REDESIGNATION REQUEST AND MAINTENANCE PLAN FOR THE CLEVELAND-AKRON-LORAIN ANNUAL $PM_{2.5}$ NONATTAINMENT AREA

Ashtabula, Cuyahoga, Lake, Lorain, Medina, Portage, and Summit, Ohio

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REDESIGNATION REQUEST AND MAINTENANCE PLAN FOR THE CLEVELAND-AKRON-LORAIN ANNUAL $PM_{2.5}$ NONATTAINMENT AREA

Ashtabula, Cuyahoga, Lake, Lorain, Medina, Portage, and Summit Counties, Ohio

CHAPTER ONE

Introduction

The Clean Air Act (CAA), as amended, requires each State with areas failing to meet the annual $PM_{2.5}$[1] National Ambient Air Quality Standard (NAAQS) to develop State Implementation Plans (SIPs) to expeditiously attain and maintain the standards. The United States Environmental Protection Agency (U.S. EPA) revised the NAAQS for particulate matter in July 1997. It replaced the existing PM_{10} standard with a health-based $PM_{2.5}$ standard and retained the PM_{10} standard as a particulate standard protecting welfare. The standards include an annual standard set at 15.0 micrograms per cubic meter ($\mu g/m^3$), based on the 3-year average of annual mean $PM_{2.5}$ concentrations and a 24-hour standard of 65 $\mu g/m^3$, based on the 3-year average of the 98th percentile of 24-hour concentrations.

The revised NAAQS was legally challenged in the U.S. Court of Appeals for the District of Columbia Circuit (the D.C. Circuit). On May 14, 1999, the D.C. Circuit remanded, without vacatur, the standard back to U.S. EPA. The remand did not question the level at which U.S. EPA set the standards but rather the constitutionality of the CAA provision that authorizes U.S. EPA to set national air quality standards. U.S. EPA requested a rehearing which the D.C. Circuit denied. Therefore, in December 1999, U.S. EPA appealed the D.C. Circuit decision to the U.S. Supreme Court. The U.S. Supreme Court issued a decision on February 27, 2001 that unanimously affirmed the constitutionality of the CAA provision but did remand several other issues back to the D.C. Circuit, including the issue of whether U.S. EPA acted arbitrarily and capriciously in establishing the specific levels of the standards.

The D.C. Circuit heard arguments in this remanded case in December 2001, and issued its decision on March 26, 2002. The D.C. Circuit rejected the claims that

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1 Particle pollution is a mixture of microscopic solids and liquid droplets suspended in air. This pollution, also known as particulate matter, is made up of a number of components, including acids (such as nitrates and sulfates), organic chemicals, metals, soil or dust particles, and allergens (such as fragments of pollen or mold spores).
Fine particle pollution or $PM_{2.5}$ describes particulate matter that is 2.5 micrometers in diameter and smaller - 1/30th the diameter of a human hair. Fine particle pollution can be emitted directly or formed secondarily in the atmosphere.

the U.S. EPA had acted arbitrarily and capriciously in setting the levels of the standards.

On December 17, 2004, U.S. EPA promulgated the initial $PM_{2.5}$ nonattainment areas designations for the $PM_{2.5}$ standards across the country. Modifications to those designations were made and an effective date was set at April 5, 2005. Unlike Subpart 2 of the CAA Amendments of 1990 which defined five ozone nonattainment classifications for the areas that exceed the NAAQS based on the severity of the ozone levels, $PM_{2.5}$ nonattainment designations are simply labeled "nonattainment." The CAA Amendments require states with $PM_{2.5}$ nonattainment areas to submit a plan within three years of the effective date of the designations (April 5, 2008) detailing how the $PM_{2.5}$ standards will be attained by April 5, 2010. Ohio EPA submitted its attainment demonstration for the entire State of Ohio on July 16, 2008.

Section 107(d)(3)(E) of the CAA allows states to request nonattainment areas to be redesignated to attainment provided certain criteria are met. The following are the criteria that must be met in order for an area to be redesignated from nonattainment to attainment:

i) A determination that the area has attained the $PM_{2.5}$ standard.
ii) An approved State Implementation Plan (SIP) for the area under Section 110(k).
iii) 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.
iv) A fully approved maintenance plan under Section 175(A).
v) A determination that all Section 110 and Part D requirements have been met.

This document addresses each of these requirements, and provides additional information to support continued compliance with the annual $PM_{2.5}$ standard.

<u>Geographical Description and Background</u>
The current Cleveland-Akron-Lorain nonattainment area is located in northeastern Ohio and includes the following counties: Ashtabula (partial nonattainment of Ashtabula Township only), Cuyahoga, Lake, Lorain, Medina, Portage, and Summit. This area is shown in Figure 1 under Chapter Three.

The Cleveland-Akron-Lorain area has not previously been subject to nonattainment area rulemakings for fine particles.

As a result of the 2005 $PM_{2.5}$ designations, U.S. EPA designated the Cleveland-Akron-Lorain area nonattainment for the 15.0 $\mu g/m^3$ annual standard[2], and Ohio

2 There were no monitors in Ohio that violated the 1997 24-hour $PM_{2.5}$ standard of 65$\mu g/m^3$.

EPA was required to develop a plan to reduce oxides of nitrogen (NO_x), sulfur dioxide (SO_2) and direct $PM_{2.5}$ emissions and to demonstrate that the area will meet the federal annual air quality standard by April 5, 2010. Ohio's main $PM_{2.5}$ components are primary particles (organic carbon, crustal material, and elemental carbon), SO_2 and NO_x, which were included in the attainment demonstration analysis. Volatile organic compounds (VOCs) and ammonia (NH3) were not included in the analysis since they were not part of Ohio's current attainment strategy for $PM_{2.5}$ (although controls for VOCs have been implemented for ozone nonattainment). This is consistent with U.S. EPA's "Clean Air Particle Implementation Rule" [74FR 20856] (hereafter referred to as "Implementation Rule"). In the Implementation Rule U.S. EPA presumes NH3 emissions are not a $PM_{2.5}$ attainment plan precursor and that States are not required to address VOC unless the State or U.S. EPA makes technical demonstration that emissions of VOCs significantly contribute to nonattainment of the annual $PM_{2.5}$ standard.

This document is intended to support Ohio's request that the Cleveland-Akron-Lorain area be redesignated from nonattainment to attainment for the annual $PM_{2.5}$ standard.

Status of Air Quality

$PM_{2.5}$ complete quality-assured ambient air quality monitoring data for the most recent three (3) years, 2008 through 2010, demonstrate that the air quality has met the NAAQS for annual $PM_{2.5}$ in this nonattainment area. The NAAQS attainment, accompanied by decreases in emission levels discussed in Chapter Four, supports a redesignation to attainment for the Cleveland-Akron-Lorain area based on the requirements in Section 107(d)(3)(E) of the CAA as amended.

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CHAPTER TWO

Requirements for Redesignation

U.S. EPA has published detailed guidance in a document entitled *Procedures for Processing Requests to Redesignate Areas to Attainment* (redesignation guidance), issued September 4, 1992, to Regional Air Directors. The redesignation request and maintenance plan are based on the redesignation guidance, supplemented with additional guidance received from staff of U.S. EPA Region 5.

Below is a summary of each redesignation criterion as it applies to the Cleveland-Akron-Lorain area.

i.) Attainment of the standard (CAA Section 107(d)(3)(E)(i))

There are two components involved in making this demonstration. The first component relies on ambient air quality data. The data that are used to demonstrate attainment should be the product of ambient monitoring that is representative of the area of highest concentration. The data should be collected and quality-assured in accordance with 40 CFR 58 and recorded in the Air Quality System (AQS) in order for it to be available to the public for review.

The second component relies upon supplemental U.S. EPA-approved air quality modeling. While no modeling is required for redesignating nonattainment areas, the redesignation guidance states it is "generally necessary" for particulate matter redesignations. Appendix C and Appendix D contains the most recent modeling results showing future attainment and maintenance are provided. Chapter Three discusses this requirement in more detail and provides the attainment demonstration.

ii.) Permanent and enforceable improvement in air quality (CAA Section 107(d)(3)(E)(iii))

The state must be able to reasonably attribute the improvement in air quality to emission reductions which are permanent and enforceable. The state should estimate the percent reduction achieved from federal measures as well as control measures that have been adopted and implemented by the state.

It was not necessary for Ohio to adopt or implement control measures for these counties beyond the federal measures.

Ohio EPA has adopted several rules recently that will have an impact on statewide $PM_{2.5}$ emissions in the future:

- Clean Air Interstate Rule (CAIR)
- NO_x SIP Call Rules

Ohio will also be subject to a Federal Implementation Plan under the CAIR replacement rule, the Cross-State Air Pollution Rule (CSAPR), that will result in even greater reductions than the CAIR program. In addition, since the initial designations were made federally enforceable consent decrees have resulted in reductions in emissions from utilities across the state.

Chapters Four and Five discuss this requirement in more detail.

iii.) Section 110 and Part D requirements (CAA Section 107(d)(3)(E)(v))

For purposes of redesignation, a state must meet all requirements of Section 110 and Part D that were applicable prior to submittal of the complete redesignation request.

Subpart 1 of Part D consists of general requirements applicable to all areas which are designated nonattainment based on a violation of the NAAQS. Subpart 4 of Part D consists of more specific requirements applicable to particulate matter (specifically to address PM_{10}). However, for the purpose of implementing the 1997 $PM_{2.5}$ standard, U.S. EPA's Implementation Rule stated Subpart 1, rather than Subpart 4, is appropriate for the purpose of implementing $PM_{2.5}$.[72 FR 20589]

i.) Section 110(a) requirements

Section 110(a) of Title I of the CAA contains the general requirements for a SIP. Section 110(a)(2) provides that the implementation plan submitted by a state must have been adopted by the state after reasonable public notice and hearing, and that, among other things, it must include enforceable emission limitations and other control measures, means or techniques necessary to meet the requirements of the CAA; provide for establishment and operation of appropriate devices, methods, systems and procedures necessary to monitor ambient air quality; provide for implementation of a source permit program to regulate the modification and construction of any stationary source within the areas covered by the plan; include provisions for the implementation of Part C, prevention of significant deterioration (PSD) and Part D, NSR permit programs; include criteria for stationary source emission control measures, monitoring, and reporting; include provisions for air quality modeling; and provide for public and local agency participation in planning and emission

control rule development. In Ohio's December 5, 2007 and September 4, 2009 infrastructure SIP submissions, Ohio verified that the State fulfills the requirements of Section 110(a)(2) of the Act.

