Commonwealth of Pennsylvania
Department of Environmental Protection

REQUEST FOR REDESIGNATION
AS ATTAINMENT

LANCASTER COUNTY
EIGHT-HOUR OZONE NONATTAINMENT AREA

SEPTEMBER 2006

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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 (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 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 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.

In 2004, EPA designated Lancaster County as nonattainment for the eight-hour ozone NAAQS based on data from 2001-2003. The subsequent analyses clearly demonstrate that the ambient air quality in the Lancaster County 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 Lancaster County nonattainment area has completed 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 Lancaster County ozone nonattainment 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). A public hearing on the maintenance plan, 2002 base year inventory and the request to redesignate Lancaster County to attainment for the eight-hour ozone standard was held on Tuesday, August 8, 2006 and the comment period ended on August 11.

SECTION 1

DEMONSTRATION OF ATTAINMENT AND AIR QUALITY TRENDS ANALYSIS

On April 30, 2004, the EPA promulgated its final nonattainment designations for the eight-hour ozone NAAQS. (69 FR 23858). Seventeen areas in Pennsylvania were designated as eight-hour ozone nonattainment areas. These designated nonattainment areas cover 37 counties in Pennsylvania. The eight-hour ozone designations became effective on June 15, 2004.

EPA designations were based on air-quality monitoring data for 2001, 2002 and 2003. Air quality in the Lancaster County nonattainment area has improved since the EPA's original designations. Lancaster County's design value for 2003 (based on data from 2001, 2002 and 2003 was 0.092 ppm or 92 parts per billion (ppb). Lancaster County's 2005 design value (based on data from 2003, 2004 and 2005) is 83 parts per billion (ppb). Following EPA criteria a design value below 85 ppb is considered to be attainment. The Lancaster County design value of 83 ppb thus is below the 85 ppb threshold for nonattainment of the eight-hour ozone standard. Concentrations are expected to remain below 85 ppb over the next decade.

Lancaster County's eight-hour ozone design values have decreased over the 1988 to 2005 time frame. Over the last several years, ozone concentrations at the Lancaster monitor have dropped precipitously.

A recent analysis[1] suggests that there have been substantial ozone reductions due to various emission control programs. EPA's analysis indicates slight reductions in ozone concentrations prior to 2002, an approximately 4% decline between 1997 and 2002, after adjusting for meteorology. More substantial reductions appear to have occurred after the federal NOx SIP Call program was implemented, an approximately 10% decline between 2002 and 2004, after adjusting for meteorology. Ozone concentration reductions in Lancaster County appear to be similar to what the EPA has observed in its analysis. Caution should be used in this comparison because the department did not adjust Lancaster County's ozone concentrations for meteorological factors.

A. DESIGN VALUE DETERMINATION

The ambient air-quality analysis is based on ozone data measured at site number 42-071-0007 located at Abraham Lincoln Middle School, 1020 Lehigh Avenue, Lancaster. 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 Eight-hour ozone design values were calculated in

[1] *Evaluating Ozone Control Programs in the Eastern United States: Focus on the NOx Budget Trading Program*, USEPA Office of Air Quality Planning and Standards, 2004 found at: www.epa.gov/airtrends/2005/ozonenbp/

accordance with EPA's Guideline on Data Handling Conventions for the Eight-Hour Ozone NAAQS (1998).

B. AIR QUALITY TRENDS ANALYSIS

1. Design Values

The Lancaster County ozone monitor began operations during the 1974 ozone season and has operated continuously since its installation date. It is the only monitor located in the Lancaster County nonattainment area. Trends in ozone design values were analyzed from 1987 through 2005. These were all of the years that the monitor met EPA's completeness requirements. Years prior to 1986 generally had less than 90% valid data over the entire ozone season (April 1 through October 31).

Table 1-1 lists Lancaster County's eight-hour ozone design values from 1988 through 2005. These are presented in graphic form in Chart 1-1. Design values have generally fallen slightly over the entire time period (~5% overall) with the bulk of the decline occurring over the last five years.

The Lancaster County design value trend shows a slight upward trend in values during the late 1990s. Ozone concentrations were relatively low during the preceding years (early 1990s). This pattern was also present in the number of statewide exceedance days and total monitor exceedances.

2. Exceedances

Exceedance trends were examined from 1987 through 2005. An exceedance is defined as any day the Lancaster monitor 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 Lancaster County are listed in Table 1-1 and graphed in Chart 1-2.

Exceedance days have generally declined from 1987-2005. Again, exceedances were more common during the late 1990s than they were during the early 1990s. The Lancaster monitor has on average 12.5 exceedance days per ozone season. This average was taken for ozone seasons with at least 90% valid data over the entire season.

Table 1-1
Lancaster County
Eight-Hour Ozone Statistics

YEAR	% VALID DAYS	DESIGN VALUE (PPM)	4^{TH} HIGH (PPM)	EXCEEDANCE DAYS
1985	78.5%		0.098	6
1986	86.9%		0.090	5
1987	92.1%		0.098	19
1988	94.9%	0.097	0.108	32
1989	93.9%	0.097	0.085	4
1990	92.5%	0.093	0.087	6
1991	91.6%	0.090	0.099	19
1992	95.8%	0.090	0.086	4
1993	95.8%	0.093	0.095	12
1994	94.4%	0.091	0.093	6
1995	100.0%	0.096	0.102	18
1996	98.6%	0.093	0.085	4
1997	96.7%	0.096	0.102	21
1998	99.1%	0.096	0.101	27
1999	100.0%	0.101	0.102	18
2000	99.1%	0.097	0.090	5
2001	99.5%	0.096	0.097	15
2002	98.6%	0.094	0.096	18
2003	97.7%	0.092	0.083	3
2004	99.1%	0.086	0.081	1
2005	99.1%	0.083	0.085	6

