CRITERIA POLLUTANTS

Air Quality Trend Analysis Report
(1980-2010)

NORTH CENTRAL INDIANA

Indiana Department of Environmental Management

Office of Air Quality

This page was intentionally left blank.

Table of Contents

Figures

Tables

Graphs

Charts

Appendix

Acronyms/Abbreviation List

CAA	Clean Air Act
CAIR	Clean Air Interstate Rule
CO	carbon monoxide
CSAPR	Cross-State Air Pollution Rule
D.C.	District of Columbia
EGUs	electric generating units
FR	Federal Register
I	interstate
IAC	Indiana Administrative Code

IDEM	Indiana Department of Environmental Management
MWe	megawatt electrical
NAAQS	National Ambient Air Quality Standard
NEI	National Emissions Inventory
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NSR	New Source Review
$PM_{2.5}$	particulate matter less than or equal to 2.5 $\mu g/m^3$ or fine particles
PM_{10}	particulate matter less than or equal to 10 $\mu g/m^3$ or particulate matter
ppb	parts per billion
ppm	parts per million
RACT	Reasonably Available Control Technology
SIP	State Implementation Plan
SO_2	sulfur dioxide
SUVs	sport utility vehicles
TSP	total suspended particulate
U.S. EPA	United States Environmental Protection Agency
$\mu g/m^3$	micrograms per cubic meter
VOC	volatile organic compound
VMT	vehicle miles traveled

Introduction

The North Central Indiana area is composed of five counties. The counties represented in the area shown in Figure 1 are: Elkhart, Fulton, Kosciusko, Marshall, and St. Joseph. One major interstate passes through the North Central Indiana area, Interstate (I)-80 through the northern part of Elkhart and St. Joseph counties.

There are currently 5 criteria pollutant monitoring sites in North Central Indiana collecting data for fine particles ($PM_{2.5}$), nitrogen dioxide (NO_2), and ozone. The map in Figure 1 reflects only the monitors that are currently in operation. Monitoring data for the years 2000 through 2010 for North Central Indiana are included in the tables for each regulated criteria pollutant, if available. Monitoring data prior to the year 2000 are available upon request. Trend graphs of historical data for the years 1980 through 2010 are also provided.

The largest emission sources within the North Central Indiana area include the University of Notre Dame and New Energy Corporation. Emission trend graphs and pie charts are included for the precursors for each regulated criteria pollutant. Emission information by county is available upon request.

Figure 1: Map of North Central Indiana Counties and Monitors

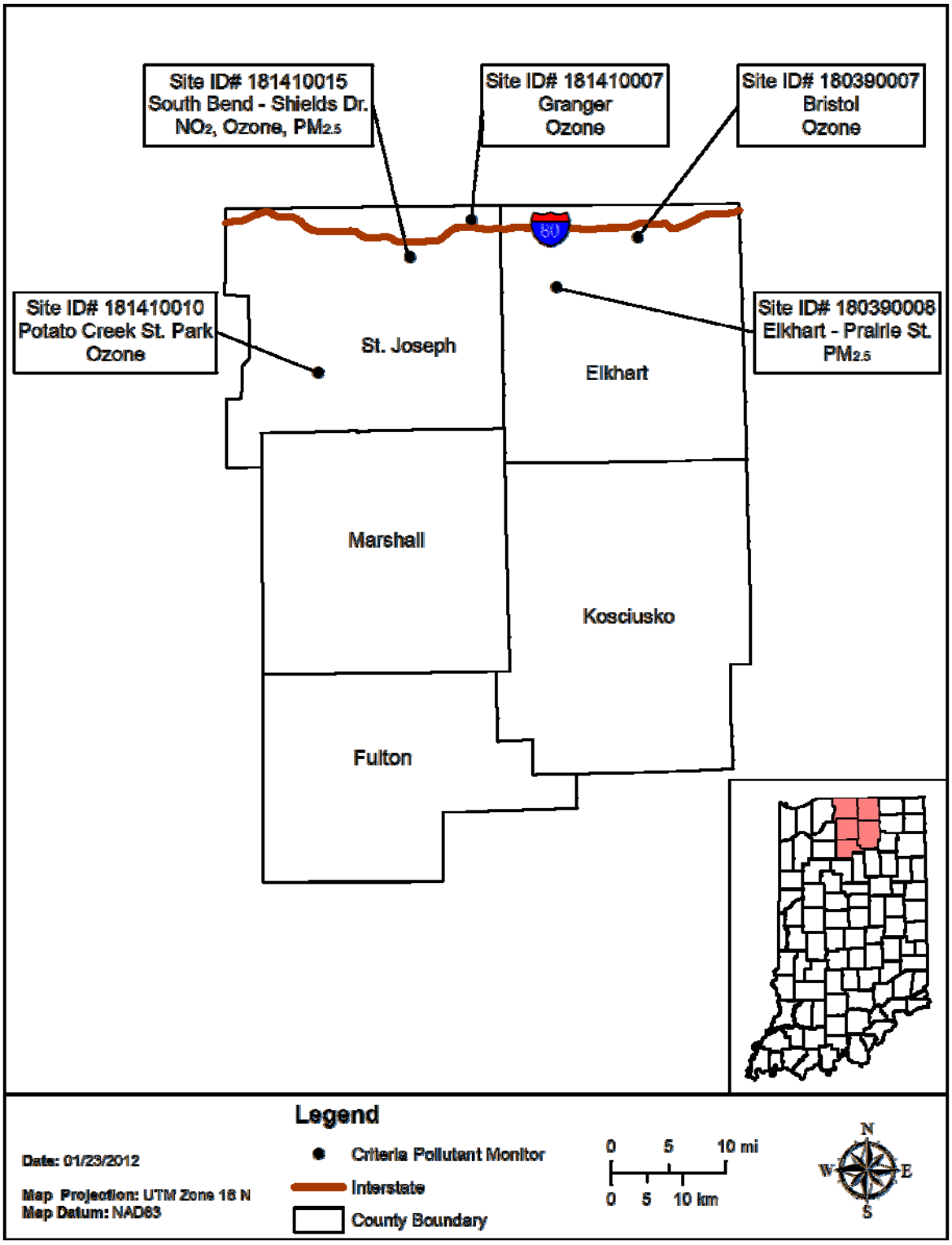


Table 1: North Central Indiana County Population Information

COUNTY	COUNTY SEAT	LARGEST CITY	2010 NUMBER OF HOUSE-HOLDS	1980 POPU-LATION	1990 POPU-LATION	2000 POPU-LATION	2010 POPU-LATION	POPULATION PERCENT DIFFERENCE BETWEEN 1980 AND 2010
ELKHART	GOSHEN	ELKHART	77,767	137,330	156,198	182,791	197,559	44%
FULTON	ROCHESTER	ROCHESTER	9,708	19,335	18,840	20,511	20,836	8%
KOSCIUSKO	WARSAW	WARSAW	37,038	59,555	65,294	74,057	77,358	30%
MARSHALL	PLYMOUTH	PLYMOUTH	19,845	39,155	42,182	45,128	47,051	20%
ST. JOSEPH	SOUTH BEND	SOUTH BEND	114,849	241,617	247,052	265,559	266,931	10%

Table 1 shows that Elkhart County has had the highest percent growth in population between 1980 and 2010, increasing by 44%. The population for every county in the North Central Indiana area had an increase in population from 1980 compared to 2010. While Elkhart County is growing significantly, the population density is less than St. Joseph County, which has experienced moderate growth with a population increase of 25,314 people since 1980. An increase or decrease in population within the counties in the North Central Indiana area can largely be attributed to changes in the job market and the location of jobs in the North Central Indiana area. Changes in population size, age, and distribution affect environmental issues ranging from basic needs such as food and water to atmospheric changes such as an increase in emissions from vehicle miles traveled (VMT), area sources, and the demand for electricity. Generally, increases in population will result in higher area source and mobile emissions. Examples of area sources that increase with higher population include household paints, lawnmowers, and consumer solvents. In addition, higher population figures indicate a secondary effect on increasing VMT if the change in population occurs away from the employment centers.

Table 2: North Central Indiana Vehicle Miles Traveled (VMT) Information

COUNTY	2010 NUMBER OF ROADWAY MILES	2009 NUMBER OF REGISTERED VEHICLES	Back Casted 1980 DAILY VMT	2010 DAILY VMT	PERCENT DIFFERENCE BEWTEEN 1992 AND 2010 DAILY VMT
ELKHART	1,803	183,908	2,570,833	4,236,000	65%
FULTON	944	24,233	624,715	686,000	10%
KOSCIUSKO	1,506	85,484	1,262,558	1,899,000	50%
MARSHALL	1,217	51,200	1,669,485	1,477,000	-12%
ST. JOSEPH	453	231,937	2,131,330	6,180,000	190%

Table 2 illustrates that St. Joseph County had the highest increase in daily VMT since 1980. The daily VMT for 4 of the 5 counties in the North Central Indiana area have increased over time. Daily VMT data are only available as far back as 1992, prior to that year, data were not collected in a comparable manner. However, the annual change between 1992 and 2010 was applied for the years 1980 to 1992 to approximate the VMT for 1980. The United States Environmental Protection Agency (U.S. EPA) estimates that motor vehicle exhaust is a major source of emissions of CO, $PM_{2.5}$, and ozone precursors (volatile organic compounds (VOCs) and nitrogen oxides (NO_x)). Generally, increases in VMT result in subsequent increases in emissions of CO, VOCs, and NO_x from mobile sources. These increases in VMT also result in increased evaporative emissions from more gasoline and diesel consumption. Each of these factors may be somewhat offset by fleet turn-over where newer, cleaner vehicles replace older, more polluting ones.

Table 3: 2009 North Central Indiana Commuting Patterns

COUNTY	NUMBER WHO LIVE AND WORK IN THE COUNTY	NUMBER WHO LIVE IN COUNTY BUT WORK OUTSIDE THE COUNTY	NUMBER OF PEOPLE WHO LIVE IN ANOTHER COUNTY OR STATE BUT WORK IN COUNTY	TOP COUNTY OR STATE SENDING WORKERS INTO COUNTY	NUMBER OF PEOPLE FROM TOP COUNTY OR STATE SENDING WORKERS INTO COUNTY	TOP COUNTY OR STATE RECEIVING WORKERS FROM COUNTY	NUMBER OF PEOPLE FROM TOP COUNTY OR STATE RECEIVING WORKERS FROM COUNTY
ELKHART	110,745	8,166	23,568	ST. JOSEPH	8,443	ST. JOSEPH	4,502
FULTON	11,120	2,562	1,354	MIAMI	327	KOSCIUSKO	703
KOSCIUSKO	45,514	5,994	6,455	WHITLEY	1,216	ELKHART	3,217
MARSHALL	24,592	5,561	4,249	STARKE	1,400	ST. JOSEPH	2,395
ST. JOSEPH	146,462	14,642	18,907	STATE OF MICHIGAN	6,258	ELKHART	8,443

Information in Table 3 from 2009 demonstrates that the largest workforce in North Central Indiana is found in Elkhart and St. Joseph counties. Commuting patterns in North Central Indiana center on the City of Elkhart in Elkhart County and the City of South Bend in St. Joseph County. Since Elkhart and St. Joseph counties have the highest populations and the highest commuting patterns to and from the counties, emissions within Elkhart and St. Joseph counties are expected to be higher than surrounding counties in the North Central Indiana area. The North Central Indiana area commuting patterns reflect that of many urban areas around the country. The largest employment counties are Elkhart and St. Joseph counties and a significant number of those workers commute from the outlying counties. This type of commuting pattern results in longer trips from the place of residence to the employer. Longer commutes result in increased emissions.

Improvements in Air Quality

Indiana's air quality has improved significantly over the last 30 years. The majority of air quality improvements in North Central Indiana have stemmed from the national and regional controls outlined below. These programs have been or are being implemented and have reduced monitored ambient air quality values in North Central Indiana and across the state.

National Controls

Acid Rain Program

Congress created the Acid Rain Program under Title IV of the 1990 Clean Air Act (CAA). The overall goal of the program is to achieve significant environmental and public health benefits through reduction in emissions of SO_2 and NO_x, the primary causes of acid rain. To achieve this goal at the lowest cost to the public, this program employs both traditional and innovative, market-based approaches to controlling air pollution. Specifically, the program seeks to limit, or "cap," SO_2 emissions from power plants at 8.95 million tons annually starting in 2010, authorizes those plants to trade SO_2 allowances, and while not establishing a NO_x trading program, reduces NO_x emission rates. In addition, the program encourages energy efficiency and pollution prevention.

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-duty trucks, including sport utility vehicles (SUVs). This rule requires automakers to produce cleaner cars, and refineries to make cleaner, lower sulfur gasoline. This rule was phased in between 2004 and 2009 and resulted in a 77% decrease in NO_x emissions from passenger cars, an 86% decrease from smaller SUVs, light duty trucks, and minivans, and a 65% decrease from larger SUVs, vans, and heavier duty trucks. This rule also resulted in a 12% decrease in VOC emissions from passenger cars, an 18% decrease from smaller SUVs, light duty trucks, and minivans, and a 15% decrease from larger SUVs, vans, and heavier duty trucks.

Heavy-Duty Diesel Engines

In July 2000, U.S. EPA issued a final rule for Highway Heavy-Duty Engines, a program that includes low-sulfur diesel fuel standards. This rule applies to heavy duty gasoline and diesel trucks and buses. This rule was phased in from 2004 through 2007 and resulted in a 40% decrease in NO_x emissions from diesel trucks and buses.

Clean Air Nonroad Diesel Rule

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

Nonroad Spark-Ignition Engines and Recreational Engine Standards

This standard, effective in July 2003, regulates NO_x, VOCs, and CO for groups of previously unregulated nonroad engines. This standard applies to all new engines sold in the United States and imported after the standards went into effect. The standard applies to large spark-ignition engines (forklifts and airport ground service equipment), recreational vehicles (off-highway motorcycles and all terrain vehicles), and recreational marine diesel engines. When all of the nonroad spark-ignition engines and recreational

engine standards are fully implemented, an overall 72% reduction in VOC, 80% reduction in NO_x, and 56% reduction in CO emissions are expected by 2020.

Regional Controls

Nitrogen Oxides (NO_x) Rule

On October 27, 1998, U.S. EPA published the NO_x State Implementation Plan (SIP) Call in the Federal Register (FR), which required 22 states to adopt rules that would result in significant emission reductions from large electric generating units (EGUs)[1], industrial boilers, and cement kilns in the eastern United States (63 FR 57356). The Indiana rule was adopted in 2001 at 326 Indiana Administrative Code (IAC) 10-1. Beginning in 2004, this rule accounted for a reduction of approximately 31% of all NO_x emissions statewide compared to previous uncontrolled years.

Twenty-one other states also adopted this rule. The result is that significant reductions have occurred within Indiana and regionally due to the number of affected units within the region. The historical trend charts show that air quality has improved due to the decreased emissions resulting from this program.

On April 21, 2004, U.S. EPA published Phase II of the NO_x SIP Call that established a budget for large (emissions of greater than one ton per day) stationary internal combustion engines (69 FR 21604). In Indiana, the rule decreased NO_x emissions statewide from natural gas compressor stations by 4,263 tons during May through September. The Indiana Phase II NO_x SIP Call rule became effective in 2006 and implementation began in 2007 (326 IAC 10-4).

Clean Air Interstate Rule (CAIR)

On May 12, 2005, the U.S. EPA published the following regulation: “Rule to Reduce Interstate Transport of Fine Particulate Matter and Ozone (CAIR); Revisions to Acid Rain Program; Revisions to the NO_x SIP Call; Final Rule” (70 FR 25162). This rule established the requirement for states to adopt rules limiting the emissions of NO_x and SO_2 and provided a model rule for the states to use in developing their rules in order to

[1] An EGU is a fossil fuel fired stationary boiler, combustion turbine, or combined cycle system that sells any amount of electricity produced.

meet federal requirements. The purpose of CAIR was to reduce interstate transport of $PM_{2.5}$, SO_2, and ozone precursors (NO_x).

Generally, CAIR applied to any stationary, fossil fuel-fired boiler or stationary, fossil fuel-fired combustion turbine, or a generator with a nameplate capacity of more than 25 megawatt electrical (MWe) producing electricity for sale. This rule provided annual state caps for NO_x and SO_2 in two phases, with Phase I caps for NO_x and SO_2 starting in 2009 and 2010, respectively. Phase II caps were to become effective in 2015. U.S. EPA allowed limits to be met through a cap and trade program if a state chose to participate in the program.

In response to U.S. EPA's rulemaking, Indiana adopted a state rule in 2006 based on the model federal rule (326 IAC 24-1). IDEM's rule includes annual and seasonal NO_x trading programs and an annual SO_2 trading program. This rule required compliance effective January 1, 2009.

SO_2 emissions from power plants in the 28 eastern states and the District of Columbia (D.C.) covered by CAIR were to be cut by 4.3 million tons from 2003 levels by 2010 and by 5.4 million tons from 2003 levels by 2015. NO_x emissions were to be cut by 1.7 million tons by 2009 and reduced by an additional 1.3 million tons by 2015. The D.C. Circuit court's vacatur of CAIR in July 2008, and subsequent remand without vacatur of CAIR in December 2008, directed U.S. EPA to revise or replace CAIR in order to address the deficiencies identified by the court. As of May 2012, CAIR remains in effect.

Cross-State Air Pollution Rule (CSAPR)

On August 8, 2011, U.S. EPA published a final rule that helps states reduce air pollution and meet CAA standards. The Cross-State Air Pollution Rule (CSAPR) replaces U.S. EPA's 2005 CAIR, and responds to the court's concerns (76 FR 48208).

CSAPR requires 27 states in the eastern half of the United States to reduce power plant emissions that cross state lines and contribute to ground-level ozone and fine particle pollution in other states.

On December 30, 2011, the U.S. Court of Appeals for the D.C. Circuit stayed CSAPR prior to implementation pending resolution of a challenge to the rule. The court ordered U.S. EPA to continue the administration of CAIR pending resolution of the current appeal. This required U.S. EPA to reinstate 2012 CAIR allowances which had been removed from the allowance tracking system as part of the transition to CSPAR. The federal rule is on hold pending resolution of the litigation.

Reasonably Available Control Technology (RACT) and other State VOC Rules

As required by Section 172 of the CAA, Indiana has promulgated several rules requiring Reasonably Available Control Technology (RACT) for emissions of VOCs since the mid 1990's. In addition, other statewide rules for controlling VOCs have also been promulgated. The Indiana rules are found in 326 IAC 8. The following is a listing of statewide rules that assist with the reduction of VOCs in North Central Indiana:

326 IAC 8-1-6	Best Available Control Technology for Non-Specific Sources
326 IAC 8-2	Surface Coating Emission Limitations
326 IAC 8-3	Organic Solvent Degreasing Operations
326 IAC 8-4	Petroleum Sources
326 IAC 8-5	Miscellaneous Operation
326 IAC 8-6	Organic Solvent Emission Limitations
326 IAC 8-8.1	Municipal Solid Waste Landfills
326 IAC 8-10	Automobile Refinishing
326 IAC 8-14	Architectural and Industrial Maintenance Coatings
326 IAC 8-15	Standards for Consumer and Commercial Products

New Source Review (NSR) Provisions

Indiana has a longstanding and fully implemented NSR program. This is addressed in 326 IAC 2. The rule includes provisions for the Prevention of Significant Deterioration permitting program in 326 IAC 2-2, and emission offset requirements for nonattainment areas in 326 IAC 2-3 for new and modified sources.

State Emission Reduction Initiatives

Outdoor Hydronic Heater Rule

Rule 326 IAC 4-3, effective May 18, 2011, regulates the use of outdoor hydronic heaters (also referred to as outdoor wood boilers or outdoor wood furnaces) designed to burn wood or other approved renewable solid fuels and establishes a particulate emission limit for new units. The rule also includes a fuel use restriction, stack height requirements, and a limited summertime operating ban for existing units.

Reinforced Plastic Composites Fabricating and Boat Manufacturing Industries Rule

Rules 326 IAC 20-48, effective August 23, 2004 and 326 IAC 20-56, effective April 1, 2006, regulate styrene emissions from the boat manufacturing and fiberglass reinforced plastic industries. The state rules implement the federal NESHAP for each of these source categories with additional requirements that were carried over from the Indiana state styrene rule (326 IAC 20-25) adopted in 2000 and now repealed.

North Central Indiana Emission Inventory Data

Emission trend graphs and pie charts for each criteria pollutant are included in this report. Emission trend graphs and pie charts for any precursors that lead to the formation of a criteria pollutant are also included. Indiana's emission inventory data are available for 1980 through 2009 for CO, $PM_{2.5}$, NO_2, PM_{10}, SO_2, and VOC. These emission estimates are reflective of U.S. EPA methodologies found in the National Emissions Inventory (NEI) Air Pollutant Emissions Trends Data. Some of the fluctuations found in the trends inventory are due to U.S. EPA not incorporating state reported data until after the submission of the 1996 Periodic Emission Inventory[1]. Further, U.S. EPA acknowledges that changes over time may be attributable to changes in how inventories were compiled[2].

[1] http://www.epa.gov/ttn/chief/trends/trends98/trends98.pdf
[2] http://www.epa.gov/air/airtrends/2007/report/particlepollution.pdf

The emissions have been broken down into contributions from the following individual source categories: point sources (including electric generating units (EGUs)), area sources, onroad sources, and nonroad sources. There are no EGUs in the North Central Indiana area. Emissions data for each county in North Central Indiana are available upon request.

Point Sources

Point sources include major and minor sources, including EGUs that report emissions through Indiana's emission reporting program. Examples include steel mills, manufacturing plants, surface coating operations, and industrial and commercial boilers.

Area Sources

Area sources are a collection of similar emission units within a geographic area that collectively represent individual sources that are small and numerous and have not been inventoried as a specific point, mobile, or biogenic source. Some of these sources include activities, such as dry cleaning, vehicle refueling, and solvent usage.

Onroad Sources

Onroad sources include cars and light and heavy duty trucks.

Nonroad Sources

Nonroad sources typically include construction equipment, recreational boating, outdoor power equipment, recreational vehicles, farm machinery, lawn care equipment, and logging equipment.