Section 110(a)(2)(D) also requires State plans to prohibit emissions from within the State which contribute significantly to nonattainment or maintenance areas in any other State, or which interfere with programs under Part C to prevent significant deterioration of air quality or to achieve reasonable progress toward the national visibility goal for Federal class I areas (national parks and wilderness areas). In order to assist States in addressing their obligations regarding regionally transported pollution, U.S. EPA finalized CAIR to reduce SO_2 and NO_x emissions from large electric generating units (EGU). Ohio has met the requirements of the federal CAIR to reduce NO_x and SO_2 emissions contributing to downwind states. On February 1, 2008, U.S. EPA approved Ohio's CAIR program, which can be found in Ohio Administrative Code (OAC) Chapter 3745-109[3]. On July 6, 2011, U.S. EPA finalized a replacement to the CAIR program, the CSAPR. CSAPR will further assist States in addressing their obligations regarding regionally transported pollution by providing reductions in NO_x and SO_2 emissions in 2012 and 2014.

ii.) <u>Section 172(c) requirements</u>

This Section contains general requirements for nonattainment plans. The requirements for reasonable further progress, identification of certain emissions increases, and other measures needed for attainment will not apply for redesignations because they only have meaning for areas not attaining the standard. The requirements for an emission inventory will be satisfied by the inventory requirements of the maintenance plan. Chapters Four and Five discuss this requirement in more detail.

iii.) <u>Conformity</u>

The state must work with U.S. EPA to show that its SIP provisions are consistent with the Section 176(c)(4) conformity requirements. The redesignation request should include conformity procedures, if the state already has

3 http://www.epa.ohio.gov/dapc/regs/regs.aspx#3745-109

these procedures in place. If a state does not have conformity procedures in place at the time that it submits a redesignation request, the state must commit to follow U.S. EPA's conformity regulation upon issuance, as applicable.

iv.) Maintenance plans (CAA Section 107(d)(3)(E)(iv))

Section 107(d)(3)(E) stipulates that for an area to be redesignated, U.S. EPA must fully approve a maintenance plan that meets the requirements of Section 175(A). The maintenance plan will constitute a SIP revision and must provide for maintenance of the relevant NAAQS in the area for at least 10 years after redesignation. Section 175 (A) further states that the plan shall contain such additional measures, if any, as may be necessary to ensure such maintenance.

In addition, the maintenance plan shall contain such contingency measures as the Administrator deems necessary to ensure prompt correction of any violation of the NAAQS. At a minimum, the contingency measures must include a requirement that the state will implement all measures contained in the nonattainment SIP prior to redesignation.

States seeking redesignation of a nonattainment area should consider the following provisions:

a.) attainment inventory;
b.) maintenance demonstration;
c.) monitoring network;
d.) verification of continued attainment; and
e.) contingency plan.

Chapter Six discusses this requirement in more detail.

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CHAPTER THREE

$PM_{2.5}$ MONITORING

CAA Section 107(d)(3)(E)(i)

Requirement 1 of 4

A demonstration that the NAAQS for annual $PM_{2.5}$, as published in 40 CFR 50.7, has been attained.

Background

There are 13 monitors measuring $PM_{2.5}$ concentrations in this nonattainment area. These monitors are operated by Ohio EPA Division of Air Pollution Control, Northeast District Office, the Cleveland Department of Public Health, the Lake County General Health District, and the Akron Regional Air Quality Management District. A listing of the design values based on the three-year average of the annual mean concentrations from 2008 through 2010 is shown in Table 1. The locations of the monitoring sites for this nonattainment area are shown on Figure 1.

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Demonstration

Figure 1 - Map of the Cleveland-Akron-Lorain nonattainment area and monitor locations

Requirement 2 of 4

Ambient monitoring data quality assured in accordance with 40 CFR 58.10, recorded in the U.S. EPA air quality system (AQS) database, and available for public view.

Demonstration

Ohio EPA has quality assured all data shown in Appendix A in accordance with 40 CFR 58.10 and all other federal requirements. Ohio EPA has recorded the data in the AQS database and, therefore, the data are available to the public.

Requirement 3 of 4

A showing that the three-year average of the annual mean values, based on data from all monitoring sites in the area or its affected downwind environs, are below 15.0 µg/m^3. (This showing must rely on three complete, consecutive calendar years of quality assured data.)

Background

The following information is taken from U.S. EPA's "Guideline on Data Handling Conventions for the PM NAAQS," U.S. EPA-454/R-99-008, April 1999.

In accordance with the CAA Amendments, three complete years of monitoring data are required to demonstrate attainment at a monitoring site. The annual $PM_{2.5}$ primary and secondary ambient air quality standards are met at an ambient air quality monitoring site when the three-year average of the annual average is less than 15.0 µg/m^3. While calculating design values, three significant digits must be carried in the computations, with final values rounded to the nearest 0.1 µg/m^3. Decimals 0.05 or greater are rounded up, and those less than 0.05 are rounded down, so that 15.049 µg/m^3 is the largest concentration that is less than, or equal to 15.0 µg/m^3. Values at or below 15.0 µg/m^3 meet the standard; values equal to or greater than 15.1 µg/m^3 exceed the standard. An area is in compliance with the annual $PM_{2.5}$ NAAQS only if every monitoring site in the area meets the NAAQS. An individual site's 3-year average of the annual average concentrations is also called the site's design value. The air quality design value for the area is the highest design value among all sites in the area.

Table 1 shows the monitoring data for 2008 – 2010 that were retrieved from the U.S. EPA AQS. The air quality design value for the area is the highest design value among all sites in the area.

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Demonstration

Table 1 - Monitoring Data for the Cleveland-Akron-Lorain area for 2008 – 2010

Site	County	Annual Standard			
		Year			Average
		2008	2009	2010	2008-2010
39-035-0027 [a]	Cuyahoga	13.2	10.6		
39-035-0034		10.9	10.2	10.9	10.7
39-035-0038		14.1	12.8	14.0	13.6
39-035-0045		13.7	11.8	13.3	12.9
39-035-0060 [b]		14.1	12.3	13.7	13.4
39-035-0065		14.6	12.4	13.2	13.4
39-035-1002 [c]		12.0	10.9	11.3	11.4
39-085-0007 [d]	Lake		10.4	10.4	10.8
39-085-3002 [e]		11.5			
39-093-3002	Lorain	11.4	9.9	10.4	10.6
39-103-0003	Medina	11.8	10.8	10.8	11.1
39-133-0002	Portage	12.1	11.1	11.2	11.5
39-153-0017	Summit	13.8	12.6	13.4	13.3
39-153-0023		12.9	11.4	12.5	12.3

Less than 75% capture in at least one quarter

[a] This site was shut down in 7/2009 due to the demolition of the building that hosted the monitor. USEPA approved the shut down without relocation.

[b] Although this is one of the highest reading monitor sites in the area, data from previous years show a decreasing trend in monitor readings. Ohio believes that had the missing data been collected it would not have resulted in a design value that would exceed the standard.

[c] Historically this monitor has been one of the, if not the, lowest reading monitor in Cuyahoga County. This monitor is located in a suburban-residential setting, approximately 2 miles away from the Cleveland Hopkins airport but more than 8.8 miles away from Cleveland's heaviest industrial area. Ohio believes that had the missing data been collected it would not have resulted in a design value that would exceed the standard.

[d] and [e] Site [e] was relocated to site[d]. USEPA evaluate the candidate site [d] and approved the replacement request, authorizing with this replacement, the combination of ozone and fine particulate data from both sites for the purpose of calculating desing values for NAAQS determinations. The three-year average (2008-2010) from combining the data from both sites is 10.8ug/m3 of PM2.5.

Source: U.S. EPA Air Quality System (AQS); http://www.epa.gov/ttn/airs/airsaqs/index.htm

The design values calculated for the Cleveland-Akron-Lorain area demonstrate that the annual $PM_{2.5}$ NAAQS has been attained. However, three monitor sites in Cuyahoga County, site 39-035-0060, site 39-035-0065, and site 39-035-1002, did not comply with the 75% data capture requirement for the 2008-2010 period. Specifically, site 39-035-0060 has only 48% and 63% capture in the second and third quarter of 2009, respectively. Site 39-035-0065 has only 74% capture in the third quarter of 2010, and site 39-035-1002 has only 71% capture in the first quarter of 2008 and 73% capture in the third quarter of 2009. These monitoring sites experienced instrument malfunctions during the low percentage capture periods.

Under 40 CFR Part 50, Appendix N, the use of less than complete data may be approved by U.S. EPA considering such factors as monitoring site closures/moves, monitoring diligence, and nearby concentrations in determining whether to use such data. Therefore, in order to further demonstrate that these monitors have attained the standard, Ohio EPA prepared a statistical analysis using multiple imputations. Ohio EPA has imputed missing values for these sites and then performed an ordinary analysis as if the imputed values were real measurements. Multiple imputations use random draws from the conditional distribution of the target variable given the other variables. When a regression model is used for imputation, the process involves adding a random residual to the "best guess" for missing values, to yield the same conditional variance as the original variable. Appendix E describes and includes the full statistical analyses performed to show that the three-year averages (2008 to 2010) of the annual mean values, based on missing data imputations, are below 15.0 µg/m^3.

Table 2 shows site 39-035-0060, site 39-035-0065, and site 39-035-1002 before and after the imputation of missing data. Also the "new" sites (with imputed values) show a passing design value for 2008 to 2010 of less than 13.6 µg/m^3.

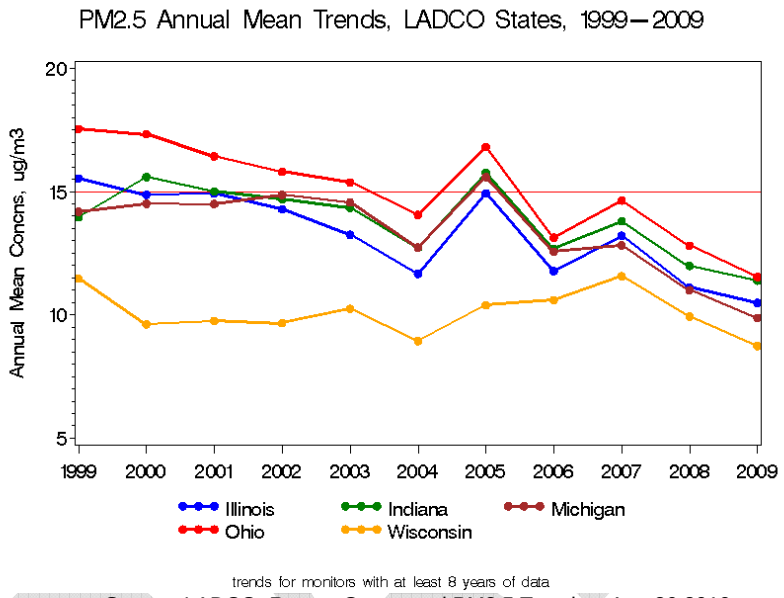
Table 2 – Comparison Between Original and Imputed Values for Monitors 39-035-0060, 39-035-0065, and 39-035-1002 from 2004 to 2010

									Annual Design Value				
	Site	Year							2004-2006	2005-2007	2006-2008	2007-2009	2008-2010
		2004	2005	2006	2007	2008	2009	2010					
OLD	39-035-0060	16.4	19.4	15.0	15.9	14.1	12.3	13.7	16.9	16.8	15.0	14.1	13.4
NEW	39-035-0060	15.6	18.5	14.6	15.4	13.8	12.5	13.6	16.2	16.2	14.6	13.9	**13.3**
OLD	39-035-0065	15.2	18.6	13.1	15.8	14.6	12.4	13.2	15.6	15.8	14.5	14.3	13.4
NEW	39-035-0065	15.2	18.4	13.2	15.7	14.8	12.4	13.4	15.6	15.8	14.6	14.3	**13.5**
OLD	39-035-1002	13.2	16.8	11.6	13.4	12.0	10.9	11.3	13.9	13.9	12.3	12.1	11.4
NEW	39-035-1002	13.1	16.7	11.0	13.3	11.1	10.6	11.1	13.6	13.7	11.8	11.6	**10.9**
	incomplete data (quarter with <75% capture)												

With the data imputation analysis and results, Requirement 3 of 4 has been met.

