Kentucky Division for Air Quality

Fiscal Year 2008 Annual Report

Commonwealth of Kentucky
Energy and Environment Cabinet
Department for Environmental Protection
Division for Air Quality
www.air.ky.gov

FROM THE DIRECTOR

I am delighted to present the Kentucky Division for Air Quality's annual report for FY 2008. This report highlights the goals and achievements of the Division for Air Quality and summarizes the current state of Kentucky's air quality, along with recognizing future challenges and areas for further improvement.

Kentucky has made great progress in improving air quality across the commonwealth since the signing of the Clean Air Act by Congress in 1963. Air pollution has decreased significantly, providing safer air quality for the commonwealth's citizens.

Every five years, the United States Environmental Protection Agency is required to review the National Ambient Air Quality Standards, and revises them as necessary to reflect increased scientific understanding about the impacts of air quality on human health and the environment. This means that although our air quality is better than ever, there is always more work to be done.

Air quality is an economic issue as well as a health concern. Economic development can be seriously curtailed if an area does not meet federal air quality standards. Progressive companies not only want to avoid these areas due to stricter permitting requirements, they also want to locate in an area that is attractive to their employees and customers.

Air is a fascinating media that literally knows no boundaries. Every Kentuckian has the ability to help keep Kentucky's air clean, and there are many ways to be involved:

- **Check** the Air Quality Index at www.air.ky.gov;
- **Learn** about air quality and the simple ways that you can make a difference;
- **Start** by making one small change that reduces air pollution;
- **Spread the word** about what you are doing;
- **Organize** locally to participate in National Air Quality Awareness Week;
- **Report** suspected air pollution concerns to your local regional office.

We all have a valuable role to play in protecting our resources for future generations. Remember, it all adds up to cleaner air!

Sincerely,

John S. Lyons, Director
Kentucky Division for Air Quality

Kentucky Division for Air Quality
Annual Report
Fiscal Year 2008

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SELECTED CHARTS AND GRAPHS

EXECUTIVE SUMMARY

The mission of the Division for Air Quality (DAQ) is to protect human health and the environment by achieving and maintaining acceptable air quality through:

- *Operation of a comprehensive air monitoring network;*
- *Creating effective partnerships with air pollution sources and the public;*
- *Timely dissemination of accurate and useful information;*
- *The judicious use of program resources; and*
- *Maintenance of a reasonable and effective compliance assurance program.*

The third largest division in the Department for Environmental Protection with over 175 staff positions, DAQ oversees a diverse air quality program that encompasses monitoring, regulation development, compliance with federal air quality standards, permitting regulated facilities and environmental education.

Selected achievements and challenges for Fiscal Year 2008

- Fiscal Year (FY) 2008 saw the implementation of a formal air toxics program for the division. Exercising authority granted under KRS 224 and operating within the scope promulgated in 401KAR 63:020, the program is designed to identify any air emissions that pose unacceptable risks to both the general public and the environment.

- The Technical Services Branch (hereafter referred to as Ambient Air Monitoring) of the division established its first solar powered air toxics ambient air monitoring station, located in Calvert City, on September 15, 2007. This energy saving experiment was conducted to test the viability of using the sun's energy to power monitors in remote locations where electric hookup is not available.

- The U.S. Environmental Protection Agency (EPA) lowered the Fine Particulate Matter ($PM_{2.5}$) 24-hour National Ambient Air Quality Standard (NAAQS) from 65 ug/m^3 to 35 ug/m^3 on October 17, 2006. The new standard allowed state, local and tribal organizations the opportunity to review the 2004-2006 data for any exceptional events that may have impacted the data. The division submitted an exceptional events package, identifying multiple sites and dates where the $PM_{2.5}$ data may have been impacted from an exceptional event, for the 2004-2006 sample years to EPA in December, 2007.

- Within the Field Operations Branch (FOB), a comprehensive State Review Framework (SRF) audit was completed by the EPA regarding 2004-2005 compliance activities. The final SRF report statistics determined that FOB compliance activities exceeded the following national averages:
  - A 97% completion rate of Full Compliance Evaluations (FCE) for Synthetic Minor (SM) sources (Synthetic Minor/Conditional Major) was achieved, as compared to a national average of 77%;
  - The completion rate of FCEs for Title V major sources was 91% while the national average was 78%;
  - 100% of annual compliance certifications were reviewed for the previously listed Title V and SM sources as compared to the national average of approximately 75%;
  - By the end of 2006, 99% of all FCEs had been completed at major facilities and the rate of completion remained very high through most of 2007.

- The high rate of retirement of FOB staff will negatively impact the branch in 2008 and beyond. Three of eight regional office supervisors and 4 of 37 (10.8%) environmental (source) inspectors retired as of August 1, 2008. Combined, the retirees had an estimated 231 years of field experience.

- It takes at least three years to fully train technical source inspectors to inspect all facility types. In the FOB, ten of 37 environmental (source) inspectors have less than three years of experience.

- FOB began to use EPA's Universal Interface to electronically upload compliance/enforcement data from the DEP Tools for Environmental Management and Protection Organizations (TEMPO) database to EPA's Air Facility System (AFS) database, reducing manual data entry and increasing staff efficiency.

- The Permit Review Branch continued the reduction of permit applications that have gone beyond the regulatory time frame (RTF) for issuing a permit. During FY 2008, 371 permits were issued and applications beyond RTF dropped from 82 to 23.

- The Program Planning and Administration Branch (PPAB) successfully submitted the State Implementation Plan (SIP) for fine particulate matter to the EPA for their review in June 2008.

- The PPAB also successfully submitted the Visibility SIP to the EPA for review in December 2007.

- The federal court vacated (made null and void) several air quality regulations, which were intertwined with state air quality planning responsibilities. The vacature of these rules leaves uncertainty on how Kentucky will move forward to meet federal clean air mandates.

Summary

Ambient Air Monitoring
The Technical Services Branch continues to successfully operate a network of 113 ambient air quality monitors and 13 meteorological data towers, report on the Air Quality Index, observe compliance demonstrations at permitted facilities, and collaborate with the EPA and the Program Planning Branch on exceptional event data.

Environmental Education
The environmental education program has reached over 1,500 students, 50 teachers, and thousands of citizens through a combination of presentations, exhibitions, workshops, and media purchases, along with serving in a number of collaborative groups that work to improve air quality.

Field Operations
The Field Operation Branch continues to respond to the needs of the public and regulated community by investigating complaints and routinely inspecting facilities via the division’s network of eight regional offices.

Permit Review
The Permit Review Branch has substantially reduced the long standing permit back log, dropping the number of applications that went beyond the allotted RTF from a high of 512 in June 2006, to 21.

Program Planning
The Program Planning and Administration Branch helped several counties to attain Clean Air Act ambient air quality standards, while simultaneously preparing for more stringent standards that may impact the ability of several counties to maintain compliance.

INTRODUCTION

The Division for Air Quality is one of six divisions in the Department for Environmental Protection, which is housed in the Energy and Environment Cabinet. The cabinet has developed a set of objectives to be implemented by each department from 2006-2009. The objectives and tactics relevant to DAQ are:

Cabinet Objective 1.0: Improve regulatory procedures and implementation. Make Kentucky's regulatory program rational, reasonable and user-friendly.

Cabinet Objective 2.0: Improve the quality of the Kentucky environment and minimize the health impacts to the citizens from environmental risks in the commonwealth.

DAQ strives to assist Kentucky's citizens and businesses in a satisfactory manner by responding to complaints, requests, and permit actions quickly and thoroughly. In addition to serving individuals and businesses, the division works to ensure that the federal Clean Air Act is met by working with county and city governments to ensure local compliance with (attainment of) the National Ambient Air Quality Standards (NAAQS), which are set by EPA. In order to better accomplish the above objectives, DAQ has established the following tactics and measures to help us track our progress:

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Tactic 1.1: Continue execution of the permit backlog reduction plan originally implemented on July 15, 2006.

Measures for **Permit Backlogs**:

- The total number of permits pending (page 39).
- The total number of permits pending that exceed regulatory time frames (page 39).
- The percentage of permit reviews completed within regulatory time frames (page 40).
- The percentage of permit reviews completed that exceed regulatory time frames (page 40).

The division has established a number of tactics and measures to meet the cabinet's second objective of protecting and enhancing Kentucky's environment and public health:

Tactic 2.1: Continue implementation of the air toxics program to evaluate and address any risks to public health associated with hazardous air pollutant (HAP) emissions (page 41).

Measures to **hazardous air pollutant reductions**:

- The total tons of hazardous air pollutants reduced (page 43).

Tactic 2.2: Implement measures contained in the June 2008 annual fine particle attainment demonstration State Implementation Plan (SIP) (page 53).

Measure for **demonstrating attainment of the fine particle standard**:

- The number of counties remaining in nonattainment (page 53).

Tactic 2.3: Continue to work with the EPA on appropriate designation for areas not meeting the 24-hour fine particle standard, and develop an attainment demonstration SIP for areas ultimately designated by EPA as not meeting that standard.

Measure for **designation of the 24-hour fine particle standard**:

- The number of counties remaining in nonattainment (page 55).

Tactic 2.4: Continue implementation of federal programs and requirements contained in the 1997 8-hour ozone attainment demonstration SIP, submitted to the EPA in December 2007.

Measure for **designation of the 1997 8-hour ozone standard**:

- The number of counties remaining in nonattainment (page 52).

Tactic 2.5: Continue implementation of federal programs and requirements contained in the December 2007 Regional Haze SIP.

Measure for **implementation of the Regional Haze State Implementation Plan**:

- Improved visibility at Class I areas, including Mammoth Cave National Park (page 54).

Tactic 2.9: Assure compliance with air quality regulations and standards.

Measures for **compliance with air quality regulations and standards**:

- Number of major stationary source inspections conducted (page 33);
- Number of minor stationary source inspections conducted (page 33);
- Number of asbestos National Emission Standard for Hazardous Air Pollutants (NESHAP) and Asbestos Hazard Emergency Response Act (AHERA) inspections conducted (page 36);
- Number of non NESHAP and AHERA complaint investigations conducted (page 36);
- Compliance rate of stationary source inspections (page 32);
- Compliance rate with 401 KAR 63:005 (open burning), 63:010 (fugitive emissions) and 401 KAR 53:010 (odor) (page 34-35); and
- Compliance rate of NESHAP and AHERA related inspections and investigations (page 35).

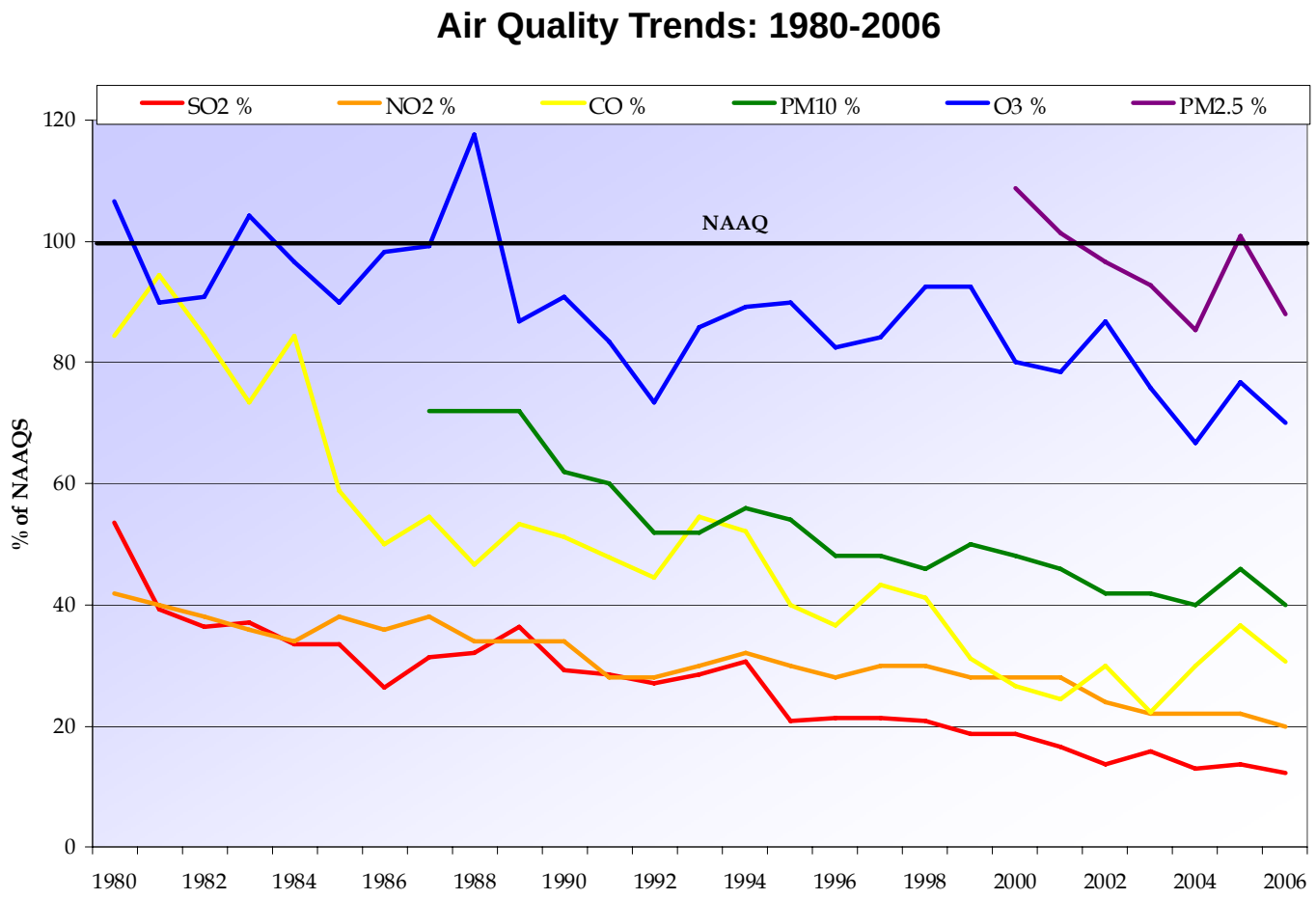

Figure 1: Air Quality Trends from 1980-2006. This chart shows trends in individual pollution levels over time. While individual pollutants may spike certain years, overall the trend is a decline in pollution levels. The pollutants are shown in terms of percentage of the National Ambient Air Quality Standards (NAAQS) because different pollutants are measured in different scales, making direct comparison difficult. For a key of pollution abbreviations, see the Glossary of Abbreviations on page 58.

AMBIENT AIR MONITORING (TECHNICAL SERVICES)

Since July 1967, the state has operated an air quality monitoring network. The 2007 network included 177 monitors in 35 counties (this total includes monitors operated by the Louisville Metro Air Pollution Control District (LMAPCD), the National Park Service (NPS) at Mammoth Cave and industrial sources).

The monitoring station locations are selected in accordance with EPA regulations (40 CFR 58, Appendix D) and, in general, are established near high population areas or air pollution sources. Each year the site locations are reviewed to ensure that adequate coverage is being provided and regulatory requirements are met.

Many staff hours are devoted to the operation of the monitoring network. Division staff routinely visit our sites to calibrate and maintain the monitoring equipment, collect samples, and verify and document data from the continuous monitors. Because it is imperative that the air monitoring data be accurate and precise, the Division for Air Quality has an extensive quality assurance program. Staff members audit every air monitor quarterly to ensure that each is operating properly. This audit process includes monitors operated by the LMAPCD, the NPS and industrial networks.

Monitoring data is used in several ways. The data is utilized to demonstrate compliance with or progress made toward meeting ambient air quality standards and to identify pollution trends. The data also assists in evaluating public health impacts and the possible need to initiate emergency control procedures.

The public has access to the monitoring data on a daily basis through the Air Quality Index (AQI) message on our website: www.air.ky.gov or toll free at: 1-800-AIR-IN-KY. The AQI is a 24-hour report on Kentucky's air quality. The public can access daily ozone and particulate matter reports through EPA's AIRNOW website at www.epa.gov/airnow.

More detailed monitoring information is available via two reports that are published annually by the Technical Services Branch—the Kentucky Ambient Air Monitoring Report and the Kentucky Air Quality Surveillance Network Report. The Ambient Air Monitoring Report details data about individual pollutants that DAQ monitors, while the Surveillance Network Report focuses on the division's network of air quality monitors.

Understanding the National Ambient Air Quality Standards

The federal Clean Air Act (42 U.S.C. 7401-7671), as amended by the U.S. Congress in 1970, 1977 and 1990, directs the U.S. Environmental Protection Agency (EPA) to establish NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS) defining maximum allowable ambient (outdoor) concentrations for criteria pollutants. The term "criteria pollutants" derives from the requirement that EPA must set criteria or standards for each pollutant in the table at right.

There are two standard goal levels for each of the criteria pollutants. The PRIMARY STANDARD is designed to protect the public health. The SECONDARY STANDARD is designed to protect public welfare. Public welfare includes damage to plants and animals, impairment of visibility and property damage.

Units of measure in the chart are micrograms of pollutants per cubic meter of air ($\mu g/m^3$) and parts of pollutants per million (ppm) parts of air.