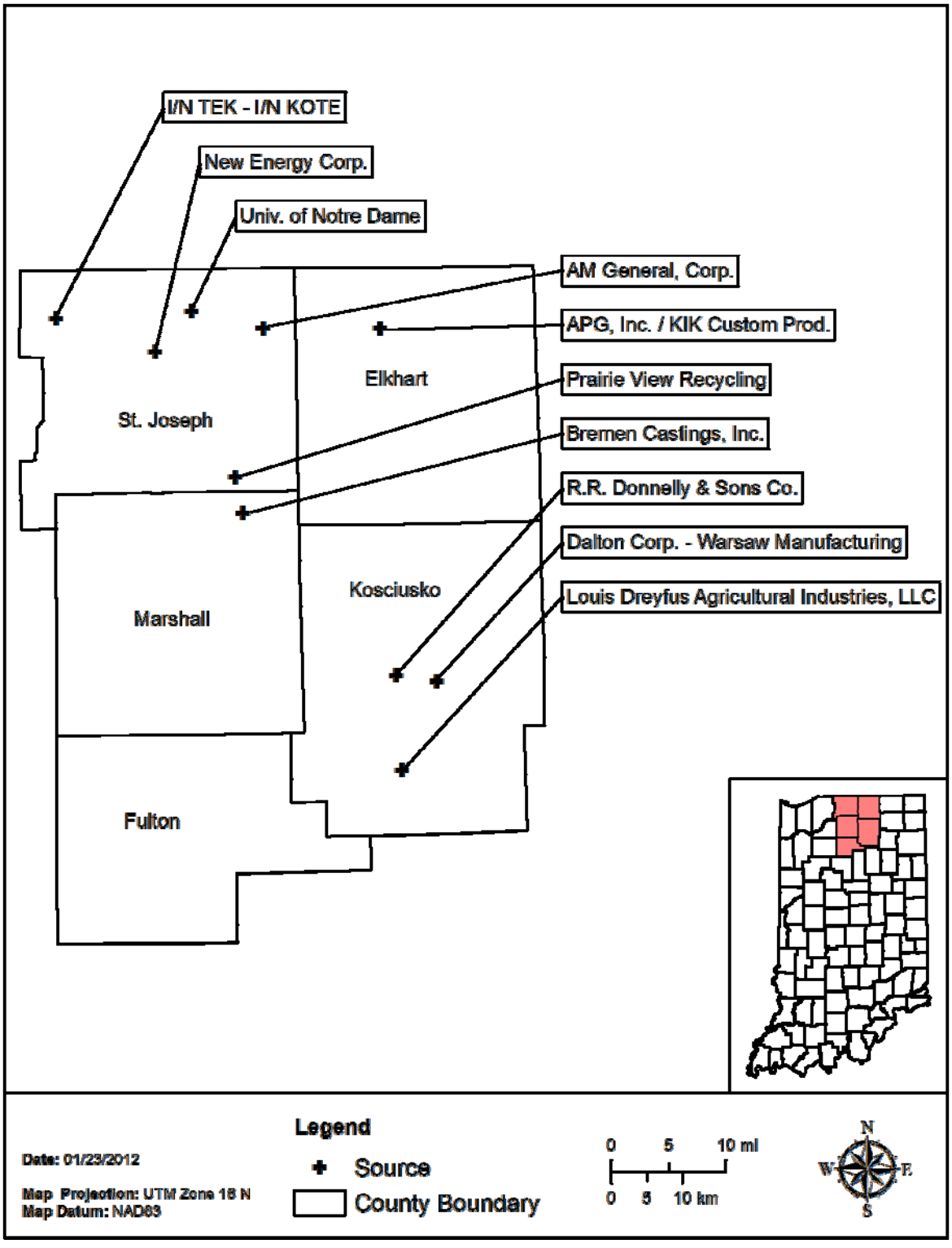
Top Ten Emission Sources

Table 4 represents the top ten sources in tons per year of emissions for the North Central Indiana area and includes coal-fired boilers at a local university, an in-stream power generation product manufacturer, and a gray iron casting foundry. Air quality in the North Central Indiana area is partially influenced by the emissions from these top ten point sources, but as new control measures are adopted, these emissions will continue to decrease. Figure 2 shows the location of these sources within the North Central Indiana area.

Table 4: North Central Indiana Top Ten Sources Data (Tons per Year)

INVENTORY YEAR	COUNTY	FACILITY NAME	CO	NO_x	PM_{10}	$PM_{2.5}$	SO_2	VOC	TOTAL
2010	SAINT JOSEPH	UNIVERSITY OF NOTRE DAME DU LAC POWER PLANT	93.5	613.7	27.7	27.7	1,949.1	5.8	2,717.3
2010	SAINT JOSEPH	NEW ENERGY CORP.	37.7	508.9	54.4	13.8	1,401.1	57.0	2,072.8
2010	KOSCIUSKO	DALTON CORPORATION WARSAW MANUFACTURING	627.3	29.8	100.7	93.6	7.5	94.1	953.0
2009	KOSCIUSKO	LOUIS DREYFUS AGRICULTURAL INDUSTRIES LL	51.4	46.0	27.4	27.2	0.4	405.3	557.7
2009	SAINT JOSEPH	PRAIRIE VIEW RECYCLING	213.7	112.0	19.7	15.0	4.4	9.9	374.6
2010	KOSCIUSKO	R.R. DONNELLEY & SONS COMPANY	18.0	21.5	3.5	2.3	0.1	297.7	343.0
2010	SAINT JOSEPH	I/N TEK I/N KOTE COMBINED	82.7	160.8	21.4	19.9	0.6	9.3	294.5
2010	MARSHALL	BREMEN CASTINGS, INC.	168.6	1.6	36.1	21.4	1.3	25.8	254.7
2010	SAINT JOSEPH	AM GENERAL CORPORATION	9.4	5.6	6.5	6.5	0.1	211.2	239.3
2010	ELKHART	APG INC./KIK CUSTOM	0.6	0.7	0.1	0.1	0.0	236.4	237.8

Figure 2: Map of North Central Indiana Top Ten Sources



Air Quality Trends

An area meets the standard when the monitoring values for a regulated criteria pollutant meet the applicable National Ambient Air Quality Standards (NAAQS). All areas in the North Central Indiana area meet the historic NAAQS. New 1-hour NAAQS were introduced in 2010 for NO_2 and SO_2. The 1-hour NO_2 monitoring data in North Central Indiana, as well as elsewhere in the state, are well below the new 1-hour NO_2 NAAQS. There are no monitors in the North Central Indiana area that measure NO_2 or SO_2.

Air Monitoring and Emissions Data

Not all counties in the North Central Indiana area have an ambient air quality monitor located within the county boundaries. Monitoring data for the years 2000 through 2010 for North Central Indiana are included in the tables in this report for each criteria pollutant, if available. Monitoring data prior to the year 2000 are available upon request. A historical trend graph of all available data for the years 1980 through 2010 is also provided. The data were obtained from the U.S. EPA's Air Quality System.

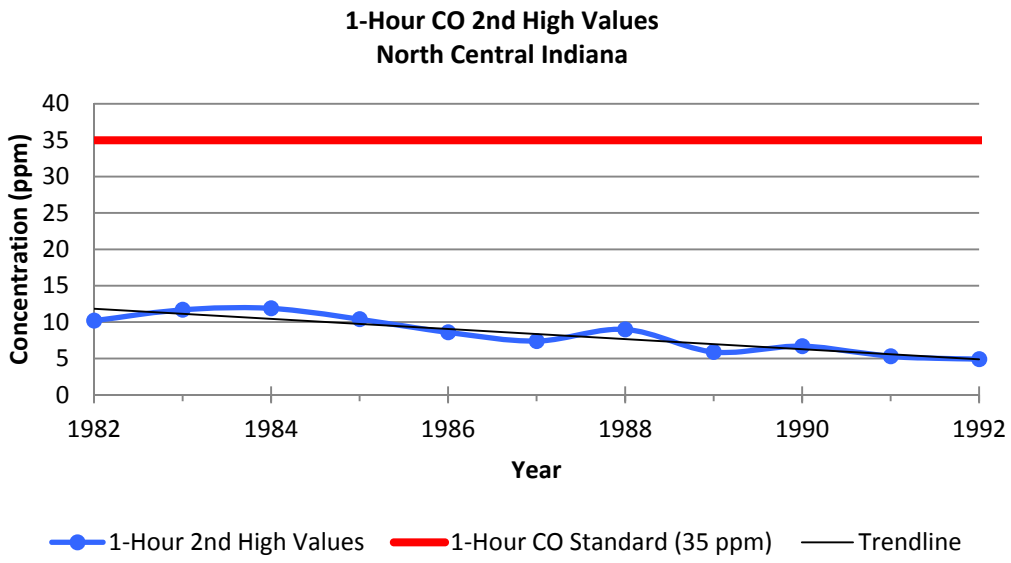
Emission trend graphs and pie charts for the criteria pollutants and precursors that lead to the formation of a criteria pollutant are outlined in this report. Indiana's emission inventory data are available for 1980 through 2009 for CO, $PM_{2.5}$, NO_x, PM_{10}, SO_2, and VOCs. The data were obtained from the U.S. EPA's National Emissions Inventory (NEI). An appendix is attached that includes county-specific emissions data for each county from 1980 through 2009.

Carbon Monoxide (CO)

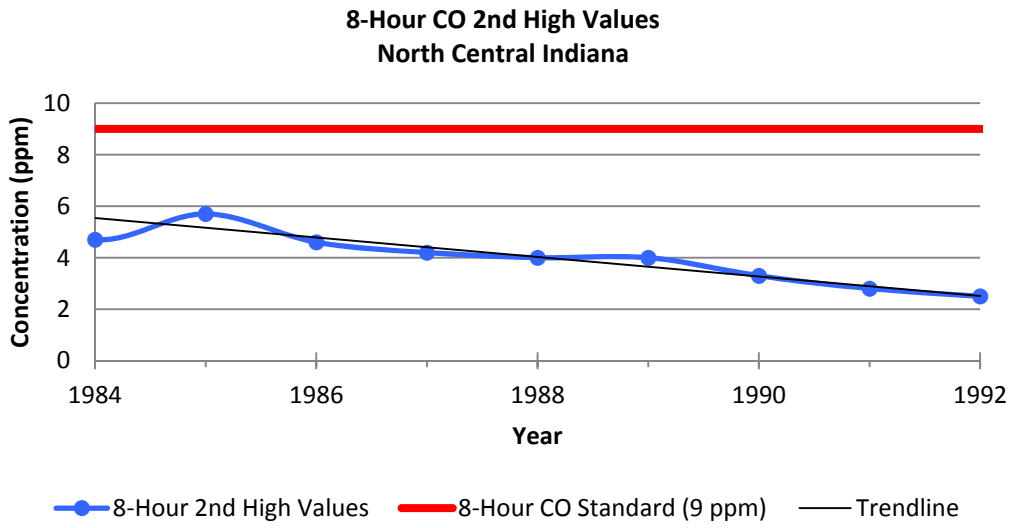
All available CO data for North Central Indiana are from monitors that were located in St. Joseph County. The trend data shown in Graphs 1 and 2 reflect the 2nd highest concentration for 1-hour and 8-hour CO. The 2nd high values are not the highest monitored concentration at a given monitoring location, rather the 2nd highest measured value. These values (2nd highs) are used to determine attainment of the primary 1-hour CO standard at 35 ppm and the primary 8-hour CO standard at 9 ppm. The primary 1-hour and primary 8-hour CO standards were first established in 1971. There are no secondary standards for 1-hour or 8-hour CO. While there are occasional spikes in the monitoring value for both 1-hour and 8-hour CO concentrations, a downward trend over time can be seen in Graphs 1 and 2. Monitoring values have historically been below both the 1-hour and the 8-hour primary CO standards.

CO monitoring sites were discontinued in the North Central Indiana area in 1992; therefore, tables of current monitoring data for 1-hour and 8-hour CO values are not included in this report. However, historical monitoring data for CO monitors in North Central Indiana are available upon request.

Graph 1: North Central Indiana 1-Hour 2nd High CO Values



Graph 2: North Central Indiana 8-Hour 2nd High CO Values



U.S. EPA's NEI contains emissions information for CO which is used for Graph 3 and Chart 1. Graph 3 illustrates the emissions trend for CO in North Central Indiana and Chart 1 shows how the average emissions are distributed among the different source categories.

Graph 3: North Central Indiana CO Emissions

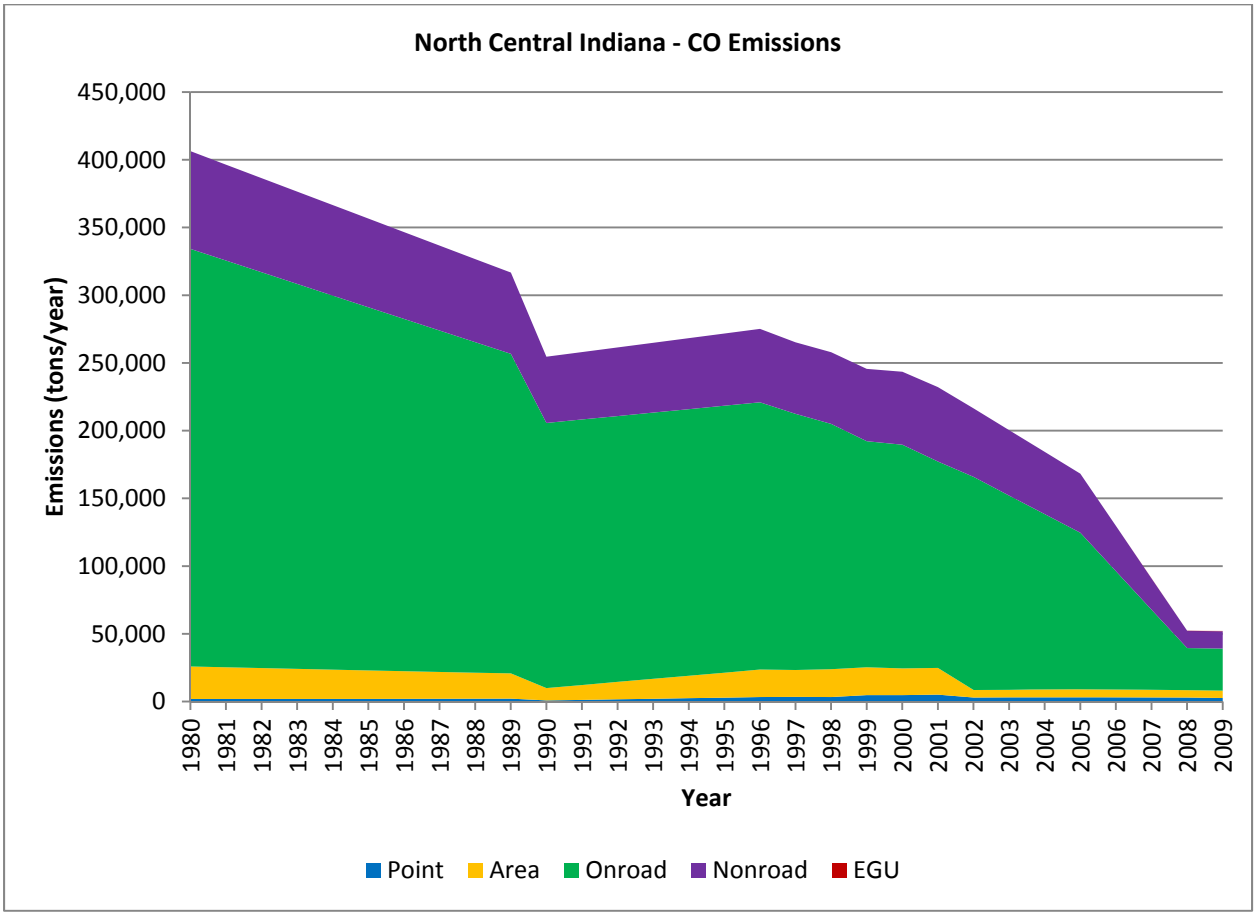
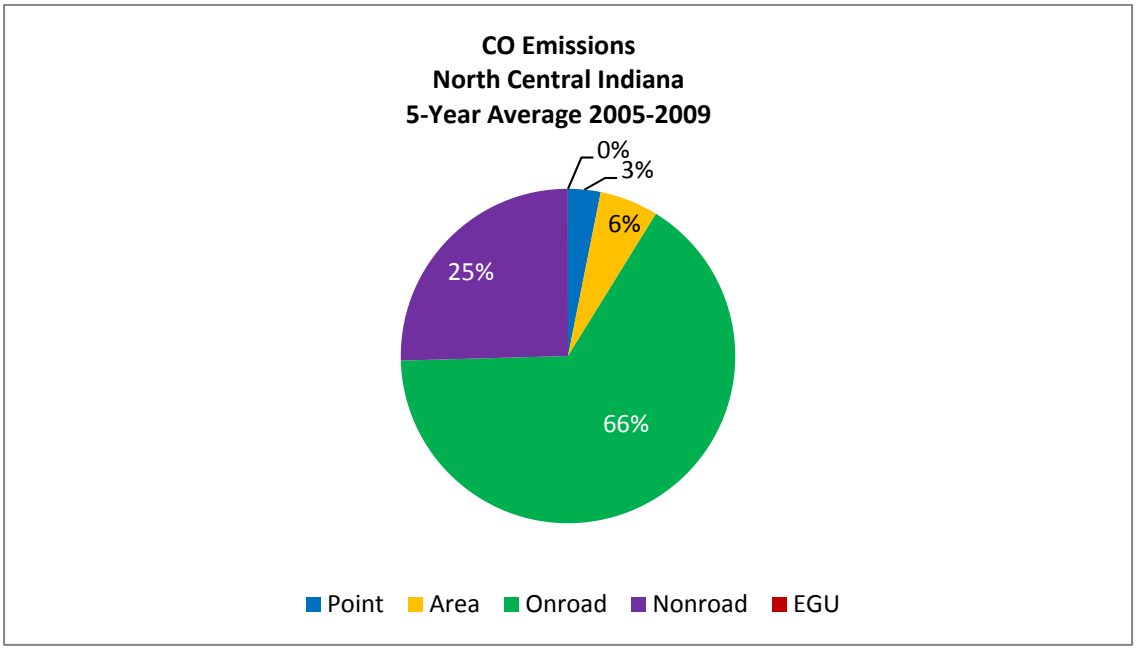


Chart 1: North Central Indiana CO Emissions



National controls have led to a decrease in CO emissions in the North Central Indiana area. As Graph 3 illustrates, CO emissions have decreased by 84% within the North Central Indiana area since 1980. This trend is true throughout Indiana and the upper Midwest. CO is a component of motor vehicle exhaust, which the U.S. EPA estimates to be the primary source of CO emissions. Levels of CO have generally declined since the mid-1980s, primarily due to stricter emission standards for onroad and nonroad engines.

For information on CO standards, sources, health effects, and programs to reduce CO, please see www.epa.gov/airqualilty/carbonmonoxide.

Fine Particles ($PM_{2.5}$)

There are two monitoring sites within North Central Indiana, located in Elkhart and St. Joseph counties currently measuring $PM_{2.5}$ levels. The trend data in Graphs 4 and 6 reflect the annual arithmetic mean (the method used to derive the central tendency of the monitoring values) for annual $PM_{2.5}$ and the 98^{th} percentile (the method used to determine the value below which a certain percent of monitored observations fall) for 24-hour $PM_{2.5}$ for each year in the North Central Indiana area counties for the years 2000 through 2010. The annual arithmetic mean values for annual $PM_{2.5}$ and 98^{th} percentile values for 24-hour $PM_{2.5}$ are not used to compare to the primary and secondary annual or 24-hour $PM_{2.5}$ standards. A three-year average, also known as the design value, is used to compare to both the primary and secondary annual $PM_{2.5}$ standards of 15.0 micrograms per cubic meter ($\mu g/m^3$), as well as the primary and secondary 24-hour $PM_{2.5}$ standards of 35 $\mu g/m^3$, but the annual arithmetic mean and 98^{th} percentile for each year do provide a good indication of annual and 24-hour $PM_{2.5}$ trends over time. The primary and secondary 24-hour $PM_{2.5}$ standards were first established in July 1997 of 65 $\mu g/m^3$. U.S. EPA revised the primary and secondary 24-hour $PM_{2.5}$ standards and lowered them to 35 $\mu g/m^3$ in October 2006.

For both annual and 24-hour $PM_{2.5}$, the secondary standard is the same as the primary standard. Attainment of the annual primary and secondary $PM_{2.5}$ standards is determined by evaluating the design value of the annual arithmetic mean from a single monitor, which must be less than or equal to 15.0 $\mu g/m^3$. An exceedance of the annual $PM_{2.5}$ standards occurs when an annual arithmetic mean value is equal to or greater than 15.0 $\mu g/m^3$. A violation of the annual $PM_{2.5}$ standards occurs when the design value of the annual arithmetic mean value is equal to or greater than 15.05 $\mu g/m^3$. A

monitor can exceed the annual $PM_{2.5}$ standards without being in violation. Attainment of the 24-hour $PM_{2.5}$ standards is determined by evaluating the design value of the 98th percentile of the 24-hour concentrations at each population-oriented monitor within an area, which must not exceed 35 µg/m^3. An exceedance of the 24-hour $PM_{2.5}$ standards occurs when the 98th percentile is equal to or greater than 35 µg/m^3. A violation of the 24-hour $PM_{2.5}$ standards occurs when the design value of the 98th percentile is equal to or greater than 35.5 µg/m^3. A monitor can exceed the 24-hour $PM_{2.5}$ standards without being in violation.

The trend data in Graph 5 reflect the three-year design value of the annual arithmetic mean for annual $PM_{2.5}$ for each year in the North Central Indiana area for the years 2000 through 2010. The trend data in Graph 7 reflect the three-year design value of the 98th percentile values for 24-hour $PM_{2.5}$ for each year in the North Central Indiana area Elkhart and St. Joseph counties for the years 2000 through 2010.

While there is some variability in the monitoring values for both annual $PM_{2.5}$ and 24-hour $PM_{2.5}$, a downward trend over time can be seen in Graphs 4, 5, 6, and 7. The design value of the annual arithmetic mean is used for comparison to the primary and secondary annual $PM_{2.5}$ standards of 15.0 µg/m^3; therefore, the one-year values shown in Graph 4 are not a true comparison to the annual $PM_{2.5}$ standards and the values in the years that are above the red line are not a violation of the primary and secondary annual $PM_{2.5}$ standards. The values in Graph 4 reflect the annual arithmetic mean and the highest value from all of the monitors in the North Central Indiana area is plotted on the graph for each year.

The design value of the 98th percentile is used for comparison to the 24-hour $PM_{2.5}$ standards; therefore, the one-year values shown in Graph 6 are not a true comparison to the 24-hour $PM_{2.5}$ standards and the values in the years that are above the red line are not a violation of the primary and secondary 24-hour $PM_{2.5}$ standards. The values in Graph 6 reflect the 98th percentile and the highest value from all of the monitors in the North Central Indiana area is plotted on the graph for each year.

The data in Tables 5, 6, 7, and 8 are from the monitoring sites that measured annual and 24-hour $PM_{2.5}$ from 2000 to 2010. Statewide monitoring for $PM_{2.5}$ began in 2000; all available data for both annual and 24-hour $PM_{2.5}$ for the North Central Indiana area are shown in the tables. Monitoring data for both annual and 24-hour $PM_{2.5}$ show a downward trend over time.

Monitoring data in Table 5 show the annual arithmetic mean for annual $PM_{2.5}$ for the years 2000 through 2010. Monitoring data in Table 6 show the design value of the annual arithmetic mean for annual $PM_{2.5}$ for the years 2000 through 2010, which are

compared to the primary and secondary annual $PM_{2.5}$ standards of 15.0 µg/m^3. Monitoring data in Table 7 show the 98th percentile for 24-hour $PM_{2.5}$ for the years 2000 through 2010. Monitoring data in Table 8 show the design value of the 98th percentile for 24-hour $PM_{2.5}$ for the years 2000 through 2010, which are compared to the primary and secondary 24-hour $PM_{2.5}$ standards of 35 µg/m^3.