National monitoring for $PM_{2.5}$ began in 1999. With respect to each of the Lake Michigan Air Directors Consortium (LADCO) states, there has been a clear downward trend in design values:

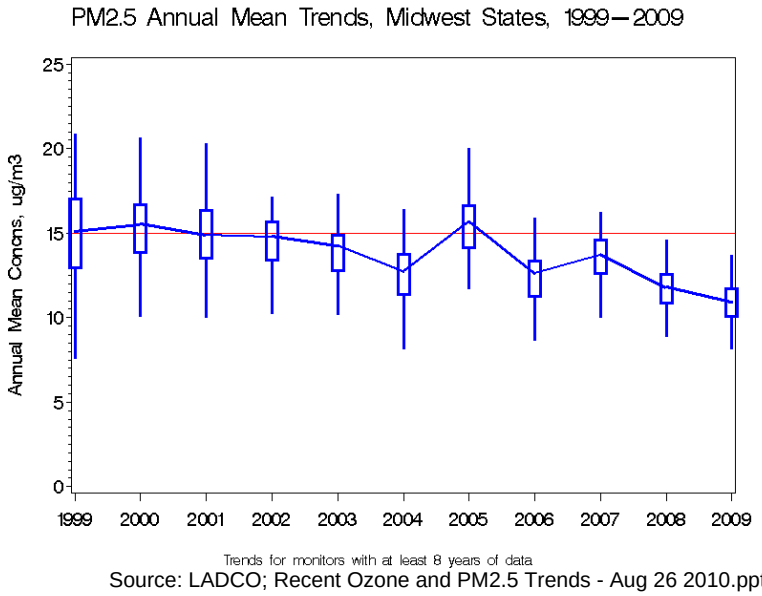
Figure 2 - $PM_{2.5}$ Annual Mean Trends LADCO States



Source: LADCO; Recent Ozone and PM2.5 Trends – Aug 26 2010.pptx

The same trend can be seen within the Midwest States as a whole:

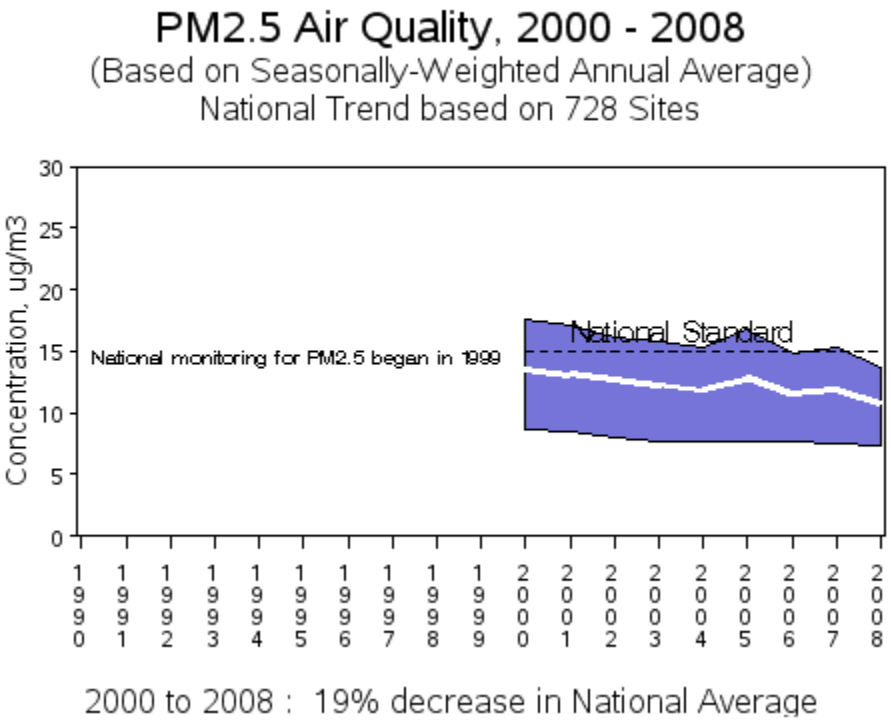
Figure 3 - $PM_{2.5}$ Annual Mean Trends Midwest States



Source: LADCO; Recent Ozone and PM2.5 Trends - Aug 26 2010.pptx

Design values have also trended downward nationally:

Figure 4 - $PM_{2.5}$ Annual Mean National Trends



Source: http://www.epa.gov/airtrends/pm.html

Requirement 4 of 4

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

Demonstration

Ohio EPA commits to continue monitoring $PM_{2.5}$ levels at the Ohio sites indicated in Figure 1 and Table 1. Ohio EPA will consult with U.S. EPA Region 5 prior to making changes to the existing monitoring network, should changes become necessary in the future. Ohio EPA will continue to quality assure the monitoring data to meet the requirements of 40 CFR 58 and all other federal requirements. Connection to a central station and updates to the Ohio EPA web site[4] will provide real time availability of the data and knowledge of any exceedances. Ohio EPA will enter all data into AQS on a timely basis in accordance with federal guidelines.

4 www.epa.ohio.gov/dapc

CHAPTER FOUR

EMISSION INVENTORY

CAA Section 107(d)(3)(E)(iii)

U.S. EPA's redesignation guidance requires the submittal of a comprehensive inventory of $PM_{2.5}$ precursor emissions (primary particles (organic carbon, crustal matter, and elemental carbon), SO_2 and NO_x[5]) representative of the year when the area achieves attainment of the annual $PM_{2.5}$ air quality standard. Ohio also must 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 emission inventory related requirements include a projection of the emission inventory to a year at least 10 years following redesignation; a demonstration that the projected level of emissions is sufficient to maintain the annual $PM_{2.5}$ standard; and a commitment to provide future updates of the inventory to enable tracking of emission levels during the 10-year maintenance period.

The emissions inventory development and emissions projection discussion below, with the exception of the mobile (on-road) emissions inventory and projections, identifies procedures used by Ohio EPA and the LADCO regarding emissions of all the counties in the Cleveland-Akron-Lorain area. All of these inventories and emissions projections were prepared using similar methodologies. Mobile emissions inventories and projections for all counties were prepared by the Northeast Ohio Areawide Coordinating Agency (NOACA) and the Ohio Department of Transportation (ODOT).

Requirement 1 of 5

A comprehensive emission inventory of $PM_{2.5}$, SO_2 and NO_x completed for the base year.

Background

The point source data are taken from Ohio's annual emissions reporting program. The 2005 periodic inventory has been identified as one of the preferred databases for SIP development and coincides with nonattainment air quality in the Cleveland-Akron-Lorain area.

Periodic inventories, which include emissions from all sectors - mobile, area, non-road, and point sources - are prepared every three years.

5 VOC and NH_3 are not addressed.

Demonstration

The 2005 inventory is used as the base year for the purpose of this submittal and was submitted to U.S. EPA with Ohio's $PM_{2.5}$ attainment demonstration SIP submitted on July 18, 2008 and revised on June 7, 2010. The detailed emission inventory information for the Cleveland-Akron-Lorain area is provided in Appendix B. Emissions of $PM_{2.5,}$ SO_2 and NO_x for 2005 are identified under Requirement Three of this Chapter.

Requirement 2 of 5

A projection of the emission inventory to a year at least 10 years following redesignation.

Background

Ohio EPA prepared a comprehensive inventory for the Cleveland-Akron-Lorain area including area, mobile, and point sources for $PM_{2.5}$, SO_2 and NO_x for base year 2005. The 2005 inventory was submitted to U.S. EPA on July 18, 2008 as part of Ohio's $PM_{2.5}$ attainment demonstration SIP for this area. The information below describes the procedures Ohio EPA used to generate the 2005 base year inventory and to develop SIP-ready modeling inventories and future year projections (Pechan Report[6]) based on a 2005 base year inventory. The report by Pechan generated future year estimates of annual emissions for each source sector using accepted growth surrogates. These inventories were provided to the LADCO and have been processed to develop average daily emissions for use in the air quality analyses. These processed modeling inventories have been identified as the correct iteration of the inventory for use in the redesignation. In this document, references to LADCO include the Midwest Regional Planning Organization. Note thatthe on-road mobile source sector was addressed by specific $PM_{2.5}$ and NO_x modeling as discussed below.

- Area sources were taken from the Ohio 2005 periodic inventory submitted to U.S. EPA. These projections were made from the U.S. Department of Commerce Bureau of Economic Analysis (BEA) growth factors, with some updated local information.
- Mobile source emissions were calculated from MOVES2010 produced emission factors. Only $PM_{2.5}$ and NO_x necessitate emissions inventory analysis. As documented in Ohio EPA's attainment demonstration SIP, Ohio EPA in consultation with U.S. EPA determined mobile

6 http://www.ladco.org/tech/emis/r5/reports/LADCO%202005%20Base%20Yr%20Growth%20and%20Controls%20Report_Final.pdf

sources are insignificant contributors for SO_2. Consistent with Ohio EPA's attainment demonstration, Ohio EPA continues to consider mobile source SO_2 to be an insignificant contributor to fine particles for this nonattainment area. Based on the demonstration below, SO_2 constitutes less than one percent (<1.21%) of the area's total SO_2 emissions in 2005, 2008, 2015 and 2022 (ranging between 0.21% and 1.21%).

- Point source information was compiled from Ohio EPA's 2005 annual emissions inventory database and the 2005 U.S. EPA Air Markets acid rain database[7].
- Biogenic emissions are not included in these summaries.
- Non-road emissions were generated using U.S. EPA's National Mobile Inventory Model (NMIM) 2002 application. To address concerns about the accuracy of some of the categories in U.S. EPA's non-road emissions model, LADCO contracted with two (2) companies to review the base data and make recommendations. One of the contractors also estimated emissions for three (3) non-road categories not included in U.S. EPA's non-road model. Emissions were estimated for aircraft, commercial marine vessels, and railroads. Recreational motorboat population and spatial surrogates (used to assign emissions to each county) 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 also was updated.

Demonstration

On-Road Emission Estimations

The on-road emission estimations for this nonattainment area where performed by the Ohio Department of Transportation (ODOT) for the Akron Metropolitan Area Transportation Study (AMATS) and Ashtabula Township areas, and by the Northeast Ohio Areawide Coordinating Agency (NOACA) for the counties of Cuyahoga, Lake, Lorain and Medina in its area.

The inventories include county based, annual totals of $PM_{2.5}$ and Oxides of Nitrogen (NO_X) for the base year 2005, the attainment year 2008, the interim year 2015, and the maintenance period horizon year 2022.

7 http://www.epa.gov/airmarkets/acidrain

Overview

U.S.EPA published a Federal Register notice[8] of availability on March 2, 2010, to approve MOVES2010 (Motor Vehicle Emissions Simulator), hereafter referred to as MOVES. Upon publication of the Federal Register notice, MOVES became U.S. EPA's approved motor vehicle emission factor model for estimating VOCs, NO_x, CO, PM_{10} and $PM_{2.5}$ and other pollutants and precursors from cars, trucks, motorcycles, and buses by state and local agencies. MOVES is a computer program designed by the U.S. EPA to estimate air pollution emissions from mobile sources. MOVES replaces U.S. EPA's previous emissions model for on-road mobile sources, MOBILE6.2. MOVES can be used to estimate exhaust and evaporative emissions as well as brake and tire wear emissions from all types of on-road vehicles.

The CAA requires U.S. EPA to regularly update its mobile source emission models. U.S. EPA continuously collects data and measures vehicle emissions to make sure the Agency has the best possible understanding of mobile source emissions. This assessment, in turn, informs the development of U.S. EPA's mobile source emission models. MOVES represents the Agency's most up-to-date assessment of on-road mobile source emissions. MOVES also incorporates several changes to the U.S. EPA's approach to mobile source emission modeling based upon recommendations made to the Agency by the National Academy of Sciences.