Footnotes:

(1) This average is not to be exceeded more than once per year.
(2) The standard is attained when the expected number of days per calendar year with a twenty-four (24) hour average concentration above 150 $\mu g/m^3$ equal to or less than one (1).
(3) The standard is attained when the 3-year average of the annual fourth-highest daily maximum 8-hr average ozone concentration is less than or equal to 0.08 ppm.
4) The standard is attained when the 3-year average of the annual 98^{th} percentile is less than or equal to 35 $\mu g/m^3$.
(5) The standard is attained when the 3-year average of annual means is less than or equal to 15 µg/m3.
(6) The standard is attained when the 3-year average of the annual fourth-highest daily maximum 8-hr average ozone concentration is less than or equal to 0.075 ppm (effective May 27, 2008).

Air monitors are located at monitoring stations or on building rooftops as seen in the left and right pictures. The center picture is a particulate matter monitor used by DAQ to speciate $PM_{2.5}$.

National Ambient Air Quality Standards (NAAQS)

Pollutant	MAXIMUM CONCENTRATION	
	Primary Standard	Secondary Standard
Carbon Monoxide 8 hour average 1 hour average	9 ppm(1) 35 ppm(1)	None None
Lead Calendar quarter average	1.5 µg/m^3	Same as primary
Nitrogen Dioxide Annual Average	0.053 ppm	Same as primary
Ozone 8 hour average	0.075 ppm (2008 std) (6) 0.08 ppm(3)	Same as primary
Particulate Matter (measured as $PM_{2.5}$) 24 hour average Annual Average	35 µg/m^3 (4) 15 µg/m^3 (5)	Same as primary
Particulate Matter (measured as PM_{10}) 24 hour Average	150 µg/m^3 (2)	
Sulfur Oxides 24 hour average Annual Average 3 hour average	0.14 ppm(1) 0.03 ppm ———	——— ——— 0.5 ppm

Figure 2: The National Ambient Air Quality Standard determines what levels of each pollutant are acceptable in terms of protecting human health (primary standard) and public welfare (secondary standard).

AIR QUALITY INDEX (AQI)

Air Quality Index Levels of Health Concern	Numerical Value	Meaning
Good	0-50	Air quality is considered satisfactory, and air pollution poses little or no risk.
Moderate	51-100	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
Unhealthy for Sensitive Groups	101-150	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	151-200	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	201-300	Health alert: everyone may experience more serious health effects.
Hazardous	> 300	Health warnings of emergency conditions. The entire population is more likely to be affected.

Figure 3: Understanding the Air Quality Index (AQI). The purpose of the AQI is to help you understand what local air quality means to your health.

The AQI is an index for reporting daily air quality. It tells you how clean or polluted your air is, and what associated health effects might be a concern for you. The AQI focuses on health effects you may experience within a few hours or days after breathing polluted air. EPA calculates the AQI for five major air pollutants regulated by the Clean Air Act: ground-level ozone, particle pollution (also known as particulate matter), carbon monoxide, sulfur dioxide, and nitrogen dioxide. For each of these pollutants, EPA has established national air quality standards to protect public health.

How Does the AQI Work?

Think of the AQI as a yardstick that runs from 0 to 500. The higher the AQI value, the greater the level of air pollution and the greater the health concern. For example, an AQI value of 50 represents good air quality with little potential to affect public health, while an AQI value over 300 represents hazardous air quality.

An AQI value of 100 generally corresponds to the national air quality standard for the pollutant, which is the level EPA has set to protect public health. AQI values below 100 are generally thought of as satisfactory. When AQI values are above 100, air quality is considered to be unhealthy; at first for certain sensitive groups of people, then for everyone as AQI values get higher.

Where can I find out about the AQI?

The Division for Air Quality reports nearly real-time AQI values on our website, at www.air.ky.gov, and via a toll-free telephone number, 1-800-AIR-IN-KY. Forecasted AQI data can be viewed at the U.S. EPA website, www.airnow.gov. Forecasted AQI data is generated using a combination of forecasted weather data and known pollution emission values. DAQ does not forecast for air pollution. In Kentucky, the Louisville Air Pollution Control District forecasts due to its population size as required by the CAA.

Understanding the Air Quality Index (AQI)

"Good" Air pollution poses little or no risk.

"Moderate" People who are unusually sensitive to ozone may experience respiratory symptoms.

"Unhealthy for Sensitive Groups" Sensitive groups (children, the elderly, those with compromised cardiovascular or pulmonary systems, and people who undergo physical exertion outdoors for prolonged periods of time) may experience health effects. This means they are likely to be affected at lower levels than the general public.

For example, people with lung disease are at greater risk from exposure to ozone, while people with either lung disease or heart disease are at greater risk from exposure to particle pollution. The general public is not likely to be affected when the AQI is in this range.

"Unhealthy" Everyone may begin to experience health effects. Members of sensitive groups may experience more serious health effects.

"Very Unhealthy" Triggers a health alert, meaning everyone may experience more serious health effects.

"Hazardous" Triggers health warnings of emergency conditions. The entire population is more likely to be affected.

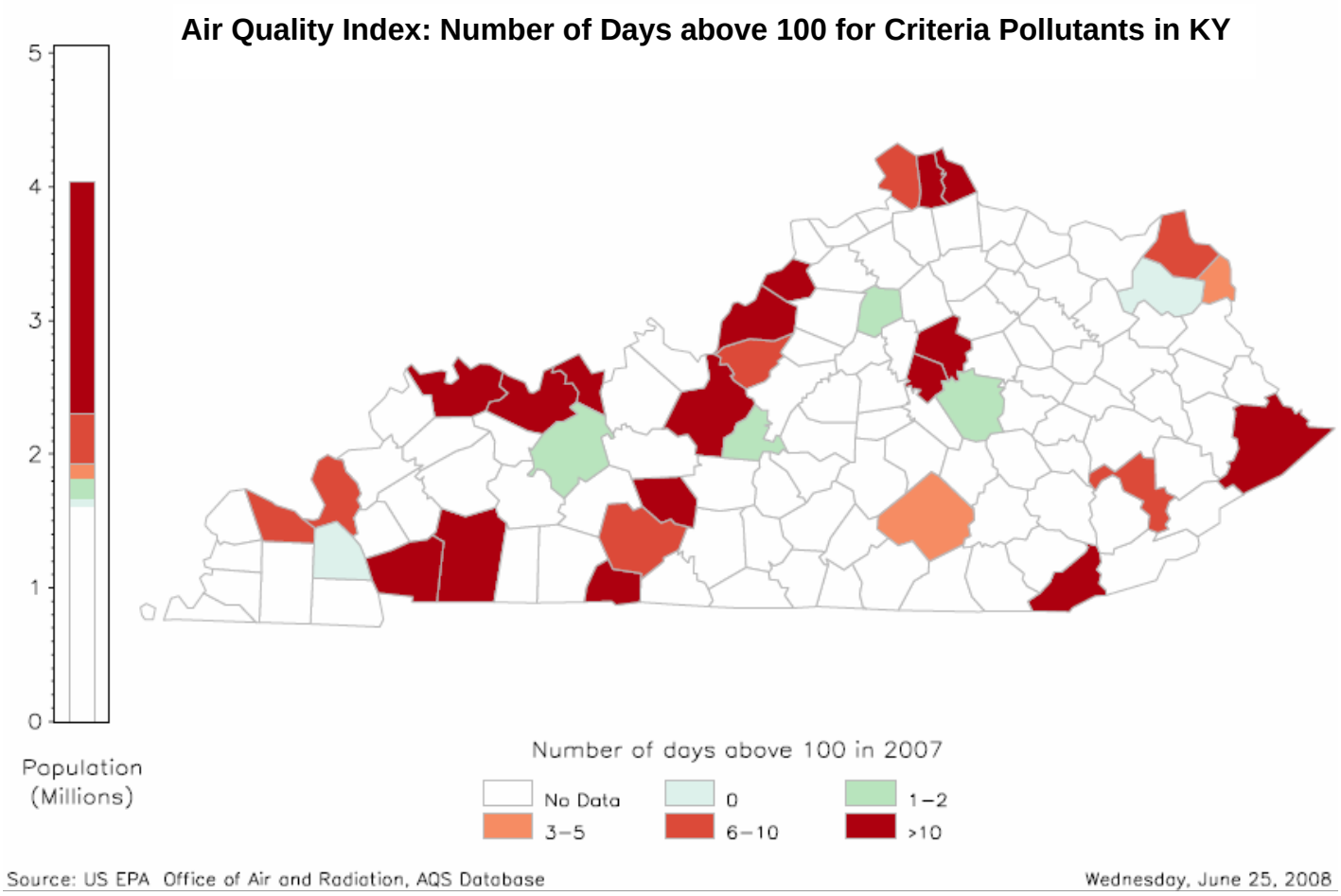

Figure 4: Air Quality Index Days Above 100. The number of days in which the AQI was in the "Unhealthy for Sensitive Groups—Orange" range or worse, by county. Areas with larger populations are more likely to have days in the orange, red, or purple range.

2007 KYDAQ/LMAPCD NETWORK MAP

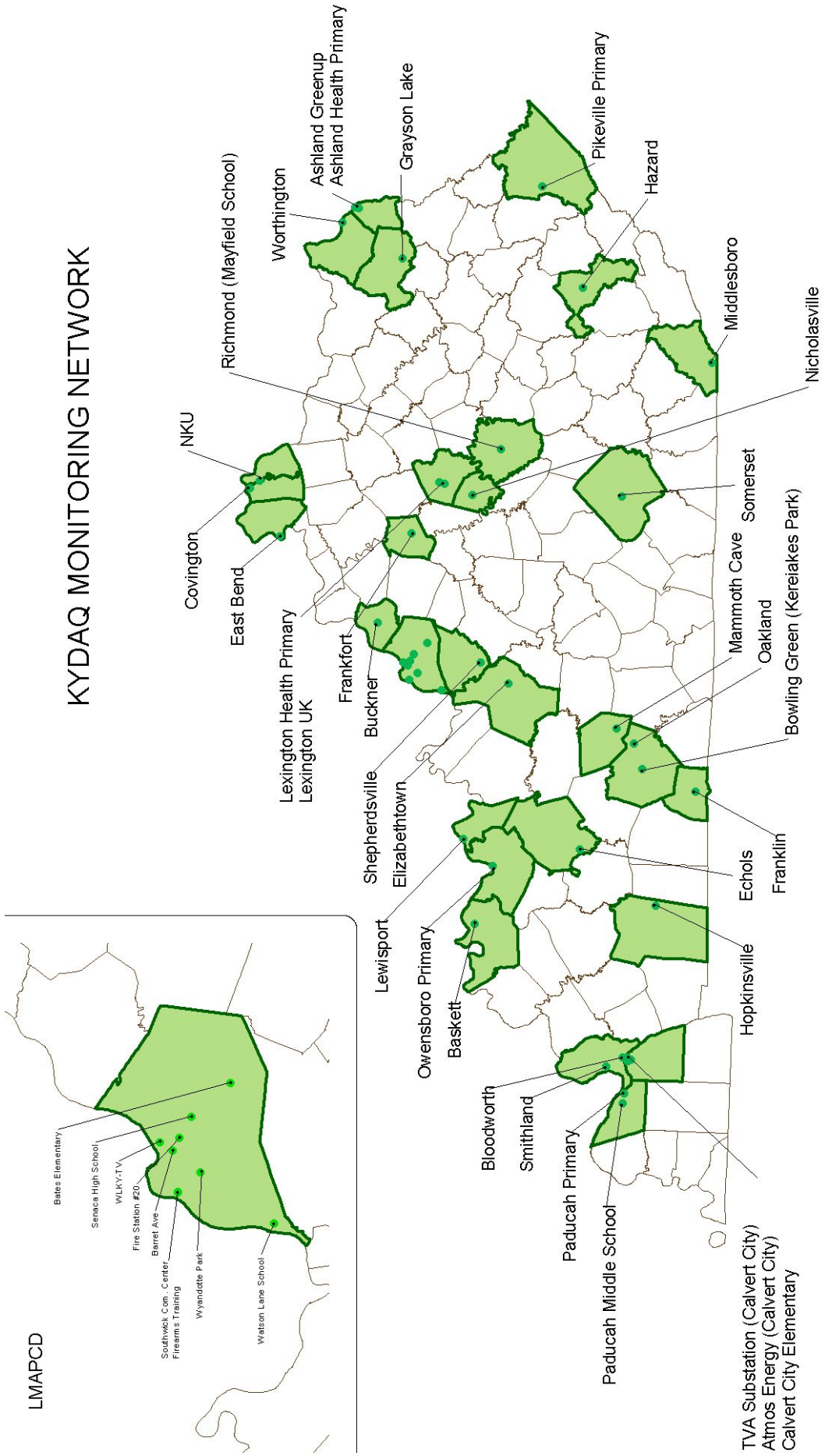

Figure 5: The Kentucky Division for Air Quality monitoring network. Inset is the Louisville Metropolitan Air Pollution Control District monitoring network.

2007 MONITORS BY COUNTY

County	$PM_{2.5}$	PM_{10}	SO_2	NO_2	CO	O_3	Acid Rain	Species	Toxics	Hg	WS/ WD
Bell*	1					1					1
Boone						1				1	1
Boyd	2	2	1	1		1		1	4		1
Bullitt	1	1		1		1					1
Campbell*	2		1	1		1					
Carroll [3]		3		1							
Carter	1					1	1			1	1
Christian	1										
Christian [3]						1					
Daviess*	2		1	1		1					1
Edmonson [1*]	1					1	1			1	1
Fayette	3	1	1	1		2		1	3		
Fleming[3]						1					
Franklin	1										
Greenup			1			1					
Hancock						1					
Hardin	2					1					
Henderson	3	1	1			1					
Henderson [3]			2								
Jefferson [2] *	9	3	2	1	2	3		1			1
Jessamine			1			1				1	1
Kenton	2		1	1		1		1	2		1
Laurel*											
Livingston			1			1			2	1	1
McCracken*	2	1	1	1		1					
Madison	1										
Marshall		1							5		1
Ohio	2	1	1						1	1	1
Oldham						1					
Perry	1	2				1		1	6		1
Pike	3					1					
Pulaski*						1					
Scott [3]						1					
Simpson						1					1
Trigg [3]	1		1	1		1					
Warren*	3			1		1					
Webster [3]			1								
Wayne, WV [3]			3	1		1					
Total	**44**	**16**	**20**	**12**	**2**	**32**	**2**	**5**	**23**	**6**	**15**

[1] Operated by the National Park Service

[2] Operated by the Louisville Metro Air Pollution Control District

[3] Industrial Air Monitoring Network

* A monitor or a site in this county was discontinued during 2006.

CARBON MONOXIDE (CO)

Louisville Metro Air Pollution Control District: Carbon Monoxide Ambient Air Monitoring Network

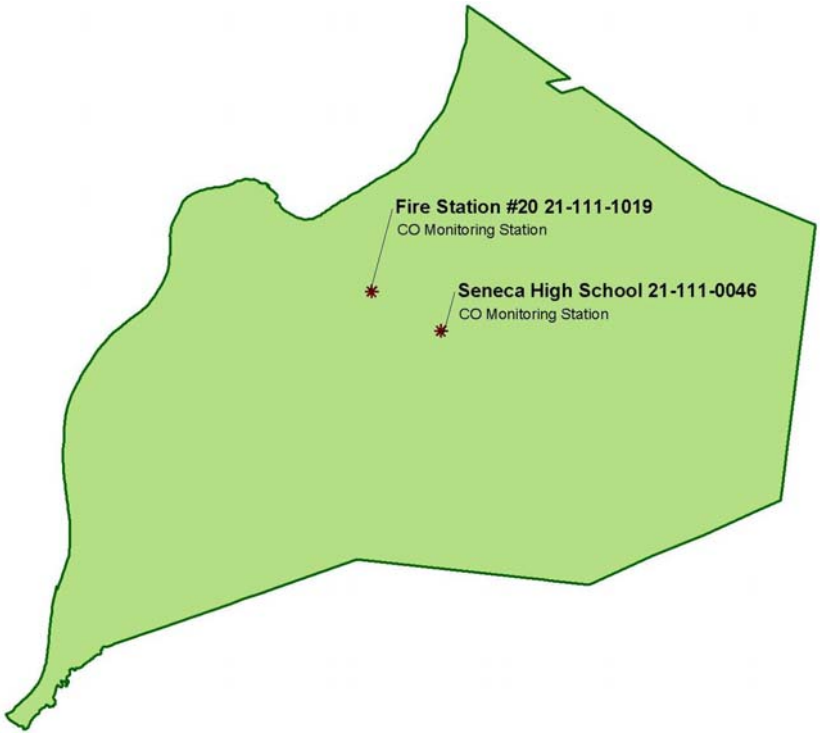

Figure 6: Carbon monoxide monitoring in Kentucky is currently conducted only in the Louisville Metro region due to statewide compliance; Jefferson County historically has had higher levels of CO than elsewhere in the state, perhaps due to the high levels of vehicle traffic in the area.

Carbon monoxide (CO) is an odorless, colorless, poisonous gas that is produced by the incomplete combustion of carbon containing fuels. The primary source of carbon monoxide is the exhaust from motor vehicles that includes highway and off-road vehicles such as construction equipment. Other sources include industrial processes, kerosene and wood burning stoves in homes.

Environmental Impacts

The main health effect of carbon monoxide is its tendency to reduce the oxygen carrying capacity of blood. Carbon monoxide enters the bloodstream in the lungs where it binds chemically with the hemoglobin in red blood cells. Hemoglobin normally carries oxygen to organs and tissues but because CO binds with the hemoglobin over 200 times more readily than oxygen, the amount of oxygen absorbed into the bloodstream is greatly reduced when CO is present.