Graph 4: North Central Indiana Annual Arithmetic Mean Values

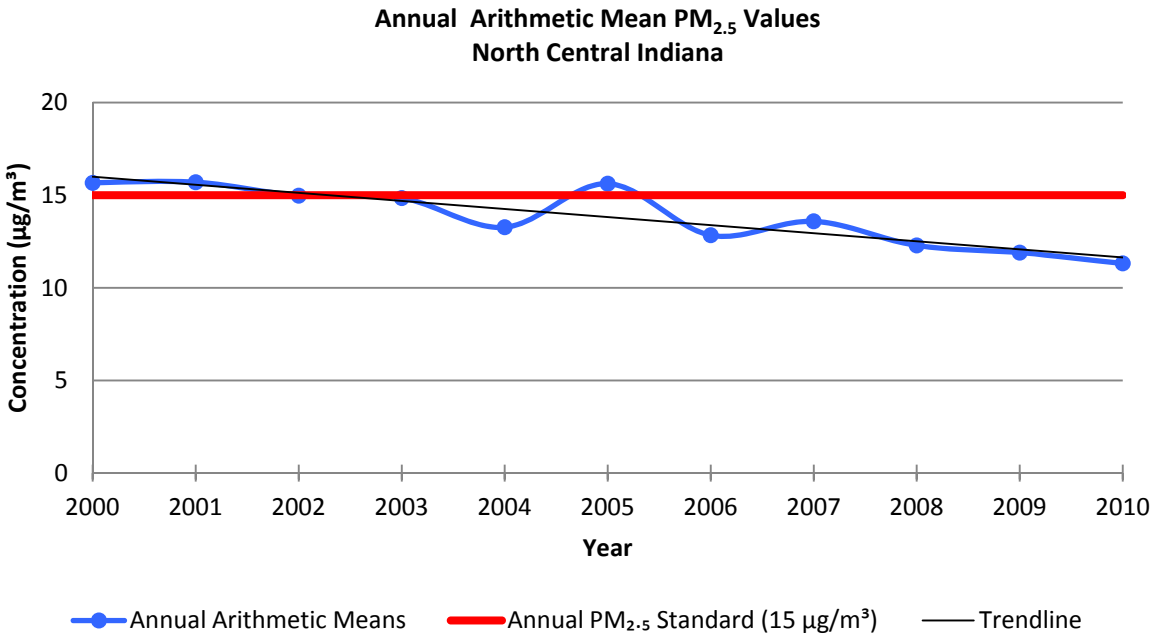


Table 5: North Central Indiana Annual Arithmetic Mean $PM_{2.5}$ Monitoring Data Summary

County	Site #	Site Name	Annual Arithmetic Mean (µg/m³)										
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Elkhart	180390003	Elkhart - Pierre Moran Sch	15.67	15.70	14.98	14.85	13.27	15.62	12.55	13.59			
Elkhart	180390003/8	Elkhart Combined (Pierre Moran & Prairie St)							12.55	13.59	12.29	11.90	
Elkhart	180390008	Elkhart - Prairie St									12.29	11.90	11.20
St Joseph	181410014	South Bend - Nuner Sch	13.78	14.04	14.27	13.82	12.31	14.83	11.90	12.79	11.32	10.77	
St Joseph	181411008	South Bend - Angela & Eddy	14.10	14.74	14.39	13.80	12.47	14.81	10.26				
St Joseph	181411008/15	South Bend Combined (Angela & Eddy & Shields Dr)					12.47	14.81	11.82				
St Joseph	181410015	South Bend - Shields Dr							12.84	12.93	11.15	11.34	11.32
St Joseph	181412004	South Bend - LaSalle HS	13.78	14.48	13.91	13.49	11.73	14.49	11.34	12.45			

Graph 5: North Central Indiana Annual $PM_{2.5}$ Three-Year Design Values

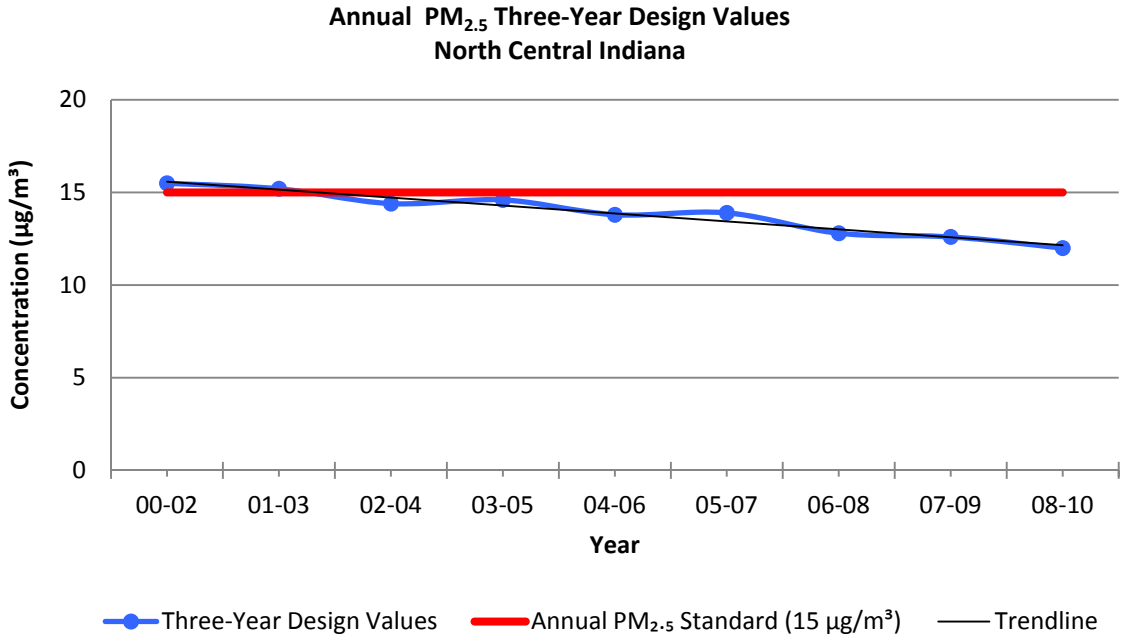


Table 6: North Central Indiana Annual $PM_{2.5}$ Three-Year Design Value Monitoring Data Summary

County	Site #	Site Name	Three-Year Design Value (µg/m³)								
			00-02	01-03	02-04	03-05	04-06	05-07	06-08	07-09	08-10
Elkhart	180390003	Elkhart - Pierre Moran School	15.5	15.2	14.4	14.6	13.8	13.9			
Elkhart	180390003/8	Elkhart Combined (Pierre Moran & Prairie Street)							12.8	12.6	
Elkhart	180390008	Elkhart - Prairie Street							12.3	12.1	12.0
St Joseph	181410014	South Bend - Nuner School	14.0	14.0	13.5	13.7	13.0	13.2	12.0	11.7	
St Joseph	181411008	South Bend - Angela & Eddy	14.4	14.3	13.6	13.7	12.5				
St Joseph	181411008/15	South Bend Combined (Angela & Eddy & Shields Drive)					13.0	13.2	12.0		
St Joseph	181410015	South Bend - Shields Drive					12.8	12.9	12.3	11.8	11.3
St Joseph	181412004	South Bend - LaSalle High School	14.1	14.0	13.0	13.2	12.5	12.8			
			Red highlighted numbers are above the annual $PM_{2.5}$ standard of 15.0 µg/m³								

Graph 6: North Central Indiana 24-Hour 98th Percentile $PM_{2.5}$ Values

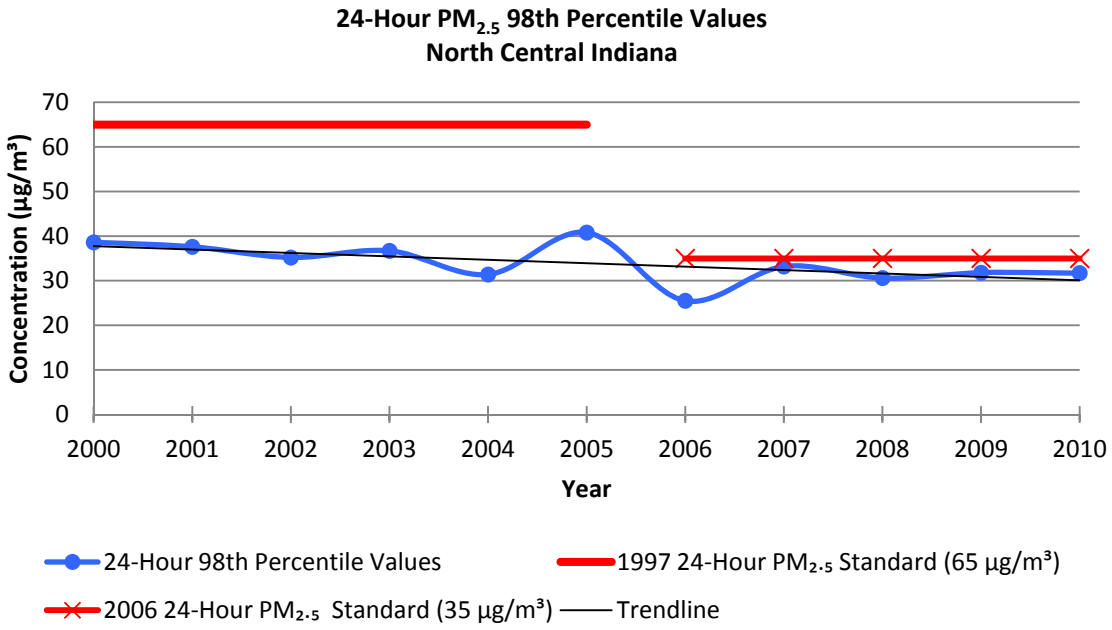


Table 7: North Central Indiana 24-Hour 98th Percentile Value $PM_{2.5}$ Monitoring Data Summary

County	Site #	Site Name	24-Hour 98th Percentile Value (µg/m³)										
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Elkhart	180390003	Elkhart - Pierre Moran Sch	38.6	37.5	35.2	36.7	31.4	40.8	25.5	33.2			
Elkhart	180390003/8	Elkhart Combined (Pierre Moran & Prairie St)						40.8	25.5	33.2	30.6	31.8	
Elkhart	180390008	Elkhart - Prairie St									30.6	31.8	31.7
St Joseph	181410014	South Bend - Nuner Sch	29.5	34.5	31.7	35.0	26.7	40.2	24.9	32.0	28.1	24.0	
St Joseph	181411008	South Bend - Angela & Eddy	30.2	37.6	32.8	34.8	27.4	37.3	24.7				
St Joseph	181411008/15	South Bend Combined (Angela & Eddy & Shields Dr)							24.7				
St Joseph	181410015	South Bend - Shields Dr							24.9	30.8	28.0	28.9	31.0
St Joseph	181412004	South Bend - LaSalle HS	30.4	36.8	31.3	33.3	25.1	35.8	24.1	31.3			

Graph 7: North Central Indiana 24-Hour $PM_{2.5}$ Three-Year Design Values

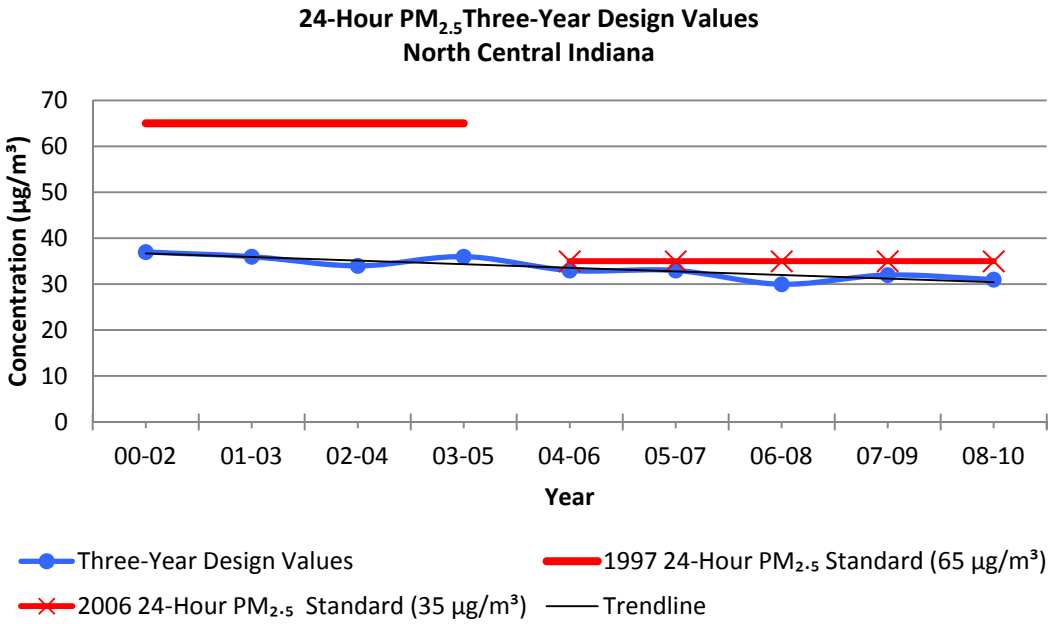


Table 8: North Central Indiana 24-Hour Three-Year Design Value $PM_{2.5}$ Monitoring Data Summary

County	Site #	Site Name	Three-Year Design Value (µg/m^3)								
			00-02	01-03	02-04	03-05	04-06	05-07	06-08	07-09	08-10
Elkhart	180390003	Elkhart - Pierre Moran Sch	37	36	34	36	33	33			
Elkhart	180390003/8	Elkhart Combined (Pierre Moran & Prairie St)						33	30	32	
Elkhart	180390008	Elkhart - Prairie St							31	31	31
St Joseph	181410014	South Bend - Nuner Sch	32	34	31	34	31	32	28	28	
St Joseph	181411008	South Bend - Angela & Eddy	34	35	32	33	30				
St Joseph	181411008/15	South Bend Combined (Angela & Eddy & Shields Dr)					30	31	28		
St Joseph	181410015	South Bend - Shields Dr					25	28	28	29	29
St Joseph	181412004	South Bend - LaSalle HS	33	34	30	31	28	30			

Prior to 2006, highlighted red numbers are above the 24-hour $PM_{2.5}$ standard of 65 µg/m^3

Beginning in 2006, highlighted red numbers are above the 24-hour $PM_{2.5}$ standard of 35 µg/m^3

Tables 5, 6, 7, and 8 demonstrate that the annual and 24-hour $PM_{2.5}$ values for the North Central Indiana area correlate with each other over time, meaning that when one monitoring site trends upward or downward, the other sites do also. Annual $PM_{2.5}$ values in North Central Indiana have been below the primary and secondary annual $PM_{2.5}$ standards since the end of 2003 and 24-hour $PM_{2.5}$ values in North Central Indiana have always been below the primary and secondary 24-hour $PM_{2.5}$ standards. The Elkhart-Pierre Moran School $PM_{2.5}$ monitoring site has historically registered the highest $PM_{2.5}$ values in North Central Indiana. This is expected since it is the downwind site for the Elkhart and South Bend metropolitan areas

While fluctuations in monitoring data are shown in Graphs 4, 5, 6, and 7, monitoring data for both annual $PM_{2.5}$ and 24-hour $PM_{2.5}$ indicate a downward trend over time. $PM_{2.5}$ is influenced by meteorology (wind speed, temperature, stagnant air, etc.). Meteorological conditions can have an episodic effect on $PM_{2.5}$ concentrations as in 2005 (Graphs 4, 5, 6, and 7), when three of the four quarters of the year had high $PM_{2.5}$ values which drove the annual $PM_{2.5}$ values higher for the year. The annual value is calculated from the average of the year's four quarterly averages. A quarterly average is the average of all available data from the respective quarter. The upper Midwest experienced several episodes of unusually high $PM_{2.5}$ concentrations in 2005 caused by unusual confluences of meteorological factors. Several times during 2005 high

pressure systems were held in place by jet streams which lead to a persistent, highly stable atmosphere with calm winds. Atmospheric mixing was suppressed and pollutants that form $PM_{2.5}$ were trapped near the surface and high values were measured. The longest and most wide spread episode happened during the first week of February 2005 which lasted for nine days and affected the upper Midwest and southern Ontario where $PM_{2.5}$ daily values exceeded 70 $\mu g/m^3$.

Fine particulates are emitted directly into the air from combustion sources such as coal-fired power plants, motor vehicles, and open burning. In addition, fine particulate matter is formed in the air via chemical reactions. Gas pollutants, such as ammonia, SO_2, and NO_x, change chemically in the air to become either liquid or solid fine particulate matter. U.S. EPA's NEI contains emissions information for $PM_{2.5}$, SO_2, and NO_x and is used for Graphs 8, 9, and 10 and Charts 2, 3, and 4. Graphs 8, 9, and 10 illustrate the emissions trend for $PM_{2.5}$ and its precursors (SO_2 and NO_x) in North Central Indiana. Charts 2, 3, and 4 show how the average emissions are distributed among the different source categories.

Graph 8: North Central Indiana $PM_{2.5}$ Emissions

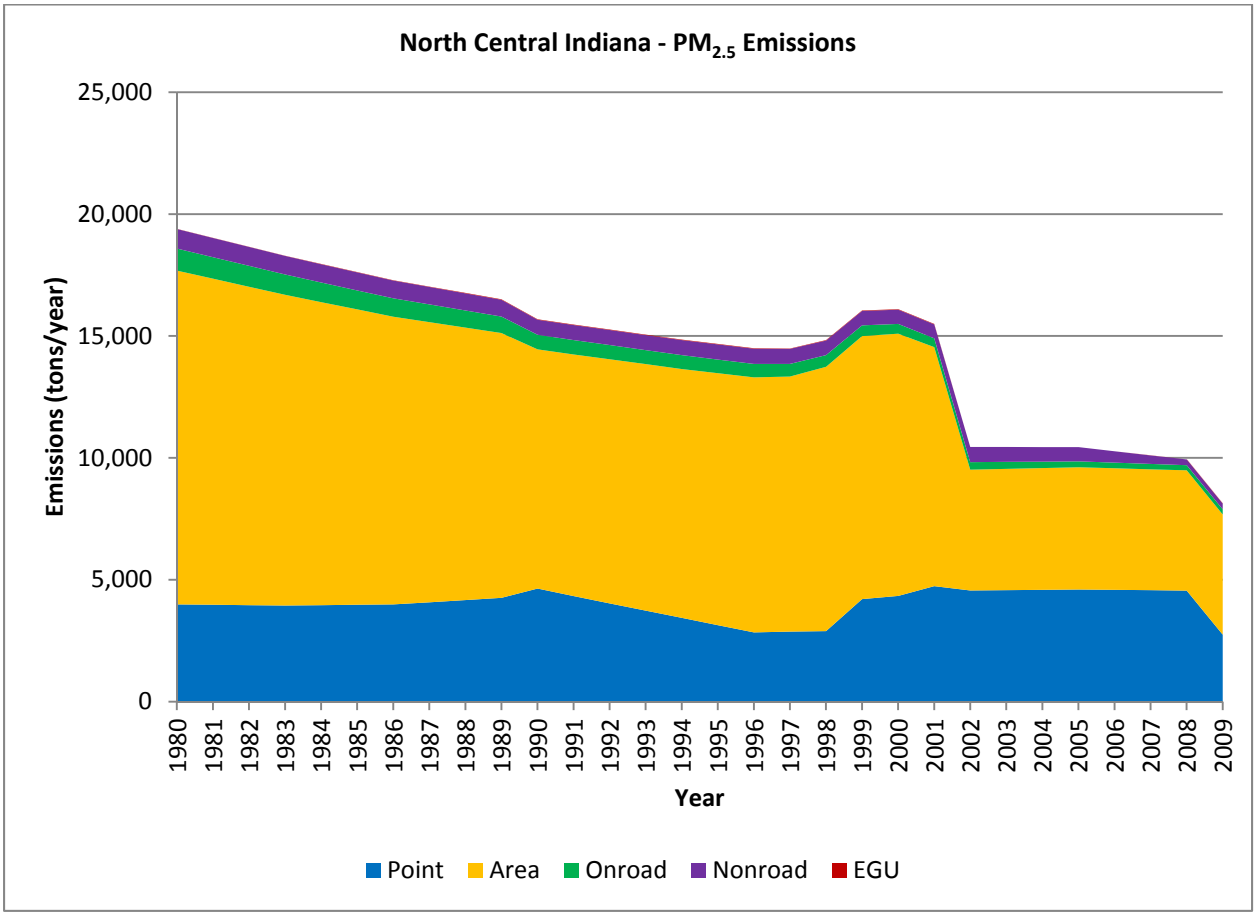
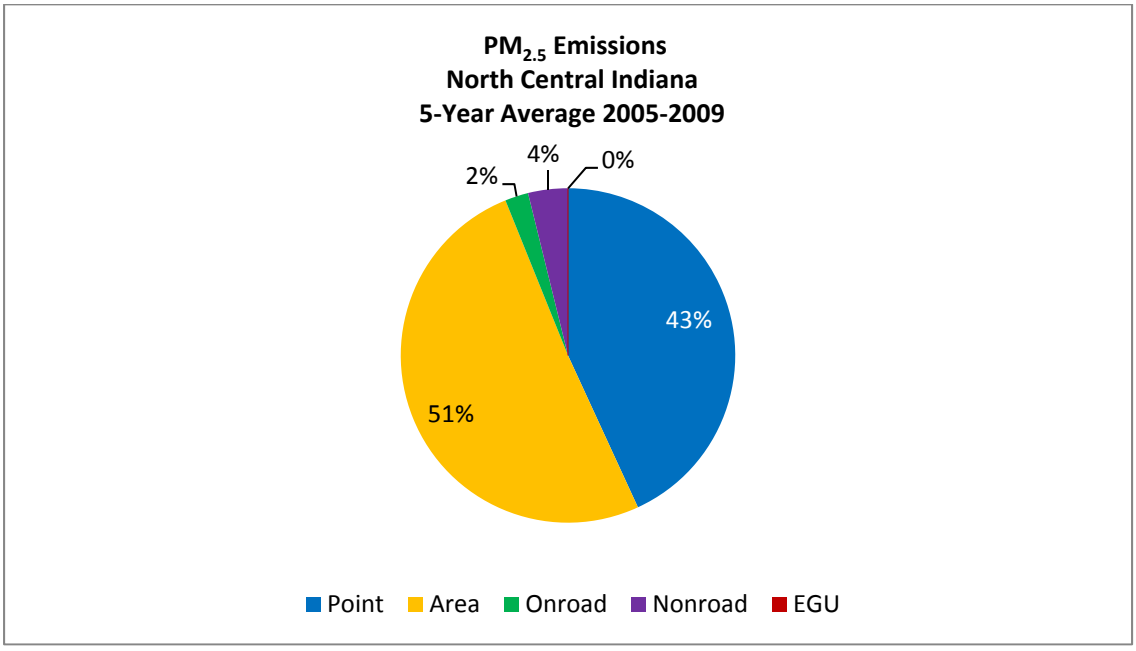


