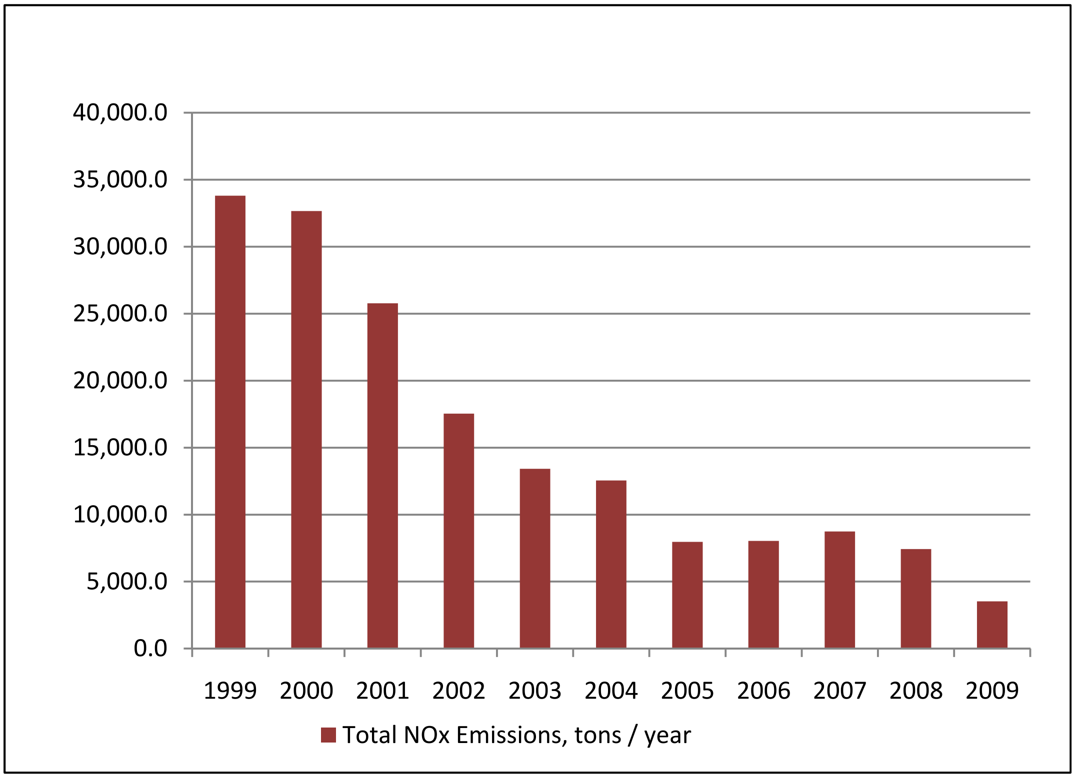
These emissions, capped by the state rule, are expected to remain near these levels throughout the maintenance period covered by this request. The state cap for the NO_x SIP Call remained in place through 2008, at which time the CAIR program superseded it. CAIR, issued in March 2005, adopted by the Indiana Air Pollution Control Board on November 1, 2006, and implemented beginning in 2010, will continue to reduce regional EGU NO_x emissions statewide by approximately another 17% by 2015 and 57% for EGU SO_2 emissions by 2015. The D.C. Circuit court's vacatur of CAIR in July of 2008 and subsequent remand without vacatur in December of 2008 directs U.S. EPA to revise the CAIR rule in the future. The proposed Clean Air Transport Rule (Transport Rule) (CAIR's replacement rule) will result in similar or greater emission reductions than assumed within the current emission inventories once it is implemented.

There is one EGU located in the Indiana portion (Lawrenceburg Township, Dearborn County, Indiana) of the Cincinnati area: American Electric Power (AEP)- Tanner's Creek. Graphs 4.13 and 4.15 depict the trends in NO_x and SO_2 emissions from the EGU in Lawrenceburg Township, Dearborn County, Indiana for the years 1999 to 2009. AEP-Tanner's Creek entered into a Consent Decree with U.S. EPA on October 9, 2007. For NO_x, the Consent Decree calls for low-NOx burners and overfire air. Further, they installed Selective Non-Catalytic Reduction (SNCRs) on Units 1, 2, and 3 in 2008 to meet CAIR requirements. As a general rule, low NO_x burners are around 40% control and SNCRs are an additional 30%. AEP-Tanner's Creek's permit does not require operation of these units, but they need to operate the controls to meet CAIR allowances for now, and the proposed Transport Rule will control when it is effective. For SO_2, the Consent Decree and the permit state AEP-Tanner's Creek has to burn coal not exceeding 1.2% sulfur. With the Consent Decree in place these controls are, therefore,

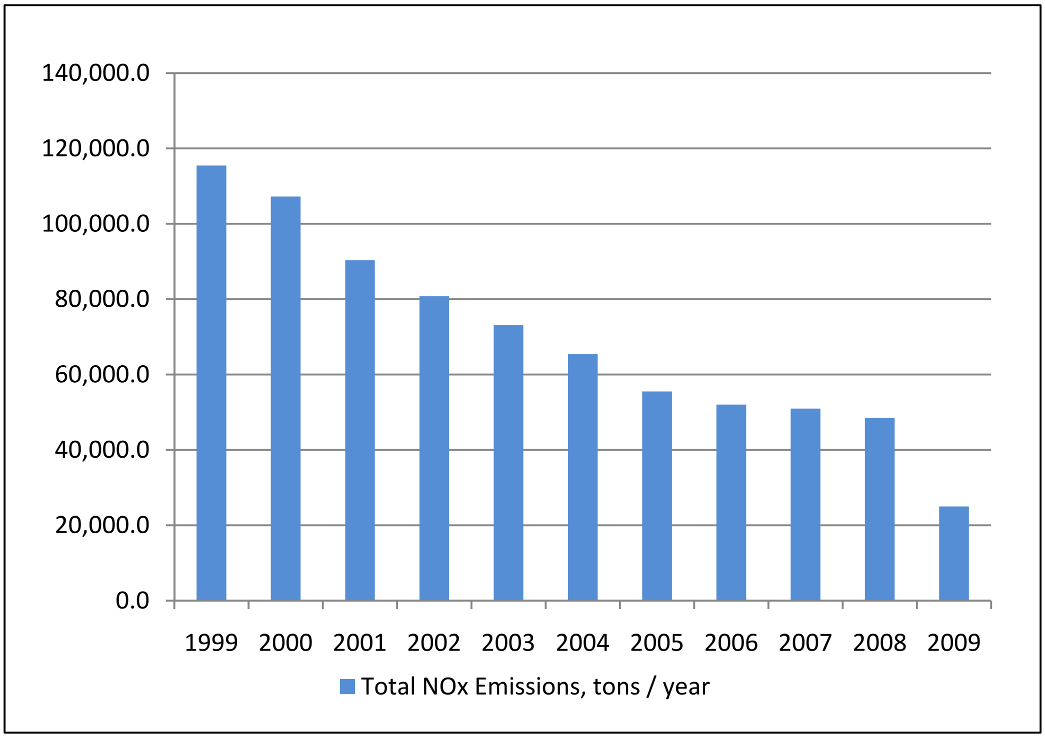
[1] http://www.epa.gov/airmarkets

considered permanent and enforceable and can be associated with the downward trend in NO_x and SO_2 emissions from AEP-Tanner's Creek. Graphs 4.14 and 4.16 depict the trends in NO_x and SO_2 emissions from the entire Cincinnati-Hamilton, OH-KY-IN nonattainment area for the years 1999 to 2009. Graphs and data tables of emissions from the EGU source category can be found in Appendix D.

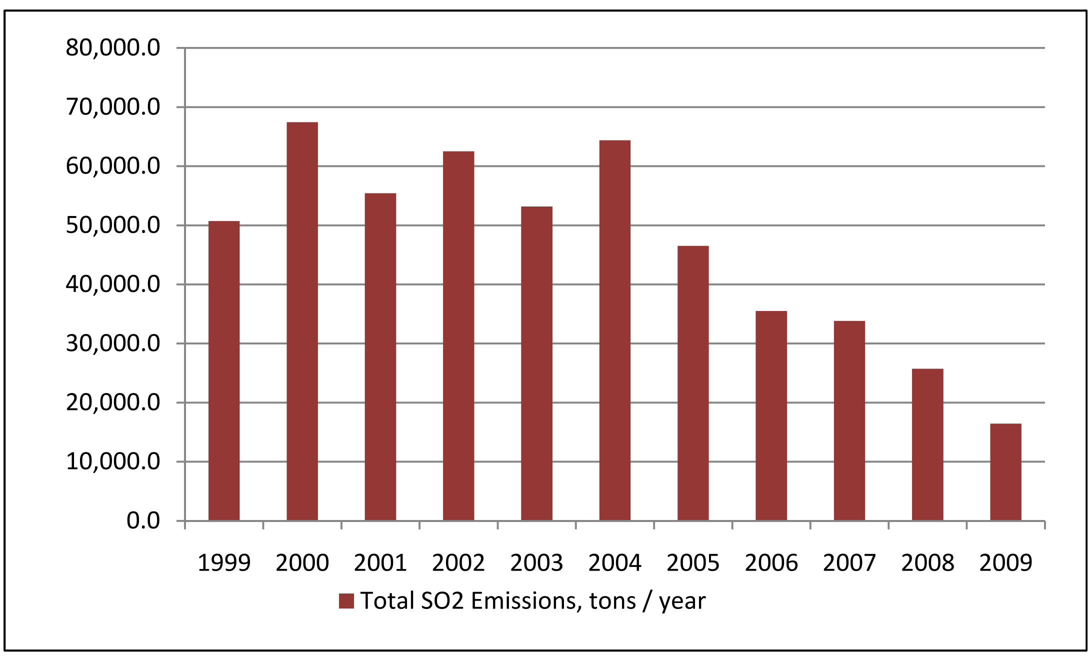
Graph 4.13
Lawrenceburg Township, Dearborn County, Indiana NO_x Emissions from EGUs, 1999 to 2009



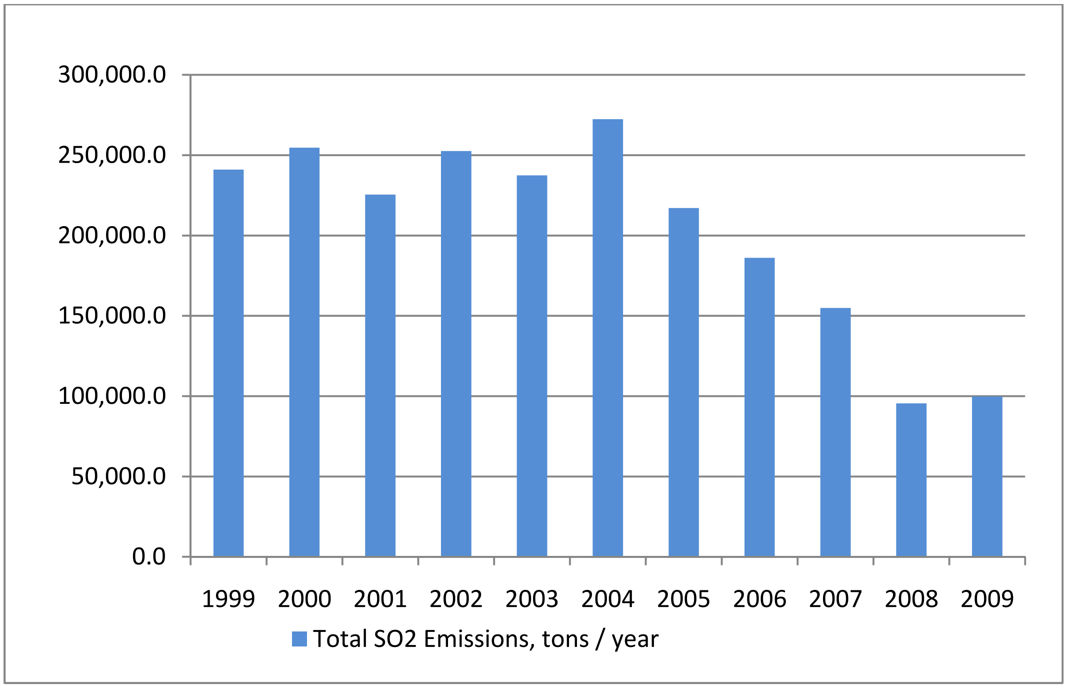
Graph 4.14
Entire Cincinnati-Hamilton OH-KY-IN Nonattainment Area NO_x Emissions from EGUs, 1999 to 2009



Graph 4.15
Lawrenceburg Township, Dearborn County, Indiana SO_2 Emissions from EGUs, 1999 to 2009



Graph 4.16
Entire Cincinnati-Hamilton OH-KY-IN Nonattainment Area SO_2 Emissions from EGUs, 1999 to 2009



4.2 Base Year Inventory

IDEM prepared a comprehensive inventory for the Cincinnati area, including area, mobile, nonroad, and point sources for direct $PM_{2.5}$ and precursors of fine particles (NO_x and SO_2) for 2005 (the year with the most complete emissions inventory available at this time). The 2008 data was extrapolated from the 2005 emission inventory to represent a base year for maintenance purposes. The 2007 implementation rule for the annual fine particles standard states that NO_x, SO_2, and direct $PM_{2.5}$ are the regulated precursors of fine particles. Ammonia and VOCs are not required to be addressed unless the state or U.S. EPA makes a technical demonstration that emissions of these pollutants from sources in the state significantly contribute to $PM_{2.5}$ concentrations in a given nonattainment area. U.S. EPA and Indiana have not determined ammonia or VOCs to be significant contributors to fine particles formation in the State of Indiana. Indiana's 2008 base year inventory was determined by the following:

- Area sources were extrapolated from the Indiana 2005 periodic inventory submitted to U.S. EPA.
- Mobile source emissions were calculated from U.S. EPA's Motor Vehicle Emissions Simulator (MOVES) model-produced emission factors and data extracted from the region's travel-demand model. These emissions were then interpolated as needed to determine 2008 base year values.