Depending on the level of exposure, CO can cause fatigue and headaches and can impair vision and reflexes. Unconsciousness and even death may occur at high concentrations. The severity of the effects is related to the length of exposure and concentration level of CO.

How is CO Monitored?

Carbon monoxide is monitored continuously by analyzers that operate using the non-dispersive infrared photometry method. In this method, ambient air is drawn into a sample cell and a beam of infrared light is passed through it. Carbon monoxide absorbs infrared light and any decrease in the

intensity of the beam is due to the presence of CO. The decrease is directly related to the concentration of CO in the ambient air. A detector measures the difference between the sample cell beam and a duplicate beam passing through a reference cell with no CO present.

The difference is translated into a measure of the CO present in the ambient air. Data from the analyzer is transmitted, by telemetry, for entry into an automated data storage system. In 2007, the Louisville Metro Air Pollution Control District operated two CO monitors in Jefferson County.

Results

There were no exceedances of the CO standards in 2007. The last exceedance of a standard occurred on January 7, 1998 in Ashland when an 8-hour average of 11.7 ppm was recorded. All Kentucky counties are currently in attainment of the standards for carbon monoxide.

Statewide and regional carbon monoxide levels have declined substantially since 1980, primarily due to improved emission controls on motor vehicles. Due to the substantial drop in monitored levels, carbon monoxide monitoring was discontinued statewide in 2003 except for Jefferson County. The 2003 statewide discontinuation of CO monitors accounts for the dramatic uptrend from 2003 to 2004 because since 2004, the annual average has been based on data only from Jefferson County. Jefferson County has historically had higher CO levels than the rest of the state.

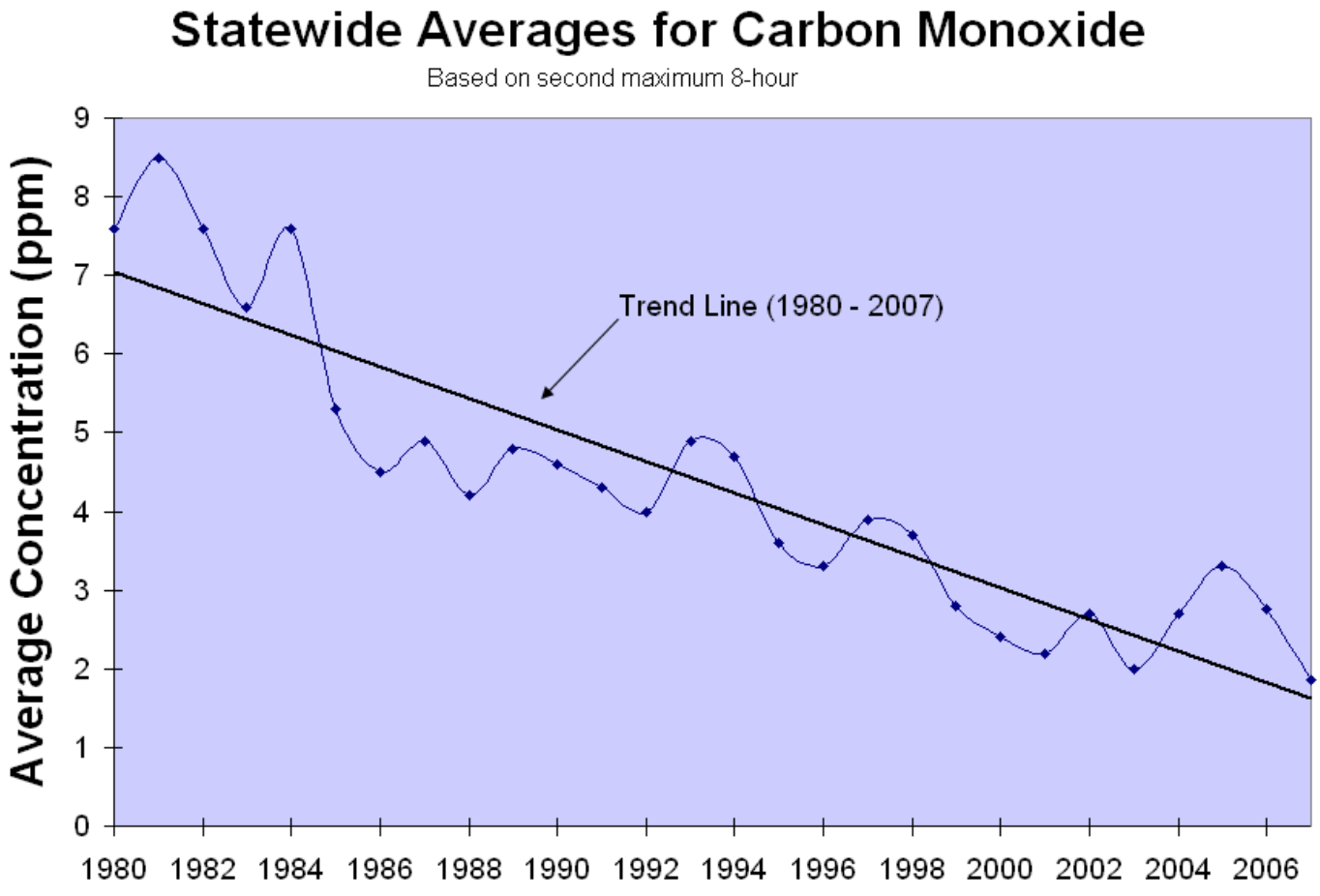

Figure 7: Statewide averages for CO monitoring indicate pollution reductions.

NITROGEN DIOXIDE (NO_2)

Nitrogen Dioxide Ambient Air Monitoring Network

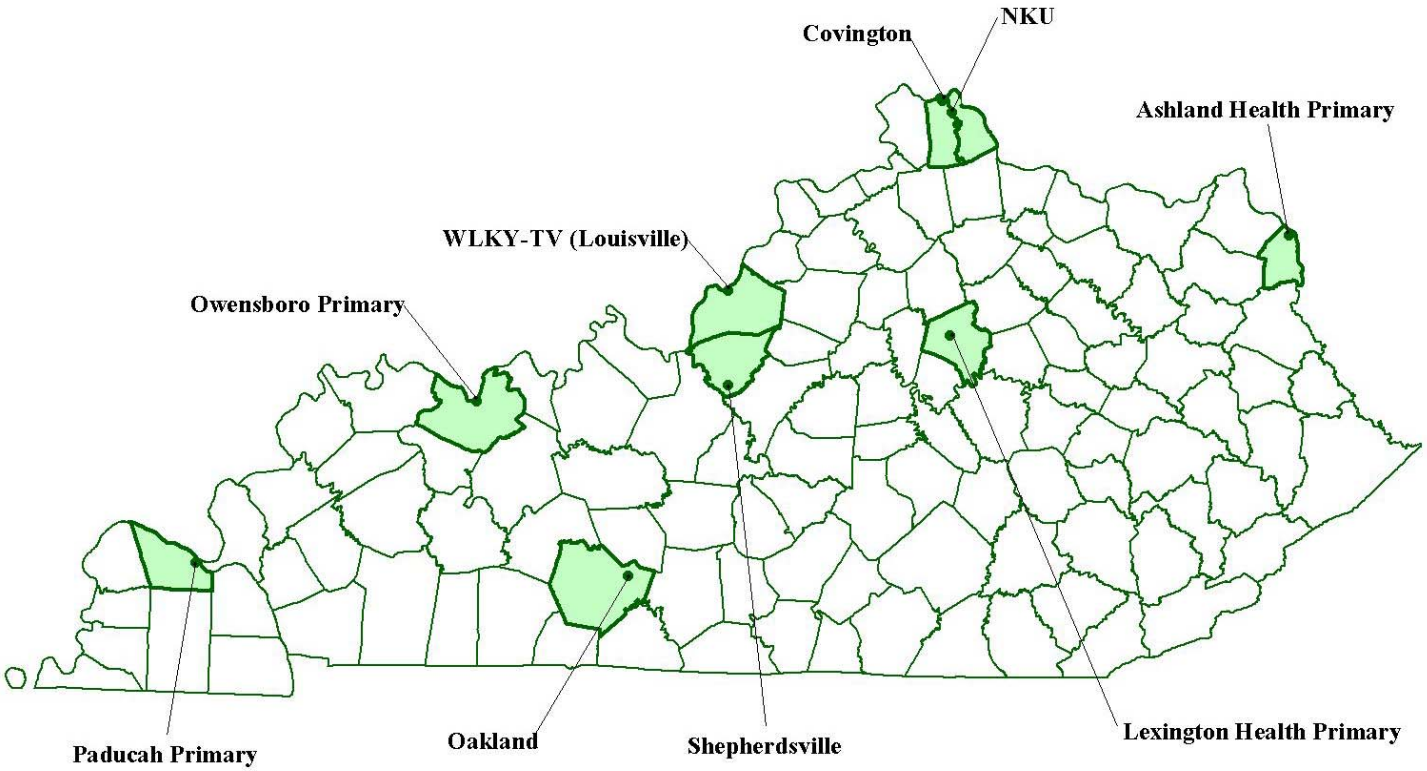

Figure 8: Nitrogen dioxide monitoring locations in Kentucky.

Nitrogen dioxide is a reddish brown gas that is produced during high temperature combustion. During combustion, nitrogen and oxygen are combined, or oxidized, to form a family of highly reactive gases called nitrogen oxides (NOx), which includes nitrogen dioxide (NO_2) and nitrogen oxide (NO). In addition to the NO_2 produced during combustion, the NO produced may, in the presence of sunlight, undergo a photochemical reaction that will also form NO_2. The rate of reaction is dependent upon the intensity of the sunlight.

Major combustion or oxidation sources that produce NO_2 include motor vehicles, power plants, incinerators, boilers and chemical processes.

Environmental Impacts

The primary health effect of nitrogen dioxide is as a lung irritant, which can cause an increase in respiratory rate, a decrease in lung function and an increase the susceptibility of the respiratory system to infection. Nitrogen oxides are also considered detrimental to human health due to their association in the formation of ozone and the resulting health effects caused by that pollutant.

Nitrogen dioxide is a contributor to the formation of acid precipitation, which can damage plant life, aquatic life, cause the deterioration of stone/masonry-type buildings and deteriorate statues.

Nitrogen oxides also react with ammonia to form ammonium nitrate, a component of $PM_{2.5}$. Nitrates are also a key component in regional haze that has been attributed to poor visibility in the southeast region of the United States.

How is NO_2 monitored?

Nitrogen dioxide is monitored continuously by analyzers that utilize the principle of photometric detection of the chemiluminescence (light) resulting from the gas phase reaction of nitric oxide (NO) and ozone. When these two gases react, light at a specific wavelength is produced. In operation, sample air is drawn into the analyzer and split into two streams.

The first air stream reacts directly with ozone (which is produced by a generator in the analyzer) and the light energy produced is proportional to the NO in the sample. Since NO_2 does not react with ozone, the second stream of air passes through a catalytic converter that converts the NO_2 in the sample to NO. The second air stream then reacts with ozone, providing a total measurement of nitrogen oxides (NOx) in the sample.

The assumption is that the majority of the NOx value is not NO_2. Through subtraction of the first air stream NOx concentration from the second stream NOx concentration, a NO_2 value is obtained. Data from the analyzer is transmitted into an automated data storage system. In 2007, the DAQ and the LMAPCD operated nine nitrogen dioxide monitors in Kentucky.

Results

There were no exceedances of the NO_2 standard in 2007, and there have been no recorded exceedances of the NAAQS since the inception of sampling in 1970. Statewide nitrogen dioxide levels show a steady, downward trend, primarily due to the use of pollution control devices on motor vehicles, power plants and industrial boilers.

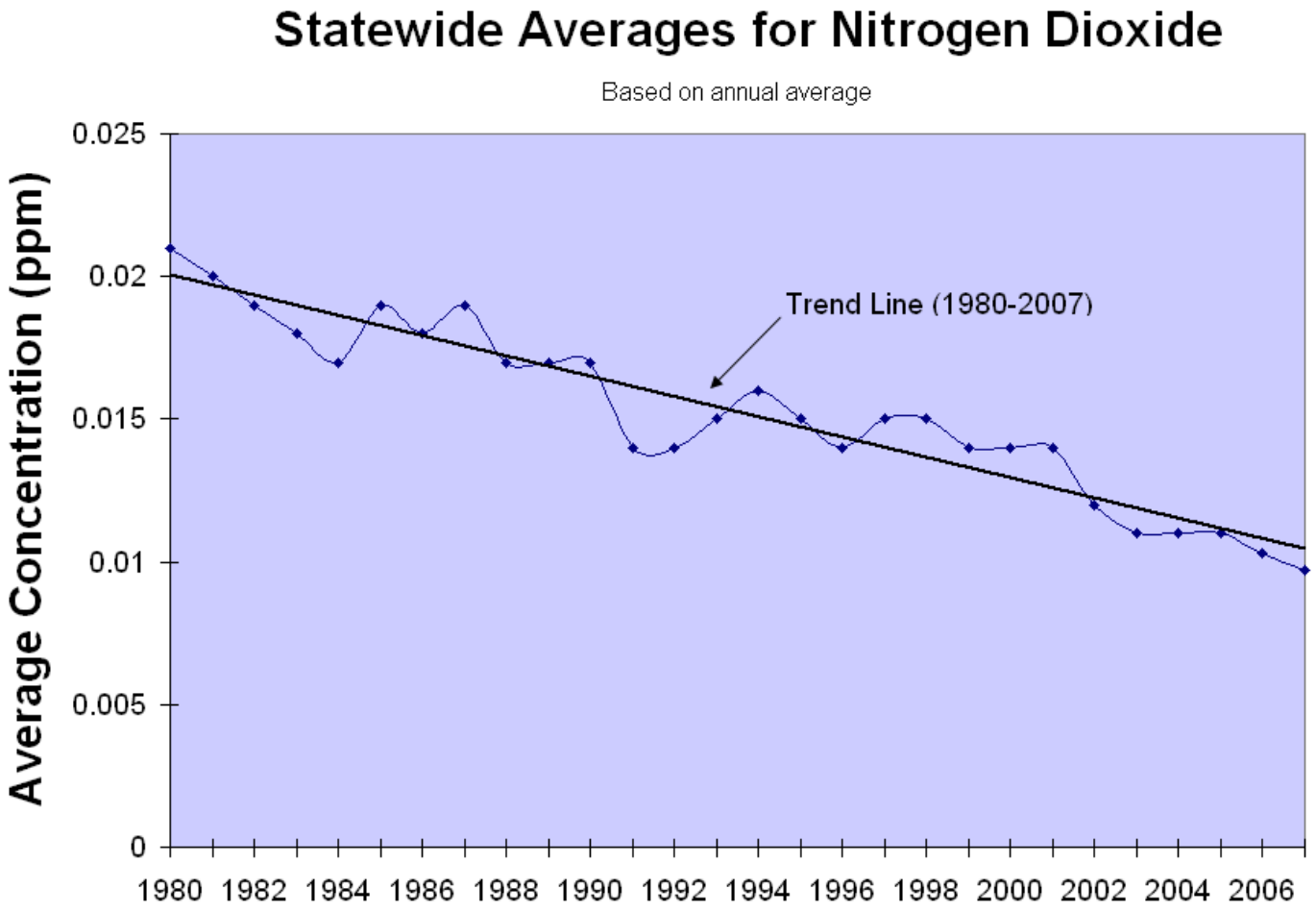

Figure 9: Statewide averages for nitrogen dioxide monitoring indicate pollution reductions.