Chart 1-1
Eight-Hour Ozone Design Values

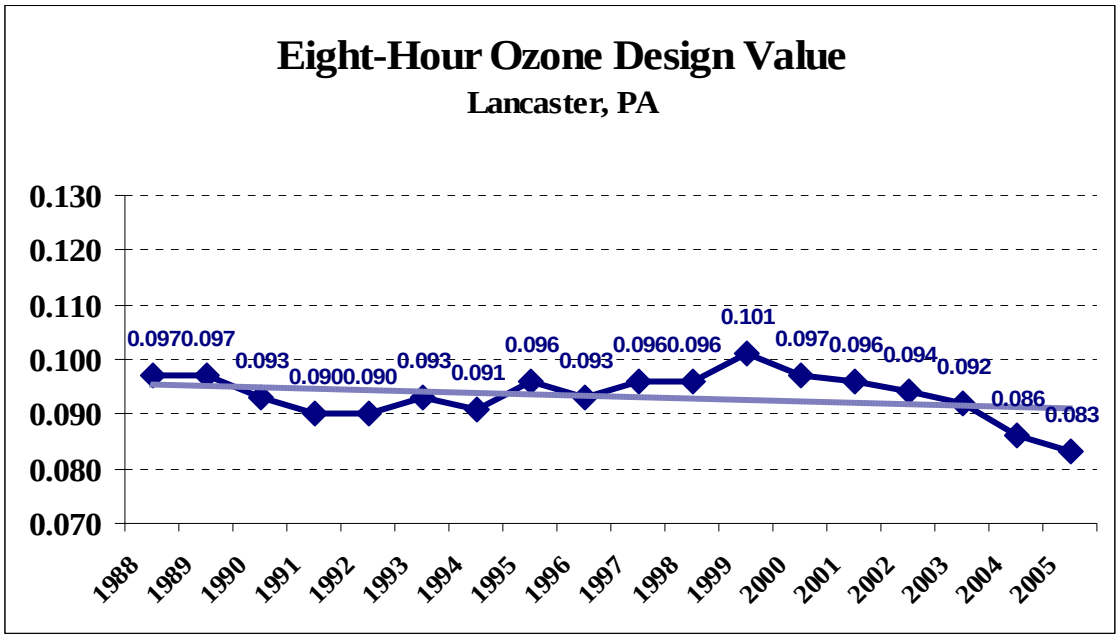
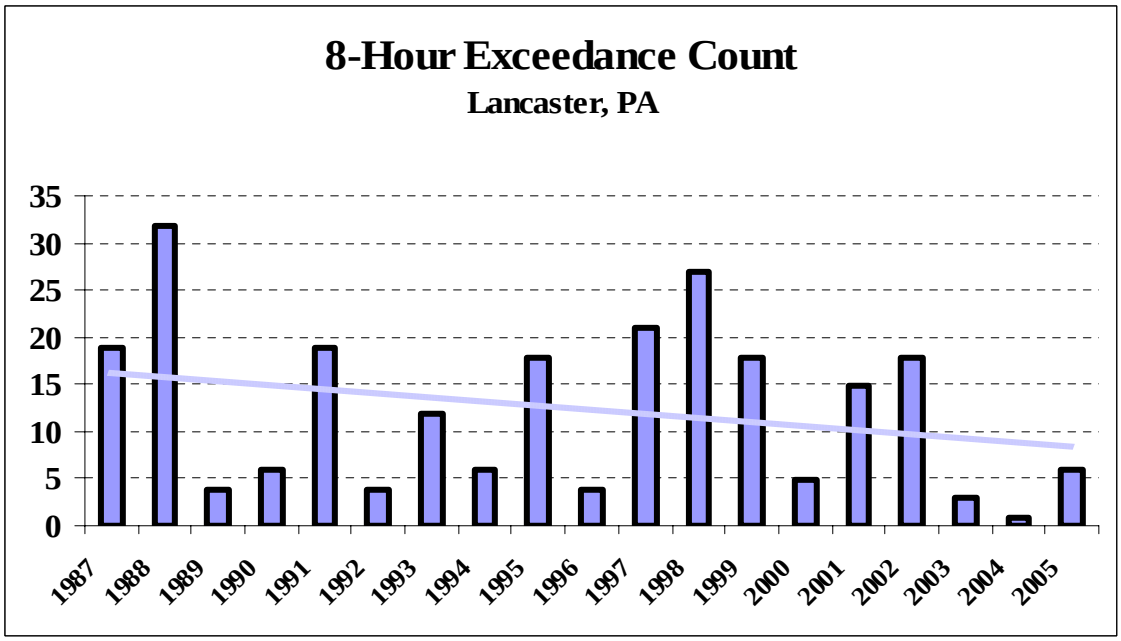