Chart 2: North Central Indiana $PM_{2.5}$ Emissions



Graph 9: North Central Indiana SO_2 Emissions

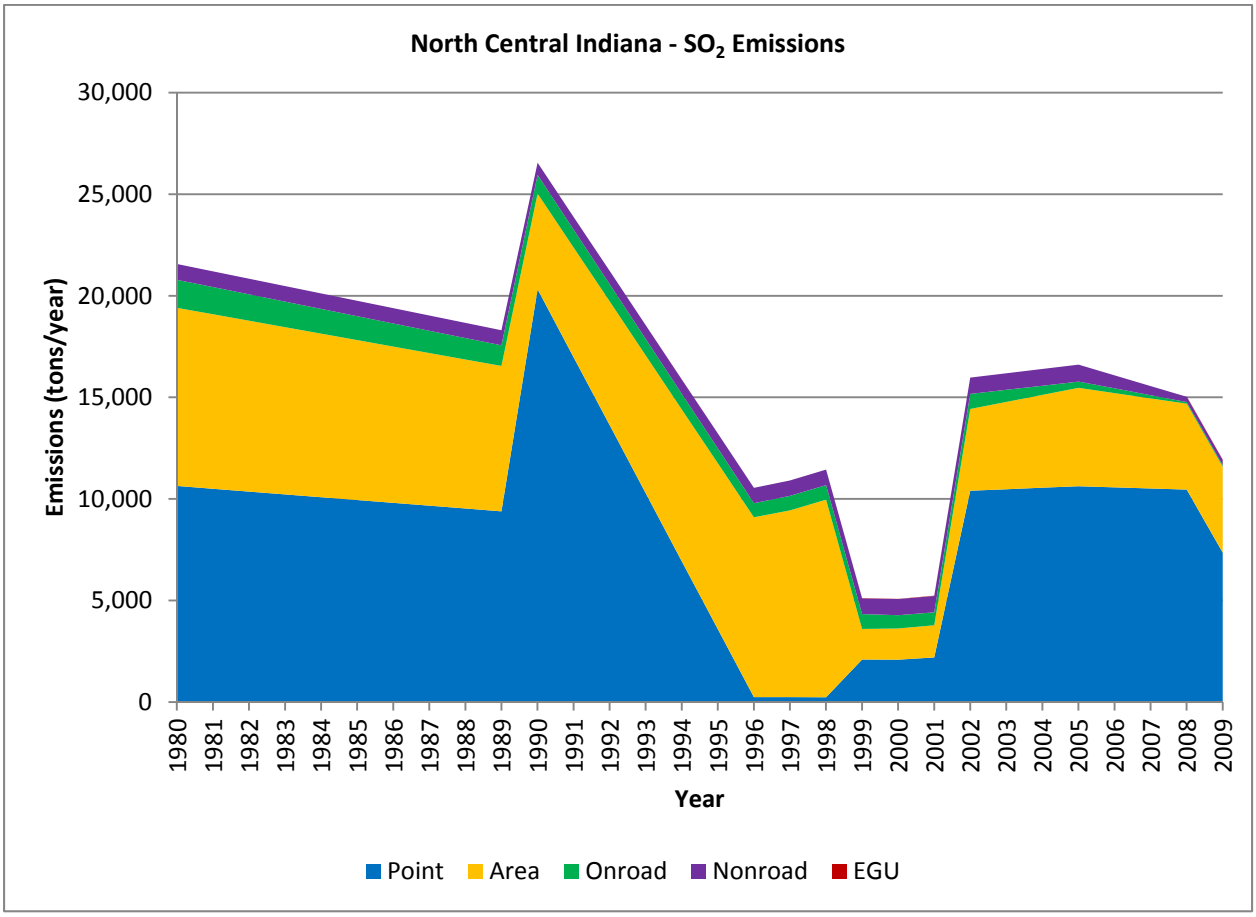
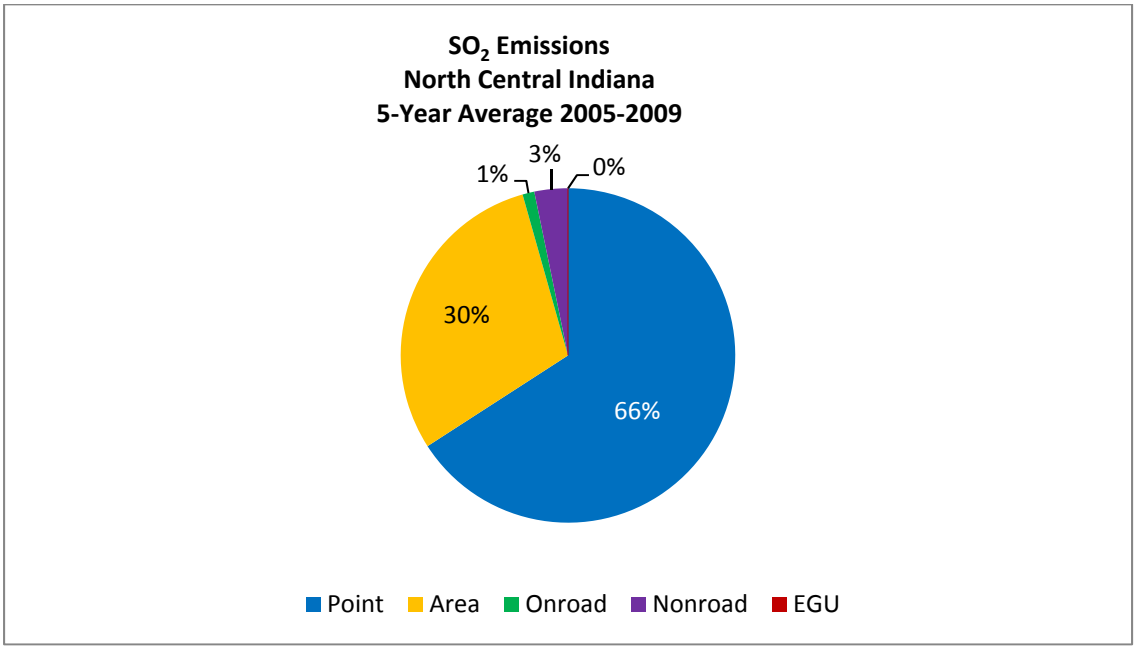


Chart 3: North Central Indiana SO_2 Emissions



Graph 10: North Central Indiana NO_x Emissions

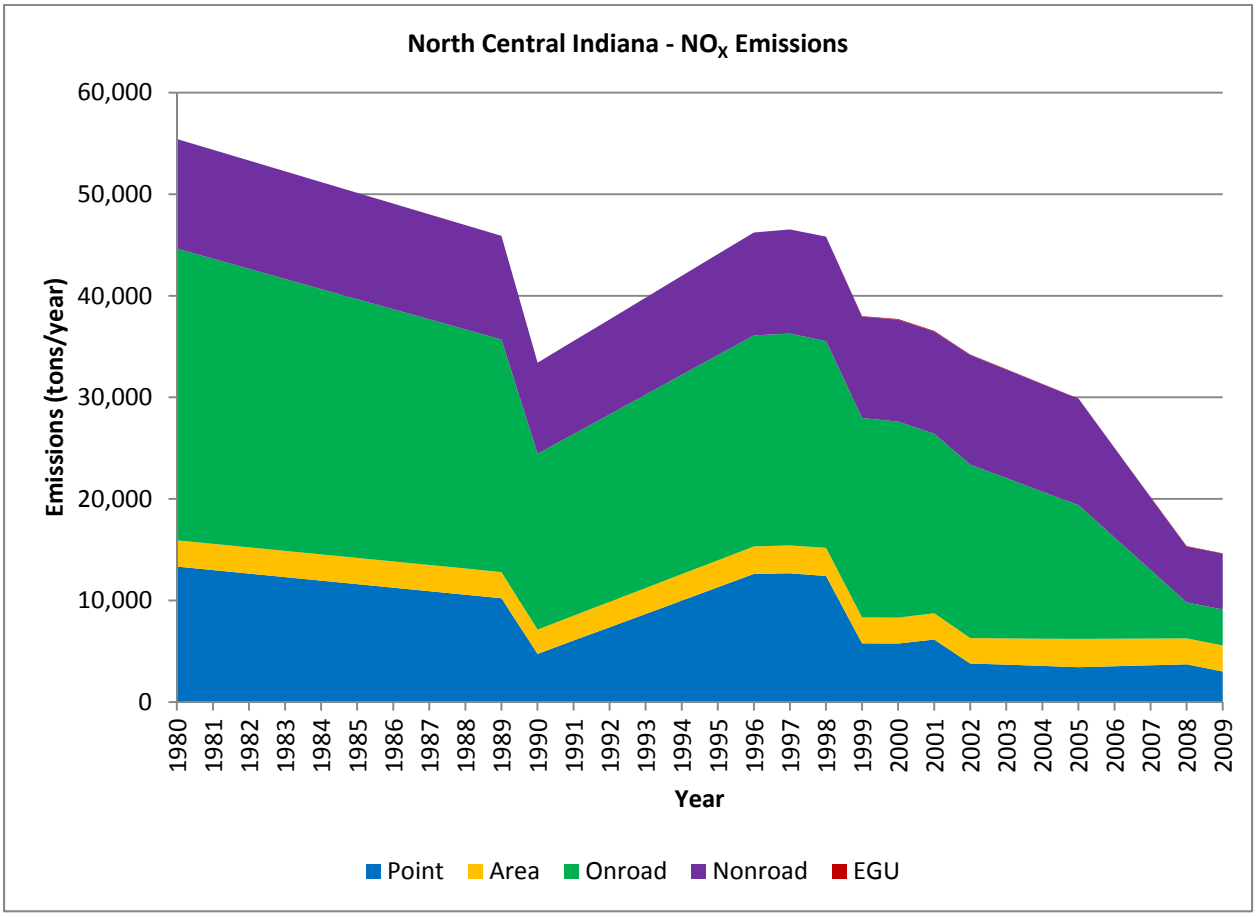
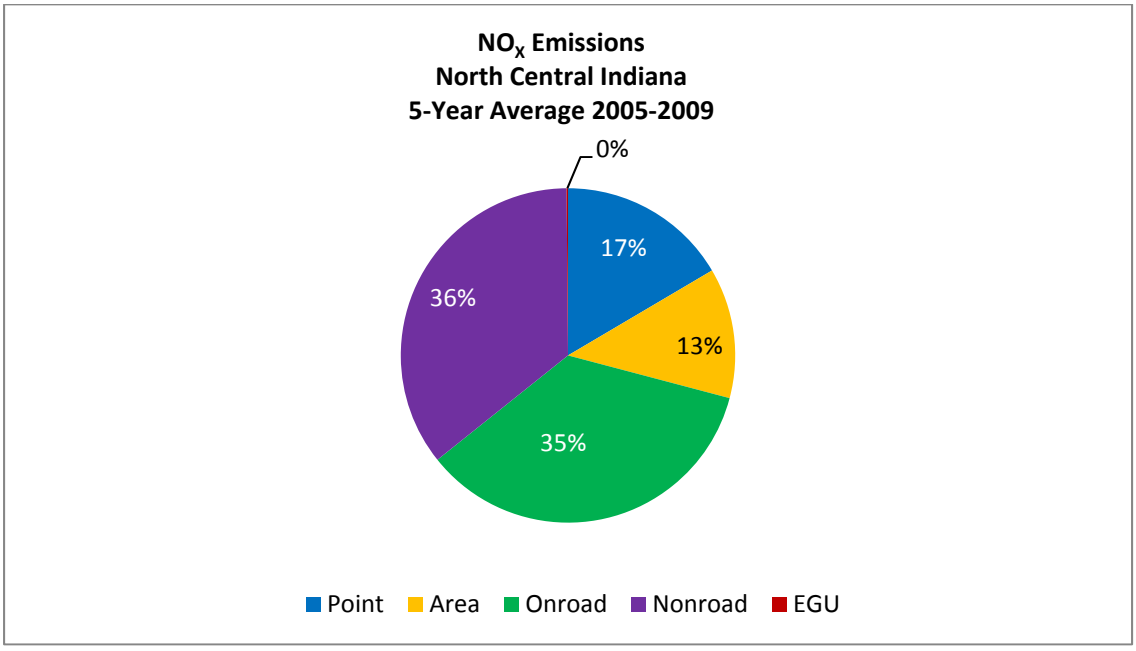


Chart 4: North Central Indiana NO_x Emissions



National controls, such as engine and fuel standards, as well as regional controls, such as the NO_x SIP Call, have led to a decrease in $PM_{2.5}$ values over time. As Graphs 8, 9, and 10 illustrate, $PM_{2.5}$, SO_2, and NO_x emissions have decreased by 58%, 45%, and 74%, respectively, within the North Central Indiana area since 1980.

Nationally, average SO_2 concentrations have decreased by more than 70% since 1980 due to the implementation of the Acid Rain Program. Reductions in Indiana for SO_2 are primarily attributable to the implementation of the Acid Rain Program, as well as federal engine and fuel standards for onroad and nonroad vehicles and equipment.

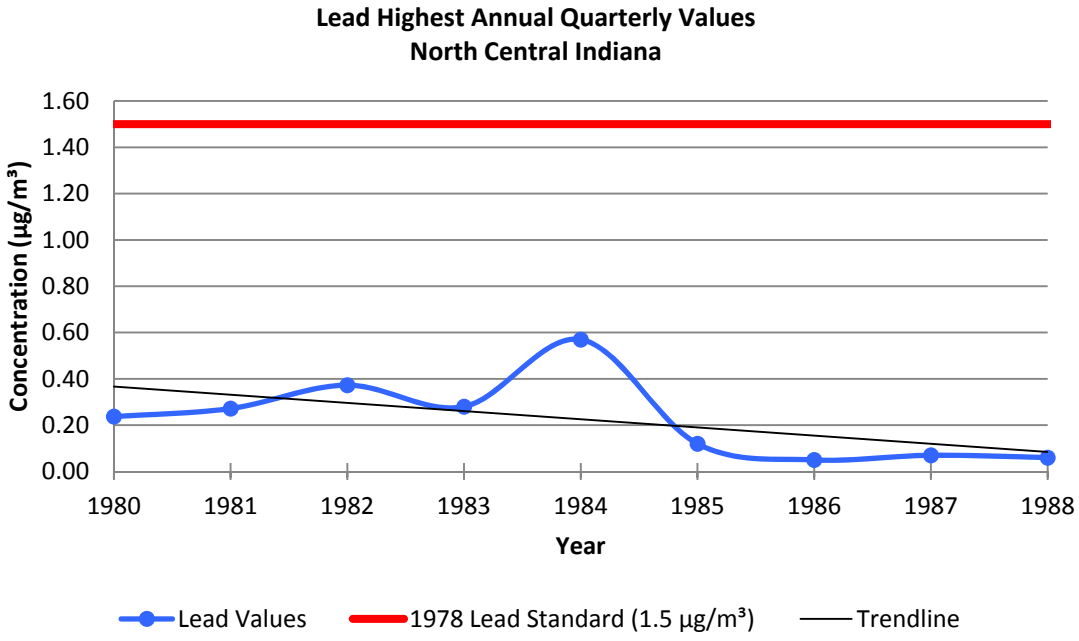
For information on $PM_{2.5}$ standards, sources, health effects, and programs to reduce $PM_{2.5}$, please see www.epa.gov/air/particlepollution.

Lead

The primary and secondary lead standards were first established in October 1978 at 1.5 µg/m^3. Attainment was determined by evaluating each calendar quarter arithmetic average, which must not exceed 1.5 µg/m^3 over a three-year period. U.S. EPA replaced the primary and secondary 1978 lead standards with new primary and secondary lead standards of 0.15 µg/m^3 in October 2008. Attainment of the primary and secondary 2008 lead standards is determined by evaluating the rolling three-month average. Any three consecutive monthly averages (January-March, February-April, March-May, etc.) must not exceed 0.15 µg/m^3 within a three-year period.

The trend data in Graph 11 reflect the highest annual quarterly arithmetic mean. Lead monitoring sites were discontinued in the North Central Indiana area in 1990; therefore, a table of current monitoring data for lead values is not included in this report. However, historical monitoring data for lead monitors in North Central Indiana are available upon request. Since there is no lead data beyond 1988 for the North Central Indiana region, monitoring data for the primary and secondary 2008 lead standards and a trend chart comparing the highest three-month rolling average for each year (which is used to compare to the primary and secondary 2008 lead standards) has not been provided.

Graph 11: North Central Indiana Lead Highest Annual Quarterly Values



Historically, the majority of lead emissions came from motor vehicle fuels. As a result of U.S. EPA's regulatory efforts to remove lead from motor vehicle gasoline, emissions of lead from the transportation sector declined by 95% between 1980 and 1999, and levels of lead in the air decreased by 94% between 1980 and 1999. As can be seen in Graph 11, lead levels in North Central Indiana are well below the current standard and will continue to do so as new federal controls are adopted.

For information on lead standards, sources, health effects, and programs to reduce lead, please see www.epa.gov/air/lead.

Nitrogen Dioxide (NO_2)

There is one monitoring site within North Central Indiana, located in St. Joseph County that measures NO_2 levels. The trend data in Graph 12 reflect the annual arithmetic mean NO_2 values. The annual arithmetic mean is used to compare to the primary and secondary annual NO_2 standards at 53 parts per billion (ppb). The secondary annual NO_2 standard is the same as the primary NO_2 standard. Attainment of the annual NO_2 standards is determined by evaluating the annual arithmetic mean concentration in a calendar year, which must be less than or equal to 53 ppb. U.S. EPA added a primary 1-hour NO_2 standard in February 2010 at 100 ppb. Attainment of the 1-hour NO_2 standard is determined by evaluating the design value of the 98th percentile of the daily maximum 1-hour averages at each monitor within an area, which must not exceed 100 ppb averaged over a three-year period.

The trend data in Graph 13 show the 98th percentile of the 1-hour NO_2 values, which are provided for reference purposes only, because they were collected prior to the implementation of the current standard. The design value of the 98th percentile is used for comparison to the primary 1-hour NO_2 standard; therefore, the one-year values shown in Graph 13 are not a true comparison to the primary 1-hour NO_2 standard. The values in Graph 14 reflect the highest 98th percentile from all of the monitors in the North Central Indiana area which is plotted on the graph for each year. The 1-hour NO_2 standard at 100 ppb is only listed for the year 2010 on this graph since it was not established until February 2010. Attainment of the primary 1-hour NO_2 standard is determined by evaluating the design value of the 98th percentile values of the daily maximum 1-hour averages at each monitor within an area, which must not exceed 100

ppb averaged over a three-year period. An exceedance of the primary 1-hour NO_2 standard occurs when a 98th percentile value is equal to or greater than 100 ppb. A violation of the primary 1-hour NO_2 standard occurs when the three-year design value of the 98th percentile is equal to or greater than 100 ppb. A monitor can exceed the standard without being in violation.

NO_2 data are presented from 2000 to 2010 in this report; however, historical monitoring data for annual NO_2 for all monitors in North Central Indiana are available upon request. Monitoring data for annual NO_2 show a downward trend over time and the monitor values for North Central Indiana have historically been below the primary and secondary annual NO_2 standards. While fluctuations in monitoring data are shown in Graphs 12, 13, and 14, monitoring data for both annual and 1-hour NO_2 indicate a downward trend over time. NO_2 monitors are located in close proximity to major sources in the area and data fluctuate based on variability in facility operations and meteorology.

The data in Tables 9, 10, and 11 are from the monitoring sites that measured NO_2 from 2000 to 2010. Historical data prior to the year 2000 are available upon request for both annual and 1-hour NO_2. Monitoring data in Table 9 are compared to the primary and secondary annual NO_2 standards at 53 ppb. Monitoring data in Table 10 show the 98th percentile of the 1-hour NO_2 values for the years 2000 through 2010. Monitoring data in Table 11 are compared to the primary 1-hour NO_2 standard at 100 ppb. The 1-hour NO_2 data prior to 2010 was not compared to any standard and the 98th percentile values and the design values from 2000 to 2007 are included for reference purposes only. NO_2 values in North Central Indiana are well below both the annual and 1-hour NO_2 standards.

Graph 12: North Central Indiana Annual Arithmetic Mean NO_2 Values

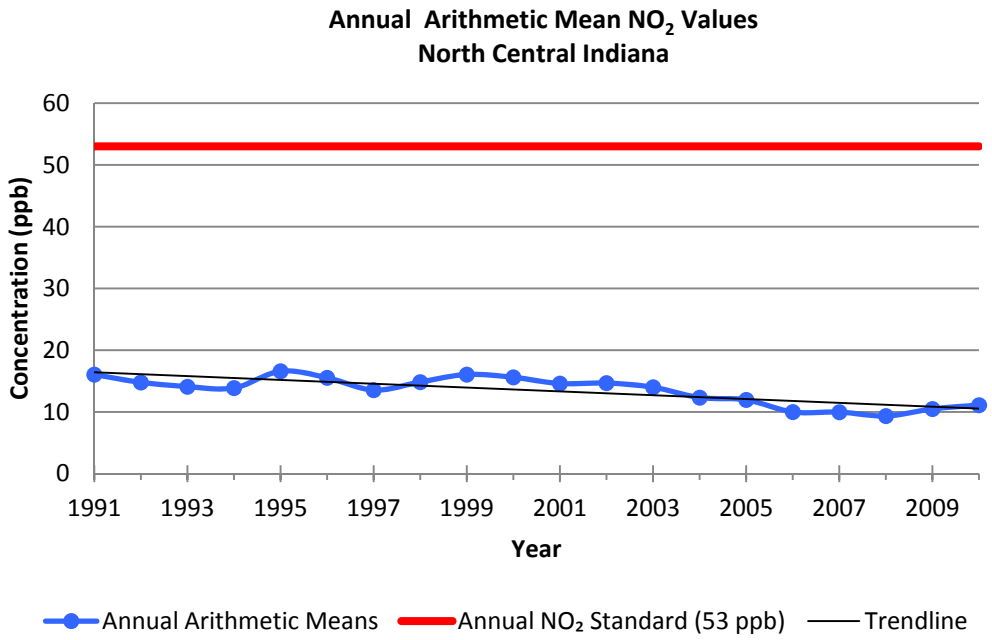


Table 9: North Central Indiana Annual Arithmetic Mean NO_2 Monitoring Data Summary

County	Site #	Site Name	Annual Arithmetic Mean (ppb)										
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
St. Joseph	181410015	South Bend-2335 Shields Dr							10	10	9	10	11
St. Joseph	181411008	South Bend-1000 E Angela & Eddy	16	15	15	14	12	12	9				
			Highlighted red numbers are above the annual NO_2 standard of 53 ppb										

Graph 13: North Central Indiana 1-Hour NO_2 Maximum Values

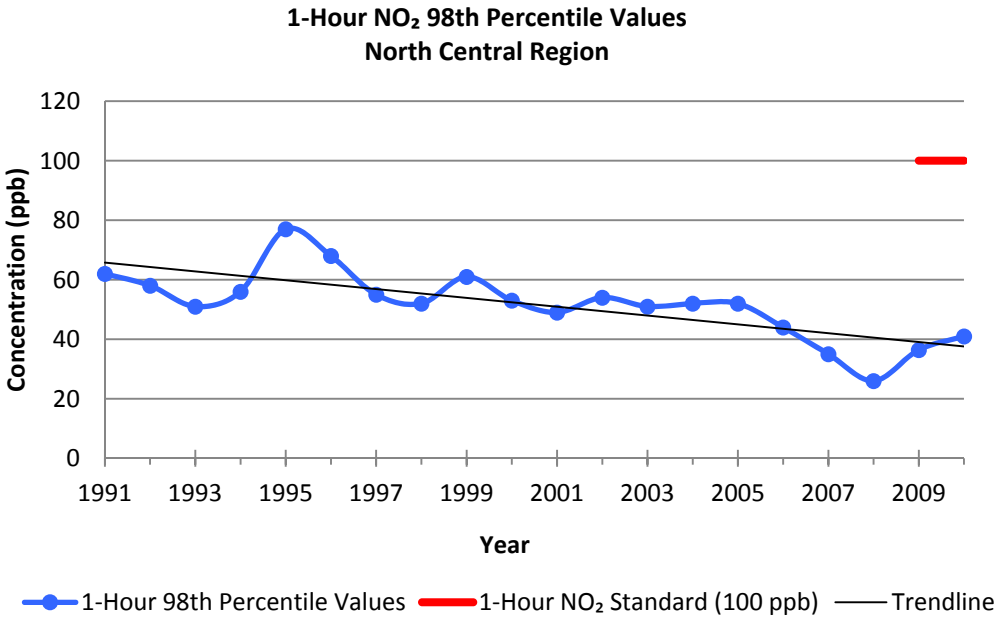


Table 10: North Central Indiana 1-Hour 98th Percentile Value NO_2 Monitoring Data Summary

County	Site #	Site Name	1-Hour 98th Percentile Value (ppb)										
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
St. Joseph	181410015	South Bend-2335 Shields Dr							30	35	26	36	41
St. Joseph	181411008	South Bend-1000 E Angela & Eddy	53	49	54	51	52	52	44				

Graph 14: North Central Indiana 1-Hour Three-Year Design Value NO_2 Monitoring Data Summary

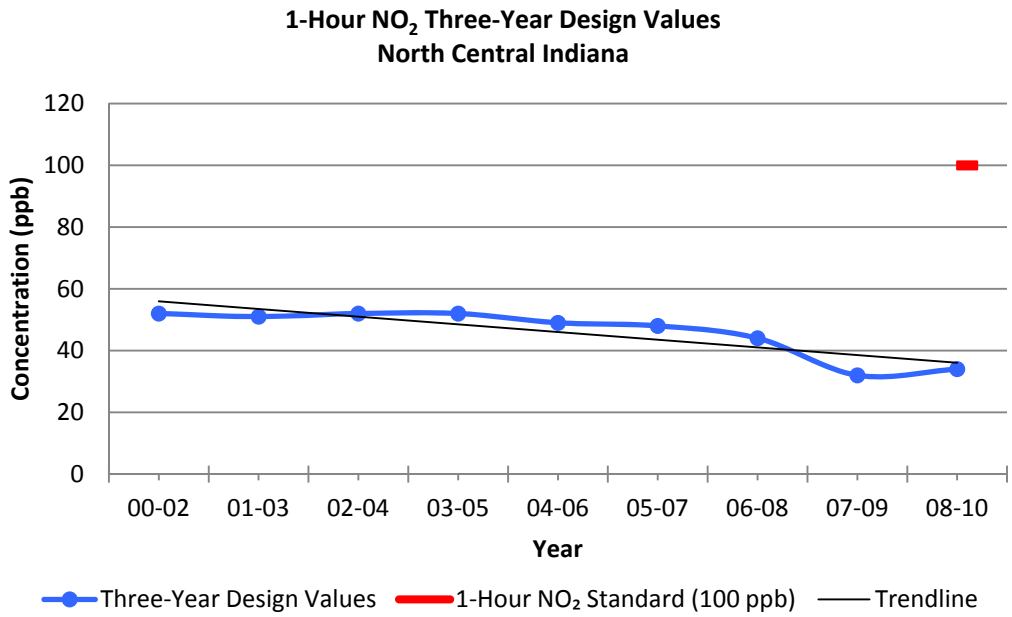


Table 11: North Central Indiana 1-Hour Three-Year Design Value NO_2 Monitoring Data Summary

County	Site #	Site Name	Three-Year Design Value (ppb)								
			00-02	01-03	02-04	03-05	04-06	05-07	06-08	07-09	08-10
St. Joseph	181410015	South Bend-2335 Shields Dr					30	33	30	32	34
St. Joseph	181411008	South Bend-1000 E Angela & Eddy	52	51	52	52	49	48	44		
			Highlighted red numbers are above the 1-hour NO_2 standard of 100 ppb								

U.S. EPA's NEI contains emissions information for NO_2 and is used for Graph 15 and Chart 5. NO_x emissions data are used as a surrogate for NO_2 in conjunction with the NO_2 NAAQS. Graph 15 illustrates the emissions trend for NO_x in North Central Indiana and Chart 5 shows how the average emissions are distributed among the different source categories.