OZONE (O_3)

Ozone Ambient Air Monitoring Network

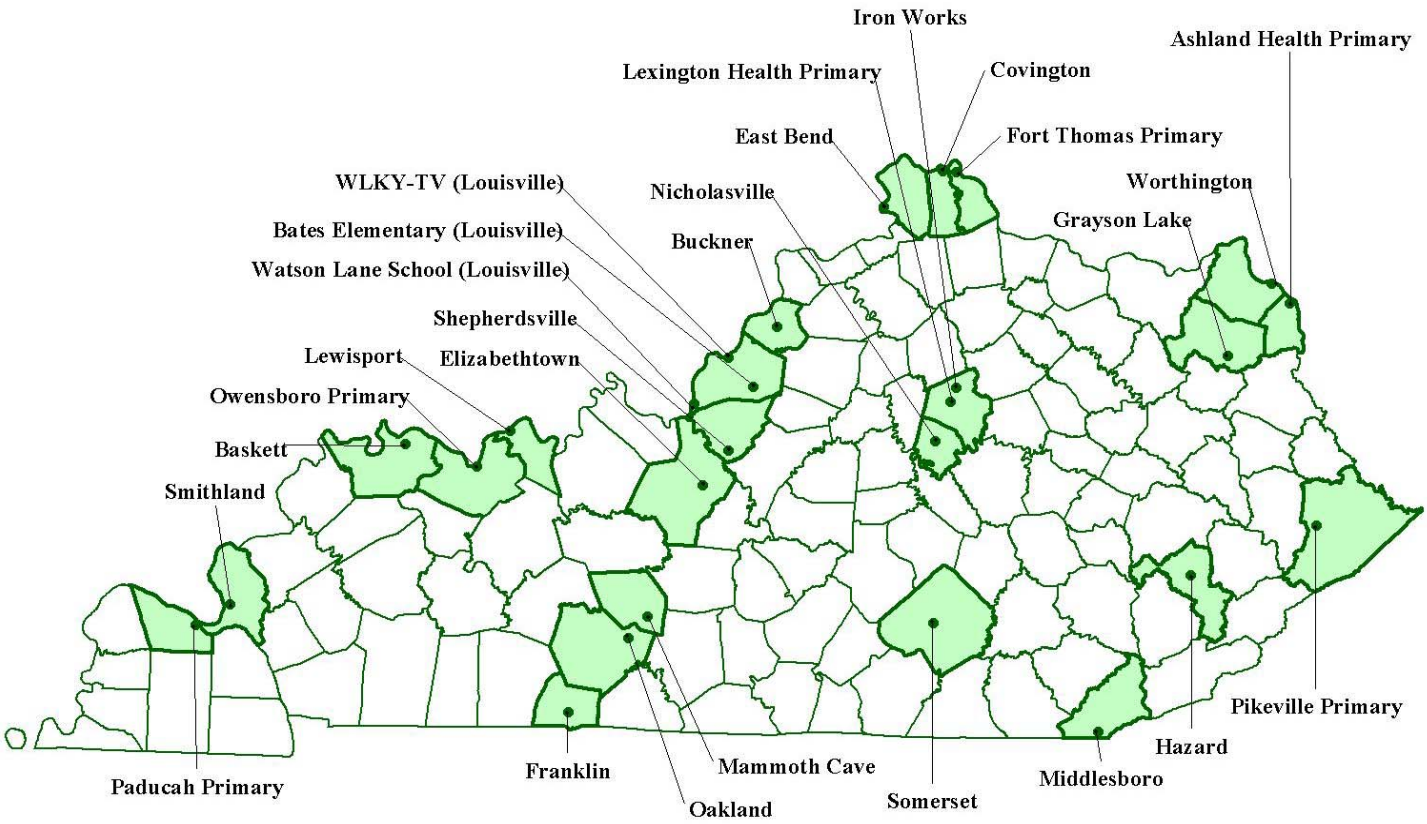

Figure 10: Ozone monitoring locations in Kentucky.

Ozone (O_3) is a colorless gas that is not emitted directly into the atmosphere from sources but forms in the atmosphere from a photochemical reaction between volatile organic compounds (VOCs) and nitrogen oxides (NOx) in the presence of sunlight. Sources of VOCs include motor vehicle exhaust, dry cleaning, paint solvents, and evaporation of gasoline from storage and fuel transfer facilities. Sources of NOx include emissions from motor vehicles, boilers and power plants.

Environmental Impacts

In the upper atmosphere, naturally occurring stratospheric ozone (commonly called the ozone layer) shields the earth's surface from the sun's harmful ultraviolet rays. Tropospheric ozone, also known as ground-level ozone, can trigger health problems at low level exposure, cause permanent lung damage after long term exposure and damage ecosystems. Ozone is "good up high, bad near by."

How is O_3 monitored?

Ozone is monitored from March 1st through October 31st each year, when meteorological conditions are most conducive to the formation of ozone. Analyzers, which operate continuously, monitor ozone by using the ultraviolet photometry method. In this method, ambient air is drawn into a sample cell and a beam of ultraviolet light is passed through the cell. Ozone absorbs ultraviolet light and a decrease in the intensity of the light indicates the presence of ozone. The intensity of the light is first measured with no ozone present to determine a reference value. An ambient sample is then introduced and the intensity of the resultant light is measured by an ultraviolet detector. The amount

of light absorbed by the sample indicates the level of ozone present. Data from the analyzers are transmitted into an automated data storage system. In 2007, DAQ, the National Park Service at Mammoth Cave and the Louisville Metro Air Pollution Control District operated a total of 27 ozone monitors in Kentucky.

Results

In November 1997, the U.S. EPA adopted an eight-hour ozone standard based on scientific and medical research, which indicated that extended exposure to lower levels of ozone might be as harmful as short-term exposure to elevated levels. The eight-hour standard was set at 0.08 ppm and was exceeded when the average level of ozone over an eight hour period was 0.085 ppm or greater. On May 27, 2008, the U.S. EPA adopted a new 8-hour standard set at .075 ppm.

The standard is attained when the fourth highest daily 8-hour average for each of the three most recent years are averaged and that average is less than 0.085 ppm. To give the reader a sense of how the new standard may impact Kentucky, consider the following: In 2007, there were 41 exceedances of the previous 8-hour standard, statewide. However, there would have been 268 exceedances based on the 2008 8-hour standard of .075 ppm.

Generally, there has been a decline in ozone levels over the past twenty-five years based on one-hour data. This downward trend is the result of emission controls on vehicles, such as catalytic converters, and controls on industrial sources of VOCs and NOx. In 1997, the federal NOx SIP Call resulted in the regional strategy control of NOx emissions from large stationary internal combustion engines and large boilers and turbines used in power plants and other industrial applications.

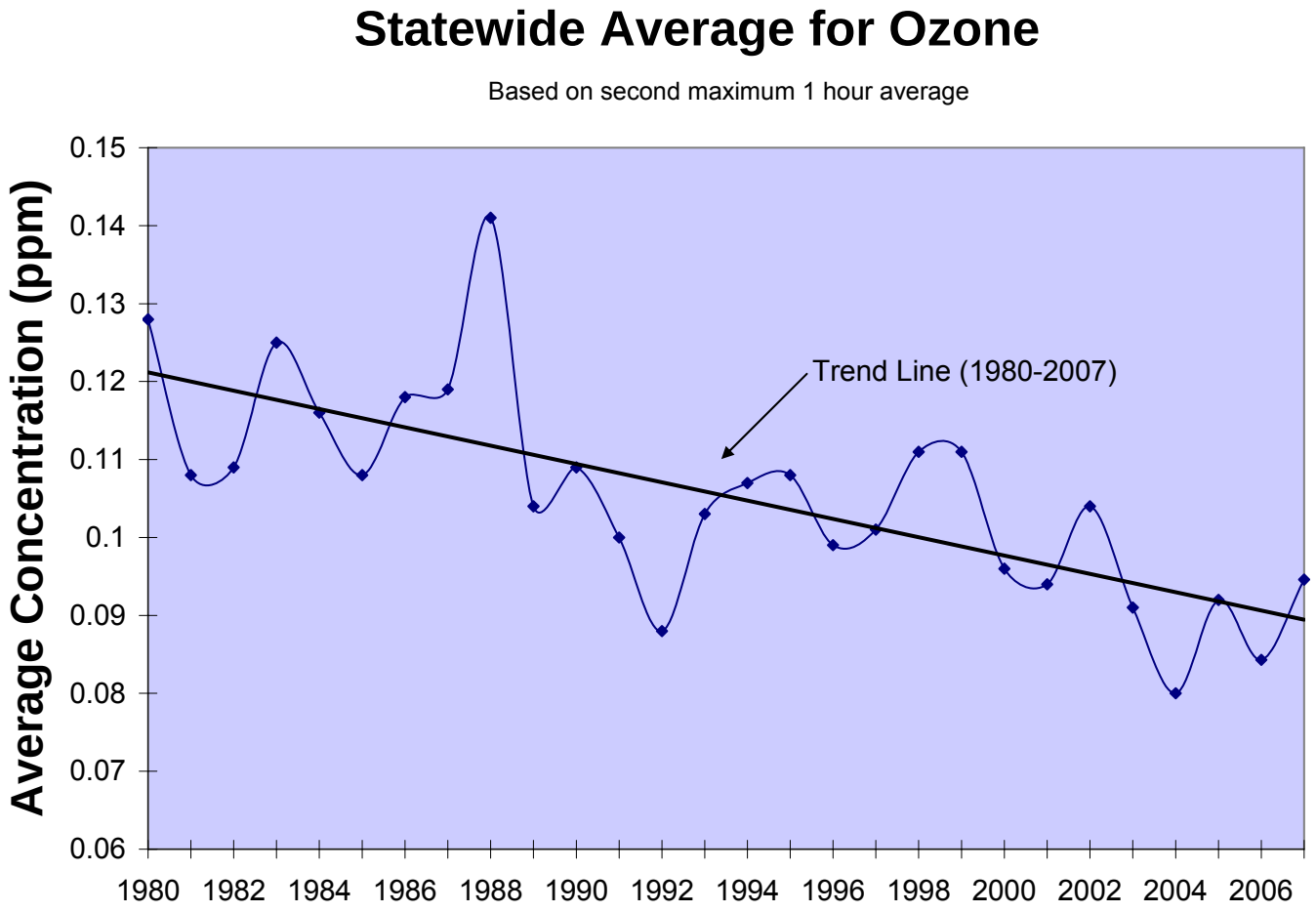

Figure 11: Statewide averages for ozone monitoring indicate pollution reductions.

PARTICULATE MATTER ($PM_{2.5}$)

Particulate Matter ($PM_{2.5}$) Ambient Air Monitoring Network

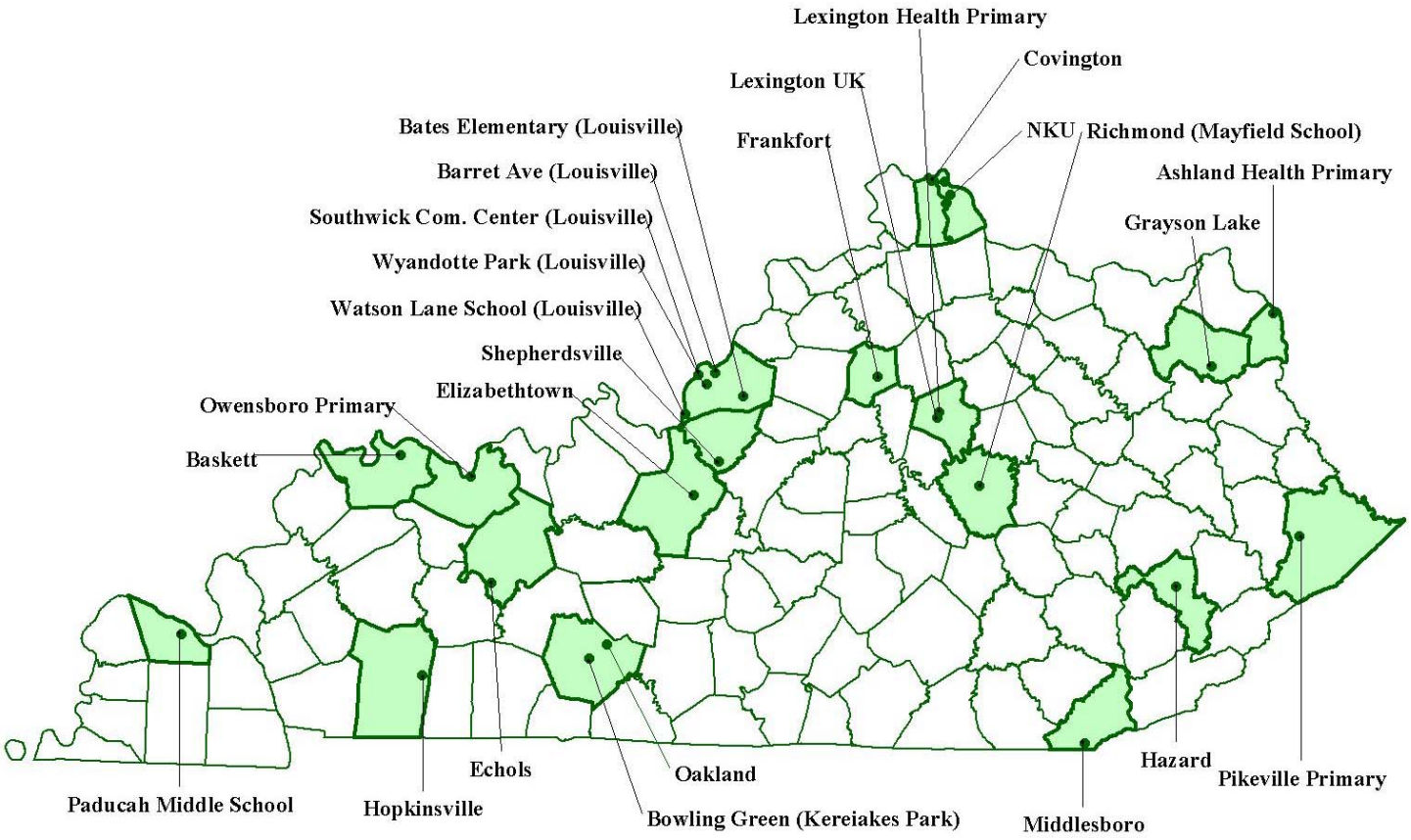

Figure 12: $PM_{2.5}$ monitoring locations in Kentucky.

Fine particulate Matter ($PM_{2.5}$) is a mixture of solid particles and liquid droplets that are 2.5 microns or smaller in size. Sources of $PM_{2.5}$ include power plants, wood burning, industrial processes, and fuel combustion. Fine particulates are also formed in the atmosphere when gases are transformed through chemical reactions. Sulfur dioxide, nitrogen oxides and VOCs are all examples of gases that can transform by chemical reactions.

Environmental Impacts

Particulate matter of 2.5 microns or less has the ability to penetrate into the deepest parts of the lungs, causing chronic respiratory symptoms in sensitive populations and premature deaths in the elderly. $PM_{2.5}$ also affects the environment by reducing visibility (up to 70% in some areas of the U.S.) and contributing to acid rain.

How is $PM_{2.5}$ monitored?

Federal Reference Method (FRM) or Federal Equivalent Method (FEM) monitors must be used for NAAQS comparisons. FRM, FEM or continuous Tapered Element Oscillating Microbalance (TEOM) monitors may be used for daily $PM_{2.5}$ Air Quality Index (AQI) results. TEOM samplers determine sample weights electronically and transmit results into an automated data storage system. Currently, TEOM monitors are not FRM or FEM equivalent. FRM and FEM $PM_{2.5}$ is monitored by an

intermittent type sampler and the continuous 24, 1-hour average measurement, FEM Beta Attenuation Mass Monitor (BAM-1020).

The monitors collect a sample over a 24-hour run cycle. While most samplers operate every third day, some operate every sixth day and some every day. These samplers operate by drawing a measured volume of air through a pre-weighed filter over a 24-hour period. Before reaching the filter, the air passes through an impaction chamber where larger particles fall out of the air stream while particles smaller than 2.5 microns pass on to the sample filter where they are collected.

After completion of the sample run, the filter is removed from the sampler and reweighed to determine the mass of the particulates collected. In 2007, the DAQ, the NPS at Mammoth Cave and the LMAPCD operated a network of 43 samplers.

Results

There were 14 exceedances of the 24-hour $PM_{2.5}$ standard and seven exceedances of the annual standard in 2007. A total of eight samplers exceeded the three year 24-hour (2005-2007) standard and seven samplers exceeded the three year (2005-2007) annual standard. The samplers were located in Bell, Bullitt, Hardin, Jefferson, Kenton, McCracken, and Warren counties.

Generally, statewide $PM_{2.5}$ levels have declined from 2000-2007 time period with a slight increase in 2007.

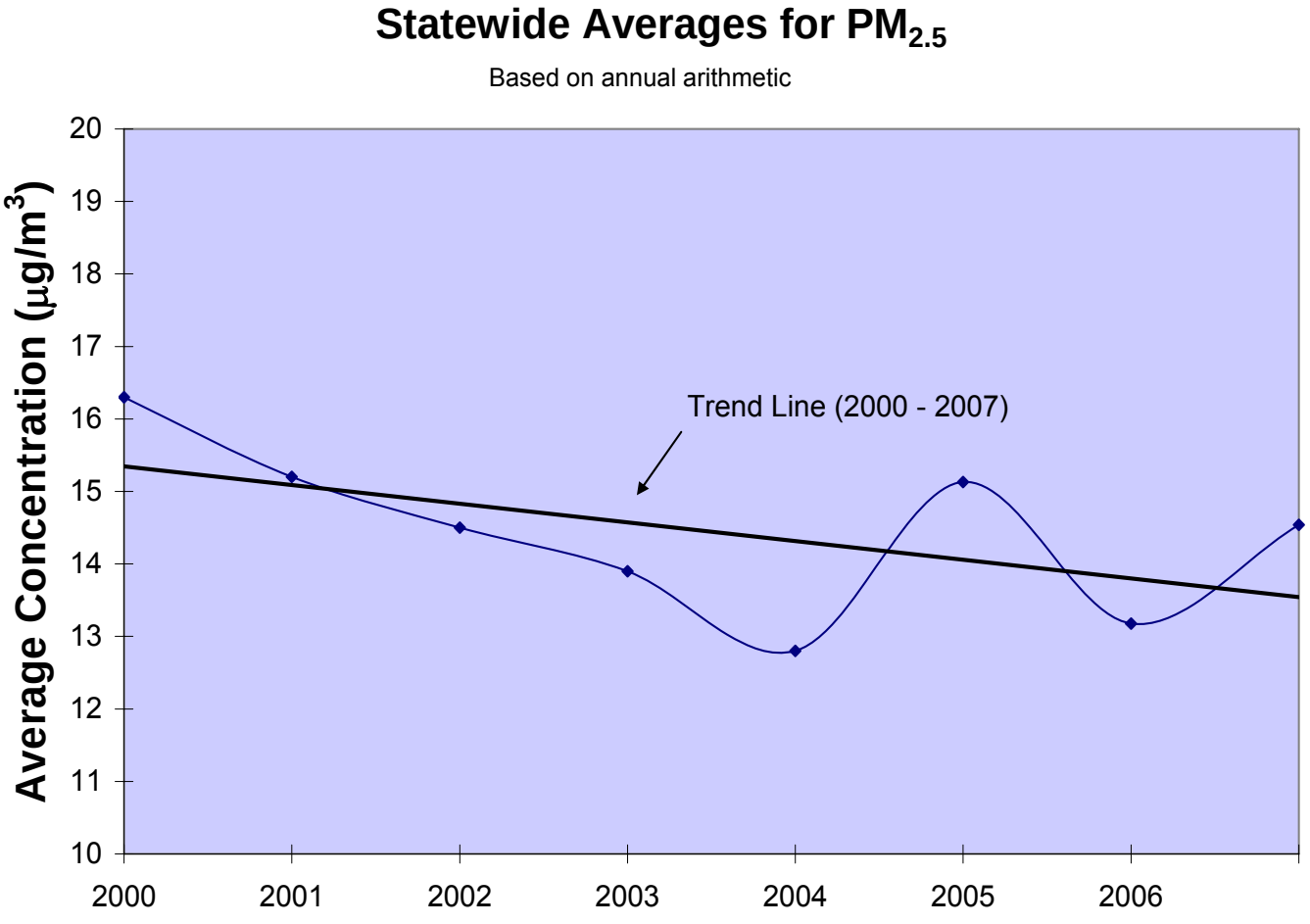

Figure 13: Statewide averages for $PM_{2.5}$ monitoring indicate pollution reductions.