Chart 1-2
Exceedance Day Count for the Lancaster Nonattainment Area

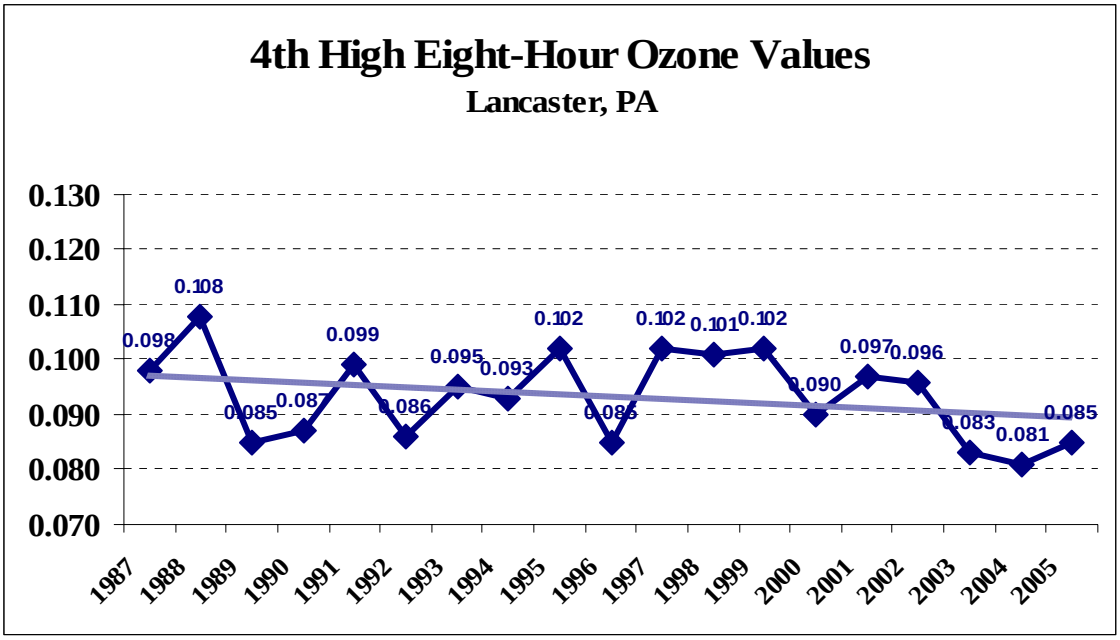


3. Fourth Highest Eight-Hour Ozone Trends

Eight-hour ozone design values are based on the fourth highest concentrations at a particular monitor over a three-year time period. An analysis of yearly "fourth highs" yields an understanding of why design values change over time. Again, only years containing more than 90% valid days (1987-2005) are included in this analysis. Fourth high values are listed in Table 1-1 of this document.

Trends in the fourth high eight-hour ozone concentrations are similar to the trends in the Lancaster design values and exceedance day counts. Year to year variability is greater for the fourth high values than for the design values. As with the design values and the exceedance days, there is a trend for higher fourth high values in the late 1990s and lower values during the early 1990s. Chart 1-3 displays fourth high values from 1987 through 2005.

Chart 1-3
Fourth High Eight-Hour Ozone Values for the Lancaster Nonattainment Area

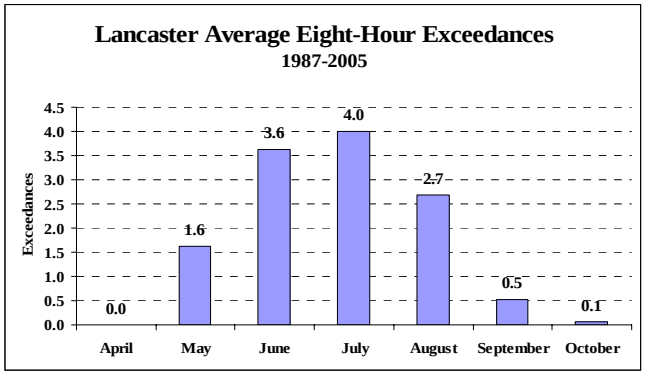


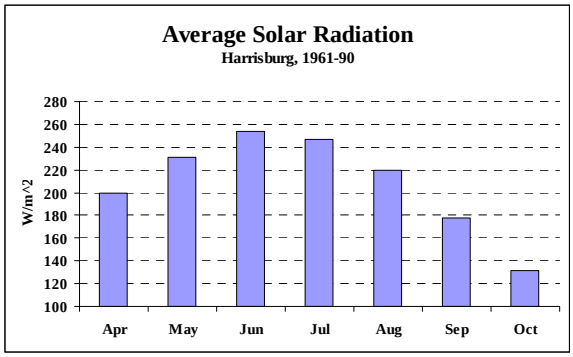
C. CLIMATE TRENDS ANALYSIS

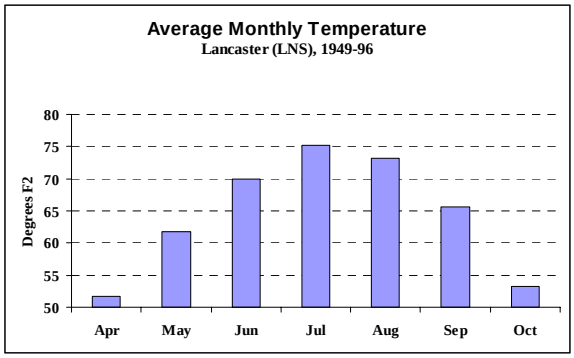
Daily ozone concentrations are heavily influenced by local meteorological conditions. Ozone is a secondary pollutant formed from NO_x and VOCs in the presence of sunlight. Since ozone chemistry is driven by solar insolation, peak ozone concentrations generally occur when solar insolation values are the strongest (mid summer). Chart 1-4 illustrates the relationship between solar insolation, ozone exceedances and average monthly temperatures. Exceedances in the Lancaster 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