Graph 15: North Central Indiana NOx Emissions

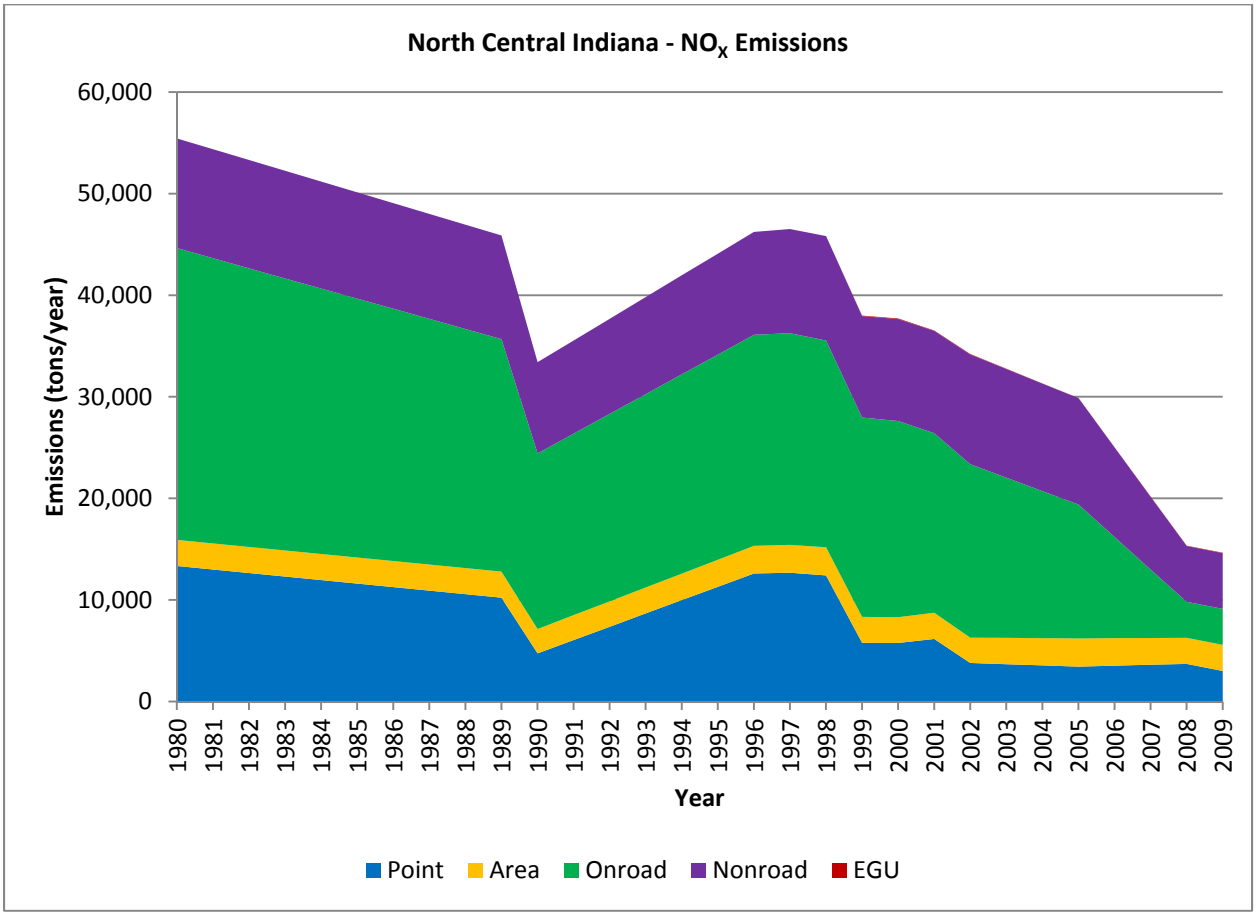
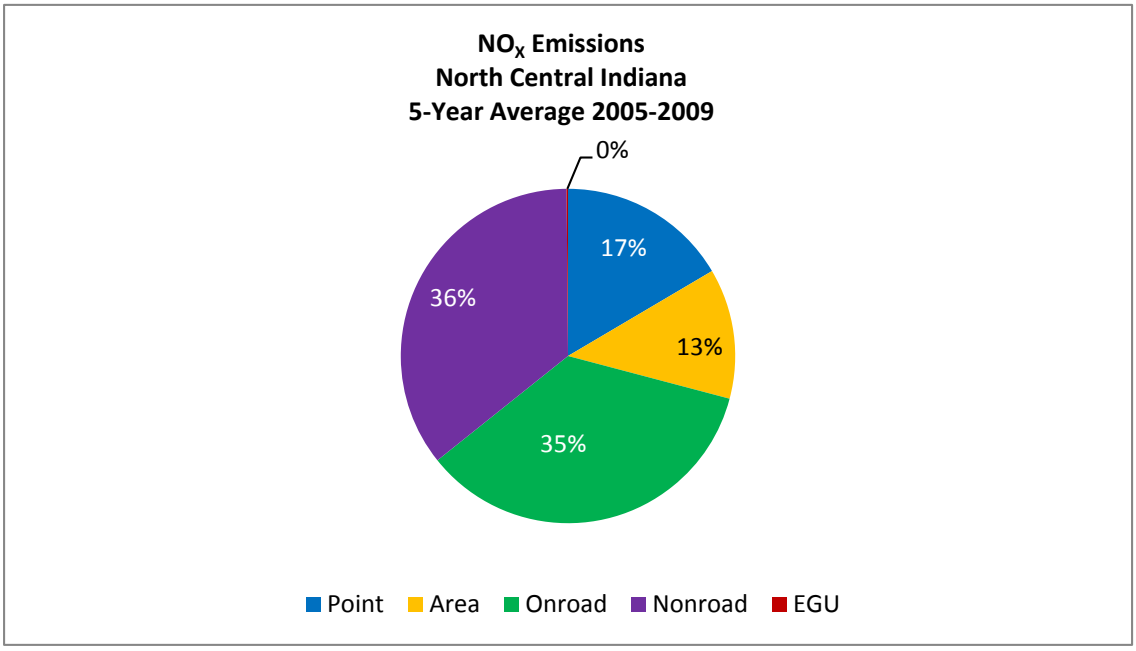


Chart 5: North Central Indiana NO_x Emissions



National and regional controls, such as the Acid Rain Program, engine and fuel standards, and the NO_x SIP Call have led to a decrease in NO_x values over time. As Graph 15 illustrates, NO_x emissions have decreased by 74% within the North Central Indiana area since 1980. This trend is true throughout Indiana and the upper Midwest. According to U.S. EPA, average NO_x concentrations have decreased by more than 40% nationally since 1980.

For information on NO_2 standards, sources, health effects, and programs to reduce NO_2, please see www.epa.gov/airquality/nitrogenoxides/.

Ozone

There are four monitoring sites within North Central Indiana, one in Elkhart County and three in St. Joseph County that measure ozone levels. Primary and secondary ozone 1-hour ozone standards were first established in April 1979 at 0.12 ppm. Based on U.S. EPA's published data guidelines, values above 0.124 ppm were deemed to be in violation of the standard. The trend data in Graph 16 reflect the 4th highest monitored concentration for 1-hour ozone within a given three-year period from all of the monitors in the North Central Indiana area is plotted on the graph for each year. These values were used to determine attainment of the primary and secondary 1-hour ozone standards before they were revoked in June 2005.

In July 1997, U.S. EPA established the primary and secondary 8-hour ozone standards at 0.08 ppm. Based on the U.S. EPA's published data handling guidelines, values above 0.084 ppm were deemed to be in violation of the standard. U.S. EPA lowered the primary and secondary 8-hour ozone standards to 0.075 ppm in March 2008. Attainment of the primary and secondary 8-hour ozone standards is determined by evaluating the design value of the 4th highest 8-hour ozone concentration measured at each monitor within an area over each year, which must not exceed 0.075 ppm. An exceedance of the standards occurs when an 8-hour ozone value is equal to or greater than 0.075 ppm. A violation of the standards occurs when the design value of the three-year average of the 4th highest 8-hour ozone value is equal to or greater than 0.076 ppm. A monitor can exceed the standards without being in violation.

The trend data in Graph 17 reflect the 4th high and the highest 4th high concentration for 8-hour ozone from all of the monitors in the North Central Indiana area for each year. The design value of the three-year average of the 4th highest 8-hour ozone values is used for comparison to the 8-hour ozone standard; therefore, the one-year values in Graph 17 are not a true comparison to the primary and secondary 8-hour ozone standards. The values in Graph 18 reflect the design value of the three-year average of the 4th highest 8-hour ozone values from the monitors for each year.

The data in Tables 12 and 13 are from all of the monitoring sites in the North Central Indiana area that measured 1-hour ozone from 2000 through 2010. Monitoring data in Table 12 show the four highest annual concentrations for 1-hour ozone for the years 2000 through 2010. Monitoring data in Table 13 show the 4th highest concentration for 1-hour ozone in a three year period for the years 2000 through 2010. The data in Tables 14 and 15 are from all of the monitoring sites in the North Central Indiana area that measured 8-hour ozone from 2000 through 2010. Monitoring data in Table 14 show the 4th highest concentration for 8-hour ozone in a three-year period for the years 2000 through 2010. Monitoring data in Table 15 show the design value of the three average of the 4th highest 8-hour ozone values for the years 2000 through 2010, which are compared to the primary and secondary 8-hour ozone standards at 0.08 ppm.

Table 12: North Central Indiana 1-Hour Ozone Annual 4th High Value Monitoring Data Summary

		1-Hour Ozone Value (ppm)											
County	**Site Name**	**1st High 2000**	**2nd High 2000**	**3rd High 2000**	**4th High 2000**	**1st High 2001**	**2nd High 2001**	**3rd High 2001**	**4th High 2001**	**1st High 2002**	**2nd High 2002**	**3rd High 2002**	**4th High 2002**
Elkhart	Bristol-Water Treatment Plant	0.085	0.083	0.080	0.078	0.067	0.066	0.064	0.063				
Elkhart	Bristol-Bristol Elementary									0.118	0.114	0.109	0.107
St Joseph	Potato Creek	0.098	0.093	0.087	0.086	0.104	0.095	0.094	0.094	0.117	0.110	0.103	0.102
St Joseph	Angela & Eddy / Shields Dr	0.119	0.095	0.094	0.089	0.115	0.106	0.099	0.092	0.118	0.118	0.111	0.107
St Joseph	Granger	0.128	0.091	0.090	0.089	0.123	0.108	0.103	0.102	0.133	0.128	0.116	0.115

County	Site Name	1st High 2003	2nd High 2003	3rd High 2003	4th High 2003	1st High 2004	2nd High 2004	3rd High 2004	4th High 2004	1st High 2005	2nd High 2005	3rd High 2005	4th High 2005
Elkhart	Bristol-Water Treatment Plant												
Elkhart	Bristol-Bristol Elementary	0.098	0.097	0.095	0.094	0.098	0.091	0.088	0.086	0.101	0.100	0.099	0.096
St Joseph	Potato Creek	0.096	0.088	0.088	0.087	0.093	0.090	0.085	0.083	0.098	0.092	0.084	0.083
St Joseph	Angela & Eddy / Shields Dr	0.100	0.098	0.088	0.088	0.094	0.093	0.082	0.080	0.104	0.101	0.099	0.096
St Joseph	Granger	0.106	0.102	0.101	0.093	0.097	0.093	0.091	0.088	0.100	0.098	0.098	0.095

County	Site Name	1st High 2006	2nd High 2006	3rd High 2006	4th High 2006	1st High 2007	2nd High 2007	3rd High 2007	4th High 2007	1st High 2008	2nd High 2008	3rd High 2008	4th High 2008
Elkhart	Bristol-Water Treatment Plant												
Elkhart	Bristol-Bristol Elementary	0.087	0.081	0.074	0.073	0.092	0.091	0.090	0.089	0.078	0.078	0.077	0.077
St Joseph	Potato Creek	0.080	0.079	0.077	0.075	0.089	0.085	0.083	0.082	0.071	0.071	0.069	0.069
St Joseph	Angela & Eddy / Shields Dr	0.080	0.070	0.063	0.063	0.079	0.079	0.076	0.075	0.068	0.068	0.067	0.067
St Joseph	Granger	0.080	0.079	0.077	0.076	0.091	0.090	0.088	0.088	0.086	0.078	0.077	0.077

County	Site Name	1st High 2009	2nd High 2009	3rd High 2009	4th High 2009	1st High 2010	2nd High 2010	3rd High 2010	4th High 2010
Elkhart	Bristol-Water Treatment Plant								
Elkhart	Bristol-Bristol Elementary	0.089	0.071	0.070	0.069	0.076	0.073	0.071	0.071
St Joseph	Potato Creek	0.082	0.072	0.070	0.068	0.081	0.073	0.069	0.067
St Joseph	Angela & Eddy / Shields Dr	0.074	0.070	0.070	0.065	0.088	0.071	0.070	0.070
St Joseph	Granger	0.082	0.077	0.071	0.068	0.080	0.069	0.067	0.064

Graph 16: North Central Indiana 1-Hour Ozone 4th Highest Value in Three-Year Period

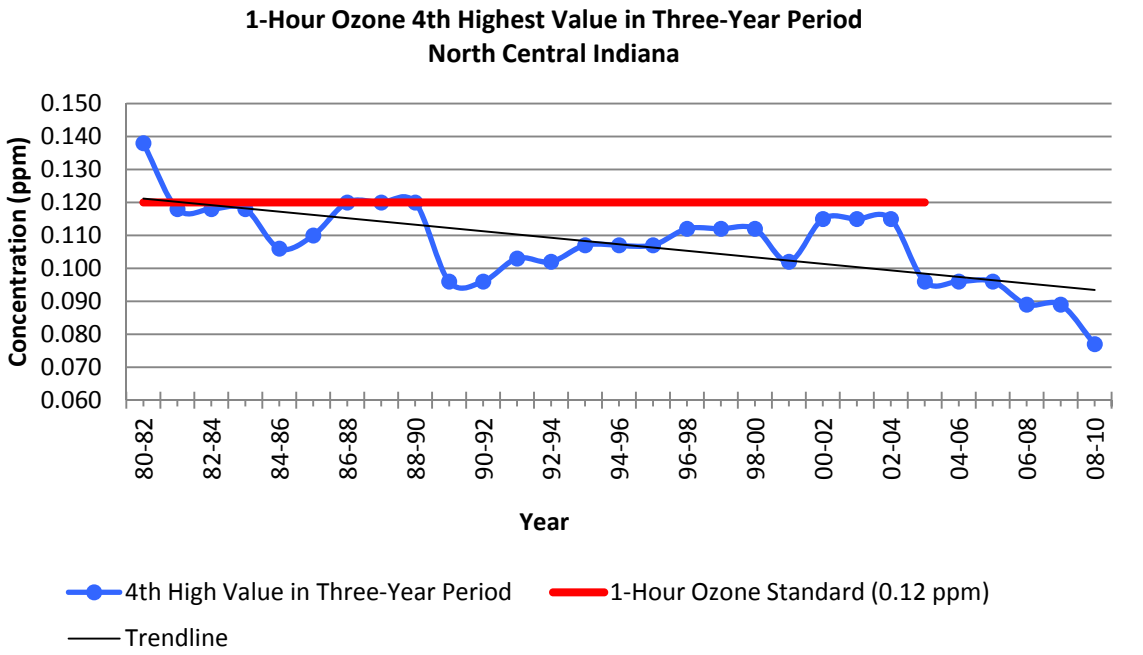


Table 13: North Central Indiana 1-Hour Ozone 4th High Value in Three-Year Period Monitoring Data Summary

County	Site #	Site Name	4th High Value in Three-Year Period (ppm)								
			00-02	01-03	02-04	03-05	04-06	05-07	06-08	07-09	08-10
Elkhart	180390002	Bristol-Water Treatment Plant									
Elkhart	180390007	Bristol-Bristol Elementary	0.107	0.107	0.107	0.096	0.096	0.096	0.089	0.089	0.077
St Joseph	181410010	Potato Creek	0.102	0.102	0.102	0.087	0.083	0.083	0.082	0.082	0.069
St Joseph	181411008/15	Angela & Eddy / Shields Dr	0.107	0.107	0.107	0.096	0.096	0.096	0.075	0.075	0.070
St Joseph	181411007	Granger	0.115	0.115	0.115	0.095	0.095	0.095	0.088	0.088	0.077

*St Joseph ozone monitor was moved from Angela & Eddy to Shields Drive on June 1, 2006. The 2004-2006 and 2005-2007 values are calculated from both monitoring sites. 2006-2008 value is calculated from Shields Dr only

Graph 17: North Central Indiana 8-Hour Ozone 4th High Values

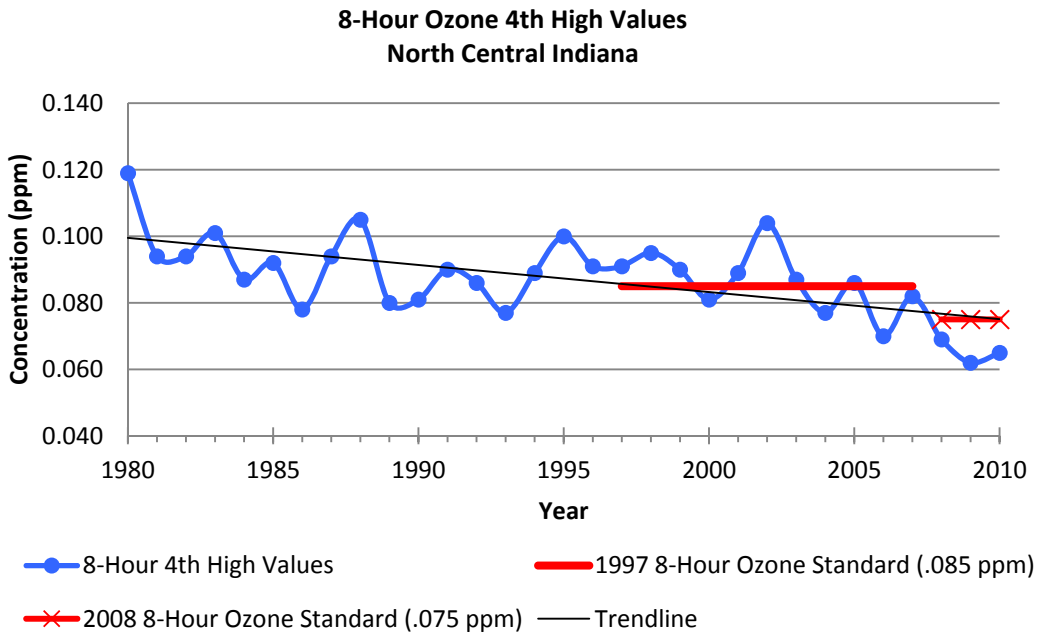


Table 14: North Central Indiana 8-Hour 4th High Ozone Monitoring Data Summary

County	Site #	Site Name	4th Highest Ozone Value (ppm)										
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Elkhart	180390002	Bristol-Water Treatment Plant	0.065	0.055									
Elkhart	180390007	Bristol-Bristol Elementary			0.099	0.087	0.077	0.086	0.067	0.082	0.068	0.061	0.065
St Joseph	181410010	Potato Creek	0.079	0.078	0.092	0.081	0.073	0.078	0.069	0.075	0.063	0.060	0.060
St Joseph	181411008/15	Angela & Eddy / Shields Dr	0.081	0.082	0.100	0.082	0.072	0.084	0.063	0.067	0.058	0.059	0.061
St Joseph	181411007	Granger	0.078	0.089	0.104	0.086	0.076	0.086	0.070	0.082	0.069	0.062	0.060

Graph 18: North Central Indiana 8-Hour Ozone Three-Year Design Values

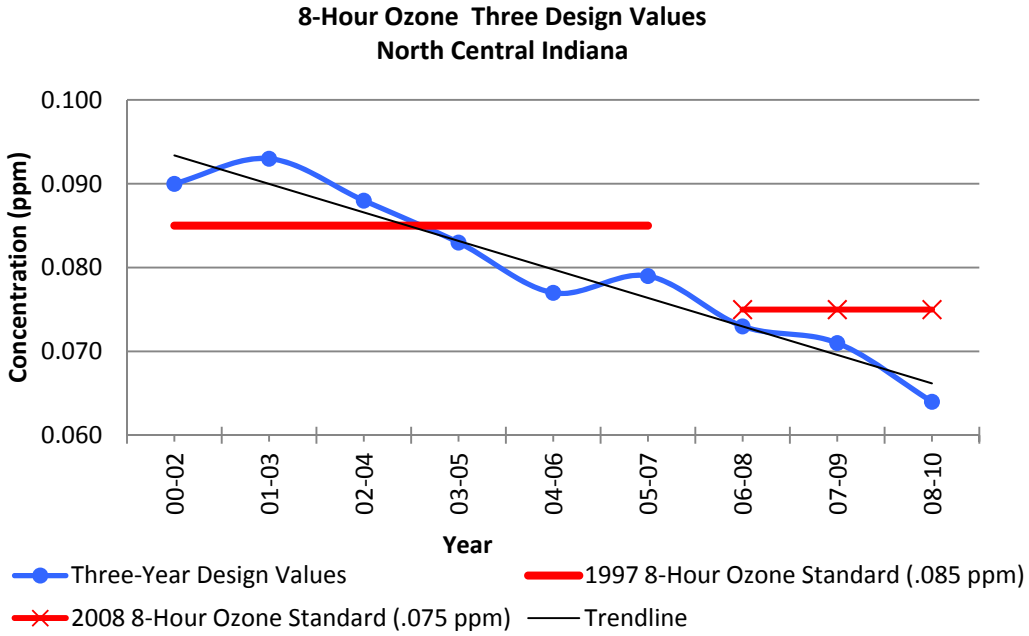


Table 15: North Central Indiana 8-Hour Ozone Three-Year Design Value Monitoring Data Summary

County	Site #	Site Name	Three-Year Design Value (ppm)								
			00-02	01-03	02-04	03-05	04-06	05-07	06-08	07-09	08-10
Elkhart	180390002	Bristol-Water Treatment Plant									
Elkhart	180390007	Bristol-Bristol Elementary		0.093	0.087	0.083	0.076	0.078	0.072	0.070	0.064
St Joseph	181410010	Potato Creek	0.083	0.083	0.082	0.077	0.073	0.074	0.069	0.066	0.061
St Joseph *	181411008/15	Angela & Eddy / Shields Dr	0.087	0.088	0.084	0.079	0.073	0.071	0.062	0.061	0.059
St Joseph	181411007	Granger	0.090	0.093	0.088	0.082	0.077	0.079	0.073	0.071	0.063

Prior to 2008, highlighted red numbers are above the 8-hour O_3 standard of 0.085 ppm

Beginning in 2008, highlighted red numbers are above the 8-hour O_3 standard of 0.075 ppm

*St Joseph ozone monitor was moved from Angela & Eddy to Shields Drive on June 1, 2006. The 2004-2006 and 2005-2007 Design Values are calculated from both monitoring sites. 2006-2008 Design Value is calculated from Shields Dr only

While fluctuations in monitoring data can be seen in Graphs 16, 17, and 18, monitoring data for both 1-hour and 8-hour ozone indicate a downward trend over time. Because ozone is formed by the secondary reaction of precursor pollutants, it is heavily influenced by meteorology (wind speed, temperature, stagnant air, etc.) and during an ozone season when peak meteorology conditions exist, it is not unusual to see an increase in ozone. The high spikes in ozone in 2002, 2005, 2007, and 2010 shown in Graph 17 can be traced back to high temperatures and stagnant weather conditions during the ozone seasons of those years.