- Point source information was compiled from IDEM's emissions statement database and U.S. EPA's Clean Air Markets acid rain database.
- Biogenic emissions are not included in these summaries.
- Nonroad emissions were extrapolated from the 2005 National Emissions Inventory (NEI). To address concerns about the accuracy of some of the categories in U.S. EPA's nonroad emissions model, LADCO contracted with two companies to review the base data and make recommendations. One of the contractors also estimated emissions for two nonroad categories not included in U.S. EPA's nonroad model. Emissions were estimated for commercial marine vessels and railroads. The recreational motorboat population and spatial surrogates (used to assign emissions to each) were significantly updated. The populations for the construction equipment category were reviewed and updated based upon surveys completed in the Midwest and the temporal allocation for agricultural sources was also updated. A new nonroad estimation model was provided by U.S. EPA for the 2005 analysis.
- The emissions data referenced for Kentucky's portion of the nonattainment area were pulled from LADCO's emissions inventory files. This inventory was prepared using similar methodologies. The 2008 data was extrapolated from the 2005 emission inventory to represent a base year for maintenance purposes.

4.3 Emission Projections

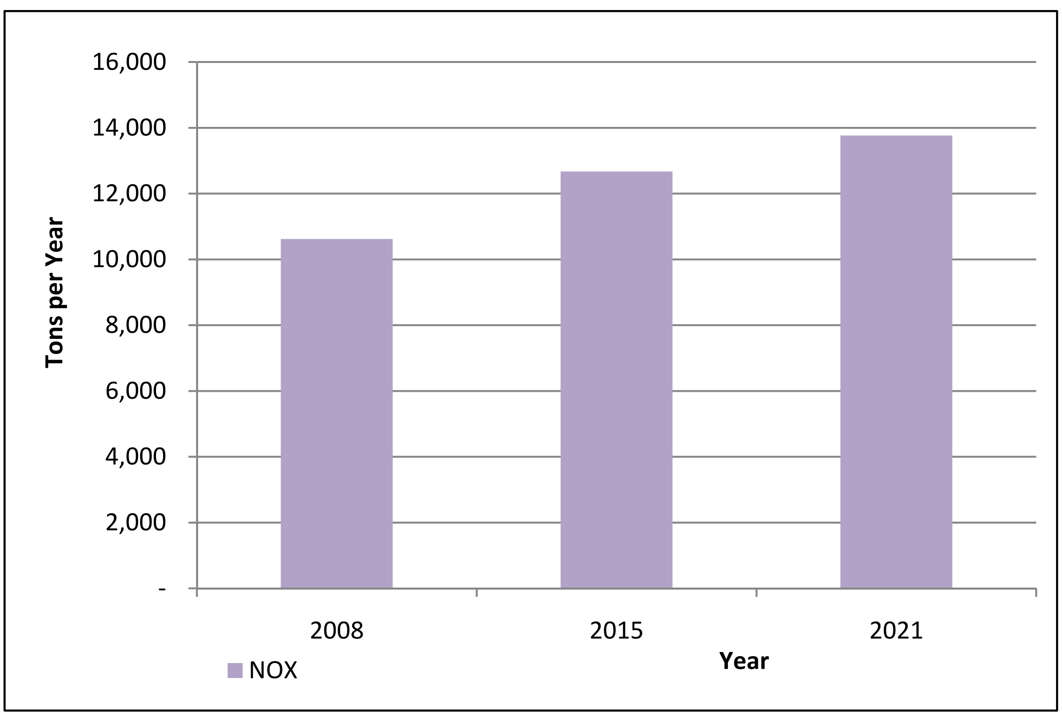
In consultation with the U.S. EPA and other stakeholders, IDEM selected the year 2021 as the maintenance year for this redesignation request. This document contains projected emission inventories for 2015 and 2021. Emission projections were prepared for Dearborn County, Indiana, as well as for the entire nonattainment area. IDEM, with assistance from LADCO, prepared emission projections for 2015 and 2021 for the entire nonattainment area.

The detailed 2015 and 2021 emissions inventory for the entire Cincinnati-Hamilton, OH-KY-IN nonattainment area can be found in Appendix E. Emission trends are an important gauge for continued compliance with the annual standard for fine particles. Therefore, IDEM performed an initial comparison of the inventories for the base year (2008-extrapolated from the 2005 emission inventory), interim year (2015-interpolated from 2009 emissions and 2018 emissions estimates) and maintenance year (2021-extrapolated from 2018 emission estimates) for Dearborn County, Indiana and the entire Cincinnati-Hamilton OH-KY-IN nonattainment area.

For the 2008 attainment year, emissions were extrapolated from the 2005 LADCO modeling inventory, using LADCO's growth factors, for all sections except point sources (electrical generating units and non-electrical generating units). Point source emissions for 2008 were compiled from Indiana, Kentucky, and Ohio's annual emissions inventory databases. The 2015 interim year emissions were estimated based on the 2009 and 2018 LADCO modeling inventory, using LADCO's growth factors, for all sectors. The 2021 maintenance year is based on emissions estimates from the 2018 LADCO modeling.

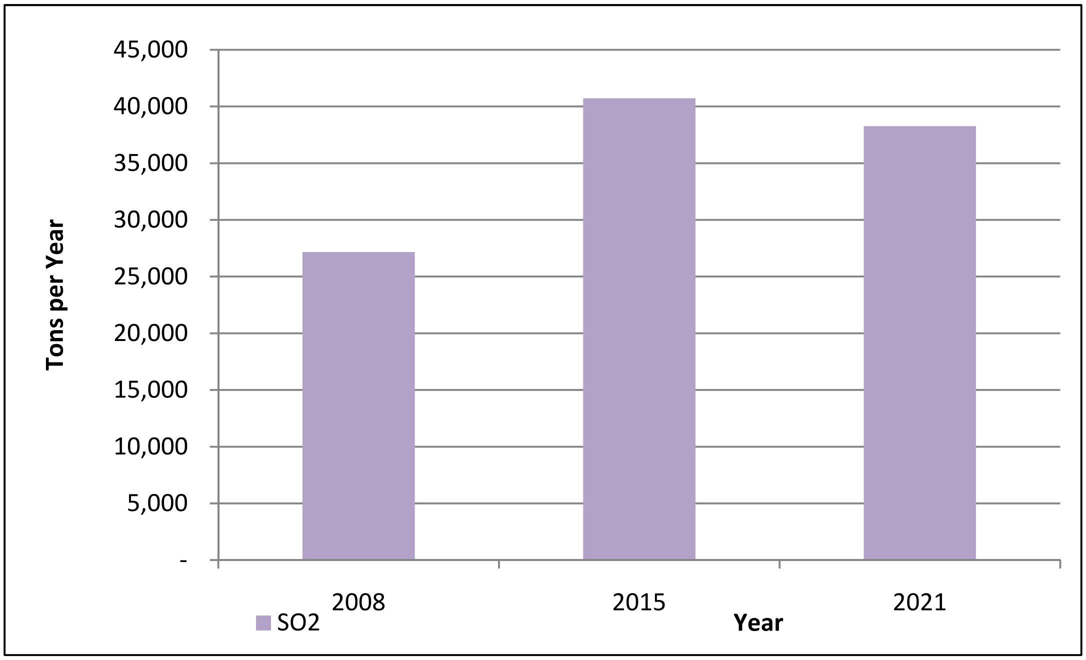
Graphs 4.17, 4.18, 4.19, and 4.20 visually compare 2008 (base year) NO_x, SO_2, and direct $PM_{2.5}$ estimated emissions with the 2015 and 2021 projected emissions for Lawrenceburg Township, Dearborn County, Indiana. Graphs 4.21, 4.22, 4.23, and 4.24 visually compare the 2008 (base year) NO_x, SO_2 and direct $PM_{2.5}$ estimated emissions with the 2015 and 2021 projected emissions for the entire Cincinnati-Hamilton, OH-KY-IN nonattainment area. AEP-Tanner's Creek accounts for over 80% of Lawrenceburg Township's total emissions. However, Lawrenceburg Township accounts for a minor portion (14%) of the total nonattainment area emissions. While an increase can be seen in the projected emissions for Lawrenceburg Township, Dearborn County, Indiana for NO_x, SO_2 and direct $PM_{2.5}$, overall emissions in the entire Cincinnati-Hamilton, OH-KY-IN nonattainment area are decreasing substantially as can be seen in Graphs 4.21, 4.22, 4.23 and 4.24. Mobile source emission inventories are further described in Section 5.0. In addition to LADCO's estimates, point source emissions were projected based upon the statewide EGU NO_x budgets from the Indiana NO_x rule. It should be noted that EGU emission estimates for 2015 and 2021 were projected utilizing the Department of Energy Information's Annual Energy Outlook Supplemental tables for the year 2018. These tables were generated for the reference case of the Annual Energy Outlook 2007 (AEO 2007) using the National Energy Modeling System. Future year actual emissions for Lawrenceburg Township may vary based upon the consent decree for AEP which includes Tanner's Creek. Additionally, the SO_2 and NO_x allocations for AEP-Tanner's Creek for 2014 and beyond within the proposed Transport Rule are less than 2008 actual emissions. Graphs and data tables of emissions from the EGU source category can be found in Appendix D.

Graph 4.17
Comparison of 2008, 2015 and 2021 Projected NO_x Emissions, Lawrenceburg Township, Dearborn County, Indiana-With CAIR



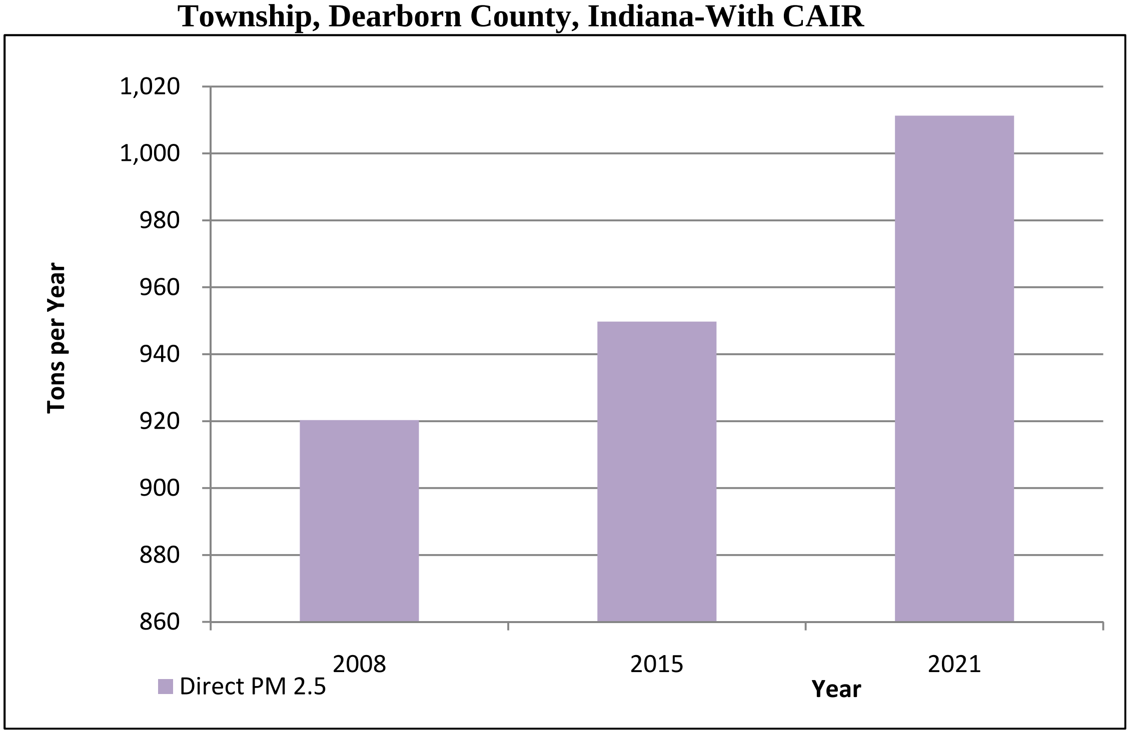
Refer to Section 4.3 above for explanation of projected increase in emissions.

