

**Commonwealth of Pennsylvania  
Department of Environmental Protection**



**REQUEST FOR REDESIGNATION  
AS ATTAINMENT**

**YOUNGSTOWN-WARREN-SHARON  
INTERSTATE  
EIGHT-HOUR OZONE NONATTAINMENT AREA**

**MARCH 2007**

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## INTRODUCTION

Maintaining concentrations of ground-level ozone below the health-based standard is important because ozone is a serious human health threat, and also can cause damage to important food crops, forests, and wildlife.

Repeated exposure to ozone pollution may cause a variety of adverse health effects for both healthy people and those with existing conditions including difficulty in breathing, chest pains, coughing, nausea, throat irritation, and congestion. It can worsen bronchitis, heart disease, emphysema, and asthma, and reduce lung capacity. Asthma is a significant and growing threat to children and adults. Ozone can aggravate asthma, causing more asthma attacks, increased use of medication, more medical treatment and more frequent visits to hospital emergency clinics. Because ozone pollution usually forms in hot weather, anyone who spends time outdoors in the summer may be affected, particularly children, the elderly, outdoor workers and people exercising. Children are most at risk from exposure to ozone because they are active outside, playing and exercising, during the summertime when ozone levels are highest.

Ozone is one of the most pervasive and detrimental pollutants known to affect vegetation, causing more injury to trees and crops than any other air pollutant in the United States. Ozone interferes with photosynthesis, the process by which plants convert water and sunlight to food. Ozone makes plants more susceptible to disease, insects, other pollutants, and harsh weather. It damages the foliage of trees and other plants, ruining the landscape of cities, parks and forests, and recreation areas. Research has shown that current ozone concentrations result in reductions in wood growth in forests of the Northeast of over 10 percent. There is strong scientific evidence showing that current levels of ozone are reducing crop yields, particularly in sensitive species - soybean, cotton, and peanuts. Annual crop loss from ozone for soybeans alone in Illinois, Indiana and Ohio has been calculated to fall between \$199 million and \$345 million. The U.S. Environmental Protection Agency (EPA) has estimated national crop yield losses due to ozone in excess of \$1 billion annually. One of the key components of ozone, oxides of nitrogen ( $\text{NO}_x$ ), contributes to fish kills and algae blooms in sensitive waterways, such as the Chesapeake Bay.

Ozone is not emitted directly to the atmosphere, but is formed by photochemical reactions between volatile organic compounds (VOCs) and  $\text{NO}_x$  in the presence of sunlight. The long, hot, humid days of summer are particularly conducive to ozone formation, so ozone levels are of concern primarily during the months of May through September. The primary sources of man-made VOCs and  $\text{NO}_x$ , the ozone precursors, are the evaporation of fuels and solvents (gasoline and consumer products), combustion of fuels (motor vehicles, power plants and non-road engines), and industrial processes.

The EPA has established the maximum limit for ozone pollution allowed in the ambient air. EPA's National Ambient Air Quality Standard (NAAQS) for ozone is 0.08 parts per million (ppm) averaged over eight hours.

As part of the 1990 amendments to the Clean Air Act (CAA), the Youngstown-Warren Sharon Area in Ohio and Pennsylvania (the Area) was designated as nonattainment for the ozone standard in effect at the time (0.120 ppm averaged over one hour). On January 17, 1995 (60 FR 3349), EPA determined that the Area had attained the one-hour standard by its attainment date of November 1994. The Ohio counties were subsequently redesignated as attainment (Mahoning and Trumbull counties on January 31, 1996 (61 FR 3319) and Columbiana County on February 8, 1995 (60 FR 7453).

In June 2004, EPA designated the Area as nonattainment for the eight-hour ozone NAAQS based on data from 2001-2003. The area includes Mercer County in Pennsylvania as well as Columbiana, Mahoning and Trumbull counties in Ohio. The subsequent analyses clearly demonstrate that the ambient air quality in the nonattainment area now meets the eight-hour ozone NAAQS and that the emission reductions responsible for the air quality improvement are both permanent and enforceable. This analysis and the maintenance plan submitted concurrently demonstrates that the Pennsylvania portion of the Area satisfies all criteria set forth in Section 107(d)(3)(E) of the Clean Air Act (CAA) and should be officially redesignated as attainment. Section 107(d)(3)(E) of the CAA states that an area can be redesignated to attainment if the following conditions are met:

- The NAAQS has been attained; (Section 1)
- The applicable implementation plan has been fully approved under Section 110(k) and the state has met all applicable requirements for the area under Section 110 and Part D; (Section 2)
- The improvement in air quality is due to permanent and enforceable reductions in emissions; and (Section 1 and Section 3)
- A maintenance plan with contingency measures has been fully approved under Section 175A. (Section 4)

This redesignation request describes how the Pennsylvania portion of the Area satisfies each of the Clean Air Act's Section 107(d)(3)(E) criteria for redesignation to attainment.

Requirements for a public comment process are set forth in Section 110(a)(2) of the CAA and 40 CFR Section 51.102(d). The Department of Environmental Protection (Department) held a public hearing on the maintenance plan, 2002 base year inventory and the request to redesignate the Mercer County portion of the Youngstown-Warren-Sharon nonattainment area to attainment for the eight-hour ozone standard on March 14, 2007. The public comment period closed on March 16, 2007. No comments were received.

## SECTION 1

### AMBIENT AIR QUALITY ANALYSIS

On April 30, 2004, the EPA promulgated its final nonattainment designations for the eight-hour ozone NAAQS (69 *Fed. Reg.* 23858). Designations became effective on June 15, 2004. Seventeen areas in Pennsylvania were designated as eight-hour ozone nonattainment areas. These nonattainment areas include 37 counties in Pennsylvania as well as additional counties in Delaware, Maryland, New Jersey and Ohio.

EPA designations were based on air-quality monitoring data for 2001, 2002 and 2003. Air quality in the Youngstown-Warren-Sharon (Youngstown) multi-state nonattainment area has improved since EPA's original designations. Youngstown's 2006 design value (based on data from 2004, 2005 and 2006) is 83 parts per billion (ppb). Following EPA criteria, a design value below 85 ppb is considered to be attainment. The current design value of 83 ppb is below the 85 ppb threshold for attainment of the eight-hour ozone standard. Concentrations are expected to remain below this level over the next decade.

#### A. DESIGN VALUE DETERMINATION

The ambient air-quality analysis is based on ozone data measured at four (4) monitors currently operating in the Youngstown-Warren-Sharon nonattainment area. The nonattainment area includes Columbiana, Mahoning, and Trumbull counties in Ohio and Mercer County in Pennsylvania. The ambient air-quality data analysis for ozone was completed using the appropriate regulations and guidance documents. Monitoring procedures were determined in accordance with 40 CFR, Part 58 (40 CFR 1992a). Eight-hour ozone design values were calculated in accordance with EPA's Guideline on Data Handling Conventions for the Eight-Hour Ozone NAAQS (1998).

#### B. TRENDS ANALYSIS

##### 1. Design Values

There are four monitors currently operating in the Youngstown-Warren-Sharon nonattainment area. A total of six monitors have operated in the nonattainment area since 1985. Only the Mercer County monitor in Pennsylvania has operated continuously over this time period. The Mercer County ozone monitor began operations during the 1981 ozone season. Trends in ozone design values were analyzed from 1987 through 2006. These were all of the years that the monitors met EPA's completeness requirements. Years prior to 1987 generally had less than 90% valid data over the entire ozone season (April 1 through October 31).

Table 1-1 lists Youngstown-Warren-Sharon's eight-hour ozone design values from 1987 through 2006. These are presented in graphic form in Chart 1-1. Design values have

fallen significantly over the entire time period (~13% overall) with the bulk of the decline occurring over the last five years.