PARTICULATE MATTER (PM_{10})

Particulate Matter (PM_{10}) Ambient Air Monitoring Network

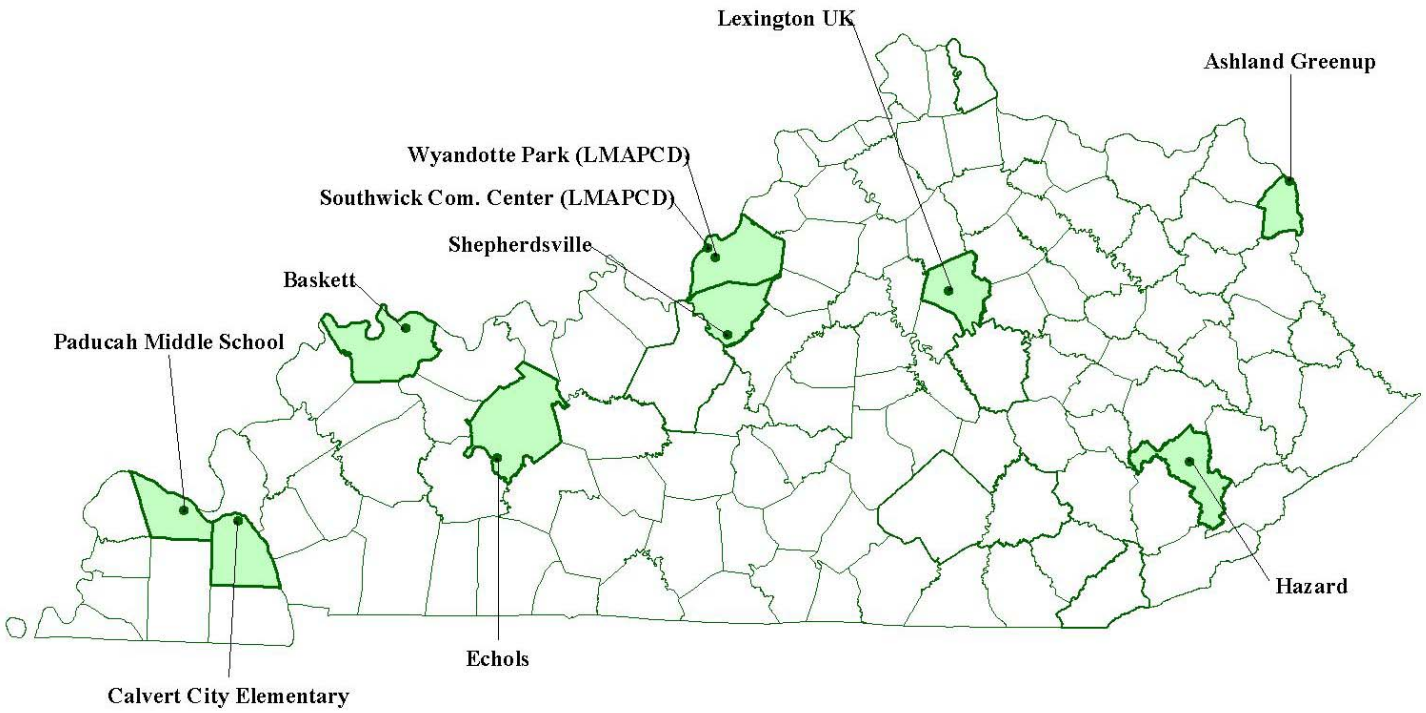

Figure 14: PM_{10} monitoring locations in Kentucky.

Particulate Matter of 10 microns or less in diameter (PM_{10}) is a mixture of solid particles and liquid droplets. Some common sources of PM_{10} are prescribed fires, construction activities, agricultural practices and smokestacks.

Environmental Impacts

The primary health effects of particulates are that they aggravate respiratory and cardiovascular disease and in large amounts increase the death rates of sufferers. The elderly, children, and people with chronic lung disease are especially sensitive to particulate matter.

Particulate matter can soil and damage a wide range of man-made items such as building surfaces. PM_{10} damages vegetation by interfering with plant photosynthesis due to the formation of a film on leaves that reduces exposure to sunlight.

Particulate pollution can also produce haze, which diminishes visibility and the amount of sunlight reaching the earth.

How is PM_{10} monitored?

For PM_{10} NAAQS comparison, both intermittent and continuous monitor types may be used because they are FRM or FEM equivalent. Most PM_{10} samplers are the intermittent type that operate for 24 hours, every sixth day. These samplers operate by drawing a measured volume of air through a pre-weighed filter over a 24-hour period. Before reaching the filter, the air passes through an impaction chamber where larger particles fall out of the air stream while particles smaller than 10 microns pass

on to the sample filter where they are collected.

After completion of the sample run the filter is removed from the sampler and reweighed to determine the mass of the particulates collected. Sample results are entered manually into a data storage system. The network also includes five continuously operating PM_{10} samplers that provide results daily. These samplers determine sample weights electronically and transmit results by telemetry into an automated data storage system. In 2007, the DAQ and the LMAPCD operated a combined network of 13 PM_{10} samplers in Kentucky.

Results

There were no exceedances of the annual PM_{10} standard in 2007. The last PM_{10} exceedance occurred on January 7, 2000, at a Louisville site (21-111-0043) where a 24-hour sample measured 152 µg/m^3. The only other exceedance of a PM_{10} standard occurred on August 27, 1990, in Ashland, where a 24-hour value measured 182 µg/m^3.

All Kentucky counties are currently in attainment with the PM_{10} standard. Statewide and regional PM_{10} levels have shown declining trends. This downward trend is the result of controls on industrial sources for particulate matter.

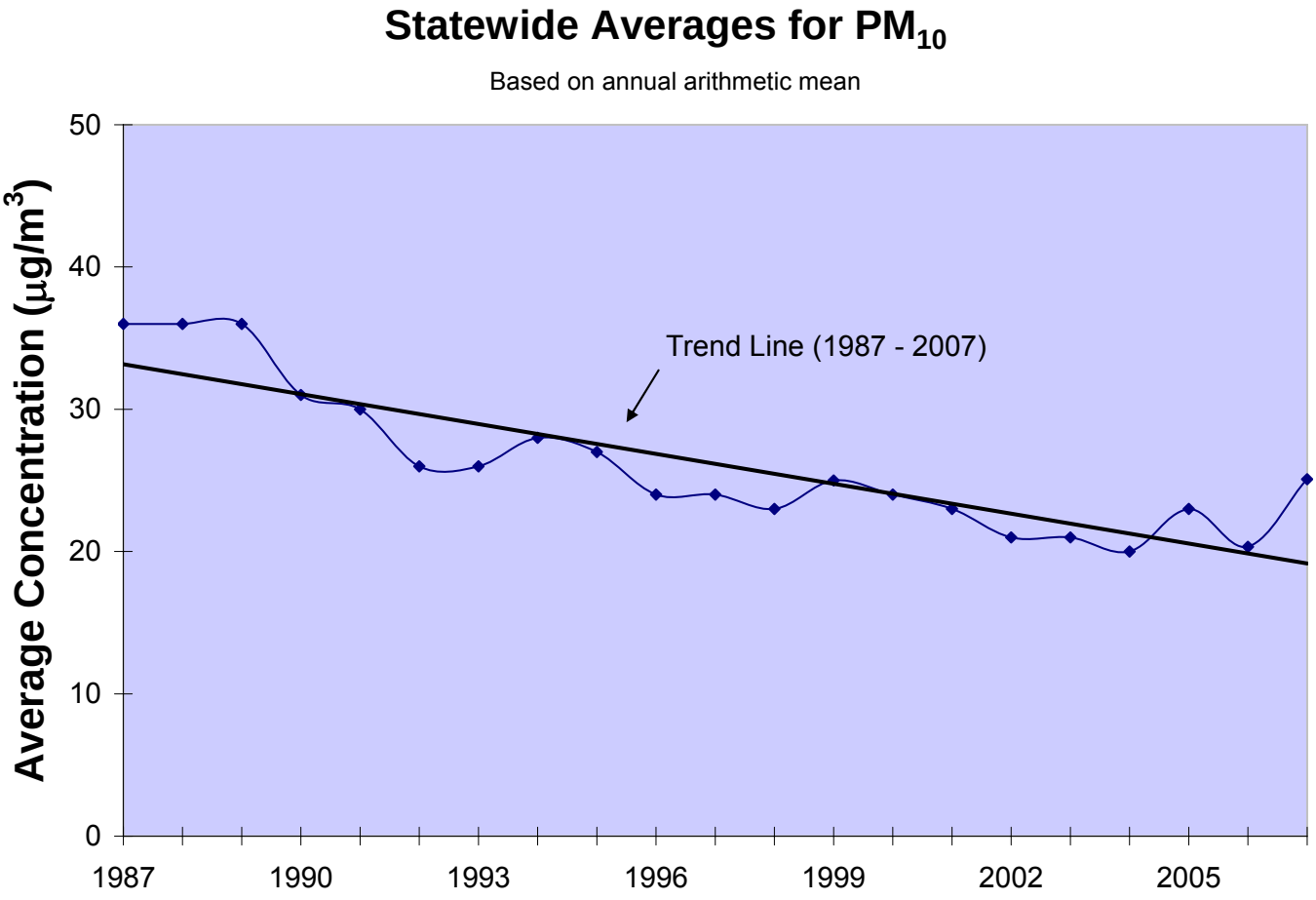

Figure 15: Statewide averages for PM_{10} monitoring indicate pollution reductions.

SULFUR DIOXIDE (SO_2)

Sulfur Dioxide Ambient Air Monitoring Network

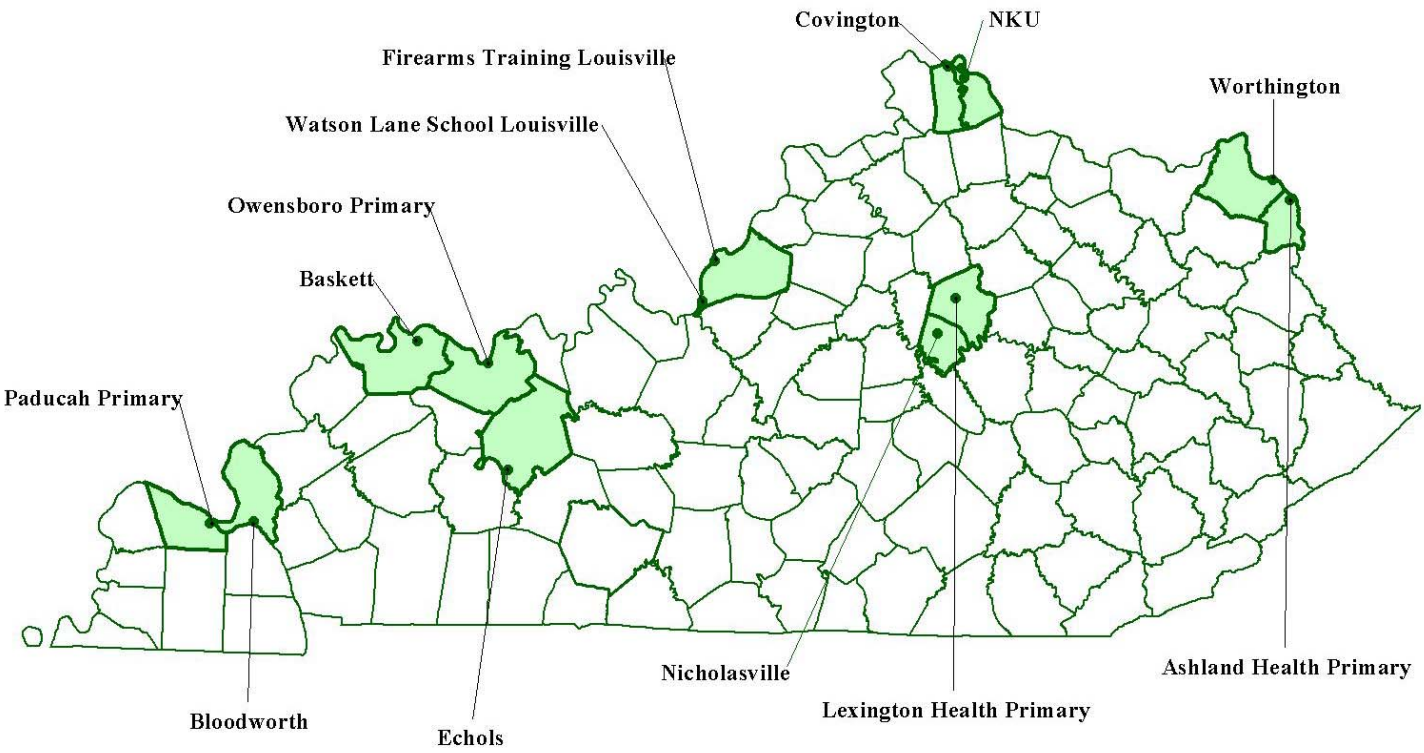

Figure 16: Sulfur dioxide monitoring locations in Kentucky

Sulfur dioxide (SO_2) is a colorless gas that has a pungent odor at concentrations exceeding 0.5 ppm. SO_2 is produced by the combustion of sulfur containing fuels, ore smelting, petroleum processing and the manufacture of sulfuric acid. Nationwide, coal-fired power plants are the largest sources of SO_2. Other industrial sources include petroleum refineries and paper mills.

Environmental Impacts

The primary health effect of exposure to SO_2 is the aggravation of pre-existing respiratory, cardiovascular and pulmonary disease. Asthmatics, children, and the elderly are especially susceptible to the effects of SO_2 pollution. SO_2 can also damage the foliage of trees and agricultural crops.

Moisture in the atmosphere combined with SO_2 form sulfuric acid (H_2SO_4), which is a component of acid precipitation. Acid precipitation causes acidification of soil and water that can deteriorate plant life, animal life, and structural surfaces.

SO_2 may also be converted into sulfates. Sulfates are significant components of $PM_{2.5}$ and regional haze. Regional haze has been attributed to poor visibility at many of the vistas in our national parks, including Mammoth Cave National Park in Kentucky and the Great Smoky Mountains in Tennessee.

How is SO_2 monitored?

Analyzers continuously monitor SO_2 by using the ultraviolet (UV) fluorescence method. Fluorescent analyzers irradiate an ambient air sample with ultraviolet light. SO_2 molecules absorb a portion of

this energy and then re-emit the energy at a characteristic wavelength of light. The light energy emitted by the SO_2 molecules is proportional to the concentration of SO_2 present in the sample. A photo multiplier cell measures the light emitted and converts it to a parts per million measurement.

Data from the analyzer is transmitted into an automated data storage system. In 2007, the DAQ and the LMAPCD operated 13 SO_2 monitors in Kentucky.

Results

There were no exceedances of any of the SO_2 standards in 2007. The last exceedance of an SO_2 standard occurred in November 1981, when the monitor at a Louisville site (21-111-0032) recorded a 24-hour average of 0.159 ppm. Statewide and regional sulfur dioxide levels have declined over the past 20 years.

The SO_2 allowances component of the Acid Rain Program provides an opportunity for electrical utilities to participate in a market-based trade of SO_2 emissions. An electric utility, that is participating in the trading program, is required to continually monitor emissions for SO_2, NO_x and any other pollutants. The continuous monitoring of the emissions provides compliance data and credibility to the trading program. The trading allowances in the Acid Rain Program has directly contributed to the decline in ambient SO_2 concentrations.