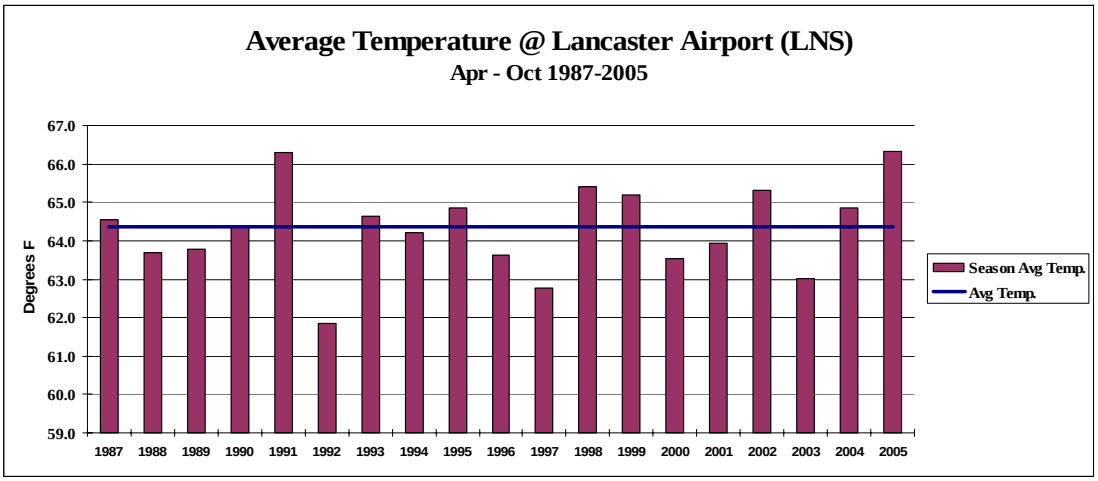
1. Temperature Trends

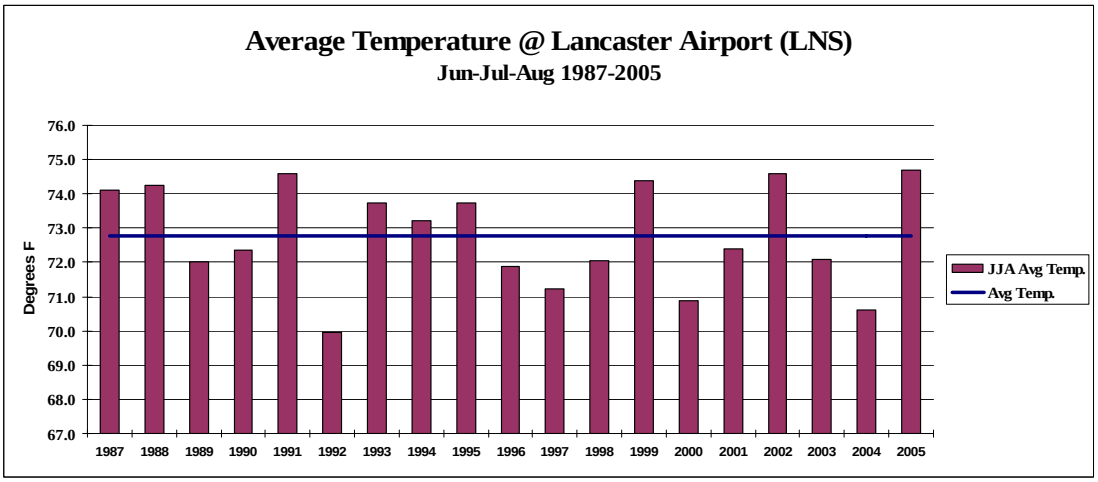
Temperature trends were examined over the same time period as the ozone trends to determine if there were similar trends in temperatures and ozone concentrations. Average temperatures as well as the number of 90º days from the Lancaster County airport were examined. The Lancaster County airport provides a consistent reporting site that had proper instrument siting and Quality Assurance/Quality Control activities during the time period in question. Data is publicly available from the Pennsylvania Climatologist's Office.

Chart 1-5 shows average temperatures at the Lancaster County Airport from 1987 through 2005. Average temperature charts for the entire ozone season (April 1 through October 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.

Average temperature and JJA average temperature patterns are generally the same (warmer than average seasons typically correspond with a warmer than average JJA). There are a few instances when warmer than average temperatures over the entire ozone season coincide with cooler than average temperatures over the JJA time period (1998). There does not appear to be a trend for warmer temperatures in the late 1990s and cooler temperatures in the early 1990s. This suggests that overall ozone season and JJA temperature trends were not responsible for the trends in the eight-hour ozone data.