**Table 1-1  
Eight-Hour Ozone Design Value**

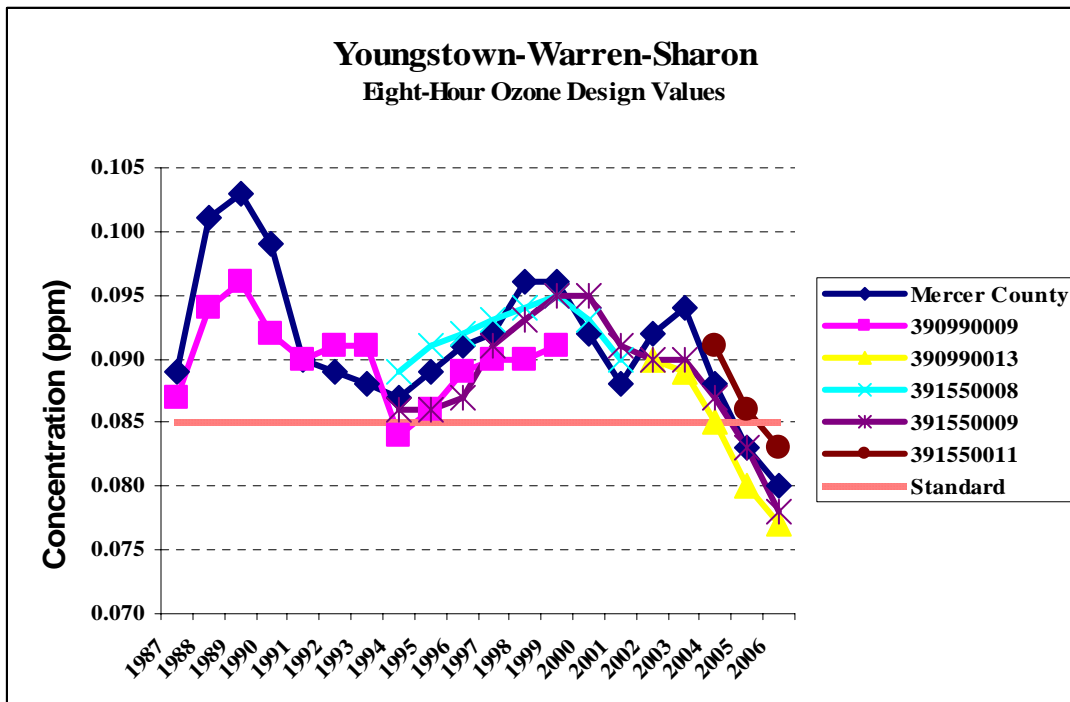
	PA	OHIO				
	Mercer County	390990009	390990013	391550008	391550009	391550011
2006	0.080		0.077		0.078	0.083
2005	0.083		0.080		0.083	0.086
2004	0.088		0.085		0.087	0.091
2003	0.094		0.089		0.090	
2002	0.092		0.090		0.090	
2001	0.088			0.090	0.091	
2000	0.092			0.093	0.095	
1999	0.096	0.091		0.095	0.095	
1998	0.096	0.090		0.094	0.093	
1997	0.092	0.090		0.093	0.091	
1996	0.091	0.089		0.092	0.087	
1995	0.089	0.086		0.091	0.086	
1994	0.087	0.084		0.089	0.086	
1993	0.088	0.091				
1992	0.089	0.091				
1991	0.090	0.090				
1990	0.099	0.092				
1989	0.103	0.096				
1988	0.101	0.094				
1987	0.089	0.087				

## 2. Exceedances

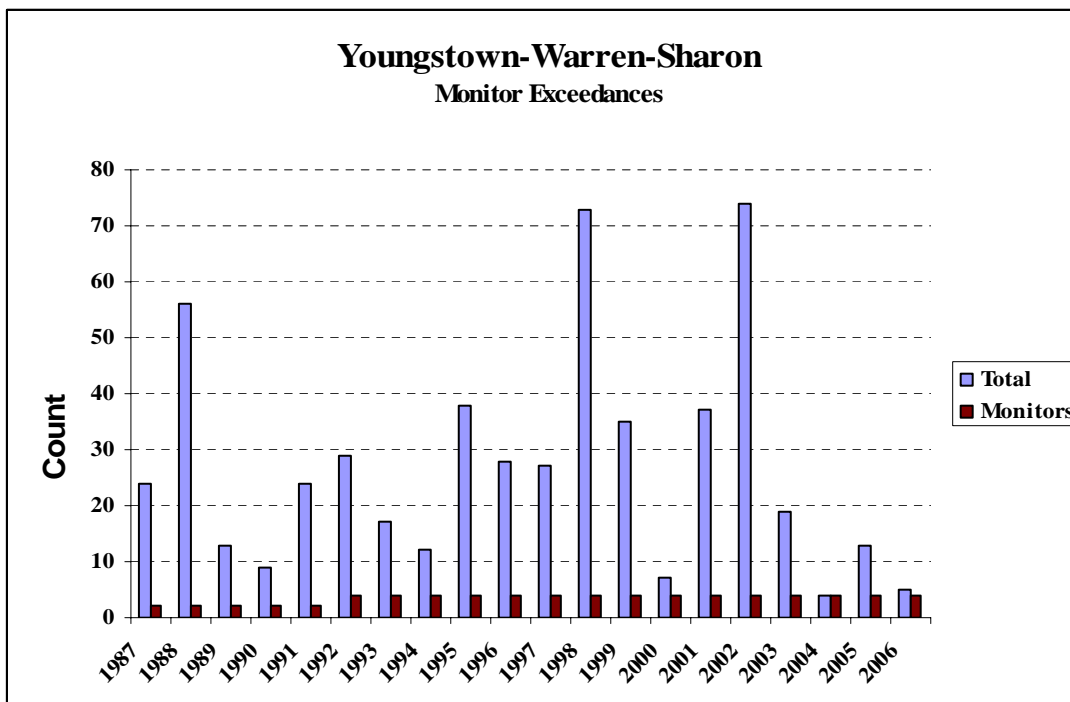
Exceedance trends were examined over the 1987-2006 time period. An exceedance is defined as any day a monitor in the nonattainment area recorded a valid eight-hour ozone concentration greater than 84 ppb. The time period examined met the 90% valid days requirement outlined in the EPA guideline. Exceedance days for Youngstown-Warren-Sharon nonattainment area are listed in Table 1-2 and graphed in Chart 1-2.

Exceedance days have generally declined over the 1987-2006 time period. On average there have been approximately 8.4 exceedances per monitor during a typical ozone season. That has dropped to about 1.8 exceedances per monitor since full implementation of the NO<sub>x</sub> SIP Call. That's 79% fewer monitor exceedances than the long term average.

**Chart 1-1**  
**Eight-Hour Ozone Design Values**



**Chart 1-2**  
**Monitor Exceedance Count for the Youngstown Nonattainment Area**

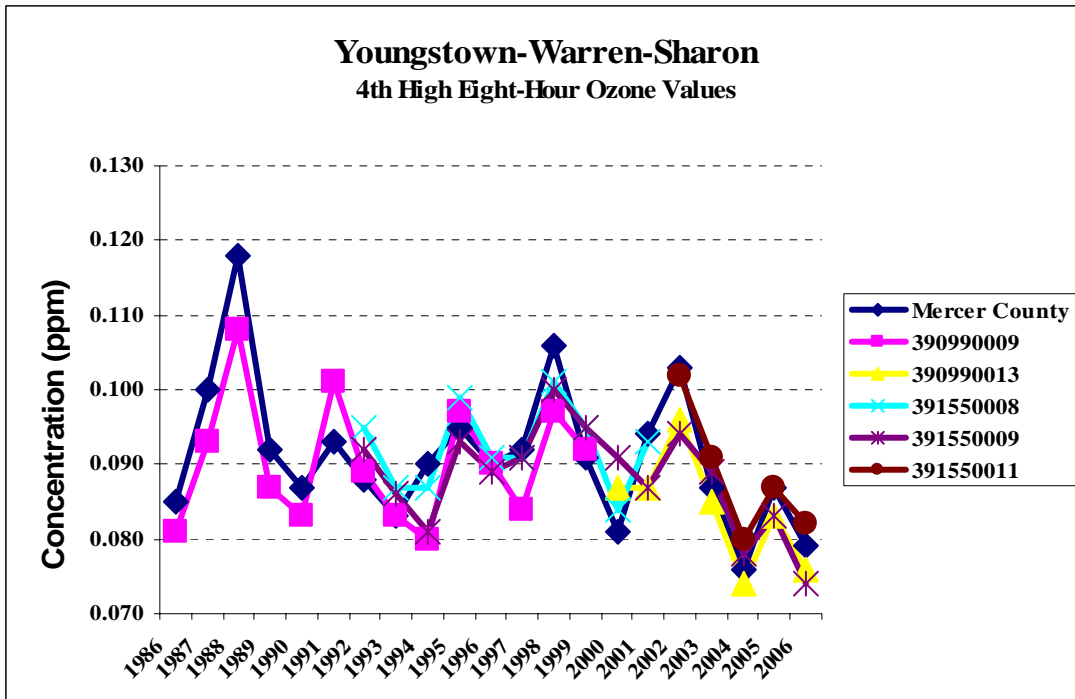




**Table 1-2**  
**Monitor Exceedance Count for the Youngstown Nonattainment Area**

YEAR	EXCEEDANCES	MONITORS
2006	5	4
2005	13	4
2004	4	4
2003	19	4
2002	74	4
2001	37	4
2000	7	4
1999	35	4
1998	73	4
1997	27	4
1996	28	4
1995	38	4
1994	12	4
1993	17	4
1992	29	4
1991	24	2
1990	9	2
1989	13	2
1988	56	2
1987	24	2

**Chart 1-3**  
**4<sup>th</sup> High Eight-Hour Ozone Values for the Youngstown Nonattainment Area**



### 3. 4<sup>th</sup> High Eight-Hour Ozone Trends

Eight-hour ozone design values are based on the 4<sup>th</sup> highest concentrations at a particular monitor over a three-year time period. An analysis of yearly “4<sup>th</sup> highs” yields an understanding of why design values change over time. Again, only years containing more than 90% valid days (1986-2006) are included in this analysis. 4<sup>th</sup> high values are listed in Table 1-3 and graphed in Chart 1-3. There is much more volatility in the 4<sup>th</sup> high eight-hour ozone values over time. Values, however, have dropped almost 16% since the late 1980s and early 1990s.