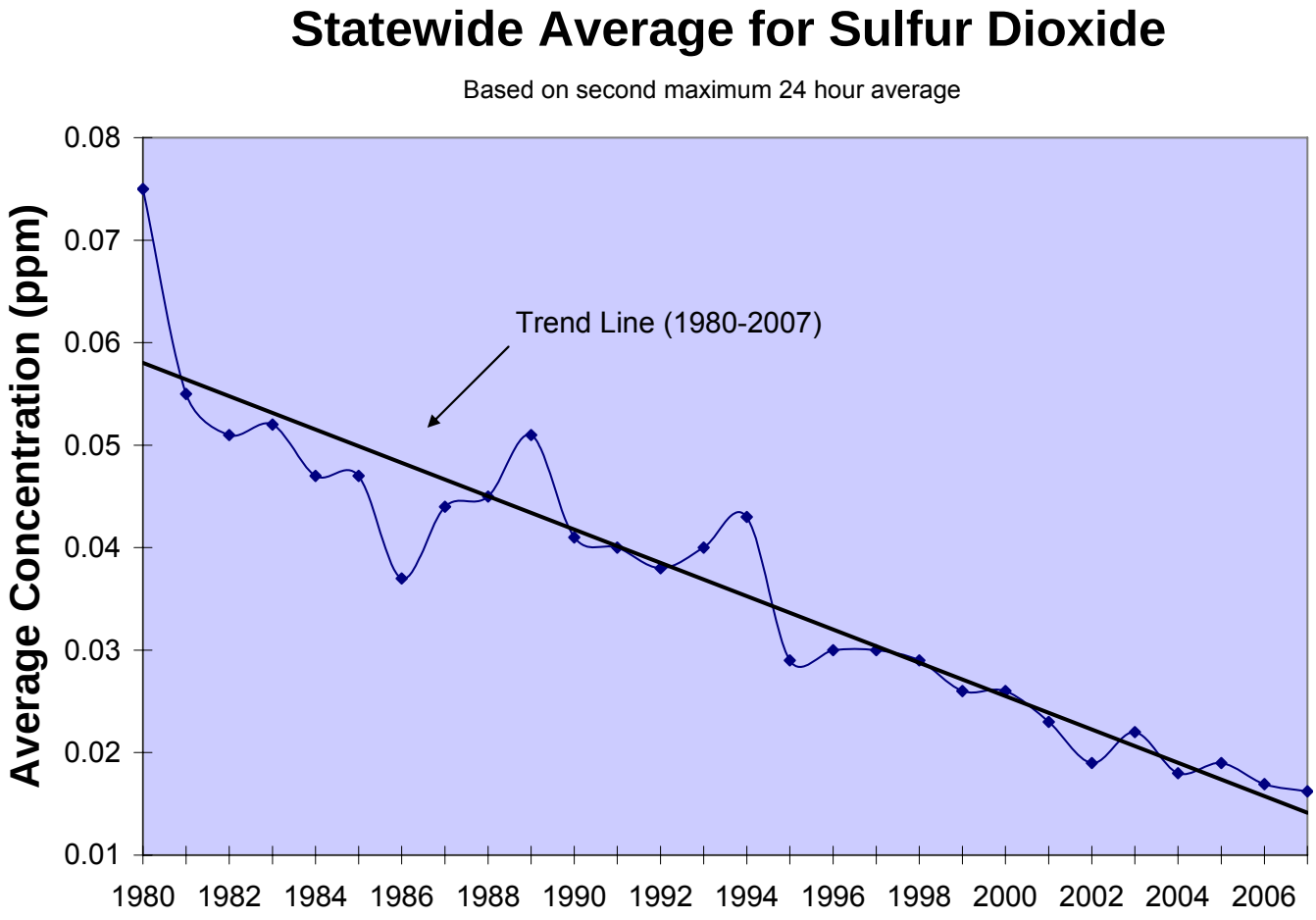

Figure 17: Statewide averages for SO_2 monitoring indicate pollution reductions.

MERCURY

Mercury (Ambient Air and Wet Deposition) Monitoring Network

Figure 18: Mercury monitoring locations in Kentucky.

Mercury (Hg) is a naturally occurring element that is found in air, water and soil. Mercury exists in several different forms: elemental, inorganic and organic. Elemental mercury is a shiny, silver-white metal that is in a liquid state at room temperature. Elemental mercury is used in thermometers, fluorescent lights and electrical switches. Exposed elemental mercury can become an invisible, odorless toxic gas at room temperature.

Inorganic Hg compounds are mercury salts with a white powder or crystal appearance except for mercuric sulfide (cinnabar), which is red. Inorganic Hg compounds are used in fungicides, antiseptics, disinfectants, skin lightening creams and traditional medicines.

Organic mercury compounds are formed when mercury combines with carbon. The most common organic mercury compound found in the environment is methyl-mercury, a highly toxic form that builds up in fish, shellfish and animals that eat fish. Methyl-mercury is formed when inorganic mercury, released into the air from the combustion of coal, settles into water or onto land where it can be washed into water and converted into organic mercury by microorganisms. Fish and shellfish are the main sources of methyl-mercury exposure to humans.

Environmental Impacts

Mercury exposure at high levels can harm the brain, heart, kidneys, lungs, and immune system of people of all ages. Research has shown that most fish consumption does not cause an exposure to high levels of mercury in adults. However, it has been demonstrated that high levels of methylmercury in the bloodstream of unborn babies and young children may harm the developing nervous system.

Kentucky is one of 31 states that have issued a statewide fish consumption advisory due to unsafe levels of mercury. The advisory is for women of childbearing age and children 6 years and younger.

How is Hg monitored?

Mercury is monitored in Kentucky by two different collection methods. The first collection method is wet deposition (e.g. rain) monitoring. When a wet deposition sample is over 320 grams, there is enough sample for mercury analysis. Fifty grams or more of the excess wet deposition sample is transferred into a 250ml borosilicate glass container, five drops of hydrochloric acid is added to the sample for preservation, and shipped to Frankfort for mercury analysis. The Division of Environmental Program Support (DEPS) laboratory performs the analysis using Method 1631, Revision E: *Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry*.

Another method of Hg collection is by the use of analyzers, which operate continuously, using Cold Vapor Atomic Fluorescence Spectrometry (CVAFS). The analyzer traps Hg vapor, from an air sample, into a cartridge containing an ultra-pure gold adsorbent. The amalgamated mercury is then thermally desorbed and detected using CVAFS.

Mercury is not a criteria pollutant—that is, DAQ is not currently required to monitor for mercury as part of the Clean Air Act. However, mercury is considered a Hazardous Air Pollutant (HAP), and out of concern for citizens of the commonwealth, DEP and DAQ are monitoring deposition levels.

Results

Ambient air background levels of mercury range from 1-3 ng/m^3. CVAFS analyzer results do not indicate concentrations above background levels.

Wet deposition monitoring works in concert with ambient (CVFAS) monitoring. Although the National Atmospheric Deposition Program has collected wet deposition data at Mammoth Cave National Park as part of its Mercury Deposition Network for years, DAQ has only in the last two years been collecting wet deposition samples statewide. Therefore trends analysis is not yet available.

As mentioned earlier in this section, there are no federally established standards for comparative analysis of statewide mercury levels. In the future, DAQ hopes to correlate wet deposition and ambient data with fish tissue samples from around the state.

WET DEPOSITION (ACID RAIN)

Wet deposition (sometimes referred to as “acid rain”) is a classification of pollutants that are precipitation borne. Snow, sleet, hail, rain or fog can combine with pollutants in the atmosphere and fall to earth as harmful acidic compounds. Acidified rainwater may contain combinations of sulfuric and nitric acids that form when water vapor and sulfur dioxide and nitrogen oxides react.

Major sources of sulfur dioxide include power plants, paper and wood pulp processing plants and facilities with coal fired boilers. Nitrogen oxides are produced primarily from the combustion of fossil fuels in the engines of cars, trucks and other vehicles and from power plant emissions.

Aquatic life appears to be most sensitive to the effects of acidic precipitation. Small changes in the pH levels of lakes and streams may prevent some fish species and other aquatic life forms from reproducing. Many insects cannot survive in acidic waters; therefore, birds and mammals that depend on insects for food may suffer abnormally high mortality rates.

Acidic precipitation can also alter soil chemistry and nutrient availability, in turn weakening trees and shrubs and causing them to be more vulnerable to insects, diseases and fungus infestations. Acid precipitation may also damage agricultural crops and has been blamed for deterioration of monuments and building surfaces.

Wet deposition monitoring stations operate on a weekly sampling schedule. Cumulative precipitation events occurring during a seven day period are collected in one container to represent a one-week sample. An automatic wet/dry precipitation collector is used to collect the sample. The sampler consists of two collection containers. The “wet” container is fitted with a clean plastic sample bag for collection of precipitation. The “dry” container, designed for dry particulate collection is not presently utilized for sample collection. The sampler employs a moisture sensor, which activates an electrically driven movable container lid that covers the wet container during dry periods and then moves to cover the dry container when precipitation occurs.

At the end of each weekly sampling period, the wet container is removed and replaced with a new, clean container for the next sampling period. After the sample is removed, field measurements of pH and conductivity are made and recorded. The remaining sample is then shipped to Frankfort where laboratory analysis is conducted to determine levels for pH, conductivity, acidity, sulfates, nitrates, phosphates, ammonia and metal ions.

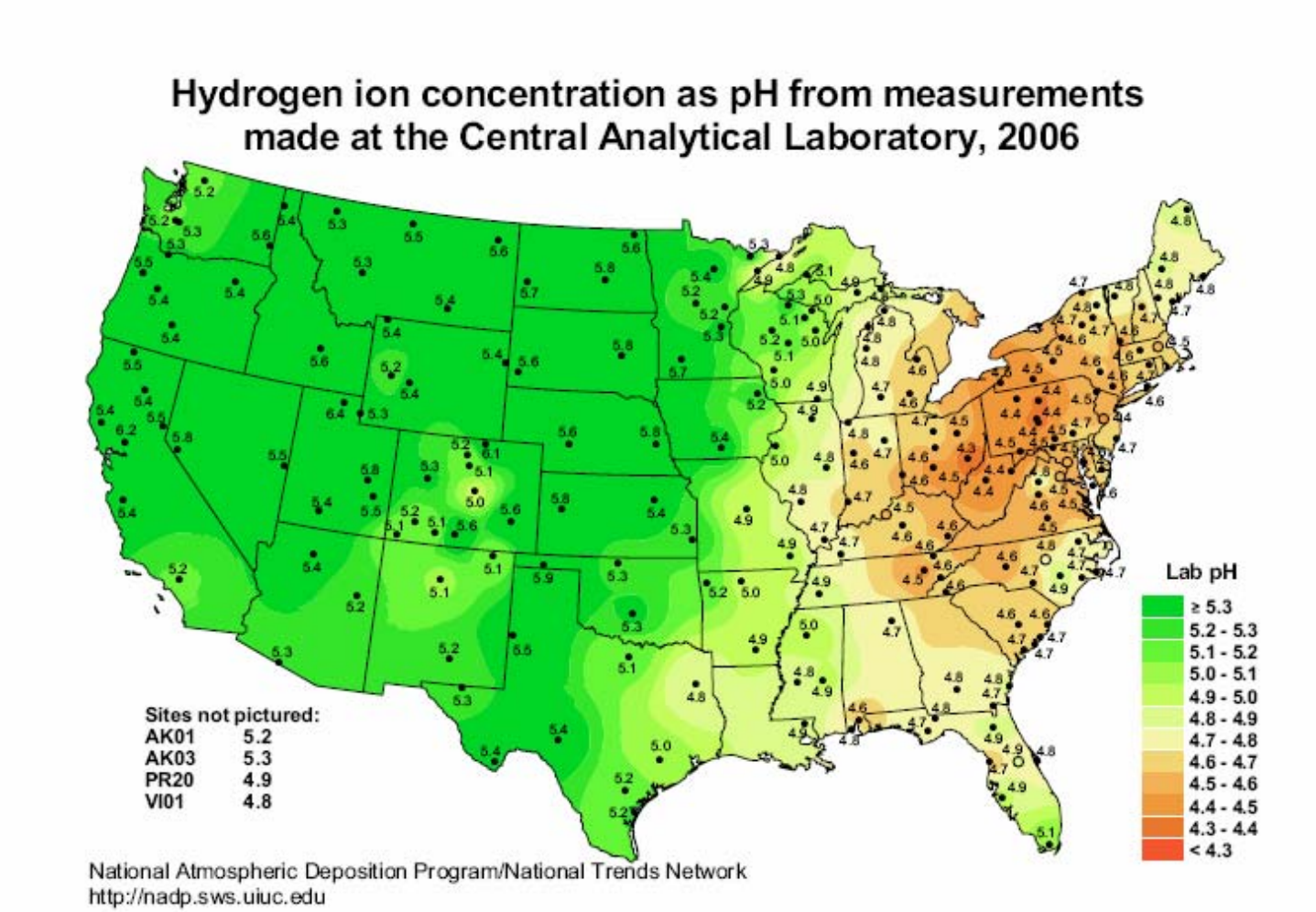

Figure 19: The pH isopleth map indicates that rainfall is more acidic in the East and Northeast regions of the United States, but monitoring has shown a decrease in acidity levels over time due to reductions in sulfur dioxide and nitrogen oxides. *Map courtesy of the National Atmospheric Deposition Program.*

In 2007, the DAQ operated one acid rain site at Grayson Lake State Park. The NPS at Mammoth Cave also operated a wet deposition sampler in 2007.

Results

Annual pH averages for both sites have shown modest upward trends since 1985 meaning that rainfall is gradually becoming less acidic. This improvement is due at least in part to successful efforts of power plants to curb sulfur dioxide and nitrogen dioxide emissions.

HAZARDOUS AIR POLLUTANTS

Hazardous Air Pollutant Monitoring Network

Figure 20: Hazardous air pollutant monitoring locations in Kentucky.

Hazardous air pollutants (HAPs) include 188 substances known or suspected to cause neurological, immunological, reproductive and respiratory disorders, as well as known or suspected human carcinogens. The ultimate goal of the U.S. EPA is to eliminate unacceptable risks of cancer, other significant health problems from exposures to air toxics emissions and to substantially reduce or eliminate adverse effects on our natural environment.

To provide a basis for decision-making with respect to these matters, the EPA developed the National Air Toxics Trends Stations (NATTS) monitoring network. In 2003, EPA designated the Division for Air Quality's air monitoring site in Hazard as a part of that network. The Hazard site was in the Rural Trends Network, and along with its Urban Trends counterpart, has been established to provide toxics trends data on a national basis. Data generated by these monitors are needed to understand the behavior of air toxics in the atmosphere and to develop control strategies.

In June 2008, the Hazard NATTS monitoring station was discontinued and moved to Carter County,

Kentucky. The new NATTS site is located at the division's Grayson Lake site. Grayson Lake is a rural setting and meets the criteria for a rural NATTS location.

The division also operates 17 hazardous air pollutant monitors through out the commonwealth using the NATTS monitoring objectives. The 17 monitors are not included in the NATTS network. The U.S. EPA has identified six required hazardous air pollutants that are to be monitored in the National Air Toxics Trends study.

A total of 23 monitored hazardous air pollutants are monitored at all of the division's air toxic monitoring sites. These pollutants can be subdivided into three monitoring groups: carbonyls, metals and VOCs. The compounds are sampled using carbonyl samplers with DNPH cartridges, low-volume PM_{10} samplers and passivated summa canisters. The samplers operate for 24-hours on every sixth day, after which the samples are collected and sent to the Division for Environmental Services laboratory in Frankfort for analysis.

Results

DAQ is currently establishing a baseline for future trends analysis of HAPs. The data indicates that several of the monitored 23 hazardous air pollutants are present in Kentucky's ambient air. More detailed information about monitored levels of HAPs can be obtained in the Ambient Air Monitoring Report.

Potential sources may be large industrial sources in the immediate area, mobile emissions (cars, trucks, and school buses), and small local source emissions such as those from fueling stations, body shops/painting, dry cleaners, asphalt plants, etc.

ENVIRONMENTAL EDUCATION

The goal of environmental education is not to tell people what to think but rather to give individuals the tools and information needed to think critically and independently about the world around them. A key component of environmental education is a focus on the connections between society and the environment. Air quality is a fitting arena for such a focus, because so much of what people do in our daily lives impacts our air quality.

The DAQ environmental education program focuses on the following areas:

- Teacher training (54 teachers attended a total of 5 trainings in FY 2008);
- The classroom (over 1500 students participated in a total of 12 school visits in FY 2008);
- Public events and festivals (10 major events, including the Governor's Conference on the Environment, the Governor's Derby Breakfast and the Bluegrass Energy Expo);
- Fire fighter education (6 trainings directly reached 76 firefighters);
- Community groups and forums; and
- Media outreach

The DAQ environmental education program primarily focuses on a few key areas that impact air quality:

- Open burning and waste reduction;
- Fuel economy and alternative fuels;
- Energy conservation and alternative energy sources; and
- Alternative modes of transit: walking, biking, vanpooling, etc.

Media Outreach

Outreach is another component of the environmental education program. In FY 2008, DAQ spent roughly $45,000 on radio programming to educate the public about the hazards of illegal open burning as a method of waste disposal. Utilizing radio media, the division reached over 468,000 people statewide. The media campaign, now in its fourth year, continues to raise awareness about what can and cannot be burned in Kentucky.

National Air Quality Awareness Week

Occurring the first week of May, National Air Quality Awareness Week is a chance for your school or community to celebrate air quality!

Students learn about hybrid technology and listen to directions as they prepare to participate in the activity "Drivers, Start your Engines" at a field day in Laurel County, led by field staff from the London Regional Office.