Chart 1-5
Average Temperatures at Lancaster County Airport

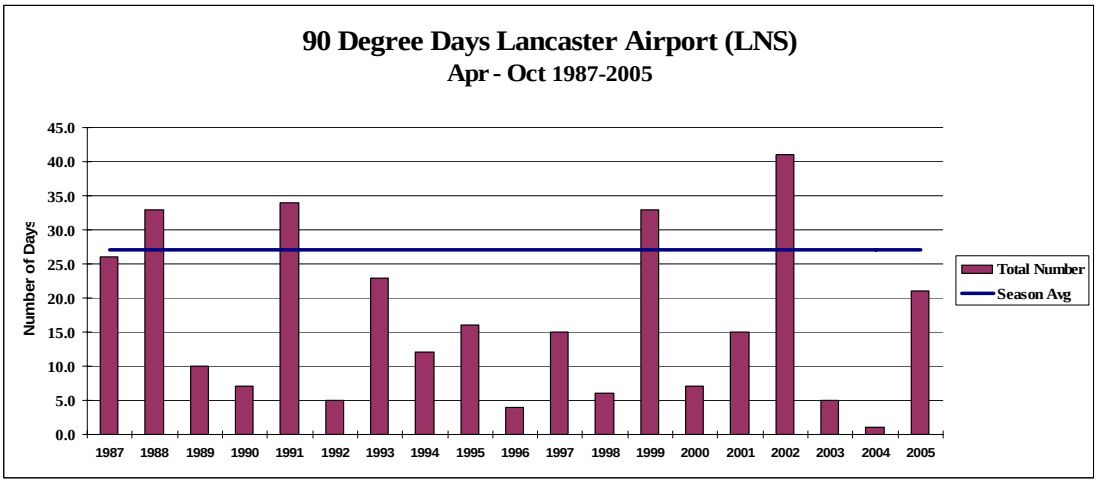


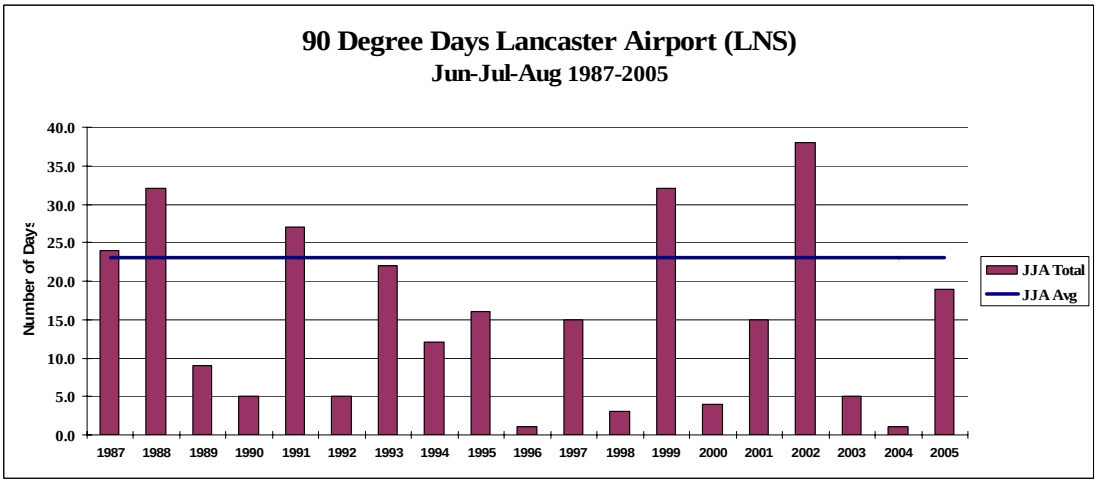


Ozone concentrations tend to peak during periods of extreme heat. One way to gauge this effect is to examine the number of 90º days. The more 90º days that occur during an ozone season the better the chance that ozone concentrations will be high. Higher ozone concentrations could lead to more exceedances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

Chart 1-6 graphically displays the number of 90º days at the Lancaster County airport over the 1987-2005 time frame. 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 90º degree-days, then it had an above average number of 90º days during the JJA time period and visa versa. There did not seem to be a substantial difference in the number of 90º days between the first and second halves of the 1990s; in fact, there were slightly more 90º days during the first half of the 1990s than during the second half. This suggests that adverse (unusually warm) weather conditions were not entirely responsible for the Lancaster County monitor's high ozone concentrations in the late 1990s.

Chart 1-6
Number of 90º Days at the Lancaster County Airport



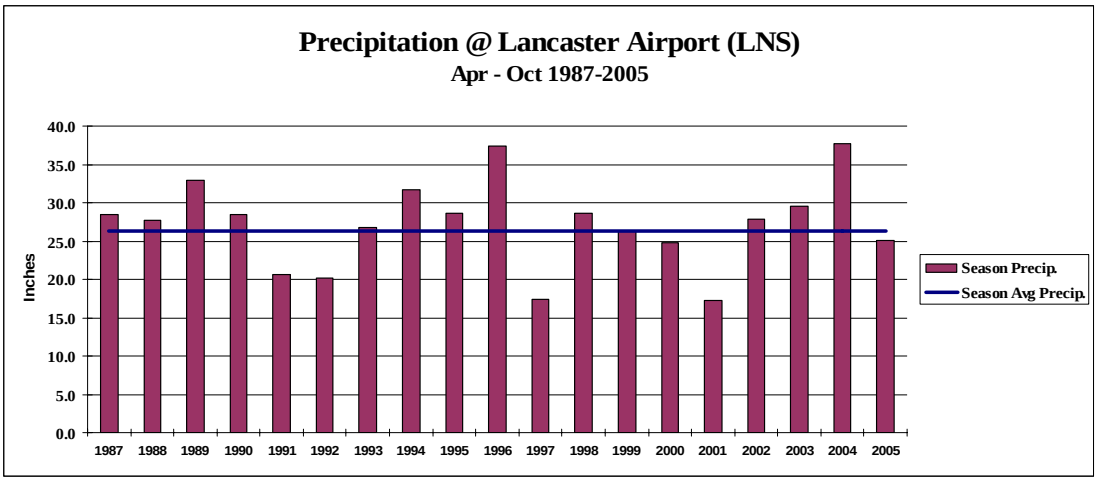


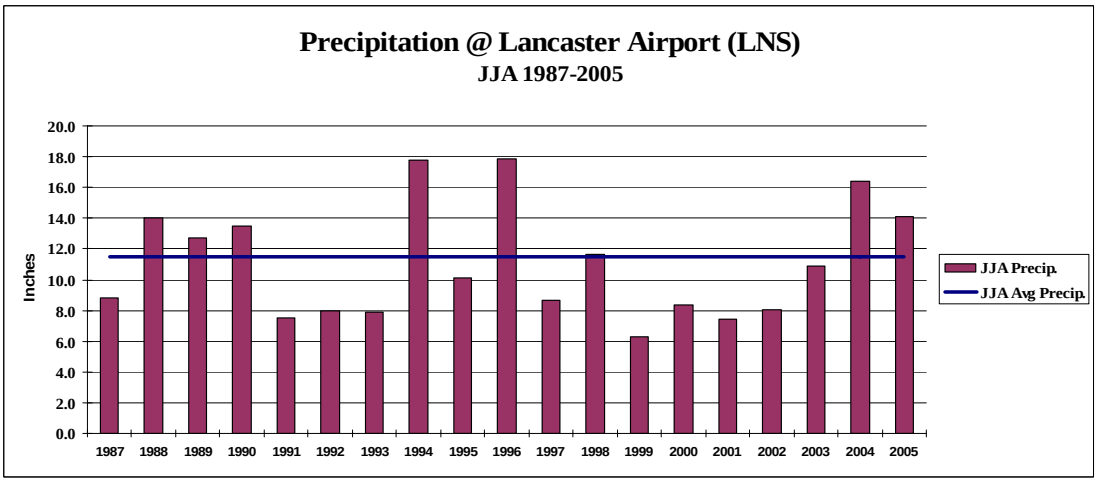
2. Precipitation Trends

Precipitation trends at the Lancaster County airport were analyzed over the 1987-2005 period. Precipitation amounts for the entire ozone season and the JJA time periods were

examined. Chart 1-7 graphically shows precipitation amounts over the 1987-2005 period.

Chart 1-7
Precipitation Totals (inches) at the Lancaster County Airport





Precipitation during the 1990s appears to be below the long-term average for the entire decade but relatively evenly distributed between the first and second halves. Thus it appears that overall precipitation patterns during the 1990s do not entirely account for the relatively high eight-hour ozone concentrations and exceedance frequency observed in the later half of the 1990s.