**Table 1-3**  
**4<sup>th</sup> High Eight-Hour Ozone Values for the Youngstown Nonattainment Area**

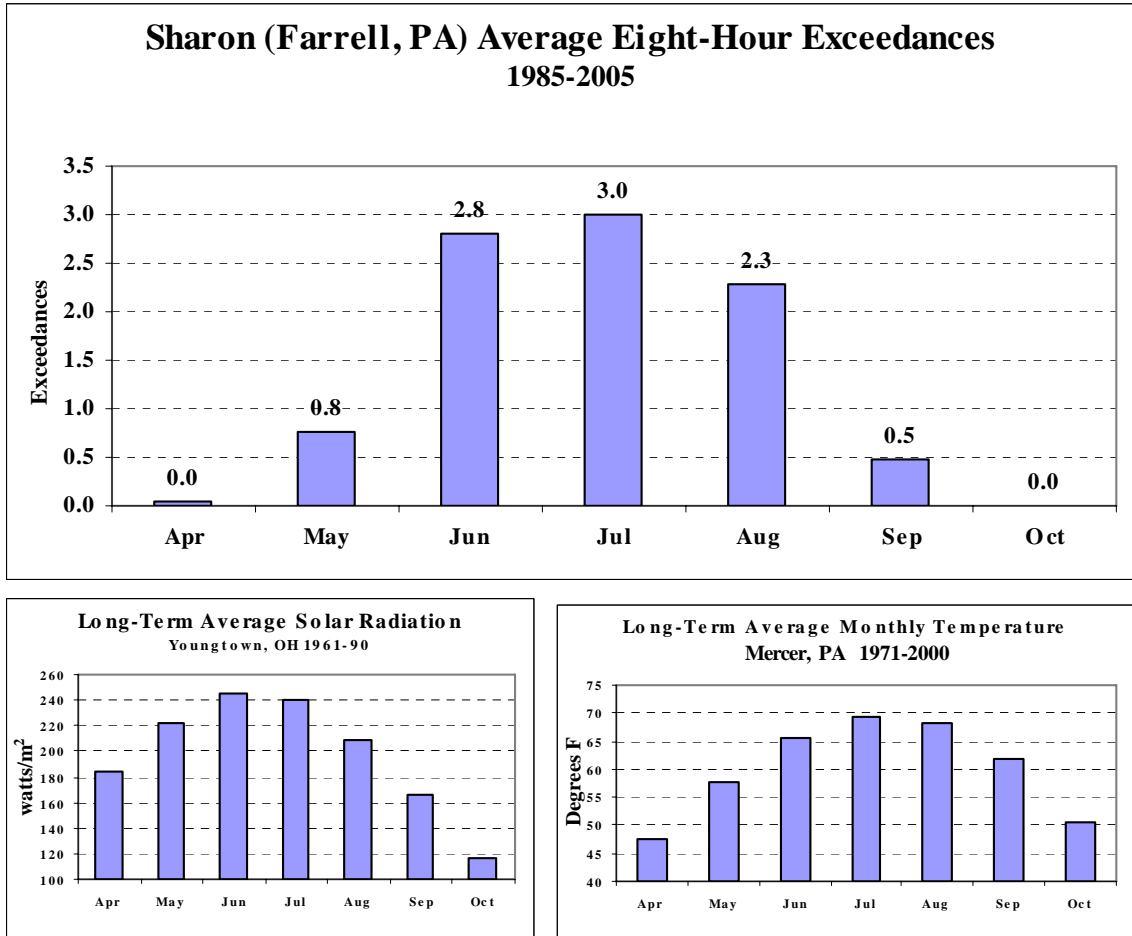
	PA	OHIO				
	Mercer County	390990009	390990013	391550008	391550009	391550011
2006	0.079		0.076		0.074	0.082
2005	0.087		0.083		0.083	0.087
2004	0.076		0.074		0.078	0.080
2003	0.087		0.085		0.089	0.091
2002	0.103		0.096		0.094	0.102
2001	0.094		0.087	0.093	0.087	
2000	0.081		0.087	0.084	0.091	
1999	0.091	0.092		0.095	0.095	
1998	0.106	0.097		0.101	0.100	
1997	0.092	0.084		0.091	0.091	
1996	0.090	0.090		0.091	0.089	
1995	0.095	0.097		0.099	0.093	
1994	0.090	0.080		0.087	0.081	
1993	0.083	0.083		0.087	0.086	
1992	0.088	0.089		0.095	0.092	
1991	0.093	0.101				
1990	0.087	0.083				
1989	0.092	0.087				
1988	0.118	0.108				
1987	0.100	0.093				
1986	0.085	0.081				

### C. CLIMATE TRENDS ANALYSIS

Daily ozone concentrations are heavily influenced by local meteorological conditions. Ozone is a secondary pollutant formed from oxides of nitrogen (NO<sub>x</sub>) and volatile organic compounds (VOCs) in the presence of sunlight. Since ozone chemistry is driven by solar insolation, peak ozone concentrations generally occur when solar insolation values are the strongest (mid summer). Chart 1-4 illustrates the relationship between

solar insolation, ozone exceedances and average monthly temperatures. Exceedances in the Youngstown-Warren-Sharon nonattainment area occur most frequently in the months of June, July and August (JJA) when peak solar insolation values and peak temperatures occur.

**Chart 1-4**  
**Relationship between Eight-Hour Ozone Exceedances, Solar Insolation and Temperature**

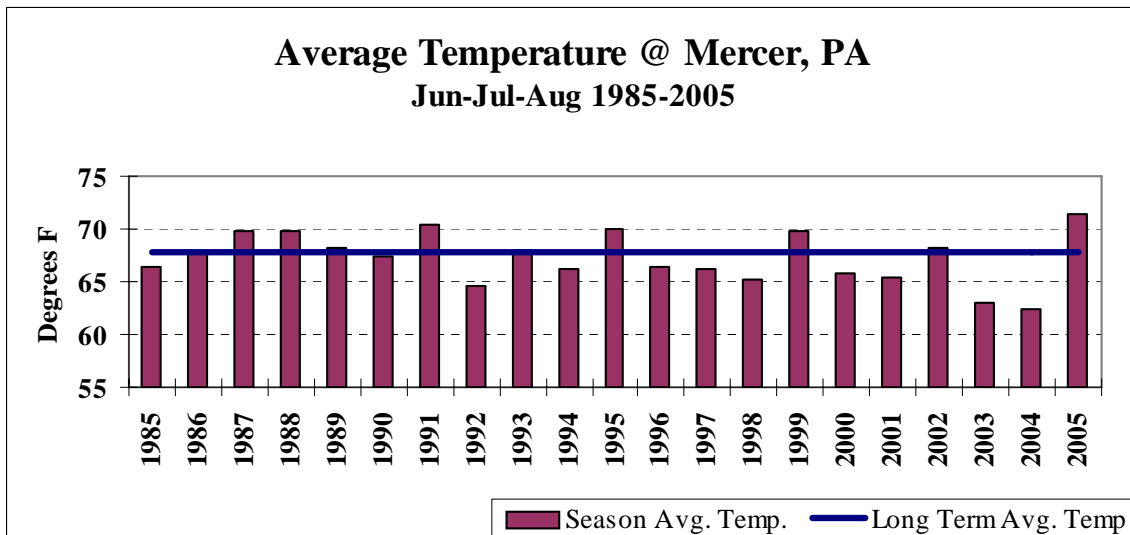
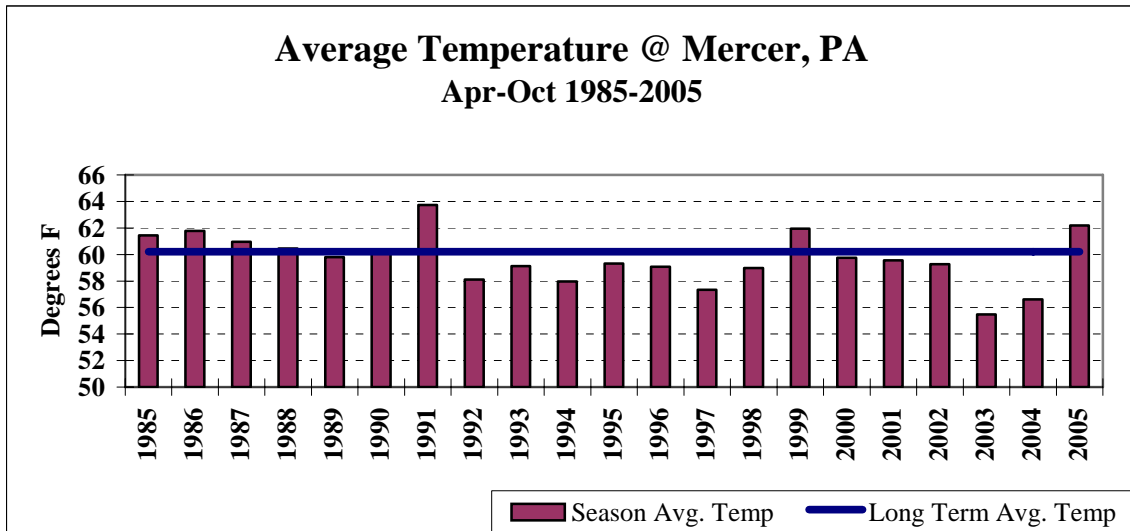