U.S.EPA believes that MOVES should be used in ozone, CO, PM, and nitrogen dioxide SIP development as expeditiously as possible. The CAA requires that SIP inventories and control measures be based on the most current information and applicable models that are available when a SIP is developed. Regarding transportation conformity, U.S. EPA and U.S. DOT intend to establish a two-year grace period before MOVES is required for new transportation conformity analyses.

The MOVES more detailed approach (when compared with the previous MOBILE model) to modeling allows U.S. EPA to easily incorporate large amounts of in-use data from a wide variety of sources, such as data from vehicle inspection and maintenance (I/M) programs, remote sensing device (RSD) testing, certification testing, portable emission measurement systems (PEMS), etc. This approach also allows users to incorporate a variety of activity

8 http://www.regulations.gov/search/Regs/home.html#documentDetail?R=0900006480ab1f98

data to better estimate emission differences such as those resulting from changes to vehicle speed and acceleration patterns. MOVES has a graphical user interface which allows users to more easily set up and run the model. MOVES database-centered design provides users much greater flexibility regarding output choices. Unlike earlier models which provided emission factors in grams-per-mile in fixed output formats, MOVES output can be expressed as total mass (in tons, pounds, kilograms, or grams) or as emission factors (grams-per-mile and in some cases grams-per-vehicle). Output can be easily aggregated or disaggregated to examine emissions in a range of scales, from national emissions impacts down to the emissions impacts of individual transportation projects. The database-centered design also allows U.S. EPA to update emissions data incorporated in MOVES more easily and will allow users to incorporate a much wider array of activity data to improve estimation of local emissions. For example, the improvements in MOVES will allow project-level PM2.5 emissions to be estimated.

The annual $PM_{2.5}$ inventory runs meet the latest planning assumption requirement. The travel forecast modeling processes used to develop vehicles miles of travel (VMT) for the Akron Metropolitan Area Transportation Study (AMATS) and the Northeast Ohio Areawide Coordinating Agency (NOACA) areas is calibrated using the latest population and land use data available and are validated using corresponding traffic count data. Currently, the travel demand models are validated to year 2005. U.S.EPA's emissions model MOVES is used for all mobile source emission analyses with inputs and output needs being established at various interagency consultation meetings. It was also established that annual emission estimates would be based on a single-season approach. Since travel demand models produce average daily conditions, the daily emissions estimates are multiplied by 365 days to produce annual emissions estimates expressed in tons per year.

Finally, the regional emissions analysis includes emissions for Direct $PM_{2.5}$ (exhaust, brake, and tire wear), and Oxides of Nitrogen (NO_X).Sulfur Dioxide (SO_2), Volatile Organic Compounds (VOCs) and Ammonia (NH_3) are considered insignificant at this time. (Appendix C)

NOACA maintains a PC-based regional travel demand forecasting model on the Citilabs CUBE platform for use in its urban transportation planning process. This model employs the traditional four step modeling process to project existing and future

traffic volumes and travel patterns on the regional transportation networks. The four step process consists of trip generation, trip distribution, mode split, and route assignment. Output from the model is link-by-link directional volumes for four time periods: AM peak, Midday, PM peak, and Night and is added together to create 24-hour traffic volumes for the existing or future regional transportation networks. The ODOT holds the transportation model for the AMATS area. AMATS prepares and submits networks for its planning area to ODOT. ODOT prepares networks for Ashtabula County. ODOT's modeling is also run on a PC-based CUBE platform.

Socio-economic variables were developed for all areas based on 2000 Census data and 2030 county-level Ohio Department of Development population projections. Minor adjustments to 2005 data have been made in an effort to have this data correspond to 2005 estimates released by the US Census Bureau.

Using MOVES, emission factor files were generated for base year-2005, attainment year-2008, interim year 2015, and maintenance year 2022. Assumptions for these runs include an I/M program in all but Ashtabula Township. Programs and corresponding MOVES parameters were developed in consultation with Ohio EPA. I/M program information was supplied by Ohio EPA. The I/M program was applied to all analysis years for every geography with the exception of Ashtabula Township.

Total emissions were computed with the aid of several custom programs by ODOT. The process uses data on daily and directional traffic distributions as well as more up to date volume/delay functions from the 2000 Highway Capacity Manual (HCM).

The first step in the process involves running ODOT postcms.exe to calculate hourly link volumes based on the percentage of the daily volume (travel demand model output) determined by a link's facility and area type. Link speeds from the travel demand model are not used in the analysis. The speeds are estimated as a post-process to the model based on HCM methods using a link's volume-to-capacity ratio and link group code.

The second step (mmoves.exe) uses a combination of the MOVES emission factors and the hourly link volumes that are output of the postcms.exe program. The hourly volumes are multiplied by the MOVES emission factor for the corresponding hour of day, speed bin, and road type to calculate emissions for every network link for

each hour. The final link on road vehicle emissions for the area is the sum of all individual link-hour emissions.

The third step, (mvehicle.exe), calculates vehicle-based emissions for each source type for each hour of the day. The vehicle source type is based on a combination of local and default data. The final vehicle emissions for each county are the sum of all individual hourly emissions for all vehicle types.

Intrazonal trips do not get loaded onto the network, so the fourth step in the process requires a separate method to account for those trips that use local roads to travel within a zone. The mintra.exe program uses intrazonal trips to estimate VMT using the area in square miles and intrazonal trips of each zone. The zone is assumed circular and the radius of the circle is used as the average trip length for these intrazonal trips. Intrazonal emissions are then calculated by combining MOVES generated emissions with estimated intrazonal VMT. The emission rates are the same as those used to calculated link based emissions.

The final step is to summarize link, vehicle, and intrazonal emissions for each county, pollutant, and analyzed year, and to multiply annual average daily emissions by 365 to produce an annual estimate.

On-Road Mobile Emission Estimations

Tables 3 through 10 contain the results of the emissions analysis for the appropriate years. All emissions estimations are expressed in tons per year (tpy).

Table 3 - Ashtabula County Emissions Estimations for On-Road Mobile Sources

	2005	2008	2015	2022
$PM_{2.5}$ (tpy)	11.50	10.04	5.37	3.03
NO_x (tpy)	294.66	232.83	107.68	54.49
SO_2 (tpy)	5.07	1.57	0.66	0.62
Annual VMT	79,693,005	80,604,775	82,946,980	85,561,840

Table 4 – Cuyahoga County, Emissions Estimations for On-Road Mobile Sources

	2005	2008	2015	2022
$PM_{2.5}$ (tpy)	1,249.47	1,040.28	430.01	320.94
NO_x (tpy)	36,545.59	28,227.20	12,371.38	6,065.83
SO_2 (tpy)	846.76	253.16	76.36	68.07
Annual VMT	10,619,449,065	10,658,861,035	10,602,063,020	10,701,988,340

Table 5 – Lake County, Emissions Estimations for On-Road Mobile Sources

	2005	2008	2015	2022
$PM_{2.5}$ (tpy)	283.09	241.78	122.02	69.42
NO_x (tpy)	8,071.90	6,425.00	2,840.39	1,417.15
SO_2 (tpy)	176.99	51.94	15.91	14.45
Annual VMT	2,113,418,985	2,155,625,760	2,180,087,695	2,251,831,000

Table 6 – Lorain County, Emissions Estimations for On-Road Mobile Sources

	2005	2008	2015	2022
$PM_{2.5}$ (tpy)	319.85	274.43	143.34	81.69
NO_x (tpy)	9,196.87	7,354.77	3,456.51	1,723.02
SO_2 (tpy)	200.28	60.17	18.51	16.83
Annual VMT	2,473,782,025	2,525,280,240	2,555,465,010	2,638,018,155

Table 7 – Medina County, Emissions Estimations for On-Road Mobile Sources

	2005	2008	2015	2022
$PM_{2.5}$ (tpy)	358.80	317.43	152.50	78.48
NO_x (tpy)	9,328.78	7,603.83	3,306.35	1,677.58
SO_2 (tpy)	208.74	57.65	17.63	16.83
Annual VMT	2,112,372,530	2,241,630,710	2,322,864,380	2,505,814,790

Table 8 – Portage County, Emissions Estimations for On-Road Mobile Sources

	2005	2008	2015	2022
$PM_{2.5}$ (tpy)	187.71	160.90	87.54	49.45
NO_x (tpy)	5,707.22	4,630.98	2,264.50	1,014.35
SO_2 (tpy)	96.74	30.52	13.23	7.40
Annual VMT	1,761,085,222	1,811,101,624	1,935,234,601	2,036,373,863

Table 9 – Summit County, Emissions Estimations for On-Road Mobile Sources

DRAFT

	2005	2008	2015	2022
$PM_{2.5}$ (tpy)	611.78	511.43	251.70	162.98
NO_x (tpy)	17,377.28	13,609.82	6,170.32	3,059.45
SO_2 (tpy)	319.72	100.66	42.76	39.57
Annual VMT	5,505,977,908	5,635,781,676	5,992,078,124	6,246,851,092

Table 10 – Emissions Estimations Totals for On-Road Mobile Sources for the Cleveland-Akron-Lorain Area

	2005	2008	2015	2022
$PM_{2.5}$ (tpy)	3,022.20	2,556.29	1,192.48	765.99
NO_x (tpy)	86,522.30	68,084.43	30,517.13	15,011.87
SO_2 (tpy)	1,854.30	555.67	185.06	163.77
Annual VMT	24,665,778,740	25,108,885,820	25,670,739,810	26,466,439,080

Motor Vehicle Emission Budget

Table 11 contains the motor vehicle emissions budgets for the Cleveland-Akron-Lorain area.

Table 11 - Mobile Vehicle Emissions Budget

	2015 Estimated Emissions	2015 Mobile Safety Margin Allocation*	2015 Total Mobile Budget	2022 Estimated Emissions	2022 Mobile Safety Margin Allocation*	2022 Total Mobile Budget
PM2.5 (tpy)	1,192.48	**178.87**	1,371.35	765.99	**114.90**	880.89
NOx (tpy)	30,517.13	**4,577.57**	35,094.70	15,011.87	**2,251.78**	17,263.65

*The 15 percent margin of safety was calculated by taking 15 percent of the mobile source emission estimates

The above budgets for the Cleveland-Akron-Lorain area, agreed upon as part of the interagency consultation process, include the emission estimates calculated for 2015 and 2022 (from Table 3 and Table 10) with an additional 15 percent margin of safety allocated for $PM_{2.5}$ and NO_x in 2015 and 2022.

In an effort to accommodate future variations in travel demand models and VMT forecast when no change to the network is planned, Ohio EPA consulted with U.S. EPA to determine a reasonable approach to address this variation. Based on this discussion, a 15 percent margin of safety allocation was agreed upon and has been added to the emissions estimates for this nonattainment area.

All methodologies, the latest planning assumptions, and the safety margins allocations were determined through the interagency

consultation process described in the Transportation Conformity Memorandum of Understanding (MOU) among NOACA, AMATS, Ohio DOT, and Ohio EPA.

A 15 percent margin of safety is 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 15 percent allocation of safety margin (as defined in 40 CFR93.101[9]) to mobile sources while still continuing to maintain the total emissions in the Cleveland-Akron-Lorain area well below the 2008 attainment level of emissions.