Table 12, 13, 14, and 15 demonstrate that the 1-hour and 8-hour ozone values 8-hour ozone values for the North Central Indiana area correlate with each other over time, meaning that when one monitoring site trends upward or downward, the other sites do also. Monitor values for 8-hour ozone in North Central Indiana were in violation of the 8-hour ozone standard, but are now below the 8-hour ozone standard. The Bristol Elementary and Granger 8-hour ozone monitoring sites have historically registered the highest 8-hour ozone values in North Central Indiana. This is expected since they are the downwind sites for the core metropolitan areas. Downwind monitors are usually the last to attain the standards due to the fact that ozone and ozone precursors from the most densely populated areas and emission sources have more time for photochemical reactions to build to peak levels.

Ozone is not emitted directly into the air, but is created in the lower atmosphere. NO_x and VOC chemically react individually or collectively in the presence of sunlight to form ground-level ozone. U.S. EPA's NEI contains emissions information for NO_x and VOC and is used in the following graphs and charts. Graphs 19 and 20 illustrate the emissions trend for the ozone precursors in North Central Indiana and Charts 6 and 7 shows how the average emissions are distributed among the different source categories.

Graph 19: North Central Indiana NO_x Emissions

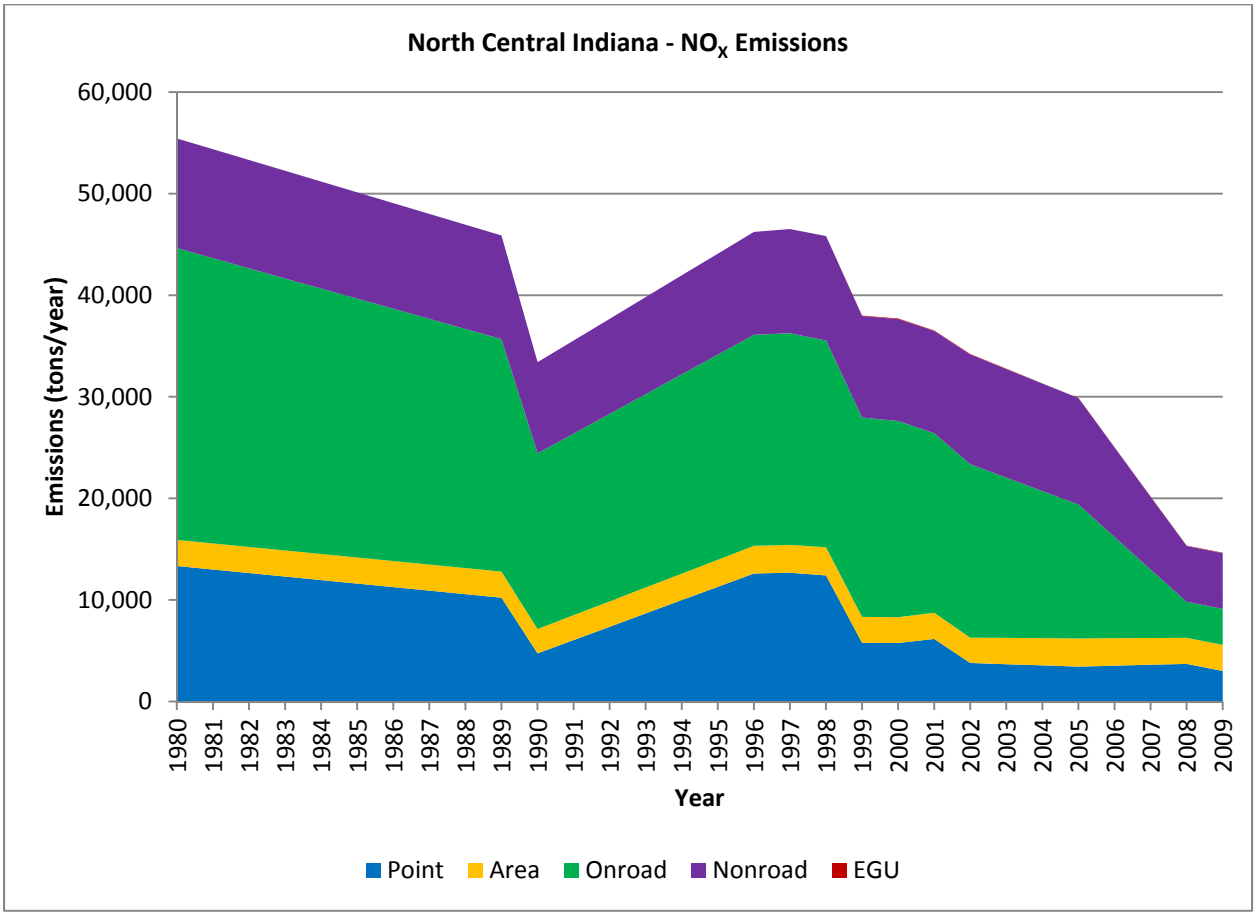
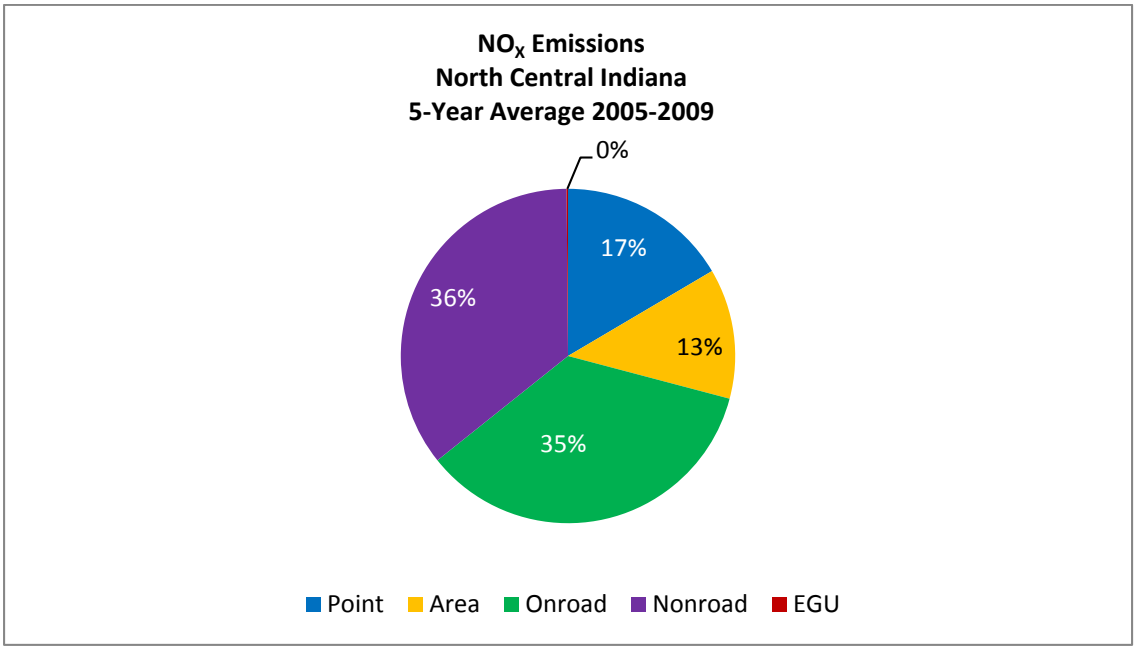


Chart 6: North Central Indiana NO_x Emissions



Graph 20: North Central Indiana VOC Emissions

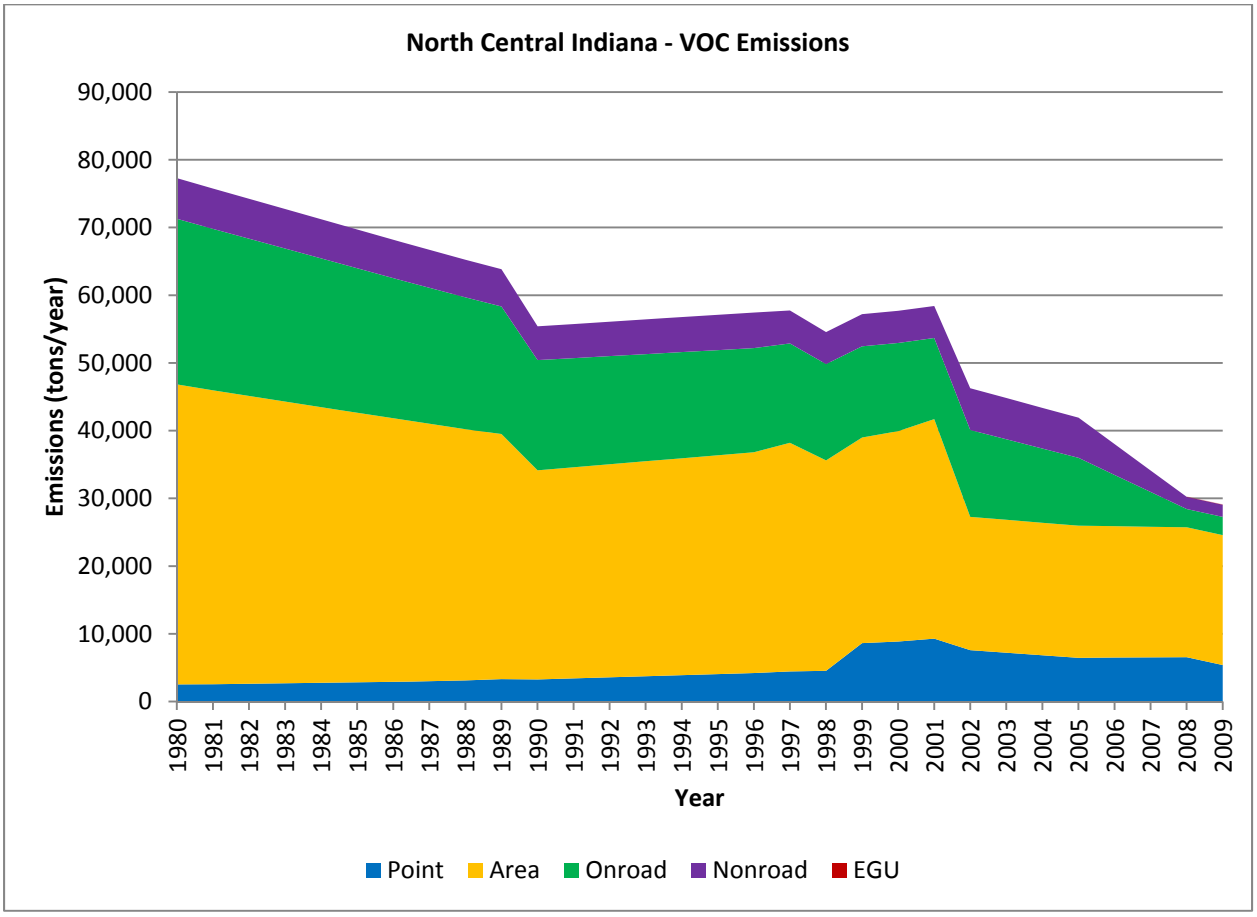
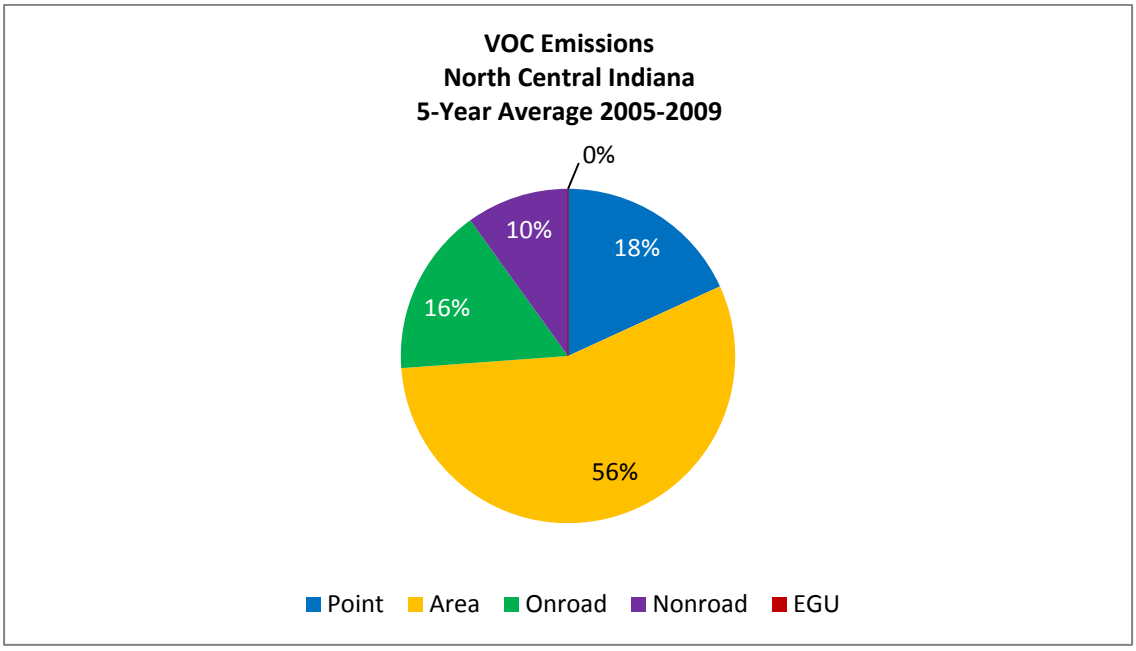


Chart 7: North Central Indiana VOC Emissions



National controls, such as engine and fuel standards, as well as regional controls, such as the NO_x SIP Call, have led to a decrease in ozone precursor emissions over time. As Graphs 19 and 20 illustrate, NO_x and VOC emissions have decreased by 74% and 62%, respectively, within the North Central Indiana area since 1980. This trend is true for the key precursors of ozone throughout Indiana and the upper Midwest. Reductions in NO_x and VOC emissions are also attributable to the implementation of the federal engine and fuel standards for onroad and nonroad vehicles and equipment and the NO_x SIP Call beginning in 2004. Nationally, average ozone levels declined in the 1980's, leveled off in the 1990's, and showed a notable decline after 2004 with the implementation of the NO_x SIP Call.

For information on ozone standards, sources, health effects, and programs to reduce ozone, please see www.epa.gov/air/ozonepollution.

Particulate Matter (PM_{10})

All available PM_{10} data for North Central Indiana are from monitors that were located in St. Joseph County. The trend data in Graph 21 reflect the annual arithmetic mean which is used to compare to the primary and secondary annual PM_{10} standards of 50 $\mu g/m^3$. The highest value from all of the monitors in the North Central Indiana area is plotted on the graph for each year. The annual PM_{10} standard was revoked in October 2006. The trend data in Graph 22 reflect the 2nd highest 24-hour PM_{10} concentration, which is used to compare to the primary and secondary 24-hour PM_{10} standards of 150 $\mu g/m^3$. Attainment of the primary and secondary 24-hour PM_{10} standards is determined by evaluating the 2nd highest 24-hour concentrations and is attained when the number of days per year with a 24-hour average above 150 $\mu g/m^3$ is equal to or less than 1 per year in a three-year period. The highest 2nd high concentration from all of the monitors in the North Central Indiana area is plotted on the graph for each year.

While there is some variability in the monitoring data for both the annual and 24-hour PM_{10} values, a downward trend over time is demonstrated in Graphs 21 and 22. The monitoring data in North Central Indiana have been below both the primary and secondary annual PM_{10} standards, as well as the primary and secondary 24-hour PM_{10} standards. PM_{10} monitors are located in close proximity to major sources in the area and data will fluctuate based on variability in facility operations and meteorology.

The data shown in Tables 16 and 17 include the monitoring sites that measured annual and 24-hour PM_{10} from 2000 through 2010. Monitoring data for both annual and 24-hour PM_{10} prior to the year 2000 are available upon request. Monitoring data in Table 16 are compared to the primary and secondary annual PM_{10} standards of 50 µg/m^3 and show that the North Central Indiana area has always been below the standards. Monitoring data in Table 17 are compared to the primary and secondary 24-hour PM_{10} standards of 150 µg/m^3 and show that the North Central Indiana area has always been below the standards.

Graph 21: North Central Indiana Annual Arithmetic Mean PM_{10} Values

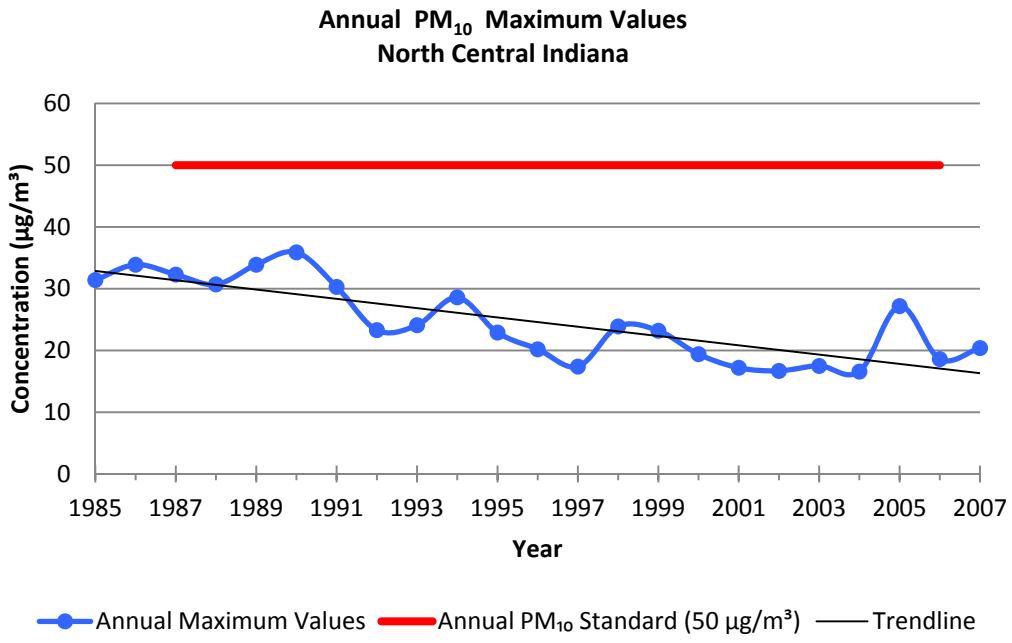


Table 16: North Central Indiana Annual Arithmetic Mean PM_{10} Values Monitoring Data Summary

County	Site #	Site Name	Annual Arithmetic Mean (µg/m^3)										
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
St. Joseph	181410015	South Bend - Shields Dr							18.6	20.4			
St. Joseph	181411008	South Bend - Angela & Eddy				17.5	16.6	27.2	14.4				
St Joseph	181412004	South Bend - LaSalle HS	19	17	17								
			Highlighted red numbers are over the annual PM_{10} standard of 50 µg/m^3										

Graph 22: North Central Indiana 24-Hour PM_{10} 2nd High Values

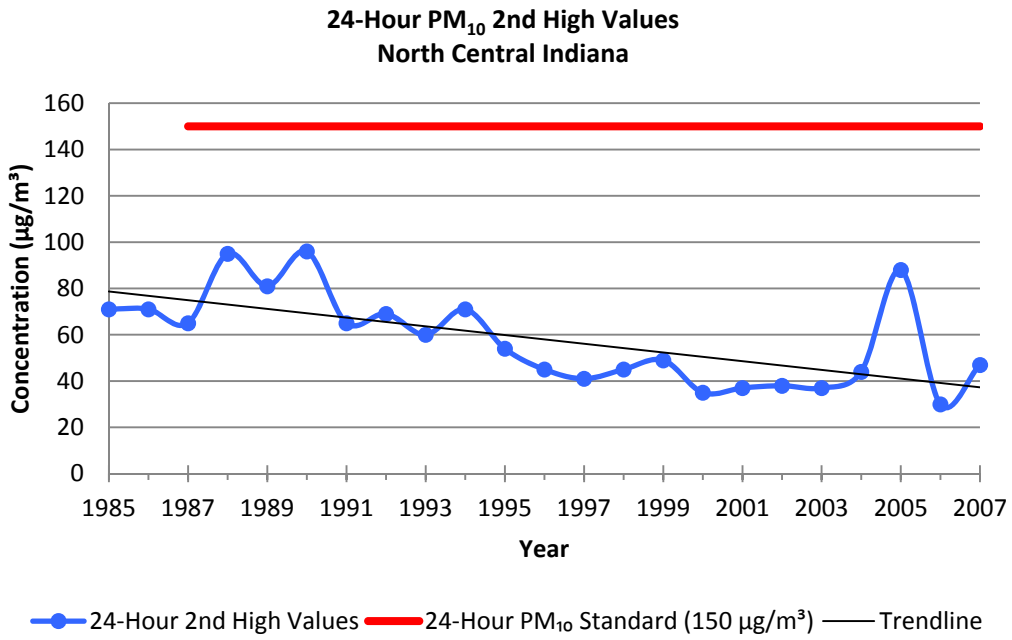


Table 17: North Central Indiana 24-Hour PM_{10} 2nd High Values Monitoring Data Summary

County	Site #	Site Name	24-Hour 2nd High Value (µg/m³)										
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
St Joseph	181410015	South Bend - Shields Dr							30	47			
St Joseph	181411008	South Bend - Angela & Eddy				37	44	88	29				
St Joseph	181412004	South Bend - LaSalle HS	35	37	38								

Highlighted red numbers are over the 24-hour PM_{10} standard of 150 µg/m³

U.S. EPA's NEI contains emissions information for PM_{10} and is used in Graph 23 and Chart 8. Graph 23 illustrates the emissions trend for PM_{10} in North Central Indiana and Chart 8 shows how the average emissions are distributed among the different source categories.