**1. Temperature Trends**

Temperature trends were examined over the same time period as the ozone trends to determine if there were similar trends in temperatures and ozone concentrations. Average temperatures as well as the number of 90° days from the Mercer, PA National Weather Service Cooperative Observer Program (COOP) station were examined. The Mercer site provides a consistent reporting site that had proper instrument siting and QA/QC activities during the time period in question. Data is publicly available from the National Climatic Data Center.

Chart 1-5 shows Mercer’s average temperatures from 1987 through 2005. Average temperature charts for the entire ozone season (Apr 1 through Oct 21) and JJA are shown. Long-term averages are also included on the charts to help define which years were warmer or cooler than normal.

**Chart 1-5**  
**Average Temperatures at the Mercer, PA COOP Station**

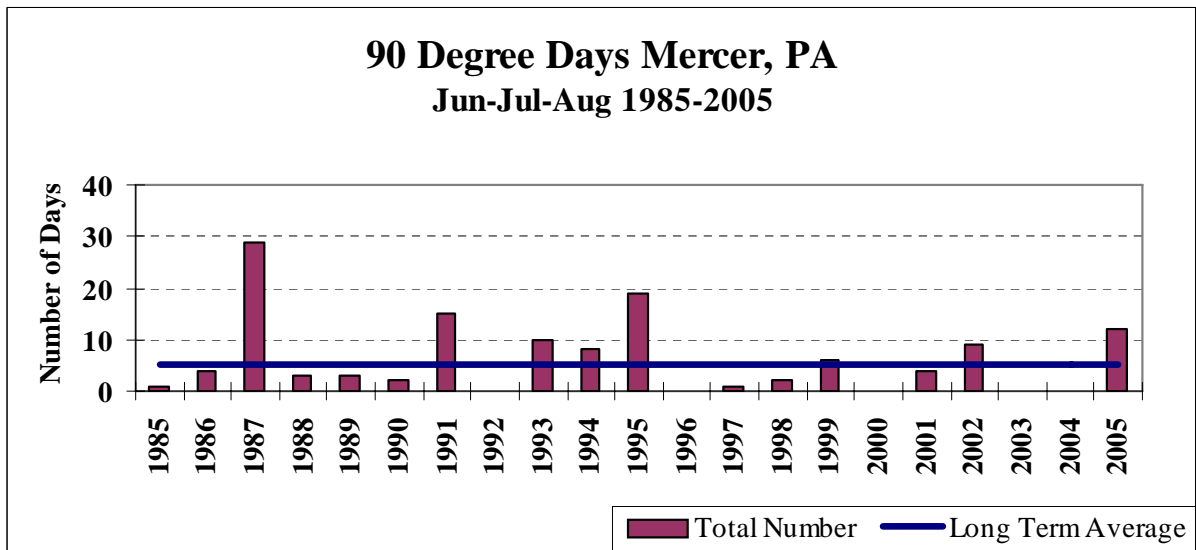
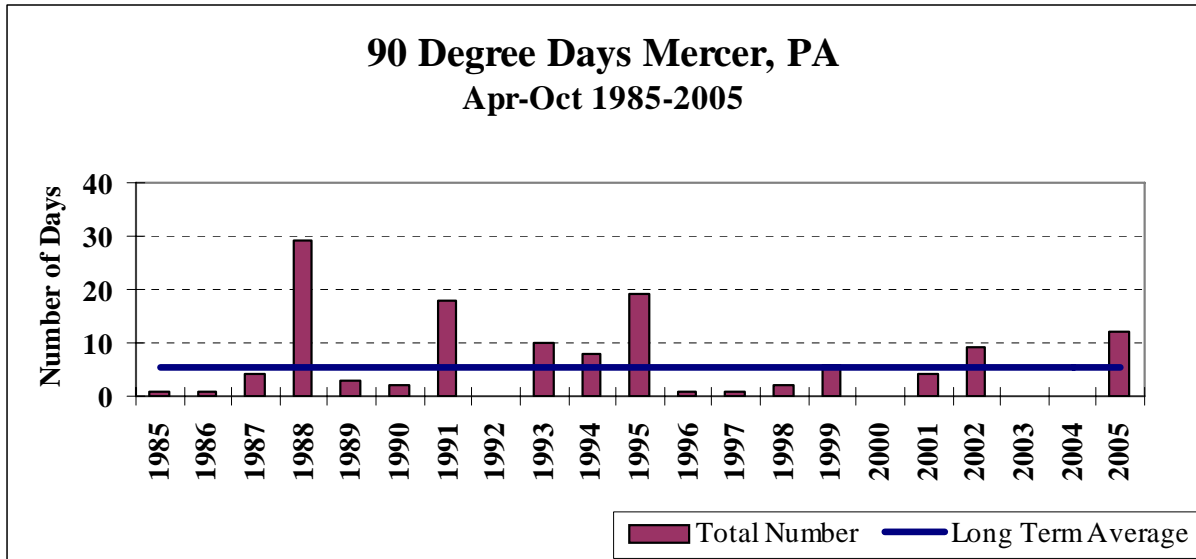


Ozone concentrations tend to peak during periods of extreme heat. One way to gauge this effect is to examine the number of 90° days. The more 90° days that occur during an ozone season the better the chance that ozone concentrations will be high. Higher ozone concentrations could lead to more exceedances and influence a monitor’s 4<sup>th</sup> high and consequently its eight-hour ozone design value.

Chart 1-6 graphically displays the number of 90° days at Mercer over the 1985-2005 time period. Two graphs are included; one for the entire ozone season and one for the JJA

time frame. For the time period in question, if the season had an above average number of 90° degree-days, then it had an above average number of 90° degree-days during the JJA time period and visa versa.