The 15 percent margin of safety was calculated by taking 15 percent of the mobile source emission estimates. Safety margin, as defined by the conformity rule, looks at the total emissions from all sources in the nonattainment area. The actual allocation is less than 15 percent of the total emission reduction from all sources as can be seen from Table 38.

In summary, the mobile budget safety margin allocation translates into an additional 178.87 tpy for $PM_{2.5}$ and 4,577.57 tpy for NO_x for 2015 and an additional 114.90 tpy for $PM_{2.5}$ and 2,251.78 tpy for NO_x for 2022.

When compared to the overall safety margin, as defined in 40 CFR 93.101, discussed under “Requirement 3 of 5” below, it is evident this allocation is significantly below the total safety margin for this area.

The current $PM_{2.5}$ and NO_x mobile budgets for the fine particle NAAQS will no longer be applicable either after the effective date of the approved redesignation or after the effective date of any U.S. EPA action approving a finding that the $PM_{2.5}$ and NO_x conformity budgets included in this submittal are adequate for transportation conformity purposes, whichever date comes first.

Finally, it is important to underline that all motor vehicle emission budgets in this Redesignation submittal, which are based on MOVES2010, will <u>replace</u> previous motor vehicle emission budgets on Attainment Demonstration submittals based on MOBILE6.2.

9 "Safety margin" means 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.

Requirement 3 of 5

A demonstration that the projected level of emissions is sufficient to maintain the $PM_{2.5}$ standard.

Background

In consultation with U.S. EPA, Ohio EPA selected the year 2022 as the maintenance year for this redesignation request. This document contains projected emissions inventories for 2015 and 2022.

Emission projections for the Cleveland-Akron-Lorain area were performed using the following approaches:

- As performed by NOACA and ODOT, mobile source emission projections are based on the U.S. EPA MOVES model. The analysis is described in more detail in Appendix C. All projections were made in accordance with "Procedures for Preparing Emissions Projections" U.S. EPA-45/4-91-019.

- Emissions inventories are required to be projected to future dates to assess the influence growth and future controls will have. LADCO has developed growth and control files for point, area, and non-road categories. These files were used to develop the future-year emissions estimates used in this document. This was done so the inventories used for redesignation are consistent with modeling performed in the future. Appendix D contains LADCO's technical support document detailing the analysis used to project emissions (Base M[10]).

- For the 2008 attainment year emissions were grown from the 2005 LADCO modeling inventory, using LADCO's growth factors, for all sectors except point sources (electrical generating units and non-electrical generating units). Point source emissions for 2008 were compiled from Ohio EPA's 2008 annual emissions inventory database. 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 2022 maintenance year is based on emissions estimates from the 2018 LADCO modeling.

[10] http://www.ladco.org/tech/emis/current/index.php

Ohio EPA is identifying emissions projections for 2015 and 2022 for EGUs with implementation of the CAIR program. U.S. EPA has raised concerns regarding the CAIR program and its remand. However, as discussed below, with the finalization of the CAIR replacement, the CSAPR, Ohio EPA believes these are the most appropriate and accurate future projections. Additional modeling has yet to be conducted that accounts for CSAPR. However, it is believed that CSAPR will provide even greater reductions in emissions than the CAIR program; therefore, these emissions projections will be conservative.

On March 10, 2004, the U.S. EPA promulgated the CAIR. Beginning in 2009, U.S. EPA's CAIR rule requires EGUs in 28 eastern states and the District of Columbia to significantly reduce emissions of NO_x and SO_2. CAIR replaced the NOx SIP Call for EGUs. The intent of the CAIR program is for national NO_x emissions to be cut from 4.5 million tons in 2004, to a cap of 1.5 million tons by 2009, and 1.3 million tons in 2018 in 28 states. States were required to submit a CAIR SIP as part of this effort. Ohio submitted a CAIR SIP which was approved by U.S. EPA on February 1, 2007. Revisions to the CAIR SIP were again submitted on July 15, 2009. The revised CAIR SIP was approved as a direct final action on September 25, 2009 (74 FR 48857). As a result of CAIR, U.S. EPA projects that in 2009 emissions of NO_x will decrease from a baseline of 264,000 tons per year to 93,000 tons per year while in 2010 emissions of SO_2 will decrease from a baseline of 1,373,000 tons per year to 298,000 tons per year, within Ohio. And by 2015 U.S. EPA projects emissions of NO_x will decrease to 83,000 tons per year while emissions of SO_2 will decrease to 208,000 tons per year, within Ohio[11].

On December 23, 2008, U.S. EPA's CAIR program was remanded without vacatur by the D.C. Circuit Court.

As can be seen in Table 12 below, Ohio has seen a significant decline in the 264,000 tons of NO_x and 1,373,000 tons of SO_2 emitted in 2005. In 2008 and 2009 facilities began preparing for and implementing control programs to address CAIR[12] and consent decrees.

Table 12 - Reductions in SO_2 and NO_x EGU Emissions Between 2008 and 2009

	SO_2			NO_x		
	2008	**2009**	**Change**	**2008**	**2009**	**Change**

11 http://www.epa.gov/CAIR/oh.html

12 Under CAIR, NOx reductions are to occur beginning in 2009 while SO2 reductions are to occur beginning in 2010.

Ohio	709,444	601,101	15%	235,018	96,351	59%
LADCO States	2,019,036	1,620,071	20%	702,384	393,930	44%
National	7,616,262	5,747,353	25%	2,996,287	1,990,385	34%

Source: Clean Air Markets Quarterly Emissions Tracking[13]

Significant reductions also occurred regionally and nationally as can be seen from the above. Data is also available for the first two quarters of 2010, the year SO_2 reductions are to be implemented under CAIR:

Table 13 – Reductions in SO_2 and NO_x EGU Emissions Between the First Half of 2008 and 2010

	SO_2			NO_x		
	2008 (1st half)	**2010 (1st half)**	**Change**	**2008 (1st half)**	**2010 (1st half)**	**Change**
Ohio	373,798	279,854	25%	130,598	53,187	59%
LADCO States	1,190,497	854,282	28%	419,114	220,907	47%
National	3,895,472	2,502,965	36%	1,487,179	930,148	37%

Source: Clean Air Markets Quarterly Emissions Tracking[14]

The following was reported by U.S. EPA's Clean Markets Division:

"Based on emissions monitoring data, EPA has observed substantial reductions in SO_2 emissions from 2005 to 2009 and in the first two quarters of 2010 as companies installed more controls, electric demand declined, and low natural gas prices made combined-cycle gas-fired units more competitive in several parts of the country. Thus, even after CAIR's vacatur and subsequent remand in late 2008, the controls in place generally have continued to operate, helping to drive continued progress in reducing emissions.[15]"

Ohio EPA is in agreement with the analysis by U.S.EPA that the CAIR program is providing real reductions at this time, Ohio believes these reductions have assisted with $PM_{2.5}$ attainment in this nonattainment area and throughout Ohio.

On July 6, 2011, U.S. EPA finalized a replacement to the CAIR program, the CSAPR. CSAPR will preserve those initial reductions achieved under CAIR and provide even greater reductions in NO_x and SO_2 emissions in 2012 and 2014, ahead of the 2015 CAIR Phase 2. As a result of CSAPR, U.S. EPA projects that in 2012 emissions of NO_x will decrease to 90,842 tons per year and in

13 http://www.epa.gov/airmarkets/quarterlytracking.html
14 http://www.epa.gov/airmarkets/quarterlytracking.html
15 http://www.epa.gov/airmarkets/background.htm

2014 to 85,744 tons per year while SO_2 will decrease to 304,022 tons per year in 2012 and 134,333 tons per year in 2014, within Ohio. In addition, U.S. EPA projections indicate that as a result of implementation of CSAPR, there will be no maintenance issues within this entire nonattainment area.

Therefore, it is Ohio EPA's belief it is most appropriate to evaluate Ohio EPA's demonstration that the projected level of emissions is sufficient to maintain the annual $PM_{2.5}$ standard by assessing future year emissions that include the CAIR program.

The detailed inventory information for Cleveland-Akron-Lorain area for 2005 is in Appendix B. Emission trends are an important gauge for continued compliance with the $PM_{2.5}$ standard. Therefore, Ohio EPA performed an initial comparison of the inventories for the base year and maintenance years. Mobile source emission inventories are described in Appendix C.

Sectors included in the following tables are: Electrical Generating Unit (EGU-Point); Non-Electrical Generating Unit (Non-EGU); Non-road Mobile (Non-road); Other Area (Other); Marine; Aircraft; Rail (MAR); and On-road Mobile (On-road).

Maintenance is demonstrated when the future-year (2022) projected emission totals are below the 2008 attainment year totals.

The Ohio emissions data in the tables below are based on the following data sources:

- All On-Road data source: NOACA and ODOT's Transportation Unit.
- 2008 EGU and non-EGU: Ohio EPA's 2008 annual emissions inventory database.
- All other data source: Lake Michigan Air Directors Consortium (LADCO).

<u>Demonstration</u>

$PM_{2.5}$

The 2005 and 2008 actual $PM_{2.5}$ emissions data below generally contains particulate fraction emissions only and not the condensable fractions as Ohio EPA did not have a consistent reporting requirement during those years. U.S. EPA IPM modeling was used to generate future year EGU emissions with the CAIR program. The IPM modeling added additional $PM_{2.5}$ condensable 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 growth. 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 will be more accurate and appropriate for the purposes of $PM_{2.5}$ to evaluate future year emissions without the CAIR program.

Table 14 - Ashtabula County $PM_{2.5}$ Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2022 (tpy) – Without CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
EGU Point	36.28	58.30	44.93	39.87	18.43
Non-EGU	62.50	76.33	87.84	101.44	-25.11
Non-road	109.41	95.76	65.76	35.58	60.18
Area	501.57	497.00	483.27	469.83	27.17
MAR	64.20	56.53	33.88	11.67	44.86
On-road	11.50	10.04	5.37	3.03	7.01
TOTAL	785.46	793.96	721.05	661.42	132.54

Table 15 - Cuyahoga County $PM_{2.5}$ Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2022 (tpy) – Without CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
EGU Point	81.43	99.40	29.82	0.00	99.40
Non-EGU	807.55	805.11	896.14	969.39	-164.28
Non-road	630.80	553.24	433.84	308.64	244.60
Area	558.62	593.73	606.91	626.56	-32.83
MAR	111.89	103.52	67.75	33.51	70.01
On-road	1,249.47	1,040.28	430.01	320.94	719.34
TOTAL	3439.76	3195.28	2464.47	2259.04	936.24

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Table 16 - Lake County $PM_{2.5}$ Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2022 (tpy) – Without CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
EGU Point	215.93	209.96	228.06	241.39	-31.43
Non-EGU	30.67	23.23	32.67	38.62	-15.39
Non-road	136.94	118.35	87.81	56.06	62.29
Area	132.09	137.25	138.11	140.01	-2.76
MAR	36.49	31.82	18.43	5.28	26.54
On-road	283.09	241.78	122.02	69.42	172.36
TOTAL	835.21	762.39	627.10	550.78	211.61

Table 17 - Lorain County $PM_{2.5}$ Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2022 (tpy) – Without CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
EGU Point	97.82	97.95	101.50	104.45	-6.50
Non-EGU	428.05	471.83	513.52	559.22	-87.39
Non-road	206.78	178.79	127.92	75.70	103.09
Area	401.71	404.47	397.99	392.72	11.75
MAR	57.49	50.13	29.17	8.56	41.57
On-road	319.85	274.43	143.34	81.69	192.74
TOTAL	1511.70	1477.60	1313.44	1222.34	255.26