DAQ issues a series of press releases each year focused on ways that individuals and communities can make a difference. Communities are invited to celebrate the occasion by hosting celebrations, issuing proclamations, or somehow celebrating that when one individual makes a slight change in their habits, whether it be to maintain their vehicle, stop burning illegally, or simply reuse a bag at the grocery store, **it all adds up to cleaner air!**

Southeast Diesel Collaborative

The Southeast Diesel Collaborative (SEDC) is a regional organization that brings together partners from federal, state and local government, non-governmental organizations and business to reduce emissions from diesel engines. A number of sectors, including on-road vehicles, agriculture, construction, ports and rail are represented in the SEDC. A wide variety of strategies are utilized by SEDC partners, including idle reduction, alternative fuels, and engine retrofits, replacements and repowers.

Federal funds, authorized by the Diesel Emissions Reduction Act, help SEDC partners to employ the above strategies in the many sectors involved.

Clean School Bus

One sector of the Southeast Diesel Collaborative is school bus fleets. School buses are the safest way to transport students to school, and DAQ is working to ensure that school buses are also the cleanest way to get students to school. Over $500,000 in Clean School Bus funding has been awarded to Kentucky schools by the EPA in years past, and DAQ is determined to help schools fund cleaner school buses in the future as well.

DAQ actively partners with school districts to help them implement idle reduction policies, saving schools money and reducing student and driver exposure to harmful diesel emissions. DAQ includes Clean School Bus activities as a component of its environmental education initiatives in schools.

Kentucky Association for Environmental Education

DAQ is an active member of the Kentucky Association for Environmental Education (KAEE), serving on the board, sponsoring the organization's annual conference and maintaining a presence on www.EEinKentucky.org, a one-stop shop for environmental education in the state.

EEinKentucky.org offers a place to search for environmental education offerings and events around the state and is designed so that interested parties can search for events by radius from a zip code, by day, or by organization.

FIELD OPERATIONS

The Field Operations Branch is one of the largest branches of the division and is currently staffed by 70 employees that include supervisors, administrative staff, air source inspectors, asbestos inspectors, and air monitoring specialists. Located in eight regional offices, the primary duties of these staff are to:

1) Ensure that permitted facilities, and non-permitted entities maintain compliance with federal and/or state air quality regulations and asbestos regulations;
2) Operate and maintain 113 air monitoring units located at 34 stations scattered throughout the state to determine ambient air quality and verify that pollutant concentrations remain below EPA established concentrations; and
3) Investigate, within five business days, numerous air quality complaints received from the general public and other sources.

Inspections

One of the primary duties of the Field Operations Branch (FOB) is to inspect sources of air pollution for compliance with air quality regulations and if applicable, permit conditions. FOB is responsible for implementing a program to assure compliance with air quality regulations and standards. The measures for the success of this program are:

- Number of major stationary source inspections conducted;
- Number of minor stationary source inspections conducted;
- Number of asbestos inspections conducted;
- Compliance rate of stationary source inspections;
- Compliance rate with 401 KAR 63:005 (open burning), 63:010 (fugitive emissions) and 401 KAR 53:010 (odor); and
- Compliance rate of asbestos related inspections and investigations.

In calendar year 2007, FOB performed 4417 inspections. Approximately 33% (1477/4417) of these inspections were in response to citizen complaints of specific air quality problems, hereafter referred to as investigations. Approximately 67% (2940/4417) of all inspections were scheduled compliance inspections of permitted sources: major Title V sources, minor sources, compliance demonstrations (stack tests), asbestos, follow-up inspections of documented violations, and self-initiated inspections of suspected violators. Those 4417 inspections and complaint investigations resulted in the issu-

ance of 604 Notices of Violation; and 67 referrals to the Enforcement Branch for additional administrative enforcement action and civil penalties.

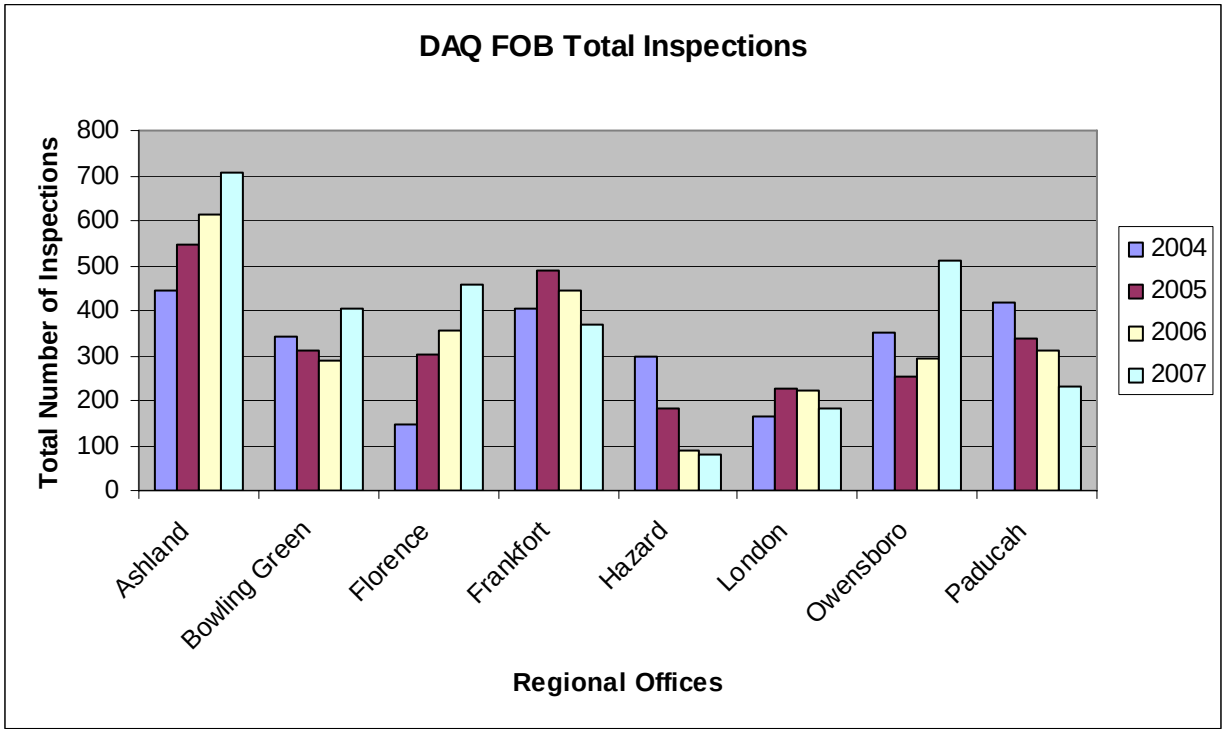

Figure 21: Total inspections conducted by regional offices. Staff turn over is tied in with the productivity trend lines in individual regional offices. For example, Hazard and Paducah regional offices lost staff, while Ashland and Florence gained staff.

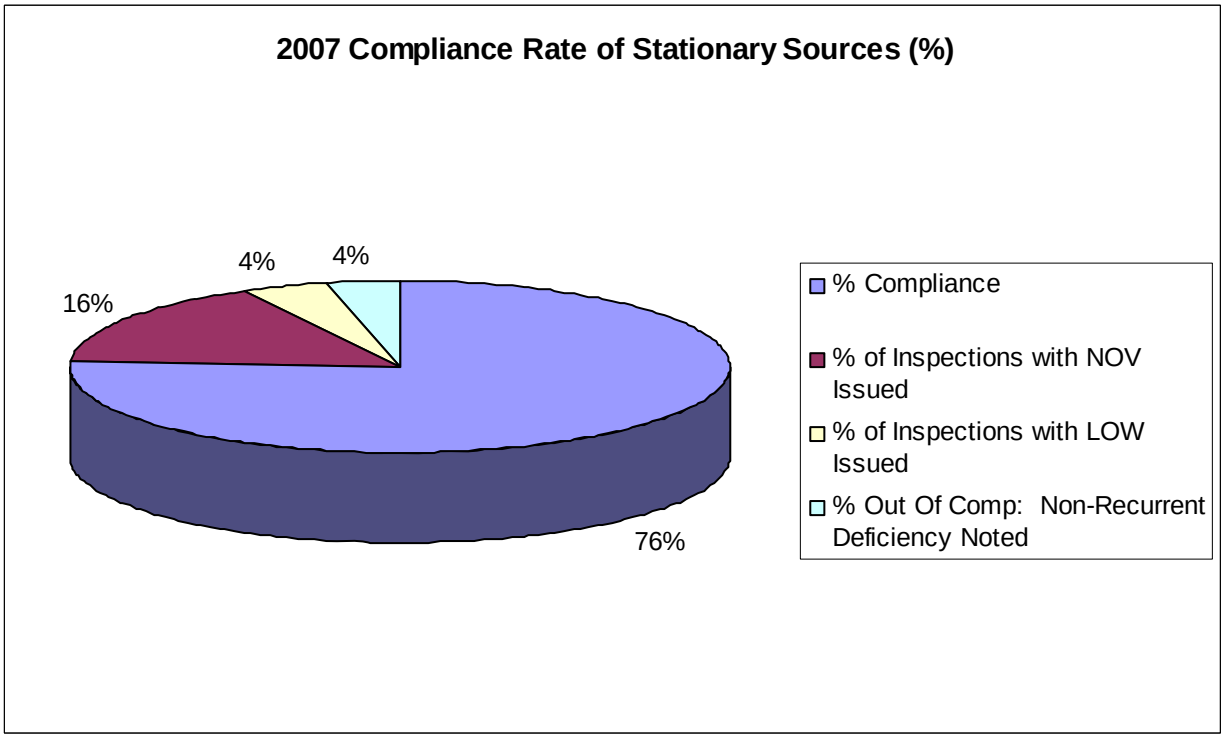

Figure 22: The compliance rate of regulated stationary sources inspected by field office staff in 2007 was 76%. Notices of Violations were issued to 16% of Kentucky's stationary sources, while 4% received Letters of Warning. Four percent were designated as non-compliant, but an NOV or LOW was not issued due to a correction of the problem before the case warranted further attention in terms of enforcement.

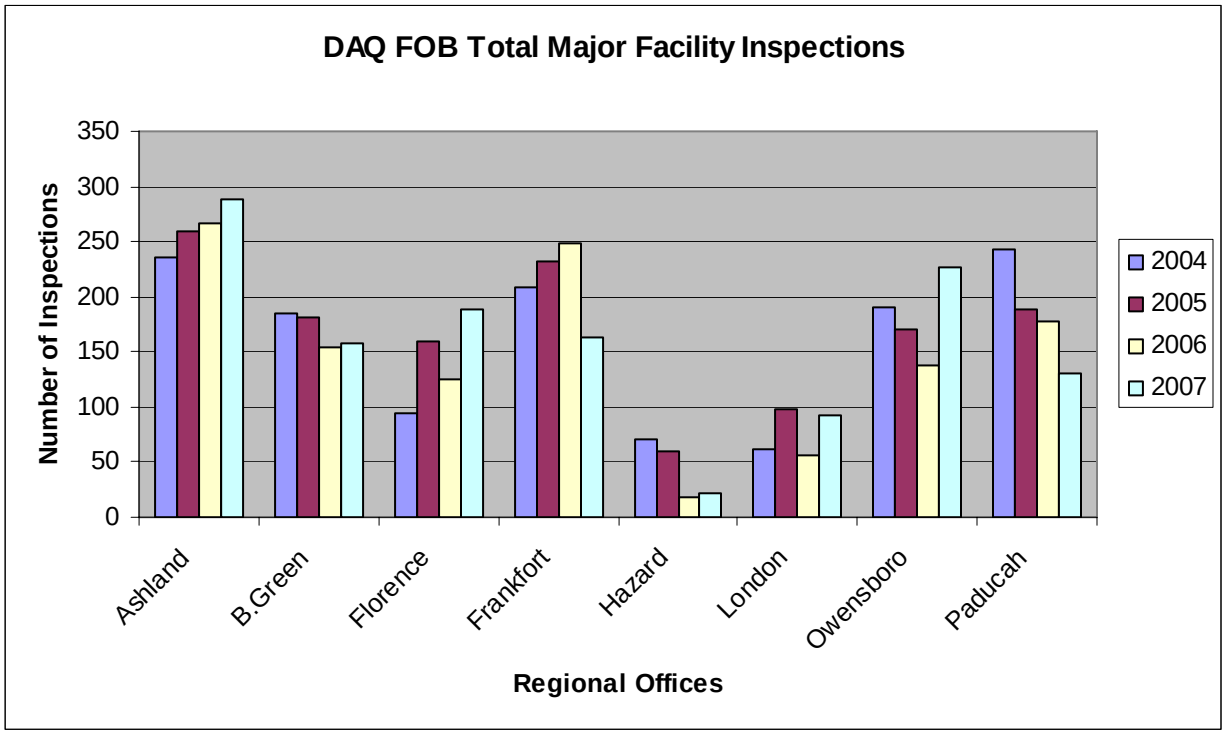

Figure 23: Number of major stationary facility inspections in Kentucky. The regional offices with more inspections are located in areas of the state with more major permitted facilities. Major permitted facilities include power plants, manufacturing facilities and chemical processing plants.

*Every type of inspection, excluding complaint investigations

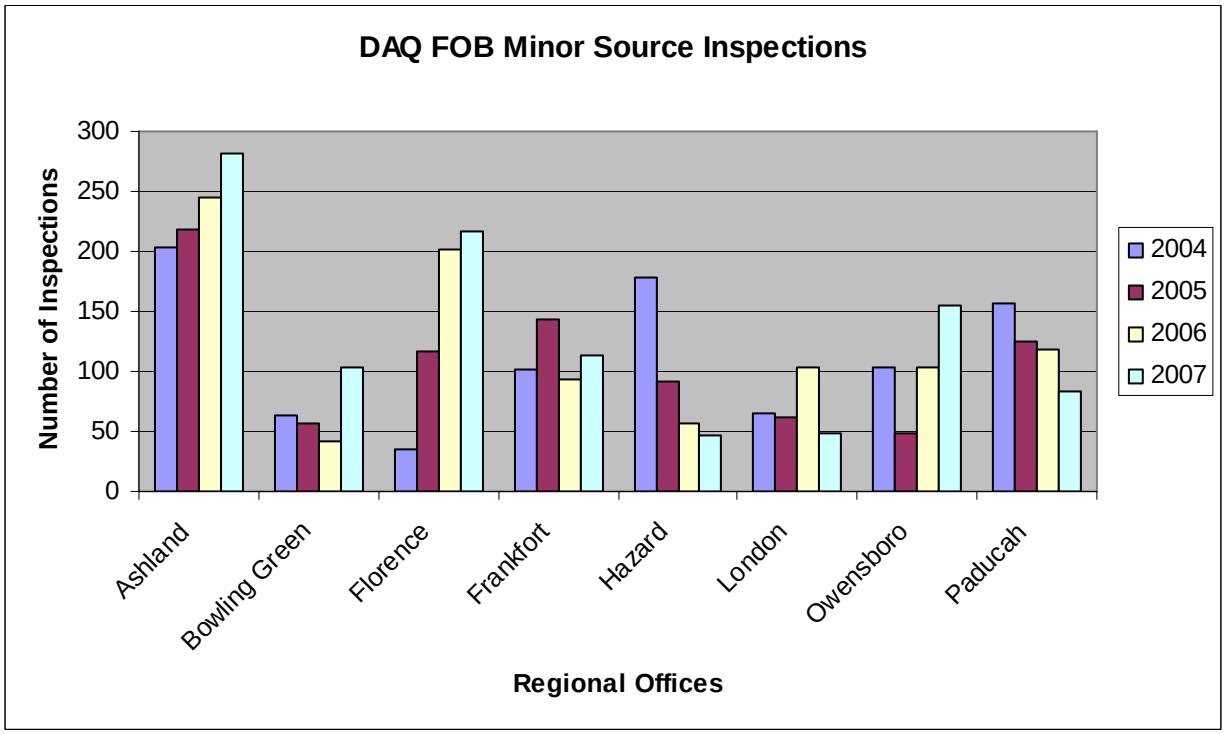

Figure 24: Number of minor stationary source inspections, 2004-2007. The regional offices with more inspections are located in areas of the state with a greater population, leading to more minor pollution sources, including auto body/paint shops and dry cleaners.