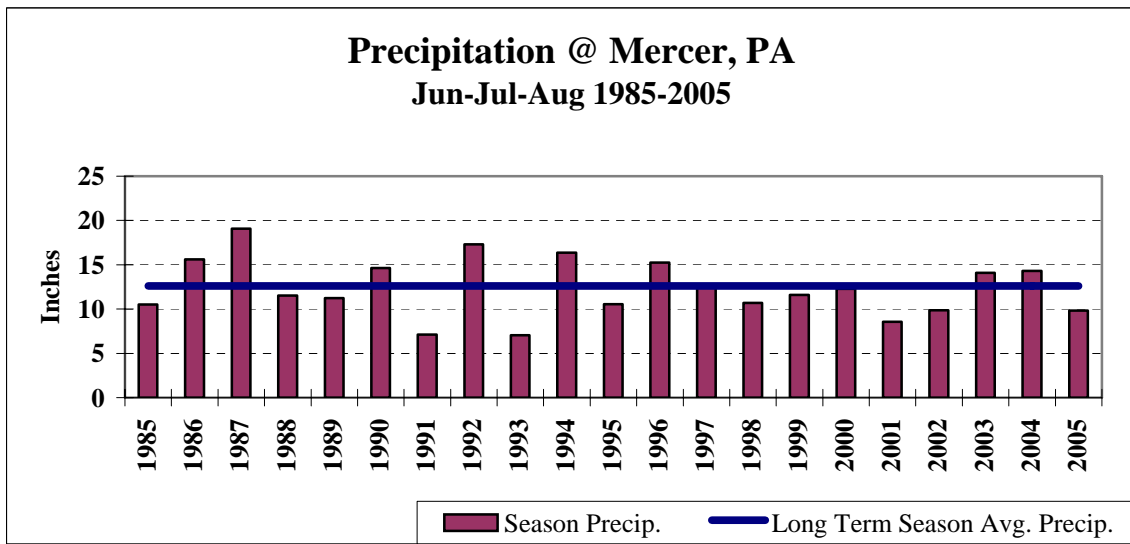
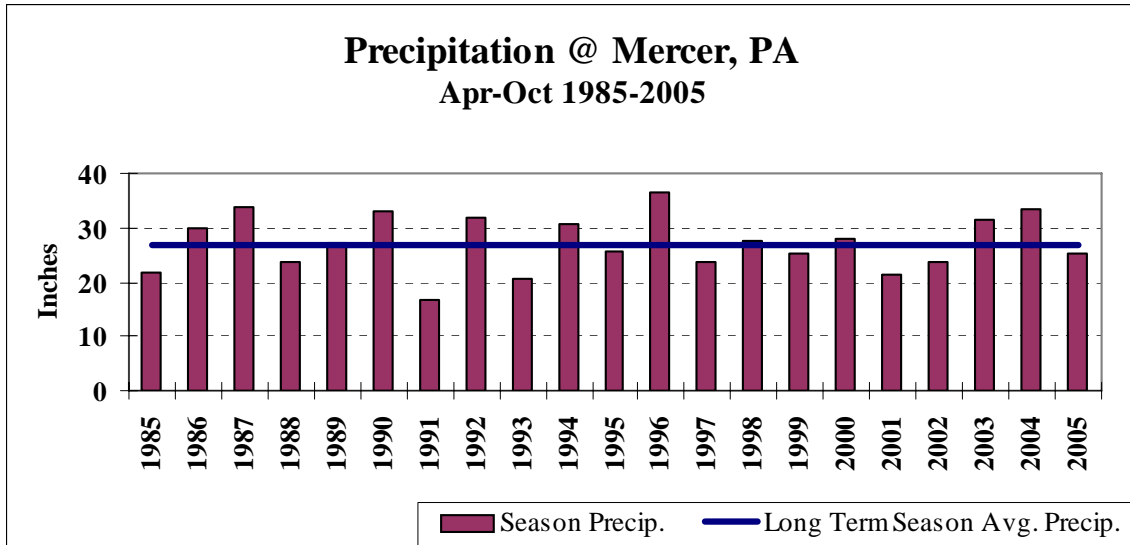
**Chart 1-6**  
**Number of 90° Degree Days at the Mercer, PA COOP Station**



## 2. Precipitation Trends

Precipitation trends at Mercer were analyzed over the 1985-2005 time period. Precipitation amounts for the entire ozone season and the JJA time periods were examined. Chart 1-7 graphically shows precipitation amounts over the 1985-2005 time period.

**Chart 1-7  
Precipitation Totals (inches) at the Mercer, PA COOP Station**



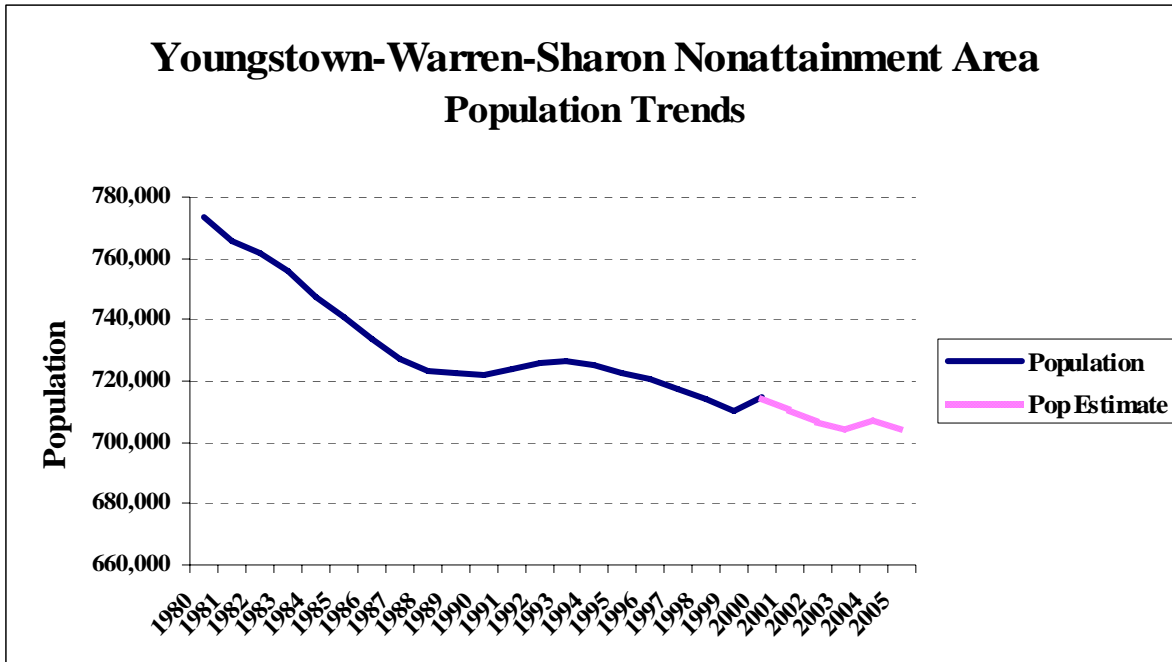
**D. ADDITIONAL TRENDS**

**1. Population Trends**

The Youngstown-Warren-Sharon nonattainment area has had significant population declines over the last several decades. The four-county's population has decreased approximately 8% between the 1980 and 2000 Census. Projections continue to show a decline in population since the 2000 Census. The 2005 population of the four counties that make up the Youngstown-Warren-Sharon nonattainment area is estimated at 704,096. According to the 1980 Census, the nonattainment area had a population of 773,221. The

area's population decline has not been steady over this time period with the greatest declines in the 1980 followed by slightly lower declines during the 1990s. Chart 1-8 shows population trends in the Youngstown-Warren-Sharon nonattainment area between 1980 and 2005.

**Chart 1-8  
Population Trends**



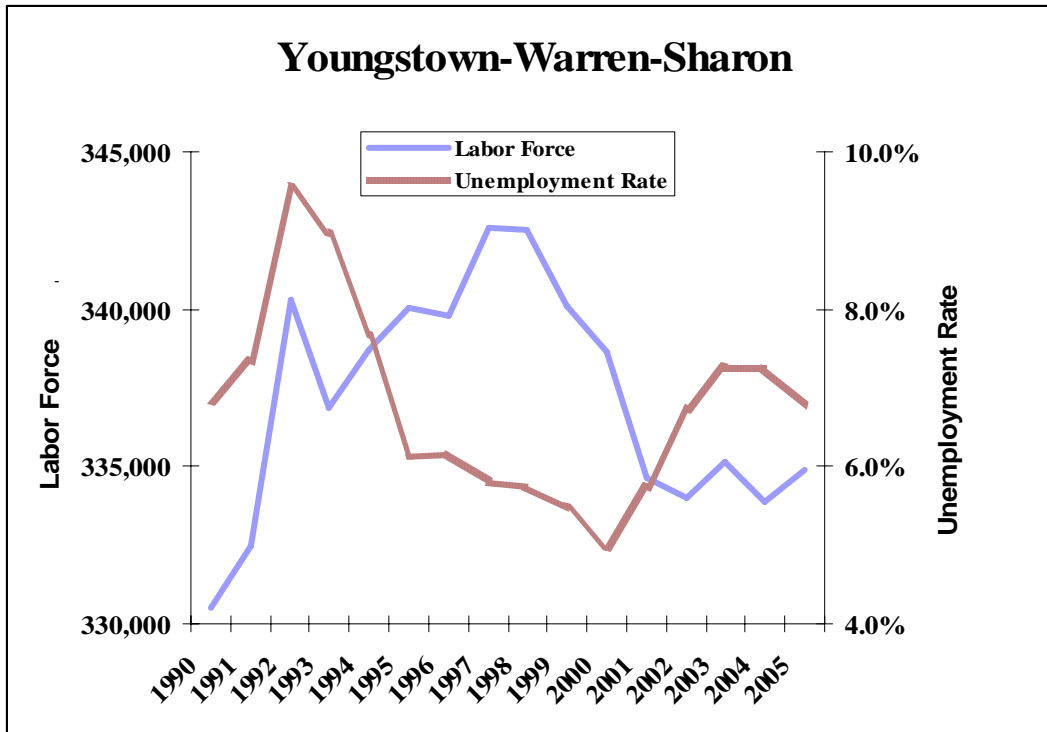
## 2. Economic Trends

Economic trends could have impacts on emissions and thus ozone concentrations in the Youngstown-Warren-Sharon nonattainment area. Employment statistics from the US Department of labor for Mercer County in Pennsylvania and Columbiana, Mahoning and Trumbull counties in Ohio. Analyses of employment statistics for other areas of Pennsylvania have show upward trends in the number of people in the labor force regardless of population trends

Analyses of employment statistics for other areas of Pennsylvania have shown upward trends in the number of people in the labor force regardless of population trends. This general trend was also observed in the Youngstown-Warren-Sharon nonattainment area. The nonattainment area's estimated labor force has remained relatively steady over the last fifteen years even though the area's population had generally declined. Labor force data from Pennsylvania indicates the labor force has greatly expanded since the mid 1970s, this occurred regardless of local population trends. This was probably due to changes in demographics including more women entering the labor force. Data for this time period is not available to confirm these labor force trends in the Youngstown-Warren-Sharon nonattainment area.