Table 18 - Medina County $PM_{2.5}$ Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2022 (tpy) – Without CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
EGU Point	0.00	0.00	0.00	0.00	0.00
Non-EGU	96.33	101.55	111.23	121.38	-19.83
Non-road	118.08	102.70	70.71	38.35	64.35
Area	267.67	268.45	263.38	258.96	9.49
MAR	11.00	9.67	5.73	1.86	7.81
On-road	358.80	317.43	152.50	78.48	238.95
TOTAL	851.88	799.80	603.55	499.03	300.77

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Table 19 - Portage County $PM_{2.5}$ Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2022 (tpy) – Without CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
EGU Point	0.00	0.00	0.00	0.00	0.00
Non-EGU	23.59	23.42	30.04	31.11	-7.69
Non-road	116.90	103.27	72.36	41.38	61.89
Area	253.00	253.83	249.01	240.15	13.68
MAR	28.11	24.24	13.66	3.22	21.02
On-road	187.71	160.90	87.54	49.45	111.45
TOTAL	609.31	565.66	452.61	365.31	200.35

Table 20 - Summit County $PM_{2.5}$ Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2022 (tpy) – Without CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
EGU Point	0.00	0.00	0.00	0.00	0.00
Non-EGU	35.45	35.95	35.47	35.29	0.66
Non-road	233.20	203.09	144.73	85.25	117.84
Area	264.95	278.15	281.96	288.30	-10.15
MAR	27.19	24.51	15.15	6.08	18.43
On-road	611.78	511.43	251.70	162.98	348.45
TOTAL	1172.57	1053.13	729.01	577.90	475.23

Table 21 – Cleveland-Akron-Lorain Area $PM_{2.5}$ Emission Inventory Totals for Base Year 2005, Estimated 2008, and projected 2015 and 2022 (tpy) – Without CAIR

PM2.5	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
Ashtabula	785.46	793.96	721.05	661.42	132.54
Cuyahoga	3,439.76	3,195.28	2,464.47	2,259.04	936.24
Lake	835.21	762.39	627.10	550.78	211.61
Lorain	1,511.70	1,477.60	1,313.44	1,222.34	255.26
Medina	851.88	799.80	603.55	499.03	300.77
Portage	609.31	565.66	452.61	365.31	200.35
Summit	1,172.56	1,053.13	729.01	577.90	475.23
COMBINED $PM_{2.5}$ TOTAL	9205.88	8647.82	6911.23	6135.82	2512.00

NO_x

Table 22 - Ashtabula County NO_x Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2022 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
EGU Point	1,592.35	1,462.80	1,931.77	2,132.76	-669.96
Non-EGU	237.55	248.73	356.26	402.35	-153.62
Non-road	1,057.58	940.93	701.40	458.81	482.12
Area	314.70	318.26	318.83	320.12	-1.86
MAR	1,809.20	1,671.71	1,090.67	534.09	1,137.62
On-road	294.66	232.83	107.68	54.49	178.34
TOTAL	5,306.04	4,875.26	4,506.61	3,902.62	972.64

Table 23 - Cuyahoga County NO_x Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2022 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
EGU Point	1,848.36	3,844.25	4,491.88	4,769.43	-925.18
Non-EGU	3,081.22	2,990.08	2,890.16	2,724.22	265.86
Non-road	8,152.55	6,959.06	4,839.11	2,656.68	4,302.38
Area	5,103.40	5,162.21	5,203.60	5,254.00	-91.79
MAR	3,672.47	3,463.56	2,376.29	1,345.39	2,118.17
On-road	36,545.59	28,227.20	12,371.38	6,065.83	22,161.37
TOTAL	58,403.59	50,646.36	32,172.42	22,815.55	27,830.81

Table 24 - Lake County NO_x Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2022 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
EGU Point	12,969.08	11,211.15	11,819.69	11,562.04	-350.89
Non-EGU	471.65	660.35	414.98	244.81	415.54
Non-road	1,873.78	1,638.69	1,228.21	804.76	833.93
Area	848.09	856.84	861.87	868.34	-11.50
MAR	1,065.83	981.02	632.84	298.78	682.24
On-road	8,071.90	6,425.00	2,840.39	1,417.15	5,007.85
TOTAL	25,300.33	21,773.05	17,797.98	15,195.88	6,577.17

Table 25 - Lorain County NO_x Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2022 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
EGU Point	6,959.73	5,696.00	2,730.14	1,459.05	4,236.95
Non-EGU	926.84	774.05	850.81	847.90	-73.85
Non-road	2,507.76	2,175.67	1,521.52	856.02	1,319.65
Area	981.14	992.64	1,000.63	1,010.38	-17.74
MAR	1,711.08	1,578.76	1,025.10	494.46	1,084.30
On-road	9,196.87	7,354.77	3,456.51	1,723.02	5,631.75
TOTAL	22,283.42	18,571.89	10,584.71	6,390.83	12,181.06

Table 26 - Medina County NO_x Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2022 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
EGU Point	0.00	0.00	2.14	3.89	-3.89
Non-EGU	72.84	96.42	63.45	39.34	57.08
Non-road	1,295.08	1,104.33	698.29	288.57	815.76
Area	577.42	583.55	587.11	591.69	-8.14
MAR	331.57	308.06	202.58	101.85	206.21
On-road	9,328.78	7,603.83	3,306.35	1,677.58	5,926.25
TOTAL	11,605.69	9,696.19	4,859.92	2,702.92	6,993.27

Table 27 - Portage County NO_x Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2022 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
EGU Point	0.00	0.00	0.00	0.00	0.00
Non-EGU	83.19	83.68	83.47	82.05	1.63
Non-road	1,184.58	1,001.73	635.48	263.55	738.18
Area	559.86	565.77	568.13	571.56	-5.79
MAR	908.80	838.60	543.41	260.56	578.04
On-road	5,707.22	4,630.98	2,264.50	1,014.35	3,616.63
TOTAL	8,443.65	7,120.76	4,094.99	2,192.07	4,928.69

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Table 28 - Summit County NO_x Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2022 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
EGU Point	0.00	0.00	0.00	0.00	0.00
Non-EGU	1,456.66	643.25	650.08	653.01	-9.76
Non-road	2,953.59	2,459.48	1,520.22	560.88	1,898.60
Area	2,034.66	2,056.80	2,071.34	2,089.36	-32.56
MAR	762.05	706.60	463.60	231.27	475.33
On-road	17,377.28	13,609.82	6,170.32	3,059.45	10,550.37
TOTAL	24,584.24	19,475.95	10,875.56	6,593.97	12,881.98

Table 29 - Cleveland-Akron-Lorain Area NO_x Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2022 (tpy) – With CAIR

NOx	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
Ashtabula	5,306.04	4,875.26	4,506.61	3,902.62	972.62
Cuyahoga	58,403.59	50,646.36	32,172.42	22,815.55	27,529.98
Lake	25,300.33	21,773.05	17,797.98	15,195.88	6,577.17
Lorain	22,283.42	18,571.89	10,584.71	6,390.83	12,181.06
Medina	11,605.69	9,696.19	4,859.92	2,702.92	6,993.27
Portage	8,443.65	7,120.76	4,094.99	2,192.07	4,928.69
Summit	24,584.24	19,475.95	10,875.56	6,593.97	12,881.98
COMBINED NOx TOTAL	155,926.96	132,159.46	84,892.19	59,793.84	72,365.62

SO_2

Table 30 - Ashtabula County SO_2 Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2022 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
EGU Point	4,159.96	3,850.10	4,982.36	5,567.61	-1,717.51
Non-EGU	20.07	31.55	26.47	25.36	6.19
Non-road	104.56	38.61	6.72	1.78	63.83
Area	109.14	107.70	102.15	96.80	10.90
MAR	337.39	274.88	166.08	53.79	221.09
On-road	5.07	1.57	0.66	0.62	0.95
TOTAL	4,736.19	4,304.41	5,284.44	5,745.96	-1,441.55

Table 31 - Cuyahoga County SO_2 Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2022 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
EGU Point	2,991.78	9,920.92	12,145.34	13,098.66	-3,177.74
Non-EGU	5,156.40	5,163.15	5,343.87	5,494.26	-331.11
Non-road	736.73	271.28	47.13	12.64	258.64
Area	291.45	291.73	289.69	287.90	3.83
MAR	423.44	368.20	246.51	124.15	244.05
On-road	846.76	253.16	76.36	68.07	185.09
TOTAL	10,446.56	16,268.44	18,148.90	19,085.68	-2,817.24

Table 32 - Lake County SO_2 Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2022 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
EGU Point	80,187.84	57,730.81	42,363.35	17,921.95	39,808.86
Non-EGU	736.41	939.89	765.31	670.80	269.09
Non-road	162.20	59.94	10.78	3.24	56.70
Area	94.92	93.60	90.23	86.88	6.72
MAR	159.67	135.58	88.03	39.68	95.90
On-road	176.99	51.94	15.91	14.45	37.49
TOTAL	81,518.03	59,011.76	43,333.61	18,737.00	40,274.76

Table 33 - Lorain County SO_2 Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2022 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
EGU Point	42,437.09	22,604.10	8,631.32	2,642.99	19,961.11
Non-EGU	547.68	485.35	541.89	573.40	-88.05
Non-road	249.83	91.90	15.51	3.64	88.26
Area	50.97	49.74	47.45	45.11	4.63
MAR	252.94	214.35	138.69	61.69	152.66
On-road	200.28	60.17	18.51	16.83	43.34

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TOTAL	43,738.79	23,505.61	9,393.37	3,343.66	20,161.95

Table 34 - Medina County SO_2 Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2022 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
EGU Point	0.00	0.00	0.00	0.00	0.00
Non-EGU	142.11	149.84	163.54	178.04	-28.20
Non-road	143.41	52.54	8.41	1.49	51.05
Area	88.82	87.65	84.06	80.55	7.10
MAR	29.01	28.47	22.59	17.15	11.32
On-road	208.74	57.65	17.63	16.83	40.82
TOTAL	612.09	376.15	296.23	294.06	82.09

Table 35 - Portage County SO_2 Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2022 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
EGU Point	0.00	0.00	0.00	0.00	0.00
Non-EGU	10.24	13.01	13.60	14.93	-1.92
Non-road	122.16	44.87	7.39	1.54	43.33
Area	143.62	141.66	134.24	127.08	14.58
MAR	78.55	76.83	60.86	46.01	30.82
On-road	96.74	30.52	13.23	7.40	23.12
TOTAL	451.31	306.89	229.32	196.96	109.93

Table 36 - Summit County SO_2 Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2022 (tpy) – With CAIR

Sector	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
EGU Point	0.00	0.00	0.00	0.00	0.00
Non-EGU	10,866.52	11,102.30	10,899.96	10,835.99	266.31
Non-road	287.66	105.55	17.38	3.65	101.90
Area	174.88	172.54	168.39	164.11	8.43
MAR	66.17	64.83	51.36	38.86	25.97
On-road	319.72	100.66	42.76	39.57	61.09
TOTAL	11,714.95	11,545.88	11,179.85	11,082.18	463.70

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Table 37 - Cleveland-Akron-Lorain Area SO_2 Emission Inventory Totals for Base Year 2005, Estimated 2008, and Projected 2015 and 2022 (tpy) – With CAIR

SO2	2005 Base	2008 Attainment	2015 Interim	2022 Maintenance	Safety Margin
Ashtabula	4,736.19	4,304.41	5,284.44	5,745.96	-1,441.55
Cuyahoga	10,446.56	16,268.44	18,148.90	19,085.68	-2,817.24
Lake	81,518.03	59,011.76	43,333.61	18,737.00	40,274.76
Lorain	43,738.79	23,505.61	9,393.37	3,343.66	20,161.95
Medina	612.09	376.15	296.23	294.06	82.09
Portage	451.31	306.89	229.32	196.96	109.93
Summit	11,714.95	11,545.88	11,179.85	11,082.18	463.70
COMBINED SO2 TOTAL	153,217.92	115,319.14	87,865.72	58,485.50	56,833.64

$PM_{2.5}$, NO_x, and SO_2

Table 38 - Cleveland-Akron-Lorain Area Comparison of 2008 attainment year and 2015 and 2022 projected emission estimates (tpy)

	2008 Attainment	2015 Interim	2015 Projected Decrease	2022 Maintenance	2022 Projected Decrease
$PM_{2.5}$	8,647.82	6,911.23	1,736.59	6,135.82	2,512.00
NO_x	132,159.46	84,892.19	47,267.27	59,793.84	72,365.62
SO_2	115,319.14	87,865.72	27,453.42	58,485.50	56,833.64

As shown in the table above (Table 38), $PM_{2.5}$ emissions in the nonattainment area are projected to decrease by 1,736.59 tpy in 2015 and 2,512.00 tpy in 2022. NO_x emissions in the nonattainment area are projected to decrease by 47,267.27 tpy in 2015 and 72,365.62 tpy in 2022. SO_2 emissions in the nonattainment area are projected to decline by 27,453.42 tpy in 2015 and 56,833.64 in 2022.