Graph 23: North Central Indiana PM_{10} Emissions

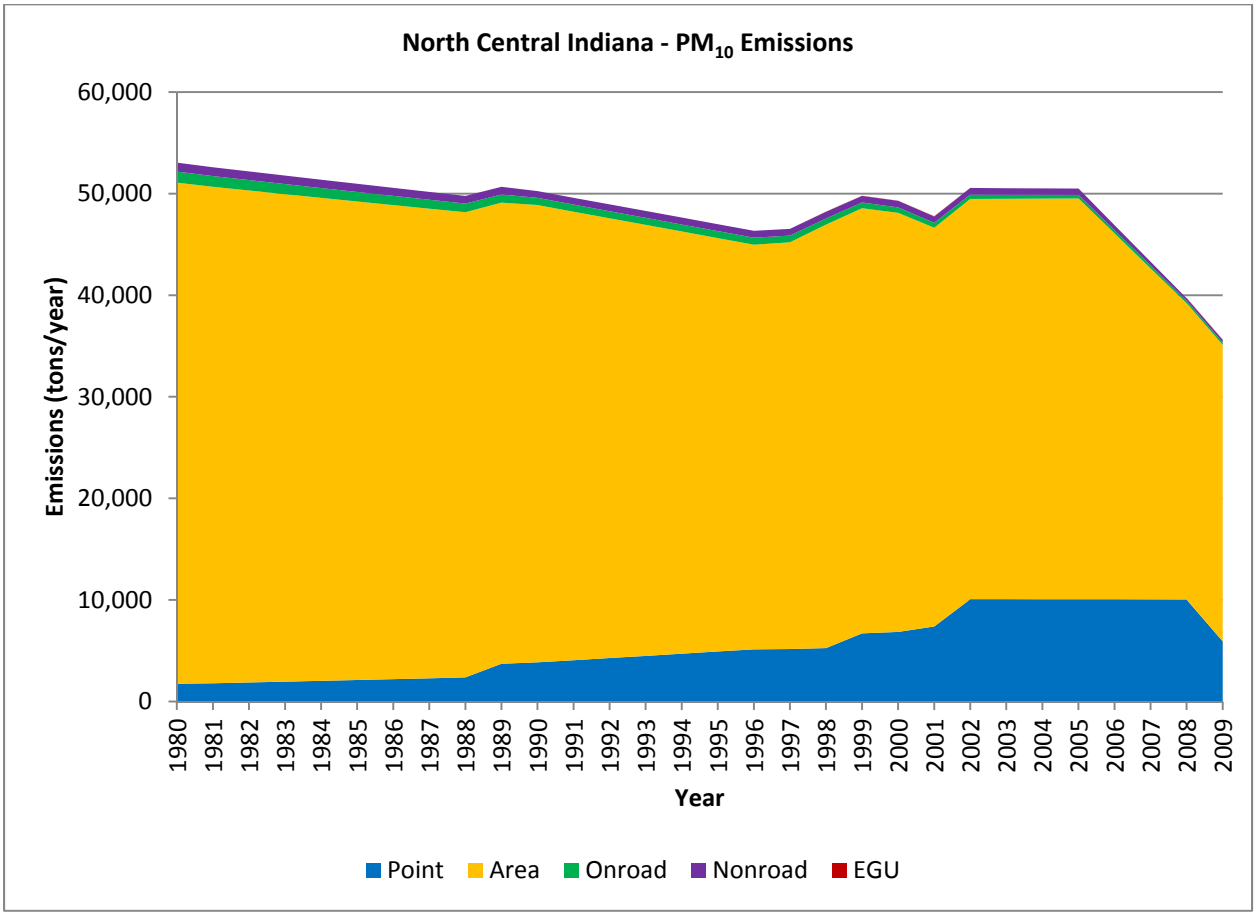
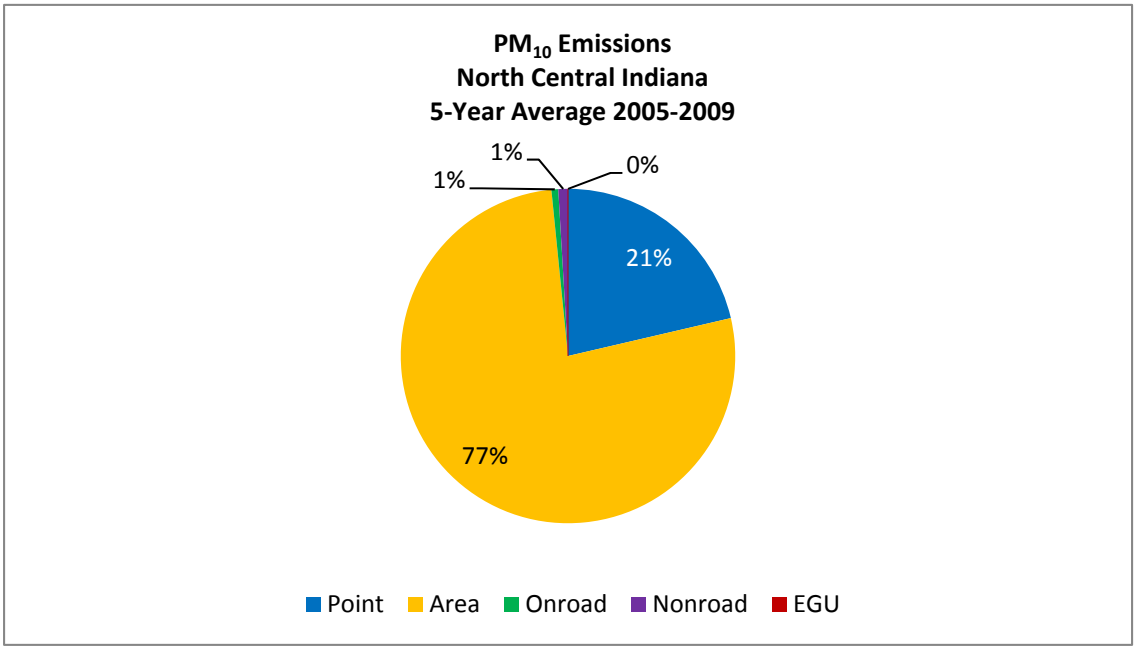


Chart 8: North Central Indiana PM_{10} Emissions



National controls, such as engine and fuel standards, as well as regional controls, such as the NO_x SIP Call, have led to a decrease in total PM_{10} values over time. As Graph 23 illustrates, PM_{10} emissions have decreased by 33% since 1980.

Sulfur Dioxide (SO_2)

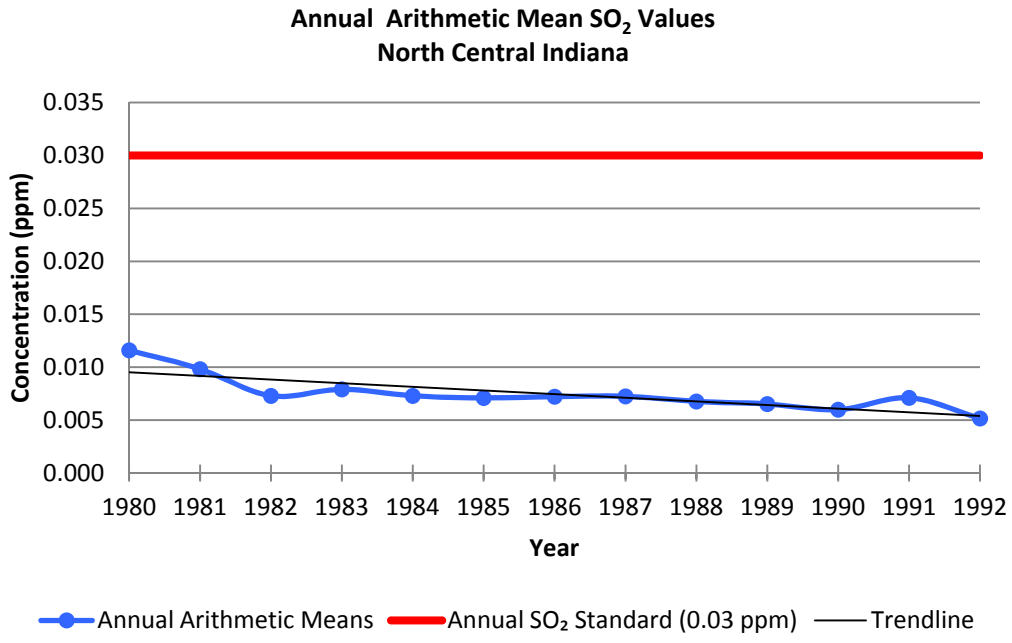
One monitoring site within North Central Indiana, located in St. Joseph County measured SO_2 levels until 1992. The trend data in Graph 24 reflect the annual arithmetic mean which was used to compare to the primary annual SO_2 standard at 0.03 ppm. Attainment of the primary annual SO_2 standard was determined by evaluating the annual arithmetic mean which could not exceed the standard. U.S. EPA revoked the primary annual SO_2 standard in June 2010 and replaced it with a 1-hour SO_2 standard. The highest annual arithmetic mean from all of the monitors in the North Central Indiana area is plotted on Graph 24 for each year.

The trend data in Graph 25 reflect the 2nd highest 24-hour SO_2 concentrations, which were used to compare to the primary 24-hour SO_2 standard at 0.14 ppm. Attainment of the primary 24-hour SO_2 standard was determined by evaluating the 2nd highest 24-hour concentration, which could not exceed the standard. U.S. EPA revoked the primary 24-hour SO_2 standard in June 2010 and replaced it with a 1-hour SO_2 standard. The highest of the 2nd high 24-hour values from all of the monitors in the North Central Indiana area is plotted on Graph 25 for each year. The trend data in Graph 26 show the 99th percentile of the 1-hour SO_2 values, which are provided for reference purposes only, because they were collected prior to the implementation of the current standard. The design value of the 99th percentile is used for comparison to the primary 1-hour SO_2 standard; therefore, the one-year values shown in Graph 26 are not a true comparison to the primary 1-hour SO_2 standard. The values in Graph 26 reflect the highest 99th percentile from all of the monitors in the North Central Indiana area which is plotted on the graph for each year. The 1-hour SO_2 standard at 75 ppb is not listed on this graph since it was not established until June 2010. Attainment of the primary 1-hour SO_2 standard is determined by evaluating the design value of the 99th percentile values of the daily maximum 1-hour averages at each monitor within an area, which must not exceed 75 ppb averaged over a three-year period. An exceedance of the primary 1-hour SO_2 standard occurs when a 99th percentile value is equal to or greater than 75 ppb. A violation of the primary 1-hour SO_2 standard occurs when the three-year design

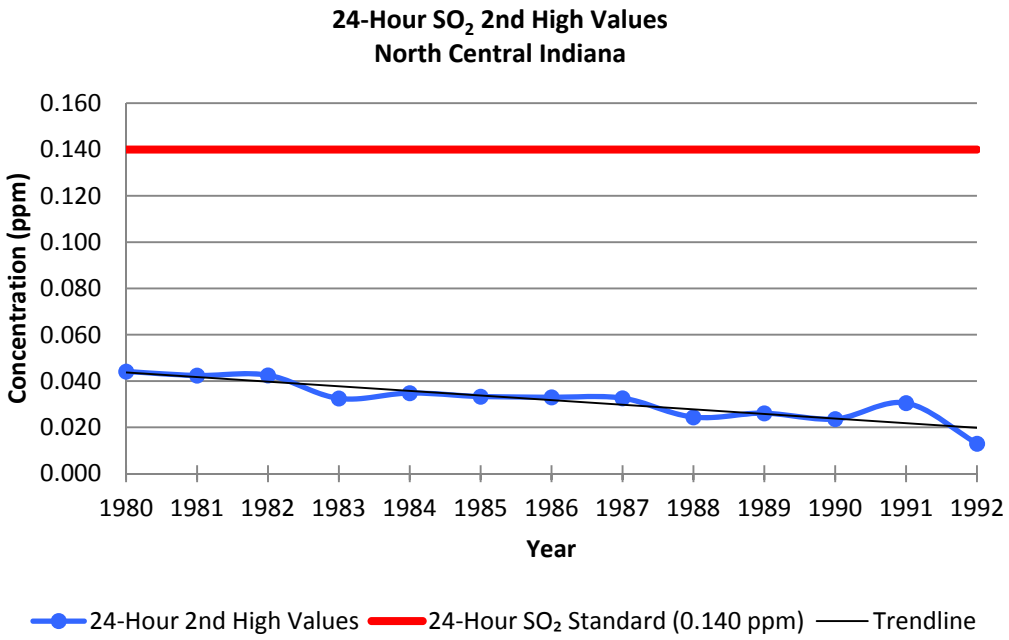
value of the 99th percentile is equal to or greater than 75.5 ppb. A monitor can exceed the standard without being in violation.

The SO_2 monitoring site in St. Joseph County was discontinued in 1992; therefore, tables of current monitoring data for the annual, 24-hour, and 1-hour SO_2 values are not included in this report. However, historical monitoring data for annual, 24-hour, and 1-hour SO_2 from the monitoring site are available upon request.

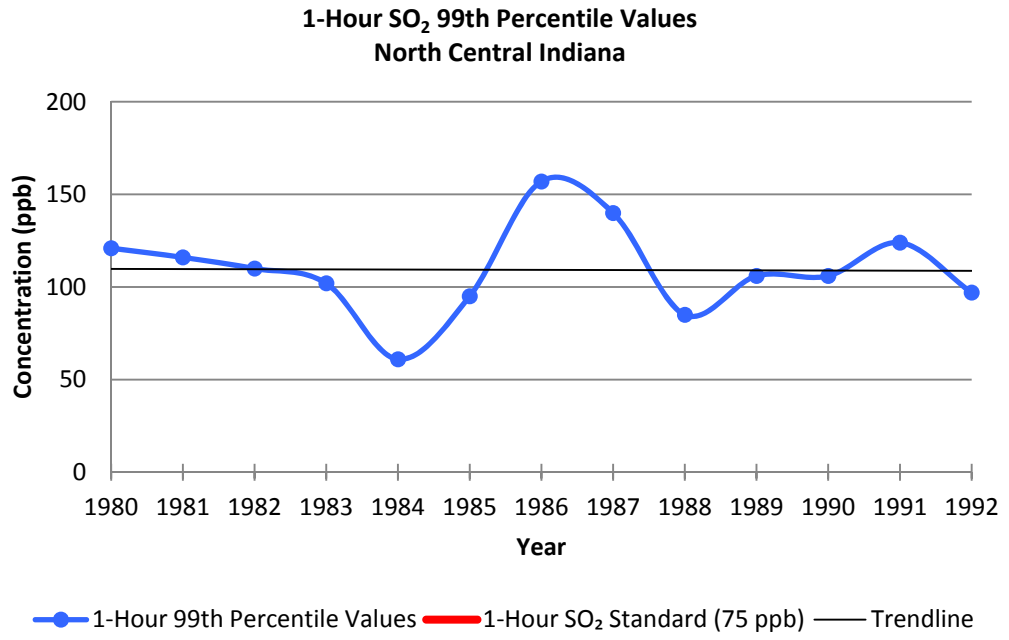
Graph 24: North Central Indiana Annual Arithmetic Mean SO_2 Values



Graph 25: North Central Indiana 24-Hour SO_2 2nd High Values



Graph 26: North Central Indiana 1-Hour SO_2 99th Percentile Values



While fluctuations in monitoring data are shown in Graphs 24, 25, and 26, monitoring data for SO_2 indicates a downward trend over time. SO_2 monitors are located in close proximity to major sources in the area and data will fluctuate based on variability in facility operations and meteorology.

U.S. EPA's NEI contains emissions information for SO_2 and is used in Graph 27 and Chart 9. Graph 27 illustrates the emissions trend for SO_2 in North Central Indiana and Chart 9 shows how the average emissions are distributed among the different source categories.

Graph 27: North Central Indiana SO_2 Emissions

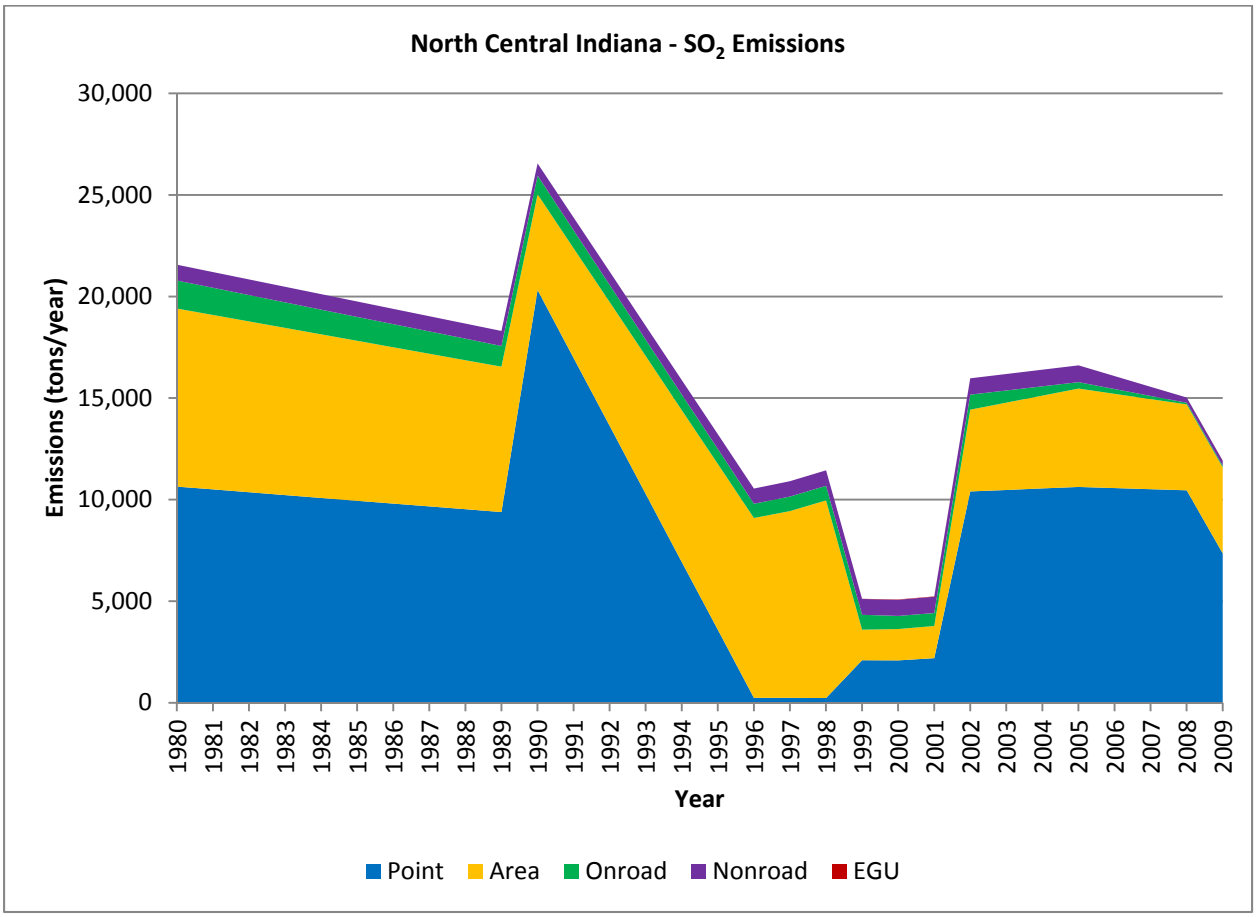
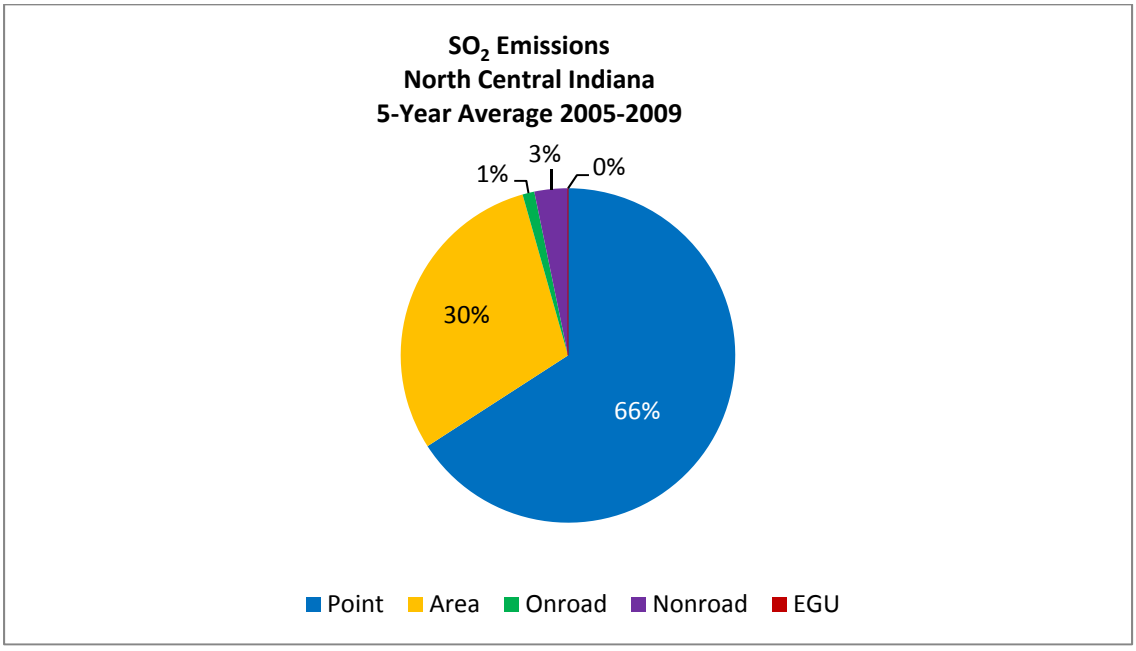


Chart 9: North Central Indiana SO_2 Emissions



National and regional controls, such as the Acid Rain Program, engine and fuel standards, and the NO_x SIP Call have led to a decrease in SO_2 values over time. As Graph 27 illustrates, SO_2 emissions have decreased by 45% within the North Central Indiana area since 1980. This trend is true throughout Indiana and the upper Midwest. Nationally, average SO_2 concentrations have decreased by more than 70% since 1980 due to implementation of the Acid Rain Program.

For information on SO_2 standards, sources, health effects, and programs to reduce SO_2, please see www.epa.gov/air/sulfurdioxide.

Total Suspended Particulate (TSP)

All available TSP data for North Central Indiana are from monitors that were located in St. Joseph County. The trend data in Graph 28 reflect the annual geometric mean values, which were used to compare to the primary and secondary annual TSP standards of 75 µg/m^3. The highest annual geometric mean from all of the monitors in the North Central Indiana area is plotted on the graph for each year. The trend data in Graph 29 reflect the 2nd highest 24-hour TSP concentrations which were used to compare to the primary 24-hour TSP standard of 260 µg/m^3. The highest 2nd high 24-hour value from all of the monitors in the North Central Indiana area is plotted on the graph for each year.

Both the primary and secondary annual TSP standards, as well as the primary and secondary 24-hour TSP standards, were revoked in 1987. TSP monitoring sites were discontinued across Indiana in 1995 because TSP was replaced by PM_{10}. Monitoring data for both annual and 24-hour TSP show a downward trend over time. While occasional spikes can be seen in the annual and 24-hour TSP values, the monitor values for North Central Indiana have historically been below the primary and secondary annual and primary 24-hour TSP standards. TSP monitors were located in close proximity to major sources in the area and data fluctuate based on variability in facility operations and meteorology.