Chart 1-9 shows Youngstown-Warren-Sharon nonattainment area's labor force changes and unemployment rate since 1990. A larger labor force could lead to more driving and increased infrastructure demands. This in turn could lead to higher emissions. There appears to be some indication that rapid expansion in the labor force (and decrease in unemployment rate) correlated with an upward trend in the nonattainment area's design values in the late 1990s. This pattern has been observed in other nonattainment areas in Pennsylvania.

**Chart 1-9**  
**Estimated Labor Force and Unemployment Rate**



**E. OZONE TRANSPORT**

Ozone transport has a significant effect in the Youngstown-Warren-Sharon eight-hour ozone nonattainment area. Ozone transport, however, is highly variable and gauging the effects on design values, exceedances and peak ozone concentrations is quite difficult because of the large amount of data that would have to be analyzed.

**1. HYSPLIT Trajectory Analysis**

One way to gauge Youngstown-Warren-Sharon's ozone transport possibilities is to examine air-parcel trajectories during periods of elevated ozone concentrations. Trajectories from NOAA's HYSPLIT Trajectory model were run for each exceedance day between 1997 and 2006. Twenty-four hour back trajectories were run for 21Z (4 PM



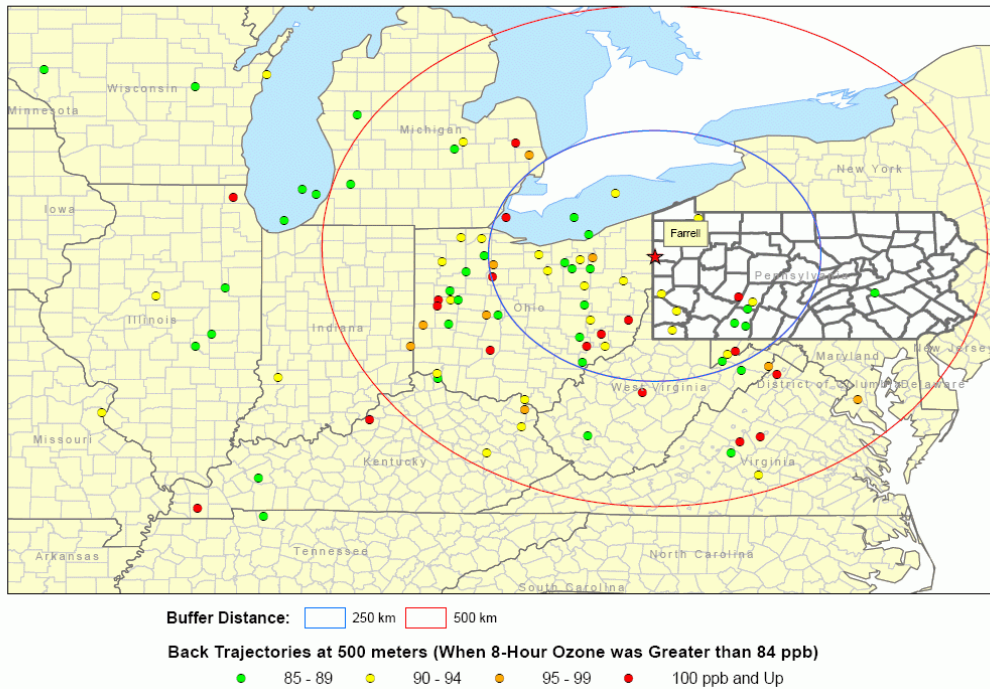
EDT) at 500 meters. End points for all of the 500-meter trajectories (91 days) were plotted on a map of the northeastern states (Figure 1-1). The end points are color coded according to the eight-hour ozone concentration on the day of the trajectory.

Trajectory results indicate a substantial number of upwind trajectories originated outside of Pennsylvania and the Ozone Transport Region (OTR) on days when Mercer County's ozone concentrations exceeded the eight-hour ozone standard (see Table 1-2). The bulk of the upwind trajectory start points lie to the west and south of Mercer County. Trajectories in some instances exceed 500 kilometers in length. This indicates the potential for substantial contributions from areas well upwind from Mercer County.

**Table 1-4**  
**Summary of Mercer County Trajectory Start Points**  
**All Exceedance days 1997 through 2006 (91 days)**

	<b>500 meter</b>	<b>%</b>
Outside OTR	77	85
Outside PA	81	89

**Figure 1-1**  
**HYSPLIT Back Trajectories**  
**Youngstown - Warren - Sharon (1997-2006)**



## 1. CAIR Modeling Summary

Modeling results for the EPA's Clean Air Interstate Rule (CAIR) were examined to determine if the model results support redesignating Youngstown-Warren-Sharon to attainment. The EPA in its technical support document outlined model results for CAIR (TSD for Final CAIR, Air Quality Modeling, 2005). Results for Youngstown-Warren-Sharon indicate modeled ozone concentrations will be below the eight-hour ozone standard. According to appendix E, Youngstown-Warren-Sharon's modeled ozone concentrations are ~80 ppb for the 2010 Base and ~ 75ppb for the 2015 CAIR runs. This result supports redesignating Youngstown-Warren-Sharon to attainment.

Base run emission reductions already in place, such as the NO<sub>x</sub> SIP Call, have been sufficient to bring Youngstown-Warren-Sharon into attainment since the modelled concentration is less than 0.08 ppm. EPA's modeling results indicate CAIR emission reductions put in place after Youngstown-Warren-Sharon's attainment date should be enough to keep the county in compliance with the current eight-hour ozone standard to model year 2015.

## SECTION 2

### SIP APPROVALS AND APPLICABLE REQUIREMENTS

In order for EPA to approve a redesignation of a nonattainment area to attainment, the applicable State Implementation Plan (SIP) revision must be fully approved under Section 110(k) of the CAA. In addition, the state must have met all requirements applicable to the area under CAA Section 110 and Part D Plan Requirements for Nonattainment Areas. The specific requirements applicable to the Youngstown-Warren-Sharon Area can be found in sections 110(a)(2), and Part D sections 172(c), 173(a), 176 and 182(a) of the CAA.

All requirements for redesignation have thus been fulfilled for the Pennsylvania portion of the nonattainment area. (The Ohio Environmental Protection Agency has submitted a redesignation request and maintenance plan for the Ohio portion of the interstate nonattainment area (reference) for “parallel processing” by EPA that demonstrates that all requirements have also been satisfied for the Ohio counties.)

The dates of EPA approval for regulatory requirements are indicated in parentheses.

#### A. REGULATORY REQUIREMENTS

The Commonwealth’s regulations for Air Resources can be found in *25 Pa. Code* Subpart C, Article III. Sections are specified below. EPA’s approval of these regulations is codified in 40 CFR Part 52, Subpart NN, section 52.2020.

- Correction of deficiencies in pre-1990 existing rules for several VOC sources (surface coating, pneumatic rubber tire manufacturing, graphic arts and Synthetic Organic Chemical Manufacturing Industry equipment leaks) as part of the Reasonably Available Control Technology (RACT) fix-up requirement of Section 182. EPA determined that Pennsylvania corrected all deficiencies in a December 22, 1994 final rule (59 FR 65971).
- Implementation of RACT for all major sources of VOCs not covered by the guideline documents for which EPA has defined RACT. Such sources included the manufacture of surface-active agents, organic liquid cargo vessel loading and ballasting and others. These sources are covered by Standards for Sources, Stationary Sources of NO<sub>x</sub> and VOCs, (*25 Pa. Code* Sections 129.51-129.82)
- Implementation of RACT for all major sources of NO<sub>x</sub>. These sources are covered by Standards for Sources, Stationary Sources of NO<sub>x</sub> and VOCs, (*25 Pa. Code* Sections 129.91-129.95).