Graph 4.18
Comparison of 2008, 2015 and 2021 Projected SO_2 Emissions, Lawrenceburg Township, Dearborn County, Indiana-With CAIR



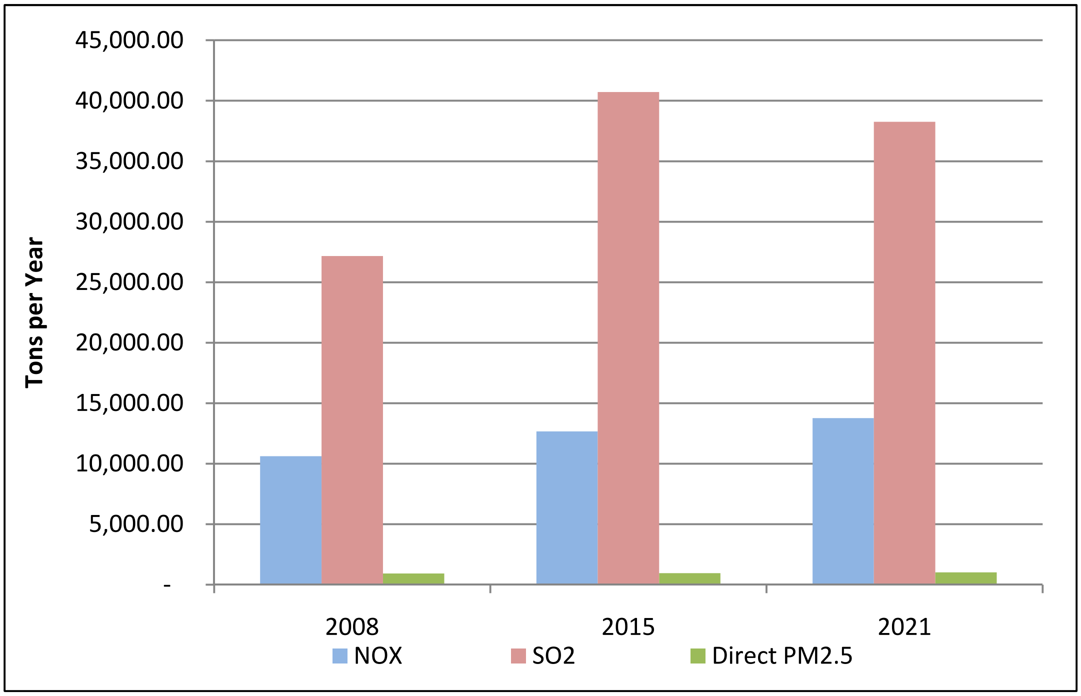
Refer to Section 4.3 above for explanation of projected increase in emissions.

Graph 4.19
Comparison of 2008, 2015 and 2021 Projected Direct $PM_{2.5}$ Emissions, Lawrenceburg Township, Dearborn County, Indiana-With CAIR

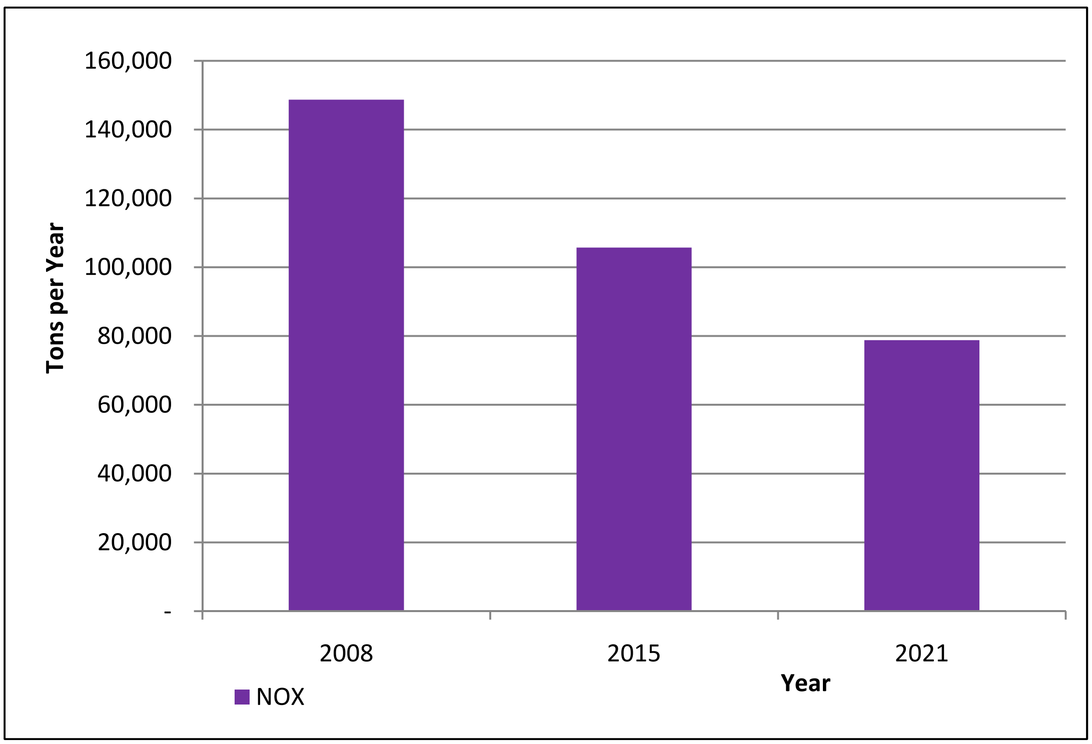


Refer to Section 4.3 above for explanation of projected increase in emissions.

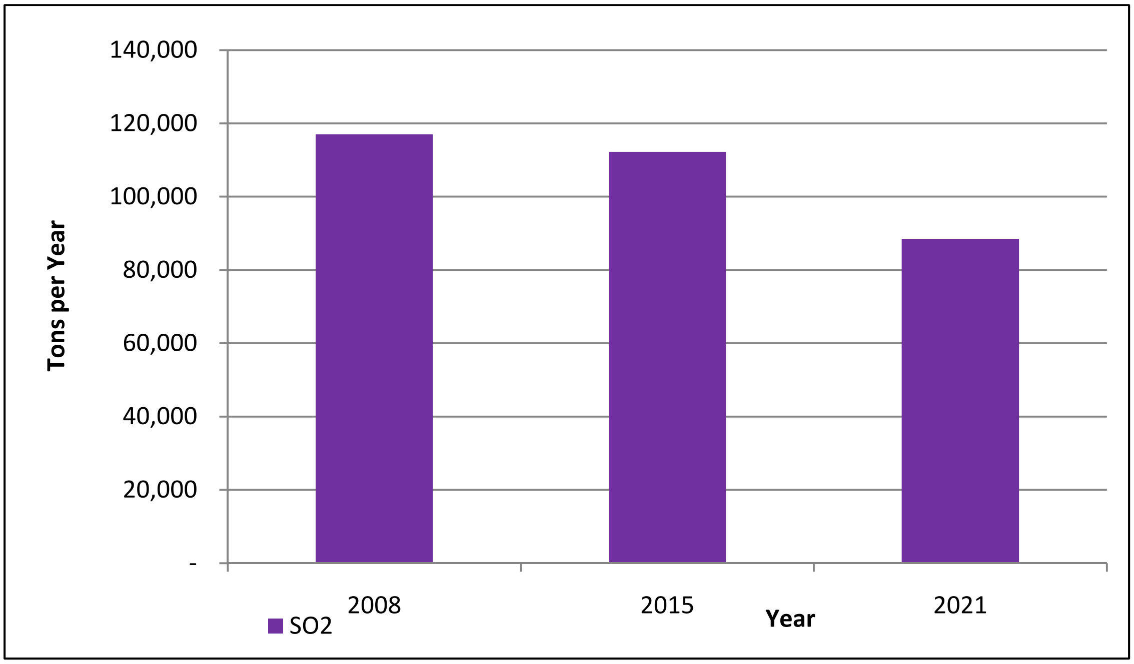
Graph 4.20
Comparison of 2008, 2015 and 2021 Projected SO_2, NO_x and Direct $PM_{2.5}$ Emissions, Lawrenceburg Township, Dearborn County, Indiana-With CAIR



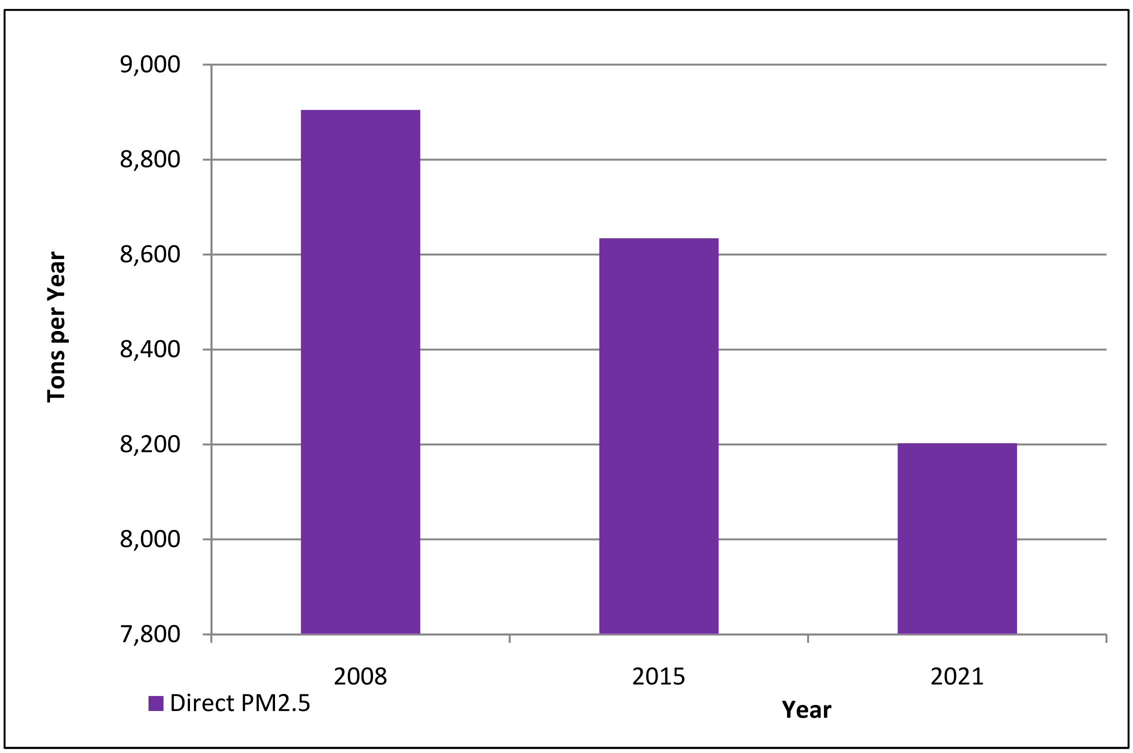
Graph 4.21
Comparison of 2008, 2015 and 2021 Projected NO_x Emissions for the Entire Cincinnati-Hamilton, OH-KY-IN Nonattainment Area-With CAIR



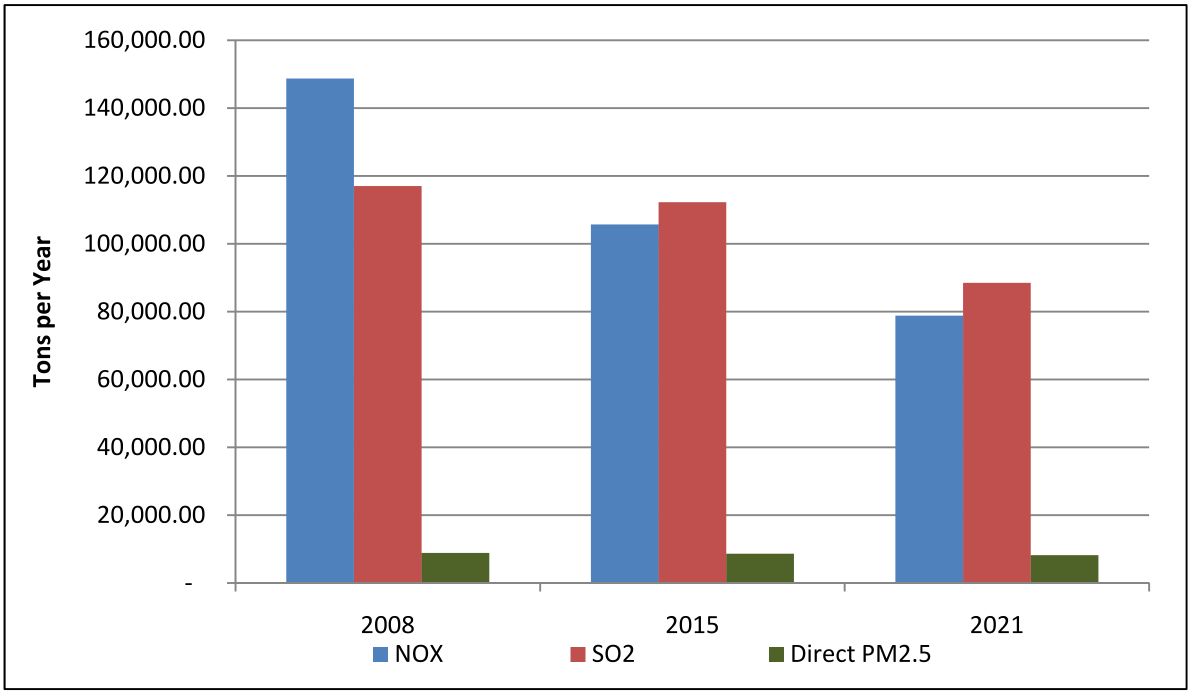
Graph 4.22
Comparison of 2008, 2015 and 2021 Projected SO_2 Emissions for the Entire Cincinnati-Hamilton, OH-KY-IN Nonattainment Area-With CAIR