Area source emissions and point source emissions for some pollutants show a slight increase due to expectations that the population will grow in this area; however, cleaner vehicles and fuels are expected to be in place in 2009 and 2018, and the CSAPR will be implemented in 2012 and 2014 and these programs should cause an overall drop in all three pollutants emissions. Decreases from U.S. EPA rules covering Tier 2 Motor

Vehicle Emissions Standards and Gasoline Sulfur Control Requirements[16], Highway Heavy-Duty Engine Rule[17], and the Non-Road Diesel Engine Rule[18] are factored into the changes.

In addition to the above, starting in September 2011, First Energy's Eastlake plant will only be used in the future for emergency power purposes. The five units at this facility represent nearly half of the available megawatts for the entire area (1,233 of 2,494 megawatts).

Requirement 4 of 5

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.

Background

Ambient air quality data from all monitoring sites indicate that air quality met the NAAQS for $PM_{2.5}$ in 2008-2010. U.S. EPA's redesignation guidance (p 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."

Demonstration

Permanent and enforceable reductions of $PM_{2.5}$, NO_x, and SO_2 emissions have contributed to the attainment of the annual $PM_{2.5}$ standard. Some of these reductions were realized due to the application of tighter federal standards on non-road diesel vehicles (Clean Air Non-road Diesel Rule) and the application of tighter federal standards on new vehicles. Also Title IV of the CAA, the NO_x SIP Call, CAIR, and federal consent decrees required the reductions of SO_2 and NO_x emissions from utility sources. Reductions achieved are discussed in greater detail under Chapter Five.

16 http://www.epa.gov/fedrgstr/EPA-AIR/2000/February/Day-10/a19a.htm
17 http://www.epa.gov/fedrgstr/EPA-AIR/1997/October/Day-21/a27494.htm
18 http://www.epa.gov/fedrgstr/EPA-AIR/1998/October/Day-23/a24836.htm

Table 39 - Cleveland-Akron-Lorain Area Comparison of 2005 base year and 2008 attainment year on-road and EGU reductions

	2005	2008
On-road $PM_{2.5}$	3,022.20	2,556.29
On-road NO_x	86,522.30	68,084.43
On-road SO_2	1,854.30	555.67
Non-road $PM_{2.5}$	1,552.11	1,355.20
Non-road NO_x	19,024.92	16,279.89
Non-road SO_2	1,806.55	664.69
EGU $PM_{2.5}$	431.46	465.61
EGU NO_x	23,369.52	22,214.20
EGU SO_2	129,776.67	94,105.93

Requirement 5 of 5

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

Demonstration

In Ohio, major point sources in all counties are required to submit air emissions information annually, in accordance with U.S. EPA's Consolidated Emissions Reporting Rule (CERR). Ohio EPA prepares a new periodic inventory for all $PM_{2.5}$ precursor emission sectors every three years. These $PM_{2.5}$ precursor inventories will be prepared for future years as necessary to comply with the inventory reporting requirements established in the CFR. Emissions information will be compared to the 2005 base year and the 2022 projected maintenance year inventories to assess emission trends, as necessary, and to assure continued compliance with the annual $PM_{2.5}$ standard.

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CHAPTER FIVE

CONTROL MEASURES AND REGULATIONS

CAA Section107 (d)(3)(E)(ii), 107(d)(3)(iv), and 107(d)(3)(E)(v)

Requirement 1 of 6

Section 172(c)(1) of the 1990 Clean Air Act Amendments requires states with nonattainment areas to implement RACM and RACT.

Background

Section 172(c)(1) of the 1990 Clean Air Act Amendments requires states with nonattainment areas to submit a SIP providing for implementation of all reasonably available control measures and as expeditiously as practicable (including such reductions in emissions from existing sources in the area as may be obtained through the adoption, at a minimum, of reasonable available control technology).

U.S. EPA's Implementation Rule interprets this requirement in great detail. Under U.S. EPA's approach, RACT is determined as part of the broader RACM analysis and identification of all measures (for stationary, mobile, and area sources) that are technically and economically feasible, and that would collectively contribute to advancing the attainment date (i.e. by one year or more). States are required to use a combined approach to RACT and RACM, that (1) identifies potential measures that are reasonable, (2) uses modeling to identify the attainment date that is as expeditious as practicable, and (3) selects the appropriate RACT and RACM.

The Implementation Rule also provides for a presumption that in States that fulfill their CAIR emission reduction requirements, EGU compliance with CAIR is equivalent to RACM/RACT.

Demonstration

In 1972, 1980, and 1991, Ohio promulgated rules requiring reasonably available controls measures for particulate emissions from stationary sources.

Statewide RACT rules have been applied to all new sources locating in Ohio since that time. RACT requirements are incorporated into permits along with monitoring, recordkeeping, and reporting necessary to ensure ongoing compliance. Ohio EPA also has an active enforcement program to address violations

discovered by field office staff. The Ohio RACT rules for particulate matter are found in OAC Chapter 3745-17[19].

In addition, Ohio EPA promulgated NO_x SIP Call rules (OAC Chapter 3745-14[20]), CAIR (OAC Chapter 3745-109[21]), and NO_x Reasonably Available Control Technology rules (OAC Chapter 3745-110[22]) over the past five years. Emissions from EGUs make up a significant contribution to Ohio's inventory. Beginning in 2009, Ohio implemented CAIR which has, and will, provide for significant reductions in NO_x, $PM_{2.5}$, and SO_2 until such time CSAPR is implemented. Then the CSAPR will provide for even greater reductions.

As part of a larger initiative, LADCO, in consultation with two contractors, performed a series of studies exploring control measures for reducing both ozone precursors and $PM_{2.5}$ precursors in Ohio, Illinois, Indiana, Michigan, and Wisconsin area. The first consultant, MACTEC, prepared a series of white papers[23] researching different stationary source categories. The results were compiled into two reports[24]. The second consultant, Environ, investigated control options for mobile sources. The results were compiled into two reports[25]. The stationary and mobile source sectors (and associated control measures) were selected by the LADCO States based on several factors presented in the report (See Chapter 2).

Photochemical modeling was then conducted (as part of LADCO Round 4 modeling) to assess the air quality benefit of the candidate control measures and a modeling report was developed[26]. Based on the results, the LADCO project team felt it would not be possible to advance the attainment date for $PM_{2.5}$. Ohio EPA, in its attainment demonstration submitted on July 18, 2008, demonstrated (using a weight of evidence approach) that

19 http://www.epa.ohio.gov/dapc/regs/3745_17.aspx
20 http://www.epa.ohio.gov/dapc/regs/3745_14.aspx
21 http://www.epa.ohio.gov/dapc/regs/3745_109.aspx
22 http://www.epa.ohio.gov/dapc/regs/3745_110.aspx
23 http://www.ladco.org/reports/control/white_papers
24 http://www.ladco.org/reports/control/final_reports/identification_and_evaluation_of_candidate_control_measures_i_april_2005.pdf; http://www.ladco.org/reports/control/final_reports/identification_and_evaluation_of_candidate_control_measures_ii_june_2006.pdf
25 http://www.ladco.org/reports/control/final_reports/final_report_evaluation_of_candidate_mobile_source_control_measures_february_2006.pdf; http://www.ladco.org/reports/control/final_reports/final_report_evaluation_of_candidate_mobile_source_control_measures_for_ladco_states_in_2009_and_2012_march_2007.pdf
26 http://www.ladco.org/reports/control/modeling/round4_modeling.pdf

attainment would be achieved in this area by 2009. Because of a projected 2009 attainment date, it would not have been reasonably possible or practicable for Ohio to develop RACT/RACM requirements, promulgate regulations and implement a control program prior to the projected attainment date.

Requirement 2 of 6

Section 172(c)(2) of the 1990 CAA Amendments requires attainment demonstration SIPs for nonattainment areas to show reasonable further progress (RFP).

Background

U.S. EPA's Implementation Rule requires RFP only for any area which a State projects an attainment date beyond 2010. The RFP would provide emission reductions showing linear progress between 2002 and 2009. If a State demonstrates attainment will occur by 2010 or earlier, U.S. EPA considers the attainment demonstration to demonstrate achievement of RFP.

Demonstration

In Ohio's attainment demonstration submitted on July 18, 2008, Ohio demonstrated (using a weight of evidence approach) that attainment would be achieved in this area by 2009; and therefore, it was not necessary to submit a separate RFP plan.

Requirement 3 of 6

Section 172(c)(3) requires states to submit a comprehensive inventory of actual emissions.

Background

Section 172(c)(3) requires states to submit a comprehensive inventory of actual emissions in the area, including the requirement for periodic revisions as determined necessary. 40 CFR 51.1008 requires such inventory to be submitted within three years of designation and requires a baseline emission inventory for calendar year 2002 or other suitable year to be used for attainment planning.

Demonstration

The 2005 comprehensive inventory was submitted to U.S. EPA with Ohio's $PM_{2.5}$ attainment demonstration SIP submitted on July 18, 2008. It was then subsequently revised and resubmitted on June 7, 2010.

Ohio also updates its inventory in accordance with U.S. EPA's CERR rule (i.e. emissions statements). Ohio EPA submitted its

emissions statement SIP on March 18, 1994 which was approved by U.S. EPA on October 13, 1995 (59 FR 51863). As discussed in Chapter 4 (Requirement 4), Ohio EPA submits, and commits to submit, emission inventories (statements) every three years.

Requirement 4 of 6

Evidence that control measures required in past $PM_{2.5}$ SIP revisions have been fully implemented.