- Stationary air pollution sources are subject to the regulations of the Commonwealth of Pennsylvania, Pennsylvania Code in Title 25 Environmental Resources (25 Pa. Code Chapters 121-145). These regulations include:
  - Standards of Performance for New Stationary Sources promulgated by EPA under the Clean Air Act;
  - Standards for Contaminants (25 Pa. Code Chapter 123)
  - National Emission Standards for Hazardous Air Pollutants (25 Pa. Code Chapter 124);
  - Construction, Modification, Reactivation and Operation of Sources, including plan approval, prevention of significant deterioration, new source review, operating permit program (25 Pa. Code Chapter 127);
  - Standards for Sources (25 Pa. Code Chapter 129)
  - Annual Emission Statements and required reporting to the Department, (25 Pa. Code Chapter 135)

These permitting, stationary source monitoring and reporting, preconstruction review, offset ratios and enforceable emission limitations requirements were adopted to implement the federally mandated requirements in sections 110, 172, 173 and 182(a) of the CAA. EPA has approved all of these regulations as SIP revisions as indicated.

- The Reasonable Available Control Technology (RACT) provisions in 25 Pa. Code sections 129.91-129.95 (relating to Stationary Sources of NOx and VOCs) continues to have “limited approval.” The Department of Environmental Protection (“Department”) has submitted SIP revisions to EPA for all subject RACT sources. On June 16, 2006, EPA proposed to convert this “limited approval” to a full approval. (71 FR 34864)
- The Department adopted and incorporated EPA’s general conformity rule (40 CFR Part 93, Subpart B) by reference in its entirety. The general conformity regulation describes procedures to determine if federally-financed, non-transportation projects are in conformity with air quality plans (25 Pa. Code Section 127.802).

## **B. NONREGULATORY REQUIREMENTS**

- EPA and the U.S. Department of Transportation (DOT) have issued regulations regarding criteria and procedures for demonstrating and assuring conformity of transportation improvement programs (TIP or program), long range plans (LRP or plan), and individual transportation projects with the requirements of the CAA and the SIP for the specific nonattainment area. Affected transportation planning organizations are complying with all federal laws, regulations and guidance for transportation conformity.

- The Department has an ongoing program to monitor and analyze ambient air quality and submits ambient air quality to EPA as required. The program is conducted in accordance with regulations in 40 CFR Part 58.
- The Department conducts and submits periodic inventories in accordance with EPA's Consolidated Emission Reporting Rule (40 CFR Part 51, Subpart A).
- The Department has adequate personnel funding and authority to carry out the implementation of all applicable requirements and provisions of its SIP.

There are no pending SIP requirement or obligations for a requirement applicable in this area. In consideration of the above, the applicable implementation plan will have been fully approved by EPA under Section 110 of the CAA and all applicable requirements are fulfilled.

## SECTION 3

### DEMONSTRATION OF PERMANENT AND ENFORCEABLE IMPROVEMENT

This section provides an assessment of the ozone precursor emissions at the time the Youngstown-Warren-Sharon Area was originally designated as nonattainment for ozone, and at the time when this area attained the 8-hour ozone NAAQS. A 2002 (base year) inventory of VOC and NO<sub>x</sub> emissions is used to represent emissions during the ozone nonattainment designation period. A 2004 inventory of VOC and NO<sub>x</sub> emissions is used to identify ozone precursor emissions during the period when the area demonstrated that it attained the 8-hour ozone NAAQS. Detailed information is presented in the Maintenance Plan by sector.

The section first describes these ozone precursor emission estimates for this area. These inventories have been developed in accordance with EPA emission inventory preparation guidance. Then, it presents information about the permanent and enforceable control measures that have been implemented in Mercer County to produce the VOC and NO<sub>x</sub> emission reductions that have occurred between these years.

#### A. BASE YEAR (2002) EMISSION INVENTORY

An emissions inventory for the base year, 2002, was developed for ozone precursors in accordance with EPA guidance. This year represents the emissions present when the area did not meet the ozone standard. The inventory contains information for these sectors:

- “Stationary sources” (or “point” sources) refer to those sources for which the Department collects individual emissions-related information. Generally they represent major stationary sources but may be smaller.
- “Stationary area sources” are industrial/commercial/residential sources too small or too numerous to be handled individually, such as commercial and residential open burning, architectural and industrial maintenance coatings application and clean-up, consumer product use, and vehicle refueling at service stations. Where there is overlap between stationary point sources and stationary area sources, the area source values are adjusted to remove any double counting.
- “Highway vehicles” include passenger cars and light-duty trucks, other trucks, buses and motorcycles.
- “Nonroad” covers a diverse collection of engines including outdoor power equipment, recreational vehicles, farm and construction machinery, lawn and garden equipment, industrial equipment, recreational marine, commercial marine vessels, locomotives, ships, aircraft and many other applications.

Table 3-1 below summarizes emissions for the 2002 base year. The Technical Appendices to the Maintenance Plan contain more detailed information for each sector the emissions for 2002 by source category.

**B. ATTAINMENT YEAR (2004) EMISSION INVENTORY**

A 2004 inventory of VOC and NO<sub>x</sub> emissions for Mercer County is used to identify ozone precursor emissions during the period when attainment of the 8-hour ozone NAAQS was demonstrated for the area. Stationary area sources were estimated based on 2002 emissions because factors used to develop emissions were not yet available for 2004.

**Table 3-1  
Mercer County  
VOC and NO<sub>x</sub> Emissions Summary: 2002 and 2004  
(tons per summer day)**

	<b>VOC Emissions</b>	
	<b>2002</b>	<b>2004</b>
Stationary Point Sources	2.4	1.7
Stationary Area Sources	7.7	7.6
Highway Vehicles	7.0	5.9
Nonroad Engines/Vehicles	3.8	3.8
<b>TOTAL</b>	<b>20.8</b>	<b>19.0</b>

	<b>NO<sub>x</sub> Emissions</b>	
	<b>2002</b>	<b>2004</b>
Stationary Point Sources	3.8	2.9
Stationary Area Sources	0.8	0.8
Highway Vehicles	17.9	15.8
Nonroad Engines/Vehicles	2.9	2.8
<b>TOTAL</b>	<b>25.5</b>	<b>22.4</b>

Table 3-2 summarizes the emission reductions made in the nonattainment area as a whole. Emissions information for the Ohio portion of the nonattainment area can be found in the Technical Appendix.

**Table 3-2**  
**Youngstown-Warren-Sharon Nonattainment Area**  
**VOC and NO<sub>x</sub> Emissions Summary: 2002 and 2004**  
**(tons per summer day)**

<b>VOC Emissions</b>		
	<b>2002</b>	<b>2004</b>
Pennsylvania	20.8	19.0
Ohio	70.5	64.6
<b>TOTAL</b>	<b>91.3</b>	<b>83.6</b>

<b>NO<sub>x</sub> Emissions</b>		
	<b>2002</b>	<b>2004</b>
Pennsylvania	25.5	22.4
Ohio	95.5	82.5
<b>TOTAL</b>	<b>121.0</b>	<b>104.9</b>

The Maintenance Plan describes how the Pennsylvania 2004 inventory was compiled. The Technical Appendices to the Maintenance Plan contain more detailed information for each sector.

### **C. CONTROL MEASURES**

Along with the analysis of ambient air quality and contributing factors in Section 1 of the redesignation request, this section describes the Pennsylvania measures to which decreases in emissions and thus ozone concentrations can be attributed from 2002 to 2004. From 2002 to 2004, VOC emissions in the Youngstown-Warren Sharon nonattainment area decreased by about 8.4 percent (8.5 percent in Mercer County only). From 2002 to 2004, NO<sub>x</sub> emissions in the nonattainment area decreased by 13.3 percent (11.9 percent in Mercer County only).

#### **1. Stationary Point Sources**

**Interstate Pollution Transport Reduction.** In response to the Federal NO<sub>x</sub> SIP call rule, the Department (and other covered states) adopted NO<sub>x</sub> control regulations for large industrial boilers and internal combustion engines, electric generating units, and cement plants. The regulation covering industrial boilers and electric generators required emission reductions to commence May 1, 2003, while the regulation covering large internal combustion engines and cement plants required emission reductions to commence May 1, 2005.



## 2. Stationary Area Source Measures

**Solvent Cleaning.** The Department adopted revisions to the volatile organic compound (VOC) requirements for solvent cleaning operations in *25 Pa. Code* Section 129.63 (relating to degreasing operations) that became effective beginning on December 22, 2001. For heated solvent cleaning machines, in most respects the provisions of *25 Pa. Code* Section 129.63 reflect the technology and operating requirements in the federal maximum achievable control technology (MACT) requirements for solvent cleaning machines. Inasmuch as essentially all of the heated solvent cleaning machines in the Commonwealth use solvents regulated under the MACT, only a slight VOC emission reduction was achieved by the requirements for heated solvent cleaning machines. The more important emission reduction component of the revised solvent cleaning regulation was the requirement related to solvent vapor pressure for solvent used in cold cleaning machines. This component of the revised solvent cleaning requirements resulted in an estimated 66 percent reduction of the VOC emissions from this category of sources. The provisions requiring the use of low vapor pressure solvents in cold cleaning machines became effective on December 22, 2002. The emission reductions resulting from this requirement would be reflected in the 2004 inventory. The regulation was submitted to EPA as a SIP revision on February 13, 2002. EPA approved the program on January 16, 2003 (68 FR 2206).