D. ADDITIONAL TRENDS

1. Population Trends

Lancaster County has had significant population growth over the last several decades. Lancaster County's population has increased approximately 23% between the 1980 and

2000 Censuses. It ranks 10th in the Commonwealth for percentage increase and 3rd overall in terms of gross population change adding 108,312 people between the 1980 and 2000 Censuses. According to the Bureau of the Census, Lancaster County's 2004 estimated population is 487,332 people, ranking the county sixth largest in population in Pennsylvania.

Population increases are thought to correspond with increased emissions and thus increased pollution levels. Lancaster County's population growth over the last several decades has been among the highest in Pennsylvania. This growth, however, has not resulted in increased ozone concentrations. In fact, the county's ozone concentrations have generally declined in spite of significant increases in population.

2. Economic Trends

Economic trends could have impacts on emissions and thus ozone concentrations in Lancaster County and Pennsylvania. The two factors considered here include estimated labor force changes in Lancaster County (provided by the Pennsylvania Labor Department) and overall economic activity in Pennsylvania (measured by the Economic Activity Index published by the Philadelphia Reserve Bank).

Lancaster County's estimated labor force has grown slightly faster than its population over the last 25 years. More substantial growth in the county's estimated labor force occurred in the 1970s. This was probably due to changes in demographics including more women entering the labor force. Chart 1-8 shows Lancaster County's population change and estimated labor force change since 1980. A larger labor force could lead to more driving and increased infrastructure demands. This in turn could lead to higher emissions. Increases in the county's labor force also contribute to overall increases in economic activity (greater family income/spending). The Philadelphia Federal Reserve Bank has tracked economic activity in Pennsylvania over the last 25 years. Pennsylvania's Economic Activity Index is graphically depicted in Chart 1-9. In spite of these upward trends, air quality continues to improve.

Chart 1-8
Lancaster County Population and Estimated Labor Force

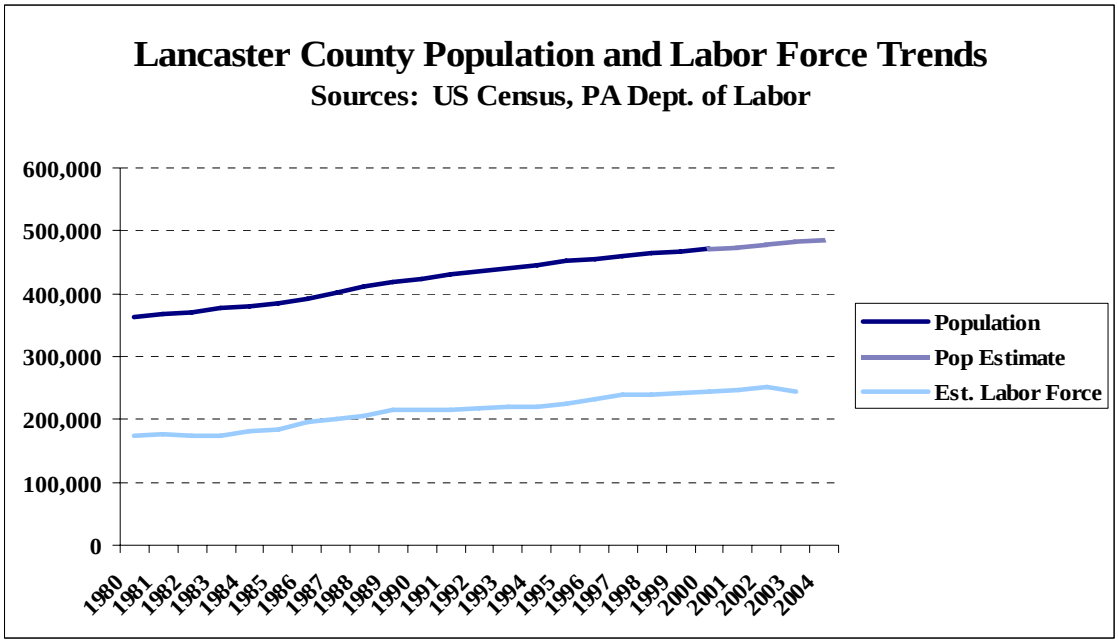
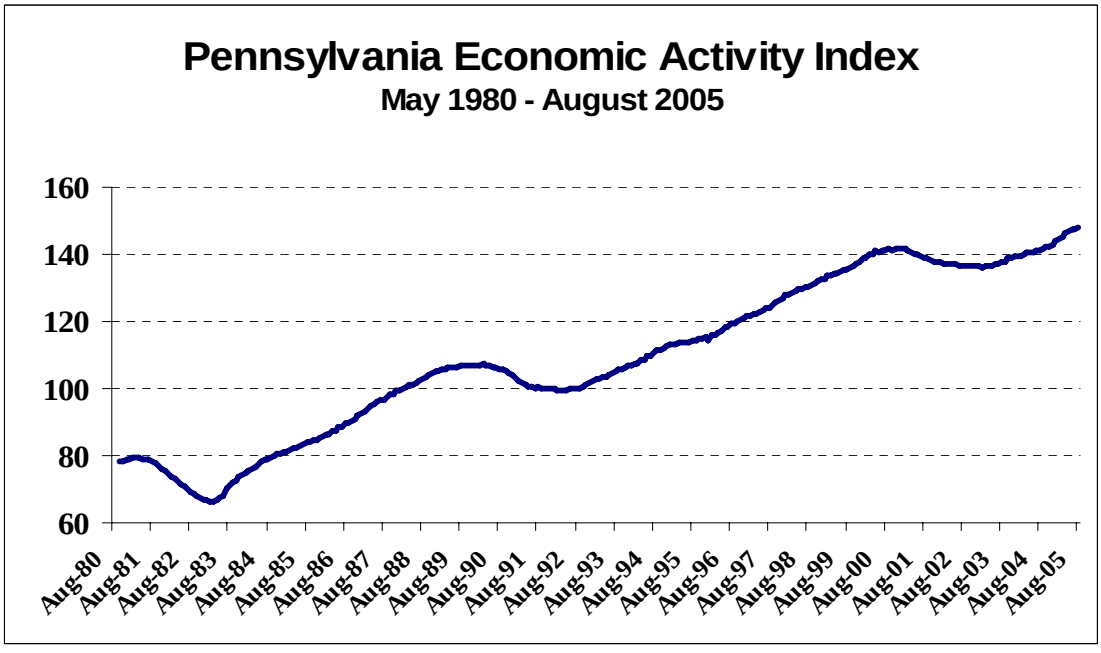


Chart 1-9
Pennsylvania Economic Activity Index from the Philadelphia Federal Reserve Bank



E. OZONE TRANSPORT

Ozone transport has a significant effect in the Lancaster County eight-hour ozone nonattainment area. Ozone transport, however, is highly variable and meteorologically dependent. Gauging the effects on design values, exceedances and peak ozone concentrations is therefore quite difficult.