The data in Tables 18 and 19 are from the monitoring sites that measured annual and 24-hour $PM_{2.5}$ from 1980 through 1991. All available data for both annual and 24-hour TSP for the North Central Indiana area are shown in the tables. Monitoring data for both annual and 24-hour TSP show a downward trend over time.

Monitoring data in Table 18 show the annual geometric mean for annual TSP for the years 1980 through 1991 which are compared to the primary and secondary annual $PM_{2.5}$ standards of 75 µg/m^3. Monitoring data in Table 19 show the 2nd highest 24-hour TSP concentrations for the years 1980 through 1991, which are compared to the primary 24-hour TSP standard of 260 µg/m^3.

Graph 28: North Central Indiana Annual Geometric Mean TSP Values

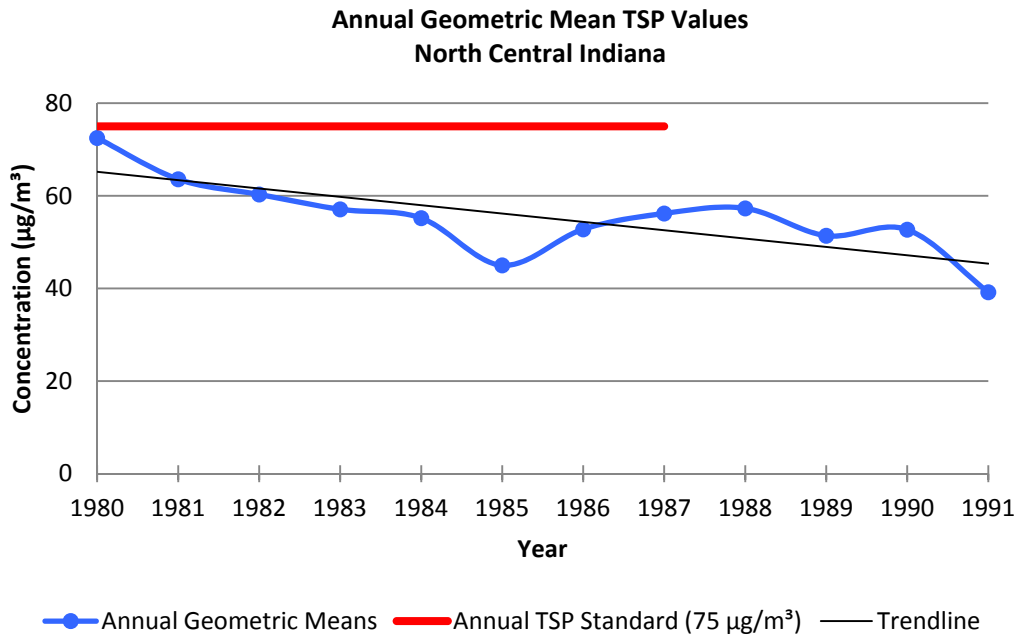


Table 18: North Central Indiana Annual Geometric Mean TSP Values

County	Site #	Site Name	Annual Geometric Mean (µg/m^3)											
			1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
St. Joseph	181410004	E. Lincoln Way	73	64										
St. Joseph	181410007	S. Main Street			50	47	55	37	42	41	46	50		
St. Joseph	181411002	W. Wayne	62	56	52	51	45	42	51	48	49	51	53	39
St. Joseph	181411006	State Police Post	47	42	38	40	38	35	37	39	49			
St. Joseph	181411008	E. Angela Street	62	55	42	43	47	45	40	42	42			
St. Joseph	181412004	LaSalle High School	52	50	42	43	40	40	41	42	47			
St. Joseph	181412006	Municipal Service Building	71	63	60	57	50	43	53	56	57			

Highlighted red numbers through 1987 are above the Annual TSP Standard of 75 µg/m^3

Graph 29: North Central Indiana 24-Hour TSP 2nd High Values

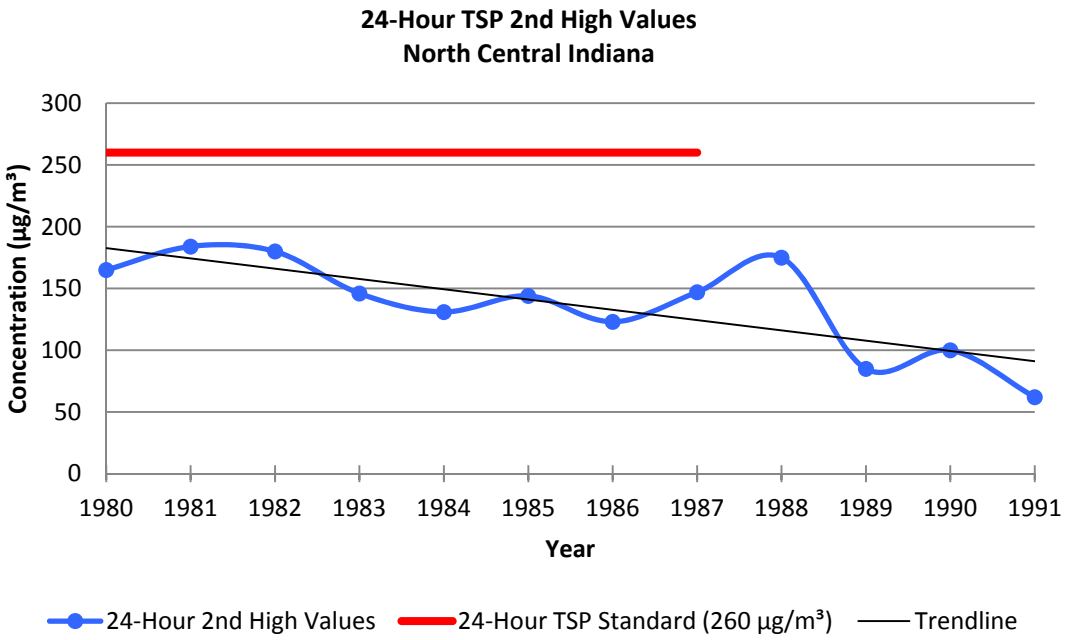


Table 19: North Central Indiana 24-Hour TSP 2nd High Values

County	Site #	Site Name	2nd High Values (µg/m³)											
			1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991
St. Joseph	181410004	E. Lincoln Way	164	158										
St. Joseph	181410007	S. Main Street			130	120	114	72	82	95	122	69		
St. Joseph	181411002	W. Wayne	108	138	148	140	99	114	95	92	118	85	100	62
St. Joseph	181411006	State Police Post	165	132	116	100	94	78	84	99	123			
St. Joseph	181411008	E. Angela Street	145	144	114	118	121	144	69	147	104			
St. Joseph	181412004	LaSalle High School	145	134	124	109	92	117	92	102	157			
St. Joseph	181412006	Municipal Service Building	162	184	180	146	131	113	123	140	175			

Highlighted red numbers through 1987 are above the 24-Hour TSP Standard of 260 µg/m³

Future of Air Quality

U.S. EPA is required by the CAA to review each criteria pollutant standard to evaluate whether it adequately protects public health. If a criteria pollutant standard is lowered in the future, the North Central Indiana area may monitor violations of the new standard simply because the standard could be set lower than current monitored values. However, as new air programs are implemented in the future, the North Central Indiana area will continue to see declines in monitor and emission values, which will help it meet the threshold for any new criteria pollutant standards that are implemented.

Conclusions

Although overall population and VMT have been on the increase over time, the North Central Indiana area's monitored air quality and emission values have been trending downward and will continue to improve into the future. The overall decrease in emissions in the North Central Indiana area can be attributed to a variety of clean air programs put in place nationally (i.e. the Acid Rain Program, Tier II Emission Standards for Vehicles and Gasoline Sulfur Standards, Heavy-Duty Diesel Engine Program, and the Clean Air Nonroad Diesel Rule), regionally (i.e. the NO_x SIP Call, CAIR, and state rules), and locally through local ordinances (i.e. open burning regulations, outdoor wood-fired heating devices, and vehicle or engine operations) over the past 30 years. It is expected that this downward trend will persist as existing clean air programs continue and new programs such as CSAPR and recently adopted state rules are implemented (e.g. the Outdoor Hydronic Heater Rule, the Consumer and Commercial Products Rule, the Architectural and Industrial Maintenance Coatings Rule, the Automobile Refinishing Operations Rule, and the Stage I Vapor Recovery Rule).

This page intentionally left blank.

Appendix

North Central Indiana County-Specific Emission Inventory Data

(1980-2009)

This page intentionally left blank.

Elkhart County Emissions (Tons per Year)

Year	CO	NO_x	$PM_{2.5}$	PM_{10}	SO_2	VOC
1980	137,806.79	15,116.48	5,399.87	12,826.70	5,043.61	29,194.71
1981	134,441.05	14,899.16	5,309.93	12,769.79	5,000.23	28,615.82
1982	131,075.30	14,681.85	5,220.00	12,712.88	4,956.86	28,036.93
1983	127,709.56	14,464.53	5,130.06	12,655.97	4,913.48	27,458.05
1984	124,343.82	14,247.21	5,070.58	12,599.06	4,870.11	26,879.16
1985	120,978.07	14,029.89	5,011.09	12,542.15	4,826.73	26,300.27
1986	117,612.33	13,812.57	4,951.61	12,485.25	4,783.36	25,721.39
1987	114,246.58	13,595.25	4,892.13	12,428.34	4,741.09	25,142.50
1988	110,880.84	13,377.93	4,832.64	12,371.43	4,699.00	24,563.62
1989	107,515.10	13,160.61	4,773.16	12,804.50	4,656.91	24,064.12
1990	87,517.47	10,424.99	4,253.18	11,586.62	9,646.35	21,359.05
1991	88,270.13	10,813.27	4,323.48	11,889.07	8,146.87	21,382.70
1992	89,022.79	11,201.55	4,403.08	12,198.19	6,647.40	21,406.35
1993	89,775.45	11,589.83	4,482.69	12,507.31	5,147.92	21,430.01
1994	90,528.11	11,978.11	4,562.30	12,816.42	3,648.44	21,453.66
1995	91,280.77	12,366.39	4,641.91	13,125.54	2,148.97	21,477.31
1996	92,033.43	12,754.67	4,721.51	13,434.66	649.49	21,500.96
1997	88,957.69	12,874.47	4,726.57	13,545.74	663.21	21,770.86
1998	87,114.93	12,708.17	4,806.94	13,852.40	659.10	19,985.59
1999	83,449.34	12,908.79	4,952.60	13,989.94	1,366.14	22,004.89
2000	83,836.10	12,899.99	5,091.41	14,045.27	1,371.56	22,387.25
2001	79,766.56	12,548.82	4,885.05	13,502.48	1,409.11	22,900.43
2002	73,288.29	11,809.50	3,896.55	15,476.82	5,743.29	17,477.28
2003	67,712.30	11,276.53	3,874.39	15,448.56	5,696.62	17,068.24
2004	62,136.31	10,743.57	3,852.23	15,420.30	5,649.96	16,659.21
2005	56,560.32	10,210.60	3,830.07	15,392.04	5,603.29	16,250.17
2006	43,685.25	8,501.93	3,793.22	14,426.74	5,516.04	14,917.98
2007	30,810.18	6,793.26	3,756.38	13,461.44	5,428.79	13,585.78
2008	17,935.10	5,084.58	3,719.53	12,496.15	5,341.53	12,253.58
2009	17,888.44	4,644.05	2,288.86	9,316.84	2,542.18	11,521.89
%Change 1980 to 2009	-79.91%	-69.28%	-57.61%	-27.36%	-49.60%	-60.53%

Fulton County Emissions (Tons per Year)

Year	CO	NO_x	$PM_{2.5}$	PM_{10}	SO_2	VOC
1980	17,130.46	2,045.95	1,687.55	6,155.16	594.77	2,748.67
1981	16,716.80	2,004.19	1,651.13	6,074.51	579.12	2,716.79
1982	16,303.15	1,962.44	1,614.72	5,993.87	563.47	2,684.90
1983	15,889.49	1,920.68	1,578.31	5,913.22	547.82	2,653.02
1984	15,475.83	1,878.93	1,541.90	5,832.58	532.16	2,621.14
1985	15,062.17	1,837.20	1,505.49	5,751.94	516.51	2,589.25
1986	14,648.51	1,795.46	1,469.08	5,671.29	500.86	2,557.37
1987	14,234.85	1,753.73	1,432.67	5,590.65	485.21	2,525.48
1988	13,821.20	1,711.99	1,396.26	5,510.00	469.56	2,493.60
1989	13,407.54	1,670.26	1,359.84	5,455.16	453.91	2,461.72
1990	11,425.87	1,387.68	1,266.80	5,540.62	790.26	2,195.17
1991	11,395.57	1,401.48	1,245.76	5,444.23	672.00	2,225.04
1992	11,365.27	1,415.27	1,224.72	5,347.85	553.74	2,254.91
1993	11,334.98	1,429.07	1,203.67	5,251.47	435.48	2,284.79
1994	11,304.68	1,442.87	1,182.63	5,155.08	317.21	2,314.66
1995	11,274.38	1,456.66	1,161.59	5,058.70	198.95	2,344.53
1996	11,244.08	1,470.46	1,145.26	4,962.32	80.69	2,374.40
1997	10,832.57	1,467.59	944.85	3,988.55	82.38	2,373.90
1998	10,484.07	1,433.97	1,034.04	4,456.86	83.34	2,290.39
1999	9,879.71	1,429.21	1,069.65	4,530.06	95.50	2,312.90
2000	9,628.51	1,382.88	1,062.08	4,446.98	91.70	2,311.85
2001	9,422.54	1,353.18	1,029.92	4,386.62	93.97	2,337.35
2002	9,696.49	1,308.29	813.11	4,808.48	332.86	2,315.43
2003	8,974.36	1,243.08	811.63	4,808.15	326.98	2,268.63
2004	8,252.23	1,177.88	810.14	4,807.83	321.10	2,221.82
2005	7,530.09	1,112.68	808.66	4,807.50	315.22	2,175.02
2006	5,785.29	871.86	795.35	4,462.20	300.82	1,926.94
2007	4,040.49	631.03	782.04	4,116.91	286.43	1,678.86
2008	2,295.69	390.21	768.73	3,771.61	272.03	1,430.78
2009	2,279.03	390.21	685.54	3,523.80	272.03	1,336.79
%Change 1980 to 2009	-79.95%	-80.93%	-59.38%	-42.75%	-54.26%	-51.37%

Kosciusko County Emissions (Tons per Year)

Year	CO	NO_x	$PM_{2.5}$	PM_{10}	SO_2	VOC
1980	48,820.35	6,201.68	3,242.25	9,572.87	1,503.31	11,286.21
1981	47,874.24	6,134.42	3,194.48	9,564.34	1,491.41	11,080.64
1982	46,928.12	6,067.16	3,146.71	9,555.81	1,479.51	10,875.07
1983	45,982.00	5,999.90	3,098.94	9,547.27	1,467.61	10,669.64
1984	45,035.88	5,932.64	3,051.16	9,538.74	1,455.71	10,465.08
1985	44,089.76	5,865.38	3,003.39	9,541.00	1,443.80	10,260.53
1986	43,157.79	5,798.12	2,957.72	9,532.47	1,431.90	10,055.98
1987	42,233.34	5,730.86	2,912.04	9,535.66	1,420.00	9,851.43
1988	41,308.89	5,663.60	2,866.37	9,538.85	1,408.10	9,646.87
1989	40,384.44	5,596.34	2,820.69	9,669.70	1,396.20	9,442.32
1990	29,963.25	4,301.35	2,683.20	9,945.32	2,804.86	9,523.82
1991	31,578.81	4,548.01	2,637.40	9,816.22	2,384.38	9,229.60
1992	33,194.38	4,794.66	2,591.60	9,687.12	1,963.89	8,935.38
1993	34,809.95	5,041.32	2,545.80	9,558.02	1,543.41	8,641.16
1994	36,425.51	5,287.97	2,500.00	9,428.91	1,122.93	8,346.93
1995	38,041.08	5,534.62	2,454.20	9,299.81	702.44	8,052.71
1996	39,656.64	5,781.28	2,408.44	9,170.71	281.96	7,758.49
1997	38,115.28	5,763.01	2,400.63	9,203.31	284.56	7,776.92
1998	36,881.40	5,624.58	2,431.20	9,408.28	284.23	7,426.52
1999	35,604.32	5,622.28	3,054.57	10,151.04	431.14	7,317.58
2000	35,966.15	5,634.34	3,061.12	9,899.32	423.05	7,408.36
2001	34,170.89	5,386.91	2,969.08	9,664.14	427.93	7,419.69
2002	35,668.26	5,446.21	2,098.86	11,430.41	1,786.92	7,739.92
2003	33,255.44	5,243.07	2,116.23	11,430.41	1,765.91	7,635.81
2004	30,842.62	5,039.94	2,133.60	11,430.40	1,744.90	7,531.70
2005	28,429.80	4,836.80	2,150.98	11,430.39	1,723.89	7,427.59
2006	22,068.71	4,029.17	2,106.07	10,627.67	1,673.70	6,574.87
2007	15,707.62	3,221.53	2,061.17	9,824.96	1,623.52	5,722.15
2008	9,346.53	2,413.90	2,016.26	9,022.24	1,573.33	4,869.43
2009	9,043.06	2,413.90	2,022.21	9,210.94	1,743.57	5,135.36
%Change 1980 to 2009	-72.76%	-61.08%	-37.63%	-3.78%	15.98%	-54.50%

Marshall County Emissions (Tons per Year)

Year	CO	NO_x	$PM_{2.5}$	PM_{10}	SO_2	VOC
1980	41,326.59	5,183.36	3,932.27	8,513.46	1,998.43	7,213.89
1981	40,262.81	5,088.74	3,853.76	8,457.11	1,940.58	7,074.36
1982	39,199.04	4,994.11	3,775.24	8,400.76	1,882.74	6,934.82
1983	38,135.26	4,899.48	3,696.72	8,344.41	1,824.90	6,795.29
1984	37,071.48	4,804.85	3,618.20	8,288.06	1,767.05	6,655.76
1985	36,007.71	4,710.23	3,539.68	8,231.72	1,709.21	6,516.22
1986	34,943.93	4,615.60	3,461.17	8,175.37	1,651.37	6,376.69
1987	33,880.16	4,520.97	3,382.65	8,119.02	1,593.52	6,258.19
1988	32,816.38	4,426.35	3,304.13	8,062.67	1,535.68	6,158.58
1989	31,752.61	4,331.72	3,225.61	8,292.12	1,477.84	6,058.98
1990	27,282.81	3,837.60	3,252.57	8,408.97	2,505.67	5,157.76
1991	27,041.31	3,828.96	3,056.46	8,233.44	2,123.18	5,235.02
1992	26,799.81	3,820.32	2,860.34	8,057.91	1,740.68	5,312.27
1993	26,558.31	3,811.68	2,664.22	7,882.39	1,358.19	5,389.53
1994	26,316.80	3,803.03	2,468.11	7,706.86	975.69	5,466.79
1995	26,075.30	3,794.39	2,271.99	7,531.33	593.20	5,544.04
1996	25,833.80	3,785.75	2,075.88	7,355.81	210.70	5,621.30
1997	24,974.41	3,767.47	2,144.36	7,745.78	213.27	5,678.50
1998	24,132.12	3,674.92	2,221.02	8,183.45	212.65	5,476.45
1999	22,763.74	3,715.70	2,423.73	8,507.54	456.18	6,042.78
2000	22,134.65	3,613.17	2,422.98	8,364.63	450.27	6,095.03
2001	21,866.42	3,569.28	2,376.62	8,255.66	462.68	6,239.29
2002	20,566.26	3,475.41	1,385.35	8,027.05	888.72	4,754.97
2003	19,067.43	3,343.29	1,382.38	8,027.81	872.40	4,649.95
2004	17,568.60	3,211.18	1,379.40	8,028.58	856.08	4,544.94
2005	16,069.77	3,079.06	1,376.42	8,029.34	839.76	4,439.92
2006	12,399.22	2,571.58	1,358.66	7,459.92	808.11	3,977.83
2007	8,728.66	2,064.10	1,340.91	6,890.50	776.46	3,515.74
2008	5,058.10	1,556.61	1,323.15	6,321.08	744.81	3,053.65
2009	4,978.61	1,565.01	1,138.93	6,058.33	789.29	2,753.05
%Change 1980 to 2009	-87.95%	-69.81%	-71.04%	-28.84%	-60.50%	-61.84%

St. Joseph County Emissions (Tons per Year)

Year	CO	NO_x	$PM_{2.5}$	PM_{10}	SO_2	VOC
1980	161,373.73	26,891.90	5,133.31	15,992.41	12,429.37	26,863.32
1981	157,199.46	26,252.95	5,019.28	15,741.41	12,195.59	26,276.70
1982	153,025.18	25,613.99	4,905.24	15,536.39	11,961.81	25,718.89
1983	148,850.91	24,975.03	4,791.21	15,330.83	11,728.04	25,163.02
1984	144,676.63	24,336.07	4,677.17	15,127.10	11,494.26	24,607.15
1985	140,502.36	23,697.12	4,563.14	14,923.37	11,260.48	24,051.28
1986	136,328.09	23,058.16	4,449.10	14,719.72	11,026.70	23,495.40
1987	132,153.81	22,419.20	4,409.87	14,515.99	10,792.92	22,939.53
1988	127,979.54	21,780.24	4,370.64	14,312.57	10,559.14	22,384.12
1989	123,806.12	21,141.29	4,331.41	14,471.93	10,325.36	21,829.03
1990	98,488.05	13,465.01	4,229.88	14,782.54	10,806.02	17,193.00
1991	99,821.69	14,963.20	4,207.85	14,223.84	10,559.93	17,696.56
1992	101,155.33	16,461.38	4,185.81	13,665.13	10,313.84	18,200.12
1993	102,488.97	17,959.57	4,163.77	13,106.43	10,067.75	18,703.68
1994	103,822.61	19,457.75	4,142.00	12,547.72	9,821.65	19,207.24
1995	105,156.25	20,955.93	4,145.71	11,989.02	9,575.56	19,710.80
1996	106,489.89	22,454.12	4,150.06	11,430.31	9,329.47	20,214.36
1997	102,453.52	22,662.09	4,273.76	12,060.93	9,670.24	20,167.04
1998	99,354.29	22,385.69	4,339.88	12,344.00	10,210.68	19,407.68
1999	94,043.82	14,332.44	4,547.18	12,632.00	2,776.78	19,540.97
2000	92,052.27	14,189.73	4,464.17	12,556.93	2,752.03	19,509.02
2001	87,012.15	13,690.26	4,238.97	11,976.02	2,849.83	19,536.97
2002	77,306.74	12,187.94	2,258.31	10,826.41	7,225.27	13,997.21
2003	71,450.12	11,674.78	2,264.94	10,833.78	7,527.41	13,210.42
2004	65,593.51	11,161.63	2,271.56	10,841.15	7,829.55	12,423.62
2005	59,736.89	10,648.47	2,278.19	10,848.53	8,131.70	11,636.83
2006	45,742.26	9,070.78	2,222.28	9,933.65	7,786.95	10,639.97
2007	31,747.63	7,493.10	2,166.38	9,018.76	7,442.20	9,643.11
2008	17,753.00	5,915.41	2,110.47	8,103.88	7,097.44	8,646.25
2009	17,812.81	5,650.37	1,994.66	7,507.96	6,576.50	8,339.45
%Change 1980 to 2009	-88.96%	-78.99%	-61.14%	-53.05%	-47.09%	-68.96%