Graph 4.23
Comparison of 2008, 2015 and 2021 Projected Direct $PM_{2.5}$ Emissions for the Entire Cincinnati-Hamilton, OH-KY-IN Nonattainment Area-Without CAIR



Graph 4.24
Comparison of 2008, 2015 and 2021 Projected SO_2, NO_x and Direct $PM_{2.5}$ Emissions for the Entire Cincinnati-Hamilton, OH-KY-IN Nonattainment Area-(NO_x and SO_2 With CAIR, $PM_{2.5}$ Without CAIR)



NO_x emissions within the entire Cincinnati-Hamilton, OH-KY-IN nonattainment area are projected to decline by 46.9% between 2008 and 2021. Emission reduction benefits from U.S. EPA rules covering the NO_x SIP Call, Tier 2 Motor Vehicle Emissions Standards and Gasoline Sulfur Control Requirements, Highway Heavy-Duty Engine Rule, and Nonroad Diesel Engine Rule are factored into the changes. Additionally, due to implementation of the NO_x SIP Call across the eastern United States, NO_x and fine particle levels entering the Cincinnati area will also be decreased. SO_2 emissions within the Cincinnati area are projected to decline by 24.3% between 2008 and 2021. Direct $PM_{2.5}$ emissions from 2008 to 2021 are also projected to decline by 5.6% within the Cincinnati area, see Tables 4.1 and 4.2.

Table 4.1
Comparison of 2008 Estimated and 2021 Projected Emission Estimates Lawrenceburg Township, Dearborn County, Indiana (Tons Per Year)

	2008	2021	Change	% Change
NO_x	10,621.35	13,767.56	3,146.21	29.6%
SO_2	27,164.52	38,261.63	11,097.11	40.9%
Direct $PM_{2.5}$	920.29	1,011.29	91.00	9.9%

Table 4.2
Comparison of 2008 Estimated and 2021 Projected Emission Estimates Entire Cincinnati-Hamilton, OH-KY-IN Nonattainment Area (Tons Per Year)

	2008	2021	Change	% Change
NO_x	148,706.15	78,819.18	-69,886.97	-46.9%
SO_2	116,966.42	88,540.12	-28,426.30	-24.3%
Direct $PM_{2.5}$	8,687.22	8,202.63	-484.59	-5.6%

4.4 Demonstration of Maintenance

Quality assured ambient air quality data from all the monitoring sites indicate that air quality in the Cincinnati area met the annual NAAQS for fine particles for the three-year period ending in 2009. U.S. EPA's Redesignation Guidance (Page 9) states, "A state may generally demonstrate maintenance of the NAAQS by either showing that future emissions of a pollutant or its precursors will not exceed the level of the attainment inventory, or by modeling to show that the future mix of sources and emissions rates will not cause a violation of the NAAQS." Emissions projections outlined in Section 4.0 of this document clearly illustrate that regional NO_x and SO_2 emissions in the area will continue to decline leading to local reductions between 2008 and 2021 (maintenance plan horizon). Section 7.0 further discusses the implications of these emission trends and provides an analysis to support these conclusions.

In Indiana, major point sources in all counties are required to submit air emissions information once every three years, or annually, if the NO_x or SO_2 potential to emit is greater than 2,500 tons per year in accordance with the Emission Reporting Rule, 326 IAC 2-6. IDEM prepares a new periodic inventory for all precursor emission sectors every three years. These precursor emission inventories will be prepared for 2011, 2014, and 2017, as necessary, to comply with the inventory reporting requirements established in the CAA. Emissions information will be compared to the 2008 base year and the 2021 projected maintenance year inventories to assess emission trends, as necessary, to assure continued compliance with the annual standard for fine particles.

4.5 Permanent and Enforceable Emission Reductions

Permanent and enforceable reductions of NO_x and SO_2 have contributed to the attainment of the annual standard for fine particles. Some of these reductions were due to the implementation of the NO_x SIP Call and some were due to the application of tighter federal standards on motor vehicles and fuels.

Section 6.0 identifies the emission control measures specific to Dearborn County, Indiana, as well as the implementation status of each measure.

4.6 Provisions for Future Updates

As required by Section 175A(b) of the CAA, Indiana commits to submit to the Administrator, eight years after redesignation, an additional revision of this SIP. The revision will contain Indiana's plan for maintaining the national primary fine particles air quality standard for ten years beyond the first ten-year period after redesignation.

5.0 MOBILE SOURCE EMISSION BUDGETS

U.S. EPA requirements outlined in 40 CFR 93.118(e)(4) stipulate that mobile source emissions budgets for $PM_{2.5}$ and NO_x be established as part of a SIP. The mobile source emissions budgets are necessary to demonstrate conformance of transportation plans and improvement programs with the SIP.

The following is a summary of the detailed mobile input and output calculation files located in Appendix F.

5.1 Onroad Emissions Estimates

The Ohio-Kentucky-Indiana Regional Council of Governments (OKI) is the Metropolitan Planning Organization (MPO) for the Cincinnati-Hamilton OH-KY-IN area which includes: Dearborn County in Indiana; Butler, Clermont, Hamilton, and Warren counties in Ohio; and, Boone, Campbell, and Kenton counties in Kentucky. This organization maintains a travel demand forecasting model that is used to simulate the traffic in the area and to predict what traffic would be 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. The travel demand forecasting model is used to predict the total daily vehicle miles traveled (VMT) and the U.S. EPA software program referred to as MOVES is used to produce emission factors to calculate the emissions per mile. The product of these two outputs, once combined, is the total amount of pollution emitted by onroad vehicles for the particular analyzed area.

5.2 Overview

Broadly described, MOVES is used to generate "emission factors," which are the average emissions per mile (grams/mile) for direct $PM_{2.5}$ and $PM_{2.5}$ precursors, including NO_x and SO_2. There are numerous variables that can affect the emission factors. The vehicle-fleet (vehicles on the road) age and the vehicle types have a major affect on the emission factors. The facility-type the vehicles are traveling on (MOVES facility-types are Freeway, Arterial, Local, and Ramp) and the vehicle speeds also affect the emission factor values. Meteorological factors such as air temperature and humidity affect the emission factors, as does fuel type, such as low Reid Vapor Pressure (RVP) gasoline. These data are estimated using the *best available data* to generate emission factors for direct $PM_{2.5}$ and $PM_{2.5}$ precursors, including NO_x and SO_2. After emission factors are generated, the emission factors must be multiplied by the VMT to determine the quantity of vehicle-related emissions. This information derives from the travel demand model (TDM).

It should be noted that each year analyzed will have different emission factors, volumes, speeds, and likely some additional links. MOVES input and output files can all be found in Appendix F.

5.3 Emission Estimates

Table 5.1 outlines the onroad emission estimates for the Ohio and Indiana portions of the nonattainment area for the years 2005, 2008 (Attainment Year), 2015 (Interim Year), and 2021 (Horizon Year). The following emission estimates are based on the actual TDM network runs for the years 2005, 2008, 2015, and 2021.

Table 5.1
Emission Estimates for Onroad Mobile Sources
for the Cincinnati-Hamilton OH-KY-IN $PM_{2.5}$ Nonattainment Area

Cincinnati-Hamilton OH-KY-IN NA Area	**2005**	**2008**	**2015**	**2021**
$PM_{2.5}$ (tons/year)	2,272.50	2,034.23	1,598.67	1,128.35
NO_x (tons/year)	58,423.36	51,357.02	31,064.20	18,911.05
Lawrenceburg Township (Dearborn County Indiana) subtotal				
$PM_{2.5}$ (tons/year)	33.98	29.89	25.14	18.11
NO_x (tons/year)	865.46	748.81	482.33	297.95
Lawrenceburg Township subtotal %				
$PM_{2.5}$ (tons/year)	1.50	1.47	1.57	1.61
NO_x (tons/year)	1.48	1.46	1.55	1.58

Table 5.2 contains the 2015 and 2021 regional mobile source emissions budgets for the Ohio and Indiana portions of the nonattainment area.

Table 5.2
Mobile Source Emission Budgets for the Ohio and Indiana Portions
of the Cincinnati $PM_{2.5}$ Nonattainment Area

	2015	**2021**
$PM_{2.5}$ (tons/year)	1,678.60	1,241.19
NO_x (tons/year)	35,723.83	21,747.71

Consistent with the federal implementation rule for fine particles, IDEM does not consider mobile SO_2 to be a significant contributor to fine particles for this nonattainment area, as SO_2

constitutes less than one percent (<1%) of the area's total anthropogenic emissions for the years 2005, 2008, 2015, or 2021.

This document creates an interim year budget for 2015 and a horizon year budget for 2021 for the Ohio and Indiana portions of the nonattainment area. These budgets are based on the 2008 onroad emission inventory used to support photochemical modeling for the same year, and has incorporated an appropriate safety margin as described below. A similar document was created for the Kentucky portion of the nonattainment area.

Initial Base M (2005) Comprehensive Air Quality Model with Extension (CAMx) modeling results indicated a worst case future design value in the Cincinnati-Hamilton OH-KY-IN nonattainment area of 84 ppb. In an effort to accommodate future variations in TDMs and vehicle miles traveled forecast when no change to the network is planned, IDEM consulted with the interagency consultation group, including U.S. EPA – Region 5, to determine a reasonable approach to address this variation. The interagency consultation group approved a five percent (5%) safety margin for $PM_{2.5}$ mobile source emissions estimates for the year 2015, a ten percent (10%) safety margin for $PM_{2.5}$ mobile source emissions estimates for the year 2021, and a fifteen percent (15%) safety margin for NO_x mobile source emissions estimates for the years 2015 and 2021.

Safety margins are appropriate because: 1) there is an acknowledged potential variation in VMT forecast and potential estimated mobile source emissions due to expected modifications to TDM and mobile emissions models; and 2) the total decrease in emissions from all sources is sufficient to accommodate the safety margin allocations detailed above to mobile sources while still continuing to maintain total emissions in the Cincinnati-Hamilton OH-KY-IN area well below the 2008 attainment level of emissions. These safety margins were calculated by adding a straight-line percentage to the mobile source emission estimates for the years 2015 and 2021. Safety margin, as defined by the conformity rule, looks at the total emissions from all sources in the nonattainment area. The resulting 2015 and 2021 budgets for $PM_{2.5}$ and NO_x emissions remain well below the 2005 base year emissions referenced in Table 5.1.

In summary, for all three states combined, the mobile budget safety margin allocation translates into:

- An allocation of 98.49 tons/year for $PM_{2.5}$ and 5,709.06 tons/year for NO_x for 2015.
- An allocation of 140.38 tons/year for $PM_{2.5}$ and 3,799.82 tons/year for NO_x for 2021.

The federal rule at 40 CFR 93.101 defines safety margin as the amount by which the total projected emissions from all sources of a given pollutant are less than the total emissions that would satisfy the applicable requirement for reasonable further progress, attainment, or maintenance. When compared to the overall safety margin as defined by 40 CFR 93.101, it is evident this allocation to mobile sources is significantly below the total safety margin for all sources in the Cincinnati-Hamilton OH-KY-IN area as detailed in Table 4.2.

While IDEM believes that this is sufficient to support the requested increase, IDEM and its partners will be conducting additional air quality modeling which will include the adjusted onroad mobile emissions as well as any additional corrections and modifications that may be necessary due to the constant review and evaluation of the model inputs.

All methodologies, latest planning assumptions, and margins of safety were determined appropriate through the interagency consultation process.

6.0 CONTROL MEASURES AND REGULATIONS

This section provides specific information on the control measures that have been or will be implemented in Dearborn County, Indiana, including CAA requirements and additional state or local measures implemented beyond CAA requirements.