Lancaster County, like most areas of eastern Pennsylvania, is affected by several types of ozone transport working on different distance and time scales. These include large-scale regional transport, short-term local transport and transport via low-level jets (thin streams of fast-moving air). Our analysis looks at regional and short-term transport. The effects of low-level jets are generally not well understood, though studies in the Philadelphia region have indicated low-level jets have the potential to transport ozone over significant distances and influence local ozone concentrations[2].

HYSPLIT Trajectory Analysis. One way to gauge Lancaster County's ozone transport 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 2005. Twenty-four hour back trajectories were run for 21 Greenwich Mean Time (4 PM Eastern Daylight Time) at 500 meters, 1000 meters and 1500 meters. End points for all of the 500-meter trajectories (115 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.

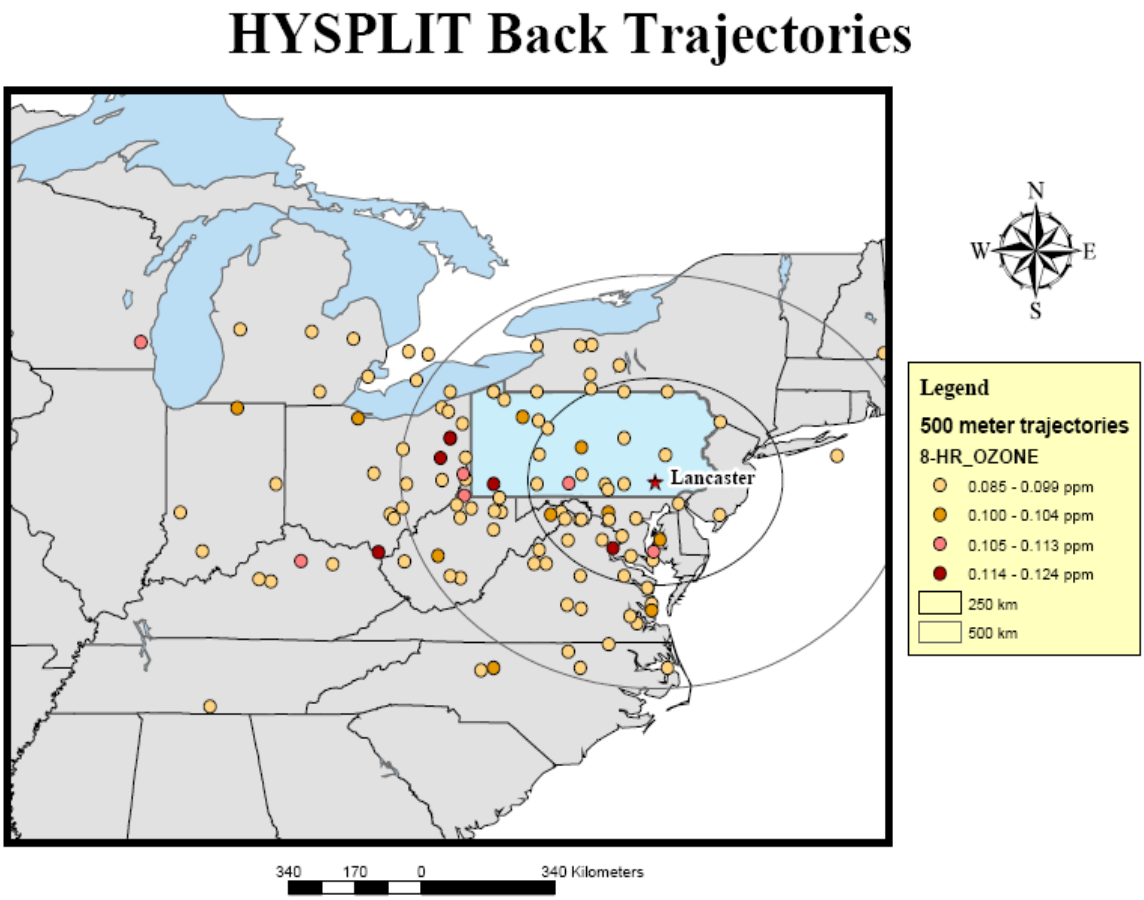
Results indicate a substantial number of upwind trajectories originated outside of Pennsylvania and the Ozone Transport Region (OTR) on days when Lancaster County's ozone concentrations exceed the eight-hour ozone standard (see Table 1-2). The bulk of the upwind trajectory start points lie to the west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

Table 1-2
Summary of Lancaster County Trajectory Start Points
All Exceedance days 1997 through 2005 (115 days)

	500 meter	%	1000 meter	%	1500 meter	%
Outside OTR	74	64%	73	63%	77	67%
Outside PA	95	83%	94	82%	92	80%

[2] NorthEast Oxidant and Particle Study (NEOPS), *Final Report to the Commonwealth of Pennsylvania*, July 2003.