**Portable Fuel Containers.** The Department adopted a portable fuel container regulation, *25 Pa. Code* Chapter 130, Subchapter A, to address VOC loss resulting from permeation through portable gasoline containers, evaporative loss through container openings, and from spillage during the filling of small tanks on machines such as lawn mowers, chain saws, jet skis and the like. This regulation requires that portable fuel containers manufactured after January 1, 2003 for sale in Pennsylvania meet certain requirements. (A “sell-through” provision allowed the sale during 2003 of containers manufactured before January 1, 2003.) The Department predicted, as part of one-hour ozone SIP demonstrations for the Southeast Pennsylvania area, that the portable fuel container regulation would be fully phased in over a 10-year period, i.e. approximately 10 percent of the existing containers would be replaced each year. Emission reduction estimates for the program reflect this phased-in replacement of the containers. The regulation was submitted to EPA as a SIP revision on March 26, 2003 and approved on December 8, 2004 (69 FR 70983).

## 3. Highway Vehicle Sources

While vehicle miles traveled (VMT) increased between 2002 and 2004, highway vehicle emissions decreased. These decreases can be attributed to the Federal Motor Vehicle Control Programs (an increased proportion of cleaner (federal Tier 1) light-duty vehicles in the fleet, an increased proportion of cleaner heavy-duty highway vehicles (federal 1998+ and 2002/2004 standards)) and implementation of the vehicle emission inspection program.

**Table 3-3  
VMT and Emissions**

<b>YEAR</b>	<b>VMT</b>	<b>VOC (tpsd)</b>	<b>NOX (tpsd)</b>
<b>2002</b>	4,100,871	7.0	17.9
<b>2004</b>	4,231,275	5.9	15.8

**Federal Motor Vehicle Control Programs (FMVCP).** The emission reductions from the programs covering fleet turnover are permanent reductions. The effects of fleet turnover between 2002 and 2004 (that is, more vehicles subject to tighter tailpipe standards became part of Pennsylvania’s fleet) produced emission reductions between 2002 and 2004.

Tier 1 tailpipe standards established by the CAA Amendments of 1990 include NO<sub>x</sub> and VOC limits for light-duty gasoline vehicles and light-duty gasoline trucks. These standards began to be phased in starting in 1994. Evaporative VOC emissions are also being reduced in gasoline-powered cars starting with model year 1998. In 1999, more stringent new light-duty vehicle standards became effective in the Ozone Transport Region in 1999 with the National Low Emission Vehicle (NLEV) Program. The Department’s New Motor Vehicle Control Program regulations (*25 Pa. Code Chapter 126, Subchapter D* (relating to new motor vehicle emissions control program) were approved by EPA on December 28, 1999 (64 FR 72564). These regulations allowed automobile manufacturers to comply with NLEV instead of the incorporated California Low Emission Vehicle (CA LEV) requirements through model year 2005. These regulations affected vehicles 6,000 pounds and less and were the ones in effect for new motor vehicles in the baseline year, 2002.

In 1999, EPA promulgated regulations more stringent than NLEV (Tier 2), which were effective starting with the 2004 model year. The New Motor Vehicle Control Program (*25 Pa. Code Section 126 Subchapter D*) adopted in 1998 includes the Pennsylvania Clean Vehicles Program which incorporated the California Low Emission Vehicle Program by reference. The regulation allowed automakers to comply with the NLEV program as an alternative to this Pennsylvania program until MY 2006. In order to participate in NLEV, Pennsylvania was required to adopt language that extended its “commitment” to NLEV until MY 2006. Because automobile manufacturers had to comply with the more stringent regulations (NLEV vs. Tier 2), the federal Tier 2 program governs new vehicles sold in Pennsylvania in the attainment year, 2004.

The same EPA regulation required the reduction of sulfur in gasoline beginning in 2004. In the first year of the program, sulfur levels are capped at 300 parts per million (ppm) and annual refinery corporate averages must be no more than 120 ppm. This analysis uses the default assumptions provided in MOBILE6 for all gasoline parameters for conventional fuel.

EPA has promulgated national regulations for heavy-duty engines and vehicles (over 14,000 pounds) starting with model year 2004. In addition, a consent decree with the major heavy-duty engine manufacturers required, among other terms, that diesel engines made by these companies comply with these 2004 standards two model years early, in model year 2002. The Department includes these programs, as provided in the MOBILE model, for the base year 2002 and for 2004.

**Vehicle Emission Inspection/Maintenance Program.** In early 2004, Pennsylvania expanded its Vehicle Emission Inspection/Maintenance (I/M) Program into Mercer County. The program applies to gasoline-powered vehicles 9,000 pounds and under, model years 1975 and newer. For vehicles 1996 and newer, the program consists of an annual on-board diagnostics test and a gas cap pressure test. For subject vehicles 1995 and older, the program consists of an annual visual inspection of pollution control devices to ensure they are present, connected and the proper type for the vehicle and a gas cap pressure test. These regulations can be found in *67 Pa. Code* Chapter 177. The Department submitted the expanded emissions program as a revision to its State Implementation Plan on December 1, 2003. EPA approved the SIP revision on October 6, 2005 (70 FR 58313).

#### **4. Nonroad Sources**

EPA has adopted a series of regulations affecting new diesel-powered (“compression ignition”) and gasoline-powered (“spark ignition”) nonroad engines of various sizes (horsepower) and applications. Information on these federal rules, including their implementation dates, can be found at [www.epa.gov/nonroad](http://www.epa.gov/nonroad). The Department used the federal control measure assumptions built into the NONROAD model to estimate emissions for all milestone years. No control programs were anticipated to affect aircraft and railroad locomotive emissions between 2002 and 2004. These requirements are codified at 40 CFR Parts 89-91. See the Technical Appendix for more information.

## SECTION 4

### MAINTENANCE PLAN

The Maintenance Plan for the Pennsylvania portion of the nonattainment area is being submitted to EPA for approval as a SIP revision concurrently with this request for redesignation. The Maintenance Plan shows that the NAAQS for eight-hour ozone will be maintained for at least 10 years after redesignation. Eight years following redesignation, the Commonwealth will submit a revised plan that ensures attainment through 2028.

In accordance with EPA guidance, the Maintenance Plan shows that emission levels over the 10 years following redesignation will remain below the emissions level in 2004, while allowing for growth in population and vehicle miles traveled. The following state and federal programs will ensure the continuing decline of VOC and NO<sub>x</sub> emissions:

- Clean Air Interstate Rule (CAIR)
- Interstate Pollution Transport Reduction
- Portable Fuel Containers
- Consumer Products
- Architectural and Industrial Maintenance coatings
- Federal Motor Vehicle Control Programs (light-duty and heavy-duty)
- Vehicle emission inspection/maintenance program
- Cleaner gasoline (federal program)
- Cleaner highway diesel (federal program)
- Cleaner nonroad diesel (federal program)
- Pennsylvania Clean Vehicles Program
- Pennsylvania Heavy-Duty Diesel Emissions Control Program
- Federal programs for nonroad engines

The Department has provided assurances that it will continue to operate the ambient air quality monitoring network in order to track maintenance of the standard and to evaluate emissions inventories periodically compared to the projections provided in the plan. The Department has also provided a list of potential contingency measures that it would consider to correct any violation of the eight-hour ozone NAAQS that occurs after redesignation of the area.

## ACRONYMS AND ABBREVIATIONS

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CAA	Clean Air Act
CAIR	Clean Air Interstate Rule
CA LEV	California Low Emission Vehicle (program)
DOT	Department of Transportation (U.S.)
EPA	U.S. Environmental Protection Agency
FMVCP	Federal Motor Vehicle Control Program
I/M	Inspection and Maintenance
JJA	June, July and August
NAAQS	National Ambient Air Quality Standard
NLEV	National Low Emission Vehicle (program)
NEOPS	North East Oxidant and Particle Study
NO <sub>x</sub>	Oxides of Nitrogen
OTR	Ozone Transport Region
ppb	parts per billion
ppm	parts per million
RACT	Reasonably Available Control Technology
SIP	State Implementation Plan
TSD	Technical Support Document
tpsd	tons per summer day
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compound