6.1 Reasonably Available Control Technology (RACT)

As required by Section 172 of the CAA, Indiana in the mid-1990s 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 IAC 8. The following is a listing of applicable rules:

326 IAC 8-1-6	BACT for Non-Specific Sources
326 IAC 8-2	Surface Coating Emission Limitations
326 IAC 8-3	Solvent Degreasing Operations
326 IAC 8-4	Petroleum Sources
326 IAC 8-5	Miscellaneous Operation
326 IAC 8-6	Organic Solvent Emission Limitations

Since Dearborn County, Indiana, attained the annual NAAQS for fine particles prior to an Attainment SIP or RACT SIP being due, and since the Implementation Rule for fine particles stipulates that states are only required to draft and implement RACT rules for the precursor emission reductions necessary to attain the standard, no further RACT rules are required for this area. These Indiana rules are CAA requirements already in the SIP and provide secondary benefits for $PM_{2.5}$.

6.2 Implementation of Past SIP Revisions

The Cincinnati area was only recently designated nonattainment for the annual standard for fine particles and the area has attained the standard well in advance of its attainment deadline of 2010. As a result, Indiana is no longer required to develop and submit an Attainment SIP or RACT SIP for this area under the annual NAAQS for fine particles.

6.3 Nitrogen Oxides (NO_x) Rule

The U.S. EPA NO_x SIP Call required twenty-two 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 accounted for a reduction of approximately thirty-one percent (31%) of all NO_x emissions statewide compared to previous uncontrolled years.

Twenty-one other states have also adopted these rules. The result is that significant reductions have occurred regionally and within the nonattainment area because of the number of affected units within the region. From Graphs 4.13 and 4.14, it can be seen that emissions covered by this program have been trending downward since 1999. Table 6.1, compiled from data taken from the U.S. EPA Clean Air Markets Web site, quantifies the gradual NO_x reductions that have occurred in Indiana as a result of Title IV (Acid Rain) of the CAA and the NO_x SIP Call Rule. The NOx SIP Call cap stayed in place through 2008, at which time the caps in the CAIR program superseded it. Since CAIR is a regional cap and trade program, it cannot be predicted at this time what effect this will have on EGU units located in the nonattainment area or other upwind counties.

Further, U.S. EPA published Phase II of the NO_x SIP Call that establishes a budget for large (emissions of greater than 1 ton per day) stationary internal combustion engines. In Indiana, the rule decreases emissions statewide from natural gas compressor stations by 4,263 tons during the ozone season (May through September). The Indiana Phase II NOx SIP Call Rule became effective February 26, 2006 and implementation began in 2007.

Table 6.1
Trends in EGU NO_x Emissions Statewide in Indiana

Year	NO_x Emissions (tons /year)
1999	347,216.5
2000	334,522.1
2001	315,419.7
2002	281,146.1
2003	260,980.0
2004	224,311.3
2005	207,981.6
2006	202,728.0
2007	196,553.1
2008	196,134.5
2009	110,968.9
Budget 2009-2014	108,935
Budget 2015 and later	90,779

6.4 Measures Beyond CAA SIP Requirements

Reductions in fine particles precursor emissions have occurred, or are anticipated to occur, as a result of local and federal programs. These additional control measures include:

Tier 2 Vehicles Standards[2]

Federal Tier 2 motor vehicle standards require all passenger vehicles in a manufacturer's fleet, including light-duty trucks and sport utility vehicles (SUVs), to meet an average standard of 0.07 grams of NO_x per mile. Implementation began in 2004 and was completed in 2007. The Tier 2 standards also cover passenger vehicles over 8,500 pounds gross vehicle weight rating (larger pickup trucks and SUVs), which are not covered by the current Tier 1 standards. For these vehicles, the standards were phased in beginning in 2008, with full compliance in 2009. The new standards require vehicles to be 77% to 95% cleaner than those on the road prior to the program. The Tier 2 standards also reduced the sulfur content of gasoline to 30 parts per million (ppm) beginning in January 2006. Most gasoline sold in Indiana prior to January 2006 had a sulfur content of about 500 ppm. Sulfur occurs naturally in gasoline, but interferes with the operation of catalytic converters on vehicles resulting in higher NO_x emissions. Lower sulfur gasoline is necessary to achieve the Tier 2 vehicle emissions standards.

Heavy-Duty Gasoline and Diesel Highway Vehicle Standards[3]
New U.S. EPA standards designed to reduce NO_x and VOC emissions from heavy-duty gasoline and diesel highway vehicles took effect in 2004. A second phase of standards and testing procedures that began in 2007, reduced $PM_{2.5}$ emissions from heavy-duty highway engines and also reduced highway diesel fuel sulfur content to 15 ppm since the sulfur can damage emissions control devices. The total program is expected to achieve a 90% reduction in direct $PM_{2.5}$ emissions and a 95% reduction in NO_x emissions for these new engines using low sulfur diesel, compared to existing engines using higher sulfur content diesel. There will also be SO_2 reductions from these rules. The U.S. EPA has not quantified the expected reductions.

Large Nonroad Diesel Engine Standards[4]
In May 2004, U.S. EPA promulgated new rules for large nonroad diesel engines, such as those used in construction, agricultural and industrial equipment, to be phased in between 2008 and 2014. The nonroad diesel rules also reduce the allowable sulfur in nonroad diesel fuel by over 99%. Nonroad diesel fuel currently averages approximately 3,400 ppm sulfur. This rule limits nonroad diesel sulfur content to 500 ppm in 2006 and 15 ppm in 2010. The combined engine and fuel rules will reduce NO_x and $PM_{2.5}$ emissions from large nonroad diesel engines by over 90%, compared to current nonroad engines using higher sulfur content diesel.

Nonroad Spark-Ignition Engines and Recreational Engines Standards
This standard, effective in July 2003, regulates NO_x, VOCs, and carbon monoxide (CO) for groups of previously unregulated nonroad engines. The 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. The regulation varies based upon the type of engine and vehicle.

[2] http://www.epa.gov/fedrgstr/EPA-AIR/2000/February/Day-10/a19a.htm
[3] http://www.epa.gov/fedrgstr/EPA-AIR/1997/October/Day-21/a27494.htm
[4] http://www.epa.gov/fedrgstr/EPA-AIR/1998/October/Day-23/a24836.htm

The large spark-ignition engines contribute to ozone formation and ambient CO and $PM_{2.5}$ levels in urban areas. Tier 1 of this standard was implemented in 2004 and Tier 2 started in 2007. Like the large spark-ignition engines, recreational vehicles contribute to ozone and fine particles formation and ambient CO and $PM_{2.5}$ levels. For model year 2006 off-highway motorcycles and all-terrain vehicles, at least 50% of a manufacture's fleet was required to meet the new exhaust emissions standard and 100% of the fleet was required to meet the standards in 2007. Recreational marine diesel engines over 37 kilowatts are used in yachts, cruisers and other types of pleasure craft. Recreational marine engines contribute to ozone formation and $PM_{2.5}$ levels, especially surrounding marinas.

When all of the nonroad spark-ignition engines and recreational engine standards are fully implemented, an overall 72% reduction in VOCs, 80% reduction in NO_x, and 56% reduction in CO emissions are expected by 2020.

Reciprocating Internal Combustion Engine Standards[5]

This new standard, effective in May 2010, regulates air toxics emissions from existing diesel powered stationary reciprocating internal combustion engines that meet specific siting, 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 emissions and constructed or reconstructed before June 12, 2006; (2) used at major sources of air toxics emissions, 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 will be 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 emissions 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.

When all of the reciprocating internal combustion engine standards are fully implemented in 2013, U.S. EPA estimates that emissions from these engines will reduce air toxics by approximately 1,000 tons per year (tpy), $PM_{2.5}$ by 2,800 tpy, carbon monoxide by 14,000 tpy, and volatile organic compounds by 27,000 tpy.

[5] http://www.epa.gov/ttn/atw/rice/fr03mr10.pdf

Category 3 Marine Diesel Engine Standards[6]

This new standard, effective in June 2010, promulgates 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 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 will apply beginning in 2011; long-term standards requiring an eighty percent (80%) reduction in NO_X emissions will begin 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 emissions in the U.S. will be reduced by approximately 1.2 million tpy and 143,000 tpy, respectively.

Clean Air Interstate Rule (CAIR)

On May 12, 2005, the U.S. EPA promulgated the "Rule to Reduce Interstate Transport of Fine Particulate Matter and Ozone (Clean Air Interstate Rule); Revisions to Acid Rain Program; Revisions to the NO_x SIP Call"; Final Rule. (40 CFR Parts 51, 72, 75 and 96) 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 to meet federal requirements. The purpose of CAIR is to reduce interstate transport of precursors to fine particles and ozone.

CAIR applies to: (1) any stationary fossil-fuel-fired boiler or stationary fossil-fuel-fired combustion turbine, a generator with nameplate capacity of more than 25 megawatt electrical (MWe) producing electricity for sale; and, (2) a unit that qualifies as a cogeneration unit during the 12-month period starting on the date that the unit first produces electricity and continues to qualify as a cogeneration unit, a cogeneration unit serving at any time a generator with a nameplate capacity of more than 25 MWe and supplying in any calendar year more than one-third of the unit's potential electric output capacity or 219,000 MWh (megawatt hours), whichever is greater to any utility power distribution system for sale.

[6] http://www.regulations.gov/search/Regs/home.html#documentDetail?R=0900006480ae43a6

This rule provides annual state caps for NO_x and SO_2 in two phases, with the Phase I caps for NO_x and SO_2 starting in 2009 and 2010, respectively. Phase II caps become effective in 2015. The U.S. EPA is allowing the caps to be met through a cap and trade program if a state chooses to participate in the program.

In response to U.S. EPA's rulemaking, IDEM adopted a state rule in 2006 based on the model federal rule. IDEM's rule includes an annual and seasonal NO_x trading program and an annual SO_2 trading program. This rule requires compliance effective January 1, 2009.

On March 10, 2005, the U.S. EPA finalized CAIR. SO_2 emissions from power plants in the 28 eastern states and the District of Columbia covered by CAIR will be cut by 4.3 million tons by 2009 and reduced by an additional 5.4 million tons in 2015. NO_x emissions will be cut by 1.7 million tons by 2009 and reduced by an additional 1.3 million tons in 2015. The D.C. Circuit court's vacatur of CAIR in July of 2008 and subsequent remand without vacatur of CAIR in December of 2008 directs U.S. EPA to revise/replace CAIR in order to properly address the deficiencies outlined by the court.

Since the court's opinion made it clear that CAIR is deficient and must be revised/replaced, the program cannot be defined as permanent and enforceable for SIP purposes. On July 6, 2010, U.S. EPA proposed the Clean Air Transport Rule to replace CAIR. The Transport Rule will result in even further benefits above and beyond CAIR than what is assumed within the emission inventories and modeling.

Together, these rules will substantially reduce local and regional sources of fine particle precursors. The modeling analyses discussed in Section 7.0 include these rules and show the reductions in annual fine particle concentrations expected to result from the implementation of these rules.

6.5 Controls to Remain in Effect

Indiana commits to maintain the control measures listed above after redesignation, or submit to U.S. EPA, as a SIP revision, any changes to its rules or emission limits applicable to NO_x, SO_2, or direct $PM_{2.5}$ sources as required for maintenance of the annual standard for fine particles in Dearborn County, Indiana.

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. After redesignation, it intends to continue enforcing all rules that relate to the emission of fine particles and fine particle precursors in Dearborn County, Indiana.

6.6 New Source Review Provisions

Indiana has a long standing and fully implemented New Source Review (NSR) program that is outlined at 326 IAC 2. The rule includes provisions for the Prevention of Significant Deterioration (PSD) permitting program in 326 IAC 2-2. Indiana's PSD program was conditionally approved on March 3, 2003 (68 FR 9892) and received final approval on May 20, 2004 (69 FR 29071) by U.S. EPA as part of the SIP.

Any facility that is not listed in the 2005 emission inventory, or for which credit through the shutdown or curtailment was taken in demonstrating attainment, 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. Once the area is redesignated, OAQ will implement NSR through the PSD program, which requires an air quality analysis to evaluate whether the new source will threaten the NAAQS.

7.0 MODELING AND METEOROLOGY

Although U.S. EPA Redesignation Guidance does not require modeling for nonattainment areas seeking redesignation, extensive modeling has been performed covering the Cincinnati, Ohio region to determine the effect of national emission control strategies on fine particle levels. These modeling analyses determined that the Cincinnati area, including Dearborn County in southeastern Indiana is significantly impacted by regional transport of fine particles and its precursors, and that regional SO_2 and NO_x reductions are an effective way to attain the annual standard for fine particles in this area. Future year modeled annual fine particle concentrations are expected to be reduced by 0.6 to 1.3 $\mu g/m^3$. Examples of these modeling analyses are described below.