Figure 1-1
HYSPLIT Back Trajectory Analysis



F. MODELING ANALYSIS

Modeling results for the EPA's Clean Air Interstate Rule (CAIR) were examined to determine if the model results support redesignating Lancaster County to attainment. EPA outlined the model results in its technical support document (TSD) for CAIR (TSD for Final CAIR, Air Quality Modeling, March 2005). Results for Lancaster County indicate modeled ozone concentrations will be below the eight-hour ozone standard. According to Appendix E of the TSD, Lancaster County's modeled ozone concentrations are ~83 ppb for both the 2010 Base and 2015 CAIR runs. This result also supports redesignating Lancaster County to attainment for the 8-hour ozone NAAQS.

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 Lancaster County can be found in sections 110(a)(2), and Part D sections 172(c), 173(a), 176 and 182(a) of the CAA. Lancaster County was not subject to specific SIP requirements for ozone before designation as a one-hour ozone nonattainment ozone area in accordance with the CAA amendments of 1990.

These requirements have been fulfilled for the Lancaster area. 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 NOx and VOCs, (25 Pa. Code Sections 129.91-129.95)

- Implementation of RACT for all major sources of NOx. These sources of covered by Standards for Sources, Stationary Sources of NOx 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 (DEP) 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 Commonwealth 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).

- Submittal of the base year (2002) inventory is required by June 15, 2006 under 182(a) of the CAA and EPA regulations for implementation of the eight-hour ozone standard. This inventory is being submitted as part of the maintenance plan, submitted concurrently with this redesignation request.

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.

- PADEP has an ongoing program to monitor and analyze ambient air quality. PADEP submits ambient air quality to EPA as required. The program is conducted in accordance with regulations in 40 CFR Part 58.

- PADEP conducts and submits periodic inventories in accordance with EPA's Consolidated Emission Reporting Rule (40 CFR Part 51, Subpart A).

- PADEP has adequate personnel funding and authority to carry out the implementation of all applicable requirements and provisions of its SIP.

The Lancaster County area thus has 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 Lancaster 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_x emissions is used to represent emissions during the ozone nonattainment designation period. A 2004 inventory of VOC and NO_x emissions is used to identify ozone precursor emissions during the period when the Lancaster 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 the Lancaster area to produce the VOC and NO_x 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 Lancaster County 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
Volatile Organic Compounds – 2002

	Tons per summer day
Stationary Sources [1]	8.5
Stationary Area Sources	24.5
Highway Vehicles	23.4
Nonroad Sources	17.4
TOTAL	**73.8**

Table 3-2
Nitrogen Oxides – 2002

	Tons per summer day
Stationary Sources [1]	3.6
Stationary Area Sources	2.6
Highway Vehicles	36.9
Nonroad Sources	13.7
TOTAL	**56.8**

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_x emissions for the Lancaster area is used to identify ozone precursor emissions during the period when attainment of the 8-hour ozone NAAQS was demonstrated for the Lancaster area. Stationary area sources were estimated based on 2002 emissions because factors used to develop emissions were not yet available for 2004.

Table 3-3
Volatile Organic Compounds –2004

	Tons per summer day
Stationary Sources[2]	8.1
Stationary Area Sources	24.4
Highway Vehicles	19.8
Nonroad Sources	17.3
TOTAL	**69.6**

[1] The stationary point source emissions shown here do not include banked emission credits of 3.7 tpd of VOC and 11 tpd of NOx as indicated in Technical Appendix A-4.
[2] The stationary point source emissions shown here do not include available banked emission credits as indicated in Technical Appendix A-4.

Table 3-4
Nitrogen Oxides – 2004

	Tons per summer day
Stationary Sources [2]	3.9
Stationary Area Sources	2.6
Highway Vehicles	32.3
Nonroad Sources	13.2
TOTAL	**52.0**

The Maintenance Plan describes how the 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 measures to which decreases in emissions and thus ozone concentrations can be attributed from 2002 to 2004. VOC emissions decreased by 5.7 percent from 2002 to 2004. NOx emissions decreased by 8.4 percent from 2002 to 2004.

Table 3-5
VOC and NO_x Emissions Summary: 2002 and 2004

	VOC Emissions (tons per summer day)	
Major Source Category	**2002**	**2004**
Point Sources	8.5	8.1
Stationary Area Sources	24.5	24.4
Highway Vehicles	23.4	19.8
Nonroad Engines/Vehicles	17.4	17.3
TOTAL	**73.8**	**69.6**
	NO_x Emissions (tons per summer day)	
Major Source Category	**2002**	**2004**
Point Sources	3.6	3.9
Stationary Area Sources	2.6	2.6
Highway Vehicles	36.9	32.3
Nonroad Engines/Vehicles	13.7	13.2
TOTAL	**56.8**	**52.0**

1. Stationary Point Sources

Interstate Pollution Transport Reduction. In response to the Federal NOx SIP call rule, Pennsylvania and other covered states adopted NOx 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. While there are no affected units located in Lancaster County, upwind NOx reductions from affected sources in Pennsylvania and other states assisted in bringing the area into attainment.

2. Stationary Area Source Measures

Solvent Cleaning. Pennsylvania 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. Pennsylvania 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. Thise 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 ozone one-hour 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 approximately four percent 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 3-6
VMT and Emissions

YEAR	VMT	VOC (tpsd)	NOX (tpsd)
2002	11,852,081	23.4	36.9
2004	12,349,269	19.8	32.3

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 NOx 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. Pennsylvania'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. Pennsylvania includes these programs, as provided in the MOBILE model, for the base year 2002 and for 2004.

Vehicle Emission Inspection/Maintenance Program. In February 2004, Pennsylvania expanded its vehicle emission inspection/maintenance (I/M) program into Lancaster 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. Pennsylvania 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 . PADEP 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 programs are codified at 40 CFR Parts 89-91.

SECTION 4

MAINTENANCE PLAN

The Maintenance Plan for the Lancaster County 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 NOx 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 Vehicle Program
- Pennsylvania Heavy-Duty Diesel Emissions Control Program
- Federal programs for nonroad engines

PADEP 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. DEP 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

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_x	Oxides of Nitrogen
OTR	Ozone Transport Region
PADEP	Pennsylvania Department of Environmental Protection
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