Background

In addition to the historic RACT requirements for PM, the U.S. EPA NO_x SIP Call required 22 states to pass rules that would result in significant emission reductions from large EGUs, industrial boilers, and cement kilns in the eastern United States. Ohio passed this rule in 2001. NOx SIP Call requirements are incorporated into permits along with monitoring, recordkeeping, and reporting necessary to ensure ongoing compliance. Ohio EPA also has an active enforcement program to address violations discovered by field office staff. Compliance is tracked through the Clean Air Markets data monitoring program. Beginning in 2004, this rule accounts for a reduction of approximately 31 percent of all NO_x emissions statewide compared to previous uncontrolled years. The other 21 states also have adopted these rules.

On March 10, 2004, the U.S. EPA promulgated the CAIR. Beginning in 2009, U.S. EPA's CAIR rule requires EGUs in 28 eastern states and the District of Columbia to significantly reduce emissions of NO_x and SO_2. CAIR replaced the NOx SIP Call for EGUs. National NO_x emissions will be cut from 4.5 million tons in 2004, to a cap of 1.5 million tons by 2009, and 1.3 million tons in 2018 in 28 states. States were required to submit a CAIR SIP as part of this effort. Ohio submitted a CAIR SIP which was approved by U.S. EPA on February 1, 2007. Revisions to the CAIR SIP were again submitted on July 15, 2009. The revised CAIR SIP was approved as a direct final action on September 25, 2009 (74 FR 48857).

Demonstration

Controls for EGUs under the NO_x SIP Call formally commenced May 31, 2004. Emissions covered by this program have been generally trending downward since 1998 with larger reductions occurring in 2002 and 2003. Data taken from the U.S. EPA Clean Air Markets web site, quantify the gradual NO_x reductions that have occurred in Ohio as a result of Title IV of the 1990 CAA Amendments and the beginning of the NO_x SIP Call Rule. Ohio developed the NO_x Budget Trading Program rules in OAC Chapter

3745-14[27] in response to the SIP Call. OAC Chapter 3745-14 regulates EGUs and certain non-EGUs under a cap and trade program based on an 85 percent reduction of NOx emissions from EGUs and a 60 percent reduction of NO_x emissions from non-EGUs, compared to historical levels. This cap was in place through 2008, at which time the CAIR program superseded it as discussed above. Requirement 3 of 5 under Chapter 4 above discussed the reductions Ohio has seen as a result of CAIR.

On April 21, 2004, U.S. EPA published Phase II of the NO_x SIP Call that establishes a budget for large (greater than 1 ton per day emissions) stationary internal combustion engines. Ohio EPA's OAC rule 3745-14-12 addresses stationary internal combustion engines, all used in natural gas pipeline transmissions. U.S. EPA approved this revision to the SIP on April 4, 2008. An 82 percent NO_x reduction from 1995 levels is anticipated. Completion of the compliance plan occurred by May 1, 2006, and the compliance demonstration began May 1, 2007.

Tier II Emission Standards for Vehicles and Gasoline Sulfur Standards

In February 2000, U.S. EPA finalized a federal rule to significantly reduce emissions from cars and light trucks, including sport utility vehicles (SUVs). Under this proposal, automakers will be required to sell cleaner cars, and refineries will be required to make cleaner, lower sulfur gasoline. This rule will apply nationwide. The federal rules will phase in between 2004 and 2009. U.S. EPA has estimated that NO_x emission reductions will be approximately 77 percent for passenger cars, 86 percent for smaller SUVs, light trucks, and minivans, and 65 to 95 percent reductions for larger SUVs, vans, and heavier trucks. The sulfur content of gasoline is estimated to be reduced by up to 90 percent. VOC emission reductions will be approximately 12 percent for passenger cars, 18 percent for smaller SUVs, light trucks, and minivans, and 15 percent for larger SUVs, vans, and heavier trucks.

Heavy-Duty Diesel Engines

In July 2000, U.S. EPA issued a final rule for Highway Heavy Duty Engines, a program which includes low-sulfur diesel fuel standards, which will be phased in from 2004 through 2007. This rule applies to heavy-duty gasoline and diesel trucks and buses. This rule will result in a 40 percent reduction in NO_x from diesel trucks and buses, a large sector of the mobile sources NO_x

27 http://www.epa.ohio.gov/dapc/regs/3745_14.aspx

inventory. It also estimated the level of sulfur in highway diesel fuel will be reduced by 97 percent by mid-2006.

Clean Air Non-road Diesel Rule

In May 2004, U.S. EPA issued the Clean Air Non-road Diesel Rule. This rule applies to diesel engines used in industries such as construction, agriculture, and mining. It also contains a cleaner fuel standard similar to the highway diesel program. The new standards will cut emissions from non-road diesel engines by more than 90 percent. Non-road diesel equipment, as described in this rule, currently accounts for 47 percent of diesel particulate matter (PM) and 25 percent of NO_x from mobile sources nationwide. Sulfur levels will be reduced in non-road diesel fuel by 99 percent from current levels, from approximately 3,000 parts per million (ppm) now to 15 ppm in 2009. New engine standards take effect, based on engine horsepower, starting in 2008. Together, these rules will substantially reduce local and regional sources of $PM_{2.5}$ precursors.

Requirement 5 of 6

Acceptable provisions to provide for new source review.

Background

Ohio has a longstanding and fully implemented New Source Review (NSR) program. This is addressed in OAC Chapter 3745-31[28]. The Chapter includes provisions for the Prevention of Significant Deterioration (PSD) permitting program in OAC rules 3745-31-01 to 3745-31-20. Ohio's PSD program was conditionally approved on October 10, 2001 (66 FR 51570) and received final approval on January 22, 2003 (68FR 2909) by U.S. EPA as part of the SIP.

Demonstration

Any facility that is not listed in the 2005 emission inventory, or for the closing of which credit was taken in demonstrating attainment, will not be allowed to construct, reopen, modify, or reconstruct without meeting all applicable NSR requirements. Once the area is redesignated, Ohio EPA will implement NSR through the PSD program.

Requirement 6 of 6

28 http://www.epa.ohio.gov/dapc/regs/3745_31.aspx

Assure that all existing control measures will remain in effect after redesignation unless the State demonstrates through modeling that the standard can be maintained without one or more control measures.

Demonstration

Ohio commits to maintaining the aforementioned control measures after redesignation. Ohio hereby commits that any changes to its rules or emission limits applicable to $PM_{2.5}$, SO_2, and NO_x as required for maintenance of the annual $PM_{2.5}$ standard in the Cleveland-Akron-Lorain area, will be submitted to U.S. EPA for approval as a SIP revision.

Ohio, through Ohio EPA's Legal office, 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 $PM_{2.5}$ precursors in the Cleveland-Akron-Lorain area.

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CHAPTER SIX

CONTINGENCY MEASURES

CAA Section 107(d)(3)(E)(v)

Requirement 1 of 4

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

Demonstration

Ohio hereby commits to review its maintenance plan eight years after redesignation, as required by Section 175(A) of the CAA.

Requirement 2 of 4

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.

Demonstration

Ohio hereby commits to adopt and expeditiously implement necessary corrective actions in the following circumstances:

Warning Level Response:

A warning level response shall be prompted whenever the $PM_{2.5}$ average of the weighted annual mean of 15.5 µg/m^3 occurs in a single calendar year within the maintenance area. A warning level response will consist of a study to determine whether the $PM_{2.5}$ value indicates a trend toward higher $PM_{2.5}$ values or whether emissions appear to be increasing. The study will evaluate whether the trend, if any, is likely to continue and, if so, the control measures necessary to reverse the trend taking into consideration ease and timing for implementation as well as economic and social considerations. Implementation of necessary controls in response to a warning level response trigger will take place as expeditiously as possible, but in no event later than 12 months from the conclusion of the most recent calendar year.

Should it be determined through the warning level study that action is necessary to reverse the noted trend, the procedures for control selection and implementation outlined under “action level response” shall be followed.

Action Level Response:

An action level response shall be prompted whenever a two-year average of the weighted annual means of 15.0 µg/m^3 or greater occurs within the maintenance area. A violation of the standard

(three-year average of the weighted annual means of 15.0 µg/m^3 or greater) shall also prompt an action level response. In the event that the action level is triggered and is not found to be due to an exceptional event, malfunction, or noncompliance with a permit condition or rule requirement, Ohio EPA in conjunction with the metropolitan planning organization or regional council of governments, will determine additional control measures needed to assure future attainment of the NAAQS for annual $PM_{2.5}$. In this case, measures that can be implemented in a short time will be selected in order to be in place within 18 months from the close of the calendar year that prompted the action level. Ohio EPA will also consider the timing of an action level trigger and determine if additional, significant new regulations not currently included as part of the maintenance provisions will be implemented in a timely manner and will constitute our response.

Control Measure Selection and Implementation

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

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

Requirement 3 of 4

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

Demonstration

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. The selection of measures will be based on cost-effectiveness, emission reduction potential, economic and social considerations or other factors that Ohio EPA deems appropriate. Ohio EPA will solicit input from all interested and affected persons in the maintenance area prior to selecting appropriate contingency measures. Because it is not possible at this time to determine what control measures will be appropriate at an unspecified time in the future, the list of contingency measures outlined below is not exhaustive.

1) Diesel reduction emission strategies.
2) Alternative fuel (e.g., liquid propane and compressed natural gas) and diesel retrofit programs for fleet vehicle operations.
3) Tighter $PM_{2.5}$, SO_2, and NO_x emissions offsets for new and modified major sources.
4) Impact crushers located at recycle scrap yards – upgrade wet suppression.
5) Concrete manufacturing – upgrade wet suppression.
6) Additional NO_x RACT statewide.

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.

Requirement 4 of 4

A list of $PM_{2.5}$, SO_2, and NO_x sources potentially subject to future additional control requirements.

Demonstration

The following is a list of $PM_{2.5}$, SO_2, and NO_x sources potentially subject to future controls.

- ICI Boilers - SO_2 and NO_x controls;
- EGUs;
- process heaters;
- internal combustion engines;
- combustion turbines;
- other sources greater than 100 tons per year;
- fleet vehicles;
- concrete manufacturers;
- aggregate processing plants;

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CHAPTER SEVEN

PUBLIC PARTICIPATION

Ohio published notification for a public hearing and solicitation for public comment concerning the draft redesignation petition and maintenance plan in the widely distributed county publications on _____.

The public hearing to receive comments on the redesignation request was held on _____, at the Ohio EPA Northeast District Office, Twinsburg, Ohio. The public comment period closed on _____. Appendix F includes a copy of the public notice, certification of publication, and the transcript from the public hearing.

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CHAPTER EIGHT

CONCLUSIONS

The Cleveland-Akron-Lorain annual $PM_{2.5}$ nonattainment area has attained the 1997 annual NAAQS for $PM_{2.5}$ and complied with the applicable provisions of the 1990 Amendments to the CAA regarding redesignations of $PM_{2.5}$ nonattainment areas. Documentation to that effect is contained herein. Ohio EPA has prepared a redesignation request and maintenance plan that meet the requirements of Section 110 (a)(1) of the 1990 CAA.

Based on this presentation, the Cleveland-Akron-Lorain annual $PM_{2.5}$ nonattainment area meets the requirements for redesignation under the CAA and U.S. EPA guidance. Ohio has performed an analysis that shows the air quality improvements are due to permanent and enforceable measures. Furthermore, because this area is subject to significant transport of pollutants, significant regional SO_2 and NO_x reductions will ensure continued compliance (maintenance) with the standard with an increasing margin of safety.

The State of Ohio hereby requests that the Cleveland-Akron-Lorain annual $PM_{2.5}$ nonattainment area be redesignated to attainment simultaneously with U.S. EPA approval of the maintenance plan provisions contained herein.

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