7.1 Summary of Modeling Results to Support Rulemakings

U.S. EPA Modeling for Transport Rule, 2010

U.S. EPA performed modeling to support the emission reductions associated with the Transport Rule. U.S. EPA used Comprehensive Air Quality Model with Extension (CAMx, Version 5), applied to the 2005 meteorology, as processed by the Mesoscale Model (MM5), Version 3.7.4. Emissions input into CAMx included SO_2, NO_x, volatile organic compounds (VOC), ammonia, and direct $PM_{2.5}$ for 2005. The modeling was based on the annual fine particles design values calculated from 2003 through 2005, 2004 through 2006, and 2005 through 2007. Future year modeling was conducted, which included the Cincinnati area, and the future year design values for 2012 and 2014 were evaluated for attainment of the annual NAAQS for fine particles of 15 $\mu g/m^3$, as shown in Table 7.1. Fine particle concentrations are accounted for by modeling both the base future year emissions and then the emissions reductions associated with the Transport Rule. U.S. EPA found model performance met suggested benchmark performance goals within or close to the ranges found in other comparable modeling applications (Technical Support Document for the Transport Rule – Air Quality Modeling).

[7] http://www.epa.gov/airquality/transport/pdfs/TR_AQModeling_TSD.pdf

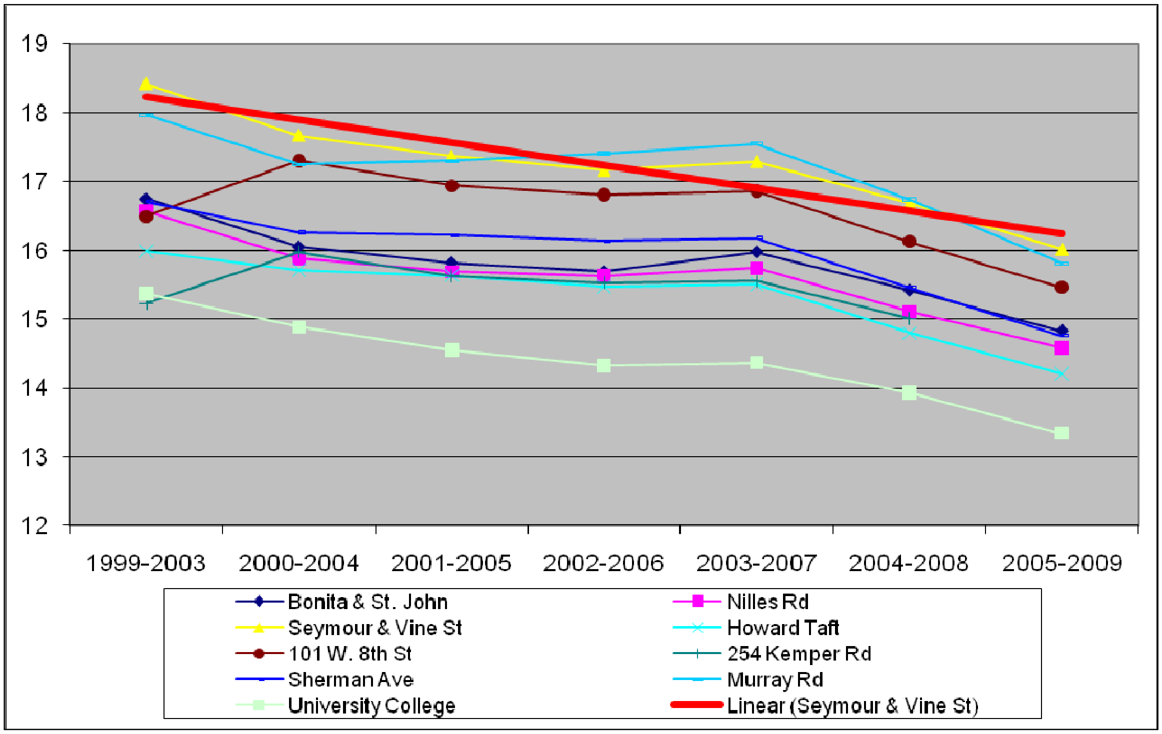
Table 7.1
Transport Rule Modeling Results from U.S. EPA – 2010

County	Monitor ID	Design Value 2003-2007 ($\mu g/m^3$)	Future Design Value 2012 Base ($\mu g/m^3$)	Future Design Value 2014 Base ($\mu g/m^3$)
Butler County	39-017-0016	15.74	15.25	14.76
Butler County	39-017-0017	15.36	14.93	14.48
Butler County	39-017-1004	14.90	14.51	14.06
Hamilton County	39-061-0006	14.84	14.36	13.88
Hamilton County	39-061-0014	17.29	16.69	16.14
Hamilton County	39-061-0040	15.50	15.03	14.51
Hamilton County	39-061-0042	16.85	16.33	15.80
Hamilton County	39-061-0043	15.55	15.05	14.56
Hamilton County	39-061-7001	16.17	15.65	15.12
Hamilton County	39-061-8001	17.54	16.93	16.38
Campbell County	21-037-0003	13.67	13.30	12.81
Kenton County	21-117-0007	14.36	13.98	13.50

Modeling results show that the base future year modeling with emission reductions from the Transport Rule accounts for approximately 0.4 to 0.6 $\mu g/m^3$ decreases in concentrations for 2012 and approximately 0.8 to1.2 $\mu g/m^3$ decreases in concentrations for 2014 in the Cincinnati area.

While results of U.S. EPA's Transport Rule modeling show modeled concentrations above the standard using base case emissions at several $PM_{2.5}$ monitoring sites in Hamilton County, Ohio, it should be noted that base year design value used by U.S. EPA was taken from 2003 through 2007 and considered higher than current 2005 through 2009 design values in the area. Graph 7.1 shows the downward trend of the design values from 1999 through 2009 for the $PM_{2.5}$ monitors in the Cincinnati area. The resulting decreases of the 2003 through 2007 design values to the 2005 through 2009 design value at the Murray Road $PM_{2.5}$ monitor is 1.75 $\mu g/m^3$, the decrease at the Seymour and Vine Street monitor is 1.27 $\mu g/m^3$ and 1.39 $\mu g/m^3$ at the West 8th Street monitor. The results decrease from all the area monitors ranged from 1.05 $\mu g/m^3$ to 1.75 $\mu g/m^3$. Therefore, U.S. EPA's Transport Rule modeling, using current 2005 through 2009 design values, would show lower modeled concentrations approaching the annual fine particle standard of 15.0 $\mu g/m^3$.

Graph 7.1
$PM_{2.5}$ Design Value Trends for Cincinnati Area: 1999 - 2009



Results of the U.S. EPA Transport Rule modeling show that the Cincinnati area will approach the annual fine particles NAAQS in 2012 with modeled impacts reduced by 3% to 4%. The 2014 projected design values will decrease by 6% to 7% from the 2003 through 2007 design values. If using current design values, U.S. EPA's CAIR modeling would show the Cincinnati area would approach the current annual fine particles standard.

LADCO Modeling for CAIR

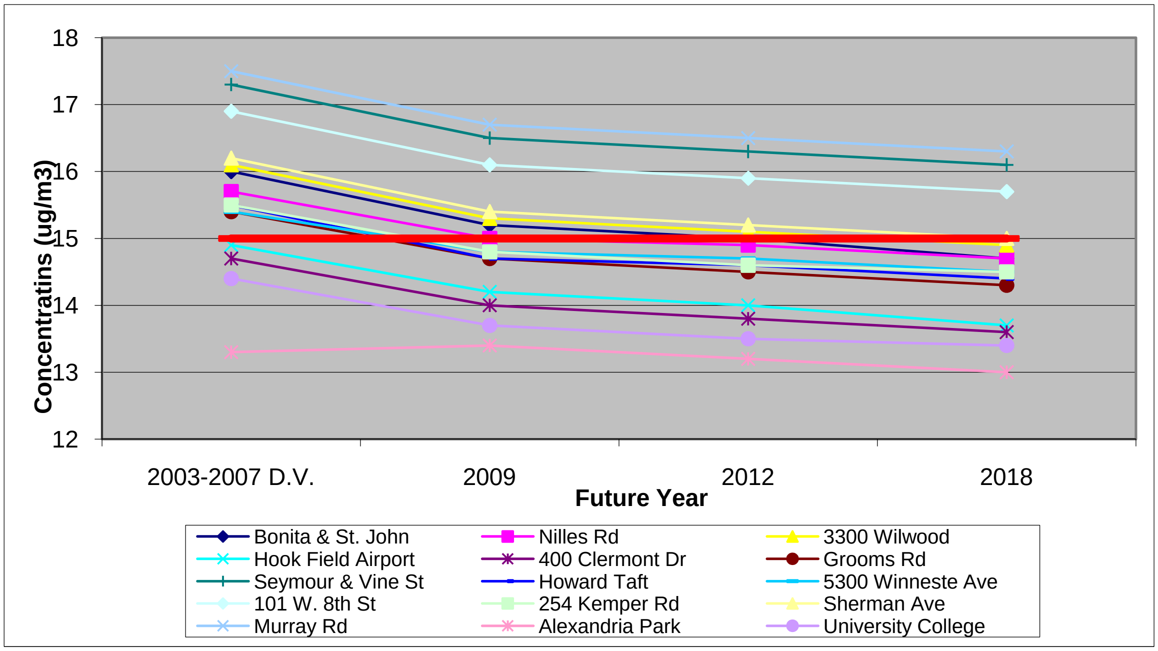
LADCO conducted modeling to determine the impact of CAIR in the Midwest. LADCO's modeling used the CAMx model applied to the year 2005 meteorology, as processed by the MM5. Emissions input into CAMx included SO_2, NO_x, VOC, ammonia, and direct $PM_{2.5}$ for 2005. The modeling was based on 2003 through 2007 design values. Future year modeling for 2009, 2012, and 2018 was conducted and the future year design values were determined without the emission reductions associated with CAIR (Round 6), as shown in Table 7.2.

Table 7.2
LADCO's Round 6 Modeling Results for the Cincinnati Area

Monitor ID	Monitor Name	County	Design Value 2003-2007 (µg/m^3)	Base-case 2012 (µg/m^3)	Base-case 2018 (µg/m^3)
390170003	Bonita & St. John	Butler	16.0	15.0	14.7
390170016	Nilles Rd	Butler	15.7	14.9	14.7
390170017	3300 Wilwood	Butler	16.1	15.1	14.9
390171004	Hook Field Airport	Butler	14.9	14.0	13.7
390250022	400 Clermont Dr	Clermont	14.7	13.8	13.6
390610006	Grooms Rd	Hamilton	15.4	14.5	14.3
390610014	Seymour & Vine St	Hamilton	17.3	16.3	16.1
390610040	Howard Taft	Hamilton	15.5	14.6	14.4
390610041	5300 Winneste Ave	Hamilton	15.4	14.7	14.5
390610042	101 W. 8th St	Hamilton	16.9	15.9	15.7
390610043	254 Kemper Rd	Hamilton	15.5	14.6	14.5
390617001	Sherman Ave	Hamilton	16.2	15.2	15.0
390618001	Murray Rd	Hamilton	17.5	16.5	16.3
210370003	Alexandria Park	Campbell	13.3	13.2	13.0
211170007	University College	Kenton	14.4	13.5	13.4

Results of the LADCO Round 6 modeling show that all but five of the fifteen monitors in the Cincinnati area continue to attain the annual NAAQS for fine particles of 15 µg/m^3 in 2012. Modeled concentrations at the five fine particle monitors, Murray Road, Seymour & Vine Street, Wilwood, Sherman Avenue and West 8th Street were above the fine particles standard. Table 7.2 shows future year modeled annual fine particle results without CAIR emission reductions. Concentrations for 2009 will be 5% to 6% lower than baseline annual fine particles design values, 6% to 8% lower in 2018. A graphical representation of the modeling results is shown in Graph 7.2. Modeled results for the Cincinnati area would approach the current annual fine particle standard would be lower if the current 2005 through 2009 design values, as shown in Graph 7.1, were used.

Graph 7.2
Modeling Results (without CAIR) for the Cincinnati Area $PM_{2.5}$ Monitors



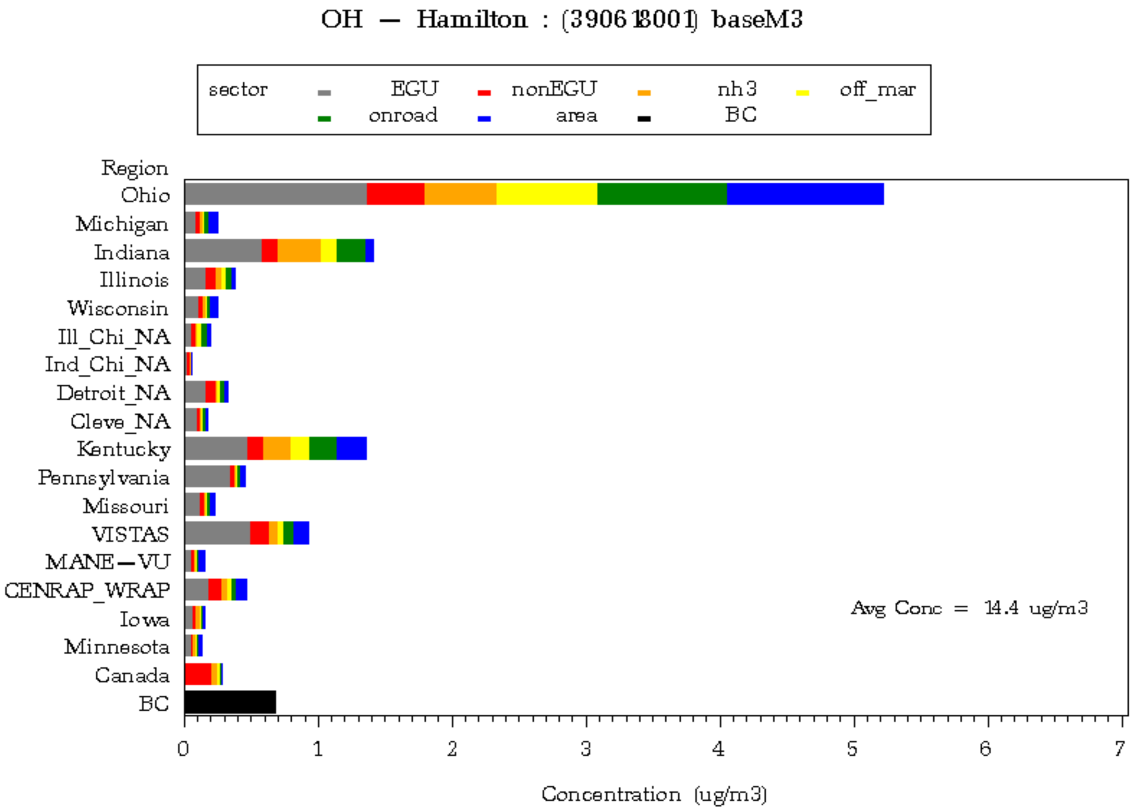
7.2 LADCO's Round 5 Particulate Source Apportionment Results

Particulate Source Apportionment (PSAT) modeling was conducted by LADCO. The results of the PSAT Round 5 modeling shows the regional contributions by emission sectors on each monitor that was modeled. Chart 7.1 shows the PSAT modeling results for the Murray Road fine particles monitor in Hamilton County in southwest Ohio. Ohio was the biggest regional contributor to the Murray Road fine particles monitor with Indiana, Kentucky, the Visibility Improvement State and Tribal Association of the Southeast (VISTAS) Regional Planning Organization (Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia and West Virginia and the Eastern Band of the Cherokee Indians), the Central Regional Air Planning Association (CENRAP) Regional Planning Organization (Nebraska, Kansas, Oklahoma, Texas, Minnesota, Iowa, Missouri, Arkansas, and Louisiana), the Western Regional Air Partnership (WRAP) Regional Planning Organization (Arizona, California, Colorado, Idaho, Nevada, New Mexico, Oregon, Utah, Wyoming) and Pennsylvania also contributing.

The sector emissions are described as EGU, non-EGU, NH_3 – ammonium emission sources, offroad emission sources including marine, air travel and railroad emission sources, onroad mobile emission sources, area, and boundary conditions.

The PSAT modeling results show the majority of Indiana's emission sector contributions come from EGUs, ammonium, onroad, offroad (including marine, aircraft and railroad), non-EGU, and area sources. Other contributions resulted mainly from EGU, non-EGU, and ammonium emissions from other regional areas.

Chart 7.1
Regional/Emission Sector PSAT Results at Murray Road in Hamilton County



The following pie charts depict the species contributions to fine particle concentrations at the Cincinnati area monitors. The pie charts include both the observed 2005 contributions and future year 2009 modeled contributions for each monitor. Since the monitors are in close proximity of each other, results are fairly similar in the distribution of species concentrations among the monitors. Charts 7.2 through 7.5 cover the three fine particle monitors in southwestern Ohio and one fine particles monitor in northern Kentucky with the highest concentrations used to determine compliance with the annual fine particles NAAQS of 15 µg/m^3.

The speciation listed in the pie charts include SO_4 – sulfate mass, NO_3 – nitrate mass, OC – organic carbon mass, EC – elemental carbon mass, Soil – crustal material mass, NH_4 – ammonium mass, PBW – particles bound water mass, BLAN – passively collected mass.

Chart 7.2
Species Modeled Contributions to Murray Road $PM_{2.5}$ Monitor

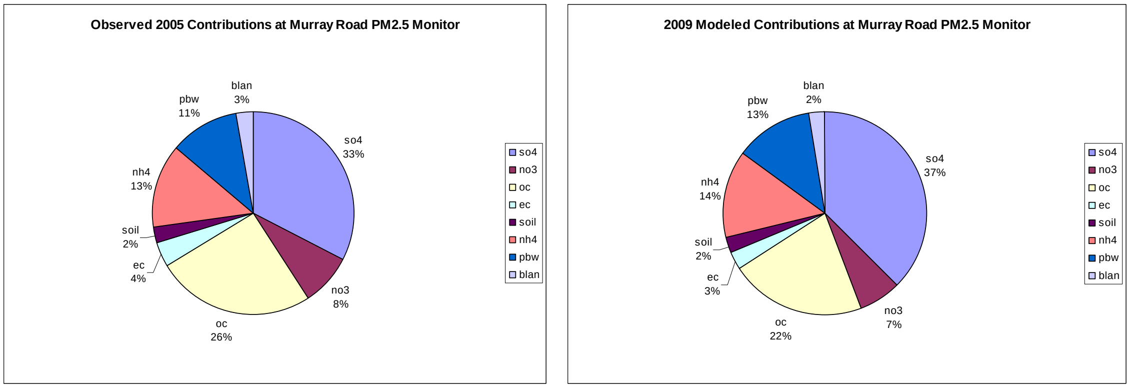


Chart 7.3
Species Modeled Contributions to Seymour & Vine St. $PM_{2.5}$ Monitor

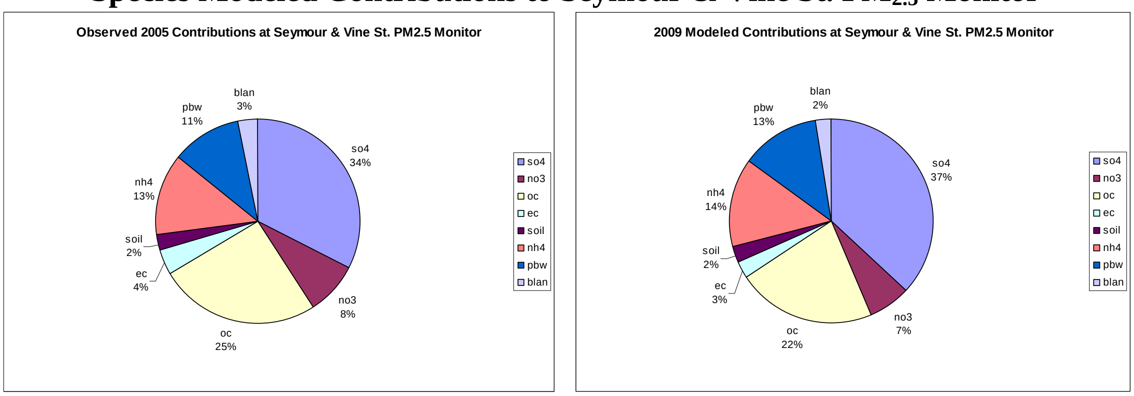


Chart 7.4
Species Modeled Contributions to 101 West 8th Street $PM_{2.5}$ Monitor

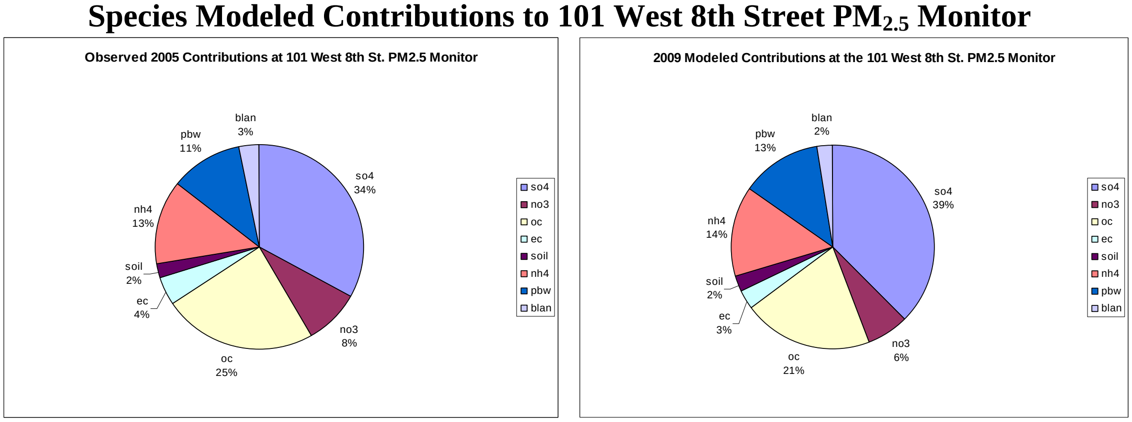
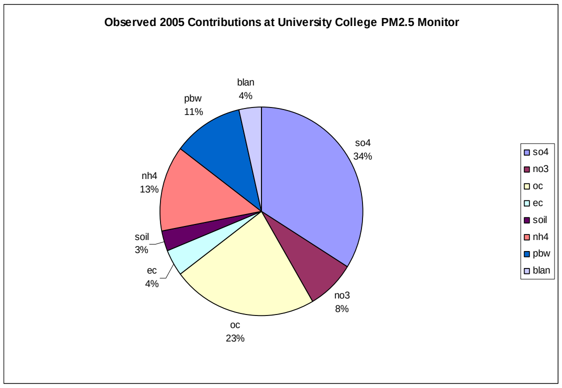
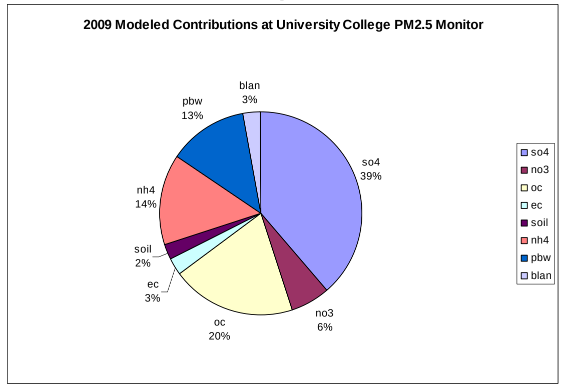


Chart 7.5
Species Modeled Contributions to University College $PM_{2.5}$ Monitor





Results of the Round 5 PSAT modeling for the Cincinnati area fine particle monitors show the highest pollutant contributors to base case and future year fine particle concentrations are sulfate, organic carbon, ammonium and nitrate. Future year modeling shows decreases in organic carbon, nitrates and elemental carbon. The future year modeling did show increases in sulfates, particles bound water and ammonium from the base-case modeled concentrations.

7.3 Summary of Existing Modeling Results

U.S. EPA and LADCO modeling for future year design values have consistently shown that existing national emission control measures will help the Cincinnati area approach attainment of the annual NAAQS for fine particles standard of 15 $\mu g/m^3$. Emission control measures to be implemented in the next several years will help air quality meet the standard in the future. U.S. EPA future year modeling of national emission control strategies, based on current design values, showed the Cincinnati area will approach the annual NAAQS for fine particles. Future national and local emission control strategies will ensure that the Cincinnati fine particles nonattainment area will maintain the lower fine particle concentrations.

7.4 Meteorological Analysis for Southeastern Indiana

Meteorological conditions are one of the most important factors that influence development and transport of fine particles. Stagnant surface conditions and upper air ridging during any time of the year provides conducive conditions for development and transport of fine particles. Ultimately, passage of surface cold fronts with a clean air mass change will lower fine particle readings in the Cincinnati area.

7.4.1 Surface Air Conditions Present during High Fine Particles Concentrations Days

Higher annual concentrations of fine particles tend to correlate with warmer temperatures and lighter wind speeds, although high fine particle episodes can occur in the summer fall, winter or spring. It should be noted that higher annual fine particle concentrations are driven by individual days with higher fine particle concentrations throughout the monitored year. Therefore, it is difficult to attribute higher fine particle concentrations to annualized meteorological rankings. Review of several of the higher fine particles concentration episodes (days with concentrations over 35 μg/m^3) over the past few years shows conditions were hot in the summer with temperatures in the middle 80^o Fahrenheit or higher and average wind speeds were fairly light. Fall and winter high fine particles concentration days had near normal temperatures but very light wind speeds with higher humidity. Surface conditions present for higher fine particle days had a high pressure system east of the Cincinnati area with a front located either north or west of the area.

Analysis of the Murray Road $PM_{2.5}$ monitor data on the higher concentration days showed over 60% occurred with maximum temperatures above 80^o F and only 5% of the high concentration days occurred at maximum temperatures below 40^o F. The location of this monitor is considered downwind of the urban center of Cincinnati so the urban emissions are transported to the monitor. However, surface meteorological conditions would also play a large role in increased fine particle readings at the monitor.

7.4.2 Upper Air Conditions Present during High Fine Particles Concentrations Days

Upper air ridges and more stagnant surface wind conditions predominately affect development and build up of fine particles. Slow moving upper air ridges can effectively suppress mixing within the many levels of the atmosphere and cause pollutants to build up over time. Inversions or increases in temperature with a rise in altitude will prevent mixing with air from the upper atmosphere. These conditions can occur at any time of the year and are evident in elevated fine particle episodes in spring, summer, fall and winter months. Review of upper air features present during higher concentration days in the Cincinnati area during the summer showed generally a ridge over the area with fairly light winds in the upper atmosphere and warm air advection. The upper air features present during higher concentration days in the fall and winter were upper air troughs with extremely light winds and moderate temperatures.

Review of surface and upper air features of higher fine particles concentration days showed stagnant surface conditions and upper air ridges existed on those days. These conditions help in the buildup of fine particle concentrations in the Cincinnati area.

7.4.3 Analyses of Atmospheric Conditions for Fine Particles Build-Up

Analyses have been conducted to determine the atmospheric conditions that are most prevalent during higher fine particles concentration days in Indiana. LADCO applied a Classification and Regression Tree (CART) analysis to data from Indiana that correlated different levels of fine particle concentrations to meteorological conditions from 1999 through 2004. (Donna Kenski, 2005). This type of analysis looks at the meteorological conditions, such as temperature, pressure, wind speed, wind direction, relative humidity and dew point temperatures at the surface, as well as lower morning and evening mixing heights in the upper atmosphere which were present when higher concentrations of fine particles were monitored. Results of this CART analysis indicated factors that played a larger role in fine particle concentrations in the southern portion of the Midwest were warm-weather conditions with high dew points, southwest winds and low evening mixing heights as well as the previous day's concentrations of fine particles.

Fine particles are made up of several constituents, including direct $PM_{2.5}$, sulfates, nitrates, ammonium, organic carbon and elemental carbon. Depending on the time of the year, concentrations of particulate constituents vary, with nitrates being more prevalent in the winter and sulfates more prevalent in the summer. Sulfates and nitrate emission reductions have the biggest impact on lower future year fine particle concentrations.

7.5 Summary of Air Quality Index Days in Southeastern Indiana

An analysis was conducted to review the daily fine particle concentrations over a year to determine the Air Quality Index (AQI) trends. Chart 7.6 shows by year (2000 through 2009), the percentage number of days during which fine particle concentrations reached the AQI ranges for "Good" (0 to 15.3 $\mu g/m^3$), "Moderate" (15.4 $\mu g/m^3$ to 40.4 $\mu g/m^3$) and "Unhealthy for Sensitive Groups (USG)" (40.5 $\mu g/m^3$ to 65.4 $\mu g/m^3$) at the Murray Road $PM_{2.5}$ monitor in Hamilton County in Ohio. There were no days which the fine particle levels reached the "Unhealthy" level of 65.5 $\mu g/m^3$ to 150.4 $\mu g/m^3$ or above.

Chart 7.6
Distribution of $PM_{2.5}$ Concentration Days on the AQI Levels of Health Concern

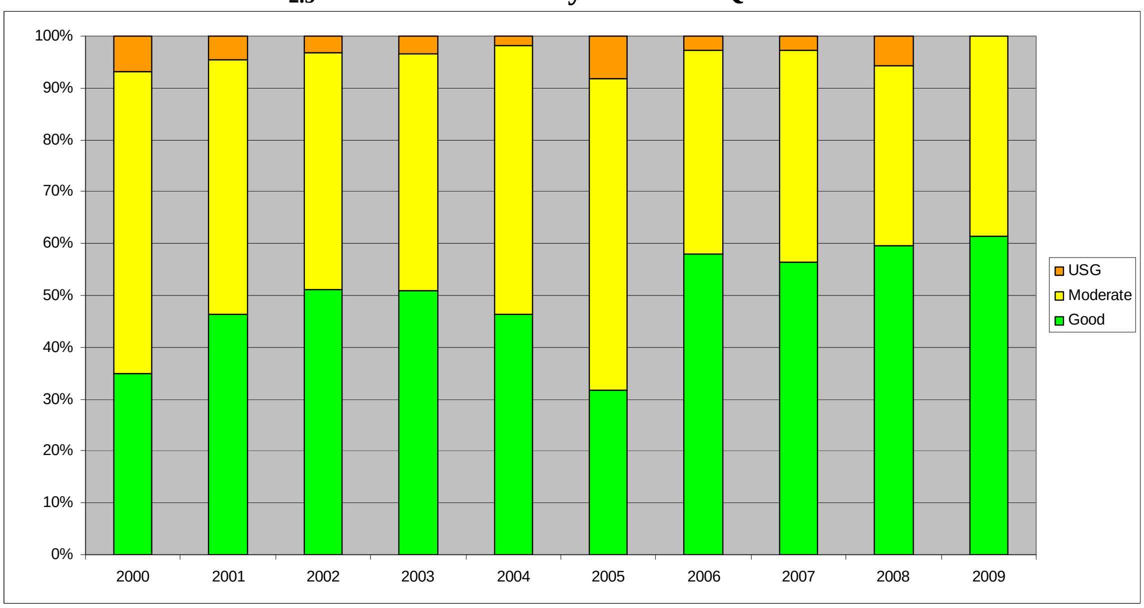


Table 7.3 shows the rankings, by year, for the three AQI ranges. The year 2009 had the most "Good" concentration days during the 10-year period analyzed (2000 through 2009) at 61%. The year 2005 had the most "Moderate" concentrations days at 60% and "Unhealthy for Sensitive Group" concentration days at 8%. As can be seen, weather plays a large role in fine particle concentrations development and transport as 2000, 2001, 2004 and 2005 were conducive to $PM_{2.5}$ development which translated to moderate and unhealthy for sensitive group levels of air quality over 50% of the time.

Table 7.3
Ranking and Percentage of Highest Number of Days at AQI Levels of Health Concern

Ranking	Good	Moderate	Unhealthy for Sensitive Group
1st	**2009** – 61%	**2005** – 60%	**2005** – 8%
2nd	**2008** – 60%	**2000** – 58%	**2000** – 7%
3rd	**2006** – 58%	**2004** – 52%	**2008** – 6%
4th	**2007** – 56%	**2001** – 49%	**2001** – 5%
5th	**2002** – 51%	**2003** – 46%	**2003** – 3%
6th	**2003** – 51%	**2002** – 45%	**2002** – 3%
7th	**2001** – 46%	**2007** – 41%	**2007** – 3%
8th	**2004** – 46%	**2006** – 39%	**2006** – 3%
9th	**2000** – 35%	**2009** – 39%	**2004** – 2%
10th	**2005** – 32%	**2008** – 35%	**2009** – 0%

7.6 Summary of Meteorological Analysis for Southeastern Indiana

Annual fine particle concentrations in the Cincinnati area are driven by higher fine particles concentration days that can occur during any time of the year. Conditions that are most prevalent during higher fine particle concentration days are lighter winds, higher relative humidity and above average maximum temperatures in the summer and lighter winds, higher relative humidity and normal temperatures in the fall, winter or spring. Upper air weather patterns generally include ridging over the area with stagnant conditions at the surface caused by lower mixing heights and stable conditions for summer episodes and ridging or troughs over the area in the fall, winter or spring episodes. Surface winds from any direction can transport pollutants from surrounding areas into the Cincinnati area. Nitrates are bigger contributors to fine particle concentrations in the winter and sulfates are bigger contributors to fine particle concentrations in the summer.

8.0 CORRECTIVE ACTIONS

8.1 Commitment to Revise Plan

As noted in Section 4.6 above, Indiana commits to review and revise as appropriate its Maintenance Plan eight years after redesignation, as required by Section 175A of the CAA.

8.2 Commitment for Contingency Measures

IDEM will monitor fine particle concentrations to determine whether trends indicate higher values or whether emissions appear to be increasing. If it is determined that fine particle levels and emissions are increasing and action is necessary to reverse that trend, IDEM will take action to reverse the noted trend, prior to a violation of the standard occurring.

Indiana commits to adopt and expeditiously implement necessary corrective action in the following circumstance:

Action Level Response

An Action Level Response shall be prompted whenever a violation of the standard (three year average annual arithmetic mean value of 15.1 $\mu g/m^3$ or greater) occurs. In the event that the Action Level is triggered and is not found to be due to an atypical unfavorable meteorological condition, exceptional event, malfunction or noncompliance with a permit condition or rule requirement, IDEM will determine additional control measures needed to assure future attainment of the annual NAAQS for fine particles. In this case, measures that can be implemented in a short time will be selected in order to be in place within eighteen months from the close of the fine particles season that prompted the Action Level.

Control Measure Selection and Implementation

Adoption of any additional control measures is subject to the necessary administrative and legal processes. This process will include publication of notices, an opportunity for public hearing and other measures required by Indiana law for rulemaking by state environmental boards.

If a new measure or control is already promulgated and scheduled to be implemented at the federal or state level, and that measure or control is determined to be sufficient to address the upward trend in air quality, additional local measures may be unnecessary. Furthermore, IDEM will submit to U.S. EPA an analysis to demonstrate the proposed measures are adequate to return the area to attainment.

8.3 Contingency Measures

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. 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 interested and affected persons in the maintenance area prior to selecting appropriate contingency measures. All of the listed contingency measures are potentially effective or proven methods of obtaining significant reductions of fine particles 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. IDEM 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) Vehicle inspection and maintenance program.
2) Alternative fuel and diesel retrofit programs for fleet vehicle operations.
3) Require NO_x or SO_2 emission offsets for new and modified major sources.

4) Require NO_x or SO_2 emission offsets for new and modified minor sources.
5) Increase the ratio of emission offsets required for new sources.
6) Require NO_x or SO_2 controls on new minor sources (less than 100 tons).
7) Wood stove change-out program.
8) Require increased recovery efficiency at sulfur recovery plants.
9) Various emissions reduction measures or dust suppressant for unpaved roads and/or parking lots.
10) Idling Restrictions.
11) Broader geographic applicability of existing measures.
12) One or more transportation control measures sufficient to achieve at least a half a percent (0.5%) reduction in actual area-wide precursor emissions. Transportation measures will be selected from the following, based upon the factors listed above, after consultation with affected local governments:
    a) Trip reduction programs, including, but not limited to, employer-based transportation management plans, area wide rideshare programs, work schedule changes and telecommuting.
    b) Transit improvements.
    c) Traffic flow improvements.
    d) Other new or innovative transportation measures not yet in widespread use that affect state and local governments deemed appropriate.

No contingency measure shall be 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.

9.0 PUBLIC PARTICIPATION

Indiana published notification for a public hearing and solicitation for public comment concerning the draft Redesignation Petition and Maintenance Plan in the Dearborn County Register on November 18, 2010.

A public hearing to receive comments concerning the redesignation request was conducted on January 5, 2011 at the Lawrenceburg Public Library in Lawrenceburg, Indiana. During the public comment period IDEM received minor technical updates from the Ohio Environmental Protection Agency (Ohio EPA) that included an updated Mobile Source Emissions Inventory. No other comments were received during the comment period. The public comment period closed on January 7, 2011. Appendix J includes a copy of the public notice, certifications of publication, the transcript from the public hearing, and a summary of the minor technical updates received from Ohio EPA.

10.0 CONCLUSIONS

Lawrenceburg Township, Dearborn County, Indiana, has attained the annual NAAQS for fine particles and does not significantly contribute to violations outside its portion of the Cincinnati-

Hamilton OH-KY-IN nonattainment area. This petition demonstrates that Lawrenceburg Township, Dearborn County, Indiana, has complied with the applicable provisions of the CAA regarding redesignation of nonattainment areas for fine particles. IDEM has prepared a State Implementation and Maintenance Plan that meets the requirement of Section 110(a)(1) of the CAA.

Indiana has performed an analysis that shows the air quality improvements are due to permanent and enforceable measures and that additional significant regional NO_x and SO_2 reductions following implementation of Phase II NO_x SIP Call and CAIR and/or its replacement rule or program will ensure continued compliance (maintenance) with the standard. Furthermore, emission projections indicate that NO_x and SO_2 emissions will continue to decline, thus ensuring that the area continues to maintain compliance with the standard and provide for an increasing margin of safety. Based on this presentation, Lawrenceburg Township, Dearborn County, Indiana, meets the requirements for redesignation under the CAA (Section 107(d)(3)) and U.S. EPA guidance for fine particles.

Consistent with the authority granted to the U.S. EPA, the State of Indiana requests that Lawrenceburg Township, Dearborn County, Indiana, be redesignated to attainment for the annual fine particles standard simultaneously with U.S. EPA approval of this Indiana State Implementation and Maintenance Plan provisions contained herein.