*Inspection Types = state plant classifications of Minor (x), Registered Source (R), and 52:080 (Z) sources; excluding incident investigations

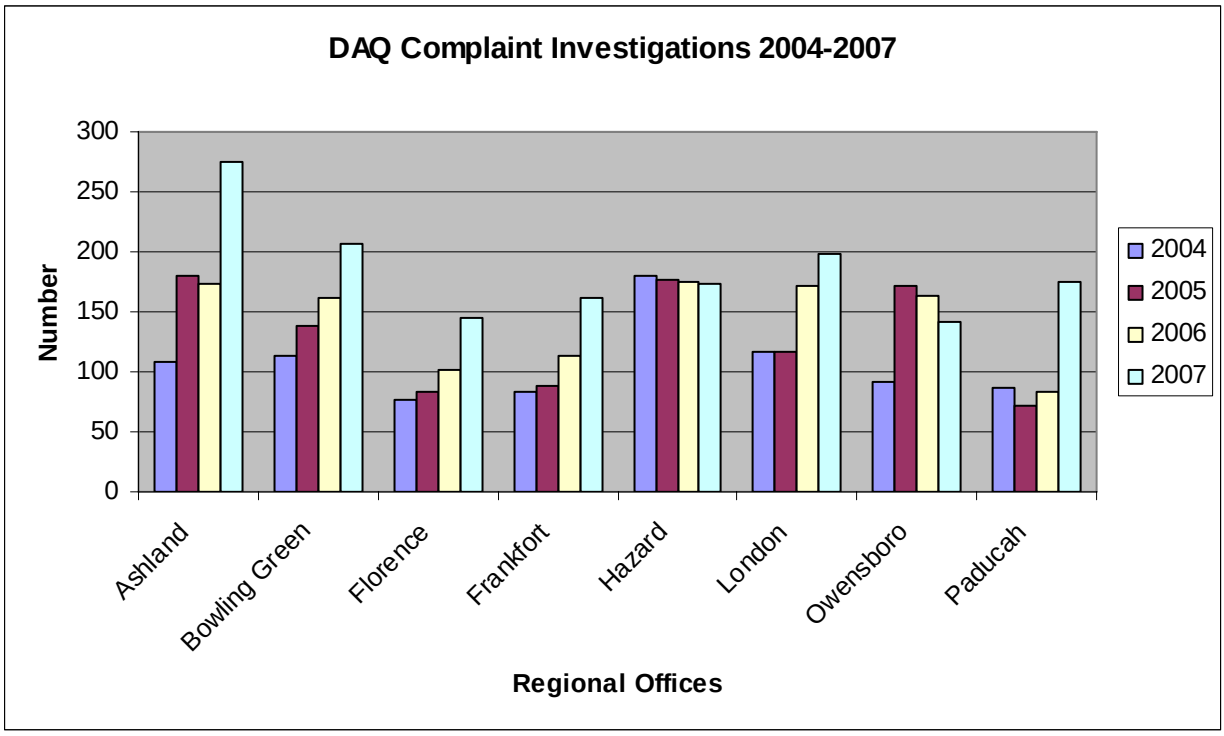

Figure 25: Investigating complaints consumes a significant portion of field office staff time.

Complaint Investigations

In 2007, field office inspectors investigated a total of 1477 complaints. Data on the numbers of Letters of Warning and Notices of Violation resulting from investigations of those complaints are included in the charts below. The compliance rate for the measures reflected in *Figures 24, 25, and 26* are low because they are complaint driven. A very high percentage of complaints lead to discovery of violations of a regulation. However, some fugitive emissions and illegal open burns are discovered during routine inspections.

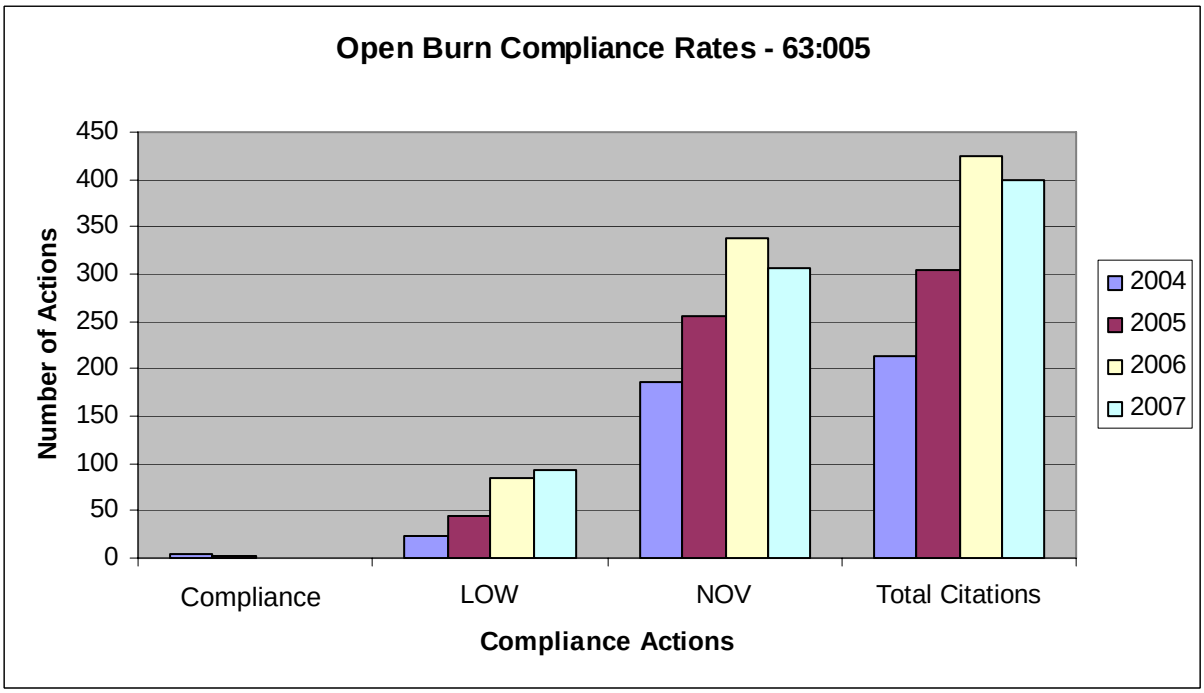

Figure 26: Compliance with the open burn rule. Education and outreach campaigns targeting illegal open burning may be driving the increase in open burning complaints and associated violations.

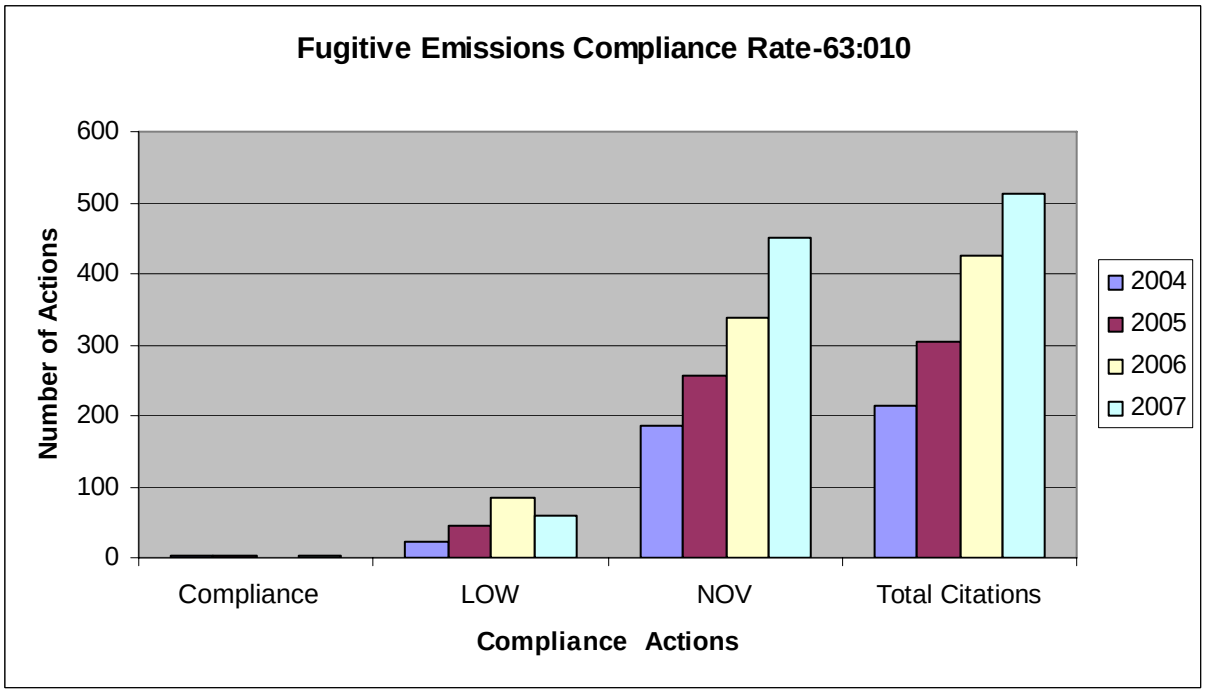

Figure 27: Compliance rates for the fugitive emissions rule. Fugitive emissions are those that do not come from a stack. Common fugitive emissions are dust from haul roads, quarries, conveyor systems, etc. The drought of 2007 may have contributed to the much higher number of citations in that year. Complaints often result in a finding of no compliance.

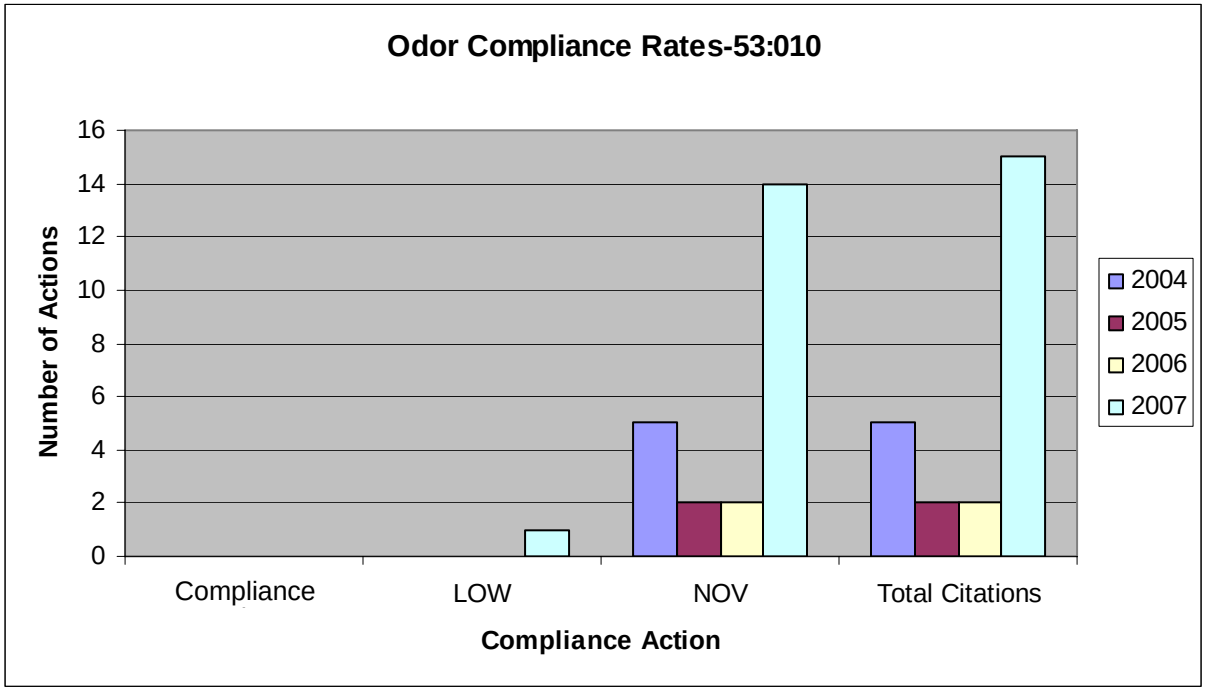

Figure 28: The number of odor complaints and violations have increased. Odor violations occur when an inspector can smell the odor through a "scentometer," which dilutes the ambient air by a magnitude of seven. Complaints often result in a finding of no compliance.

Asbestos

Asbestos removals associated with renovations and demolitions are regulated by DAQ under the National Emission Standards for Hazardous Air Pollutants (NESHAP). Division regulations also require schools to have their buildings thoroughly checked for asbestos under the Asbestos Hazard Emergency Response Act (AHERA). The inspection results must be documented in a management plan that describes how all asbestos materials in the school's buildings will be managed safely.

Compliance with the asbestos regulations is overseen by the Field Support Section and inspectors from the regional offices.

Asbestos is a mineral fiber that is used in thousands of consumer products, many of them building materials. Breathing asbestos fibers can cause lung cancer and other respiratory diseases. The EPA has banned some uses of asbestos but has been unsuccessful in its efforts to expand the ban to other products.

Without proper precautions, renovations, demolitions, and even routine maintenance can cause asbestos-containing materials to release microscopic asbestos fibers into the air we breathe. Undisturbed asbestos materials, on the other hand, can be safely maintained if they are kept in good condition. Before renovating or demolishing a structure, it should be checked for asbestos by a qualified professional. If at least 160 square, 260 linear, or 35 cubic feet of friable asbestos will be removed over a year's time, the removal must be done by a certified contractor using state-of-the-art work practices.

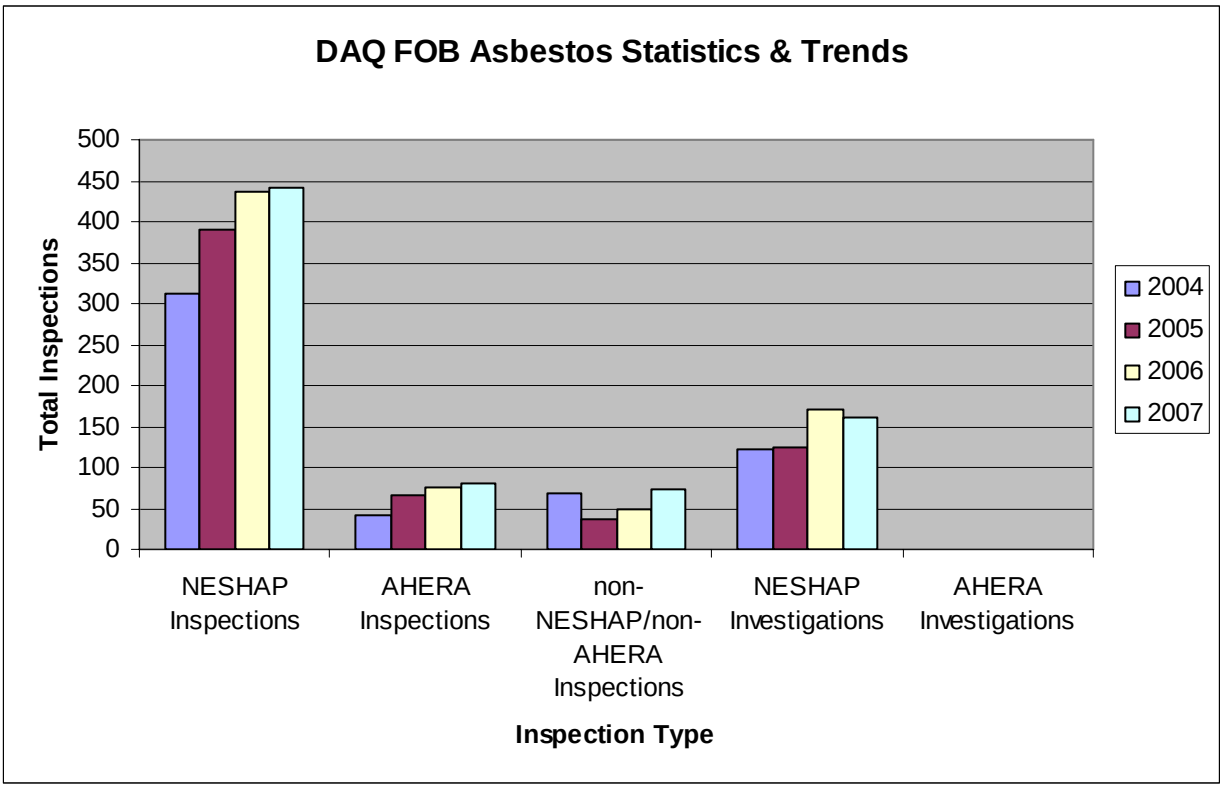

Figure 29: From 2004 to 2007 the number of asbestos inspections and investigations have grown. While AHERA investigations resulting from complaints are a measure for the program, AHERA related complaints are rare (averaging one per year), so the numbers do not show in the above chart.

Measures tracked by the division to evaluate the asbestos program's success are as follows:

- Number of asbestos NESHAP and AHERA inspections conducted.
- Number of non NESHAP and AHERA complaint investigations conducted.

In the case of AHERA inspections, this relatively new program has grown over the years under the care of well trained, tenured staff and DAQ's compliance oversight strategy has evolved from a records review approach to an actual site inspection/records verification process.

NESHAP inspections have grown due to a combination of increased renovation/demolition projects and increased awareness. Awareness has increased within the regulated community with respect to notifying the Division about asbestos removals that need to be inspected, and within the general public, who file complaints about potential violations of the regulatory program.

PERMIT REVIEW

Since the beginning of the industrial age, there has been a constant struggle regarding how much pollution is too much. There has been a continual necessity to minimize air pollution resulting from the provision of services and products to meet human needs. The issuance of permits to construct and operate industrial air contaminant generating sources has long been one of the principal methods of controlling air pollution and ensuring compliance with applicable air quality regulations.

Kentucky's air pollution control program had its origin many decades ago. Originally operating out of the state health department, the state air pollution control program was in existence at least as early as the 1940s and 1950s. Kentucky's first air pollution control agency was the Kentucky Air Pollution Control Commission. Kentucky's environmental cabinet as we know it today was first formed in the early 1970s, in part due to national legislation which brought the Environmental Protection Agency into being. Today, as in its beginning, air pollution control is divided among a hierarchy of state, federal, and local programs.

Federal Programs

The Clean Air Act authorizes two permitting programs at the federal level. The New Source Review (NSR) program has been around since 1975 and requires extensive review of applications for major new or modified air contaminant sources prior to issuance of construction permits. Title V of the 1990 CAA authorized for the first time a federally enforceable operating permit program.

Local Authority

KRS 224 recognizes the right of counties to develop their own air pollution control districts, if they wish. Jefferson County (Louisville Metro Air Pollution Control District) has maintained a local air pollution control program since the late 1940's, while activities in the rest of Kentucky counties are covered by DAQ. The Air Pollution Control District may choose to make subtle changes or be more stringent than state and federal regulations, but it must be at least as stringent as the state and federal programs.

Permit Review Branch (PRB) Structure

PRB is divided into several specialized sections. Business types that are permitted by each section are described on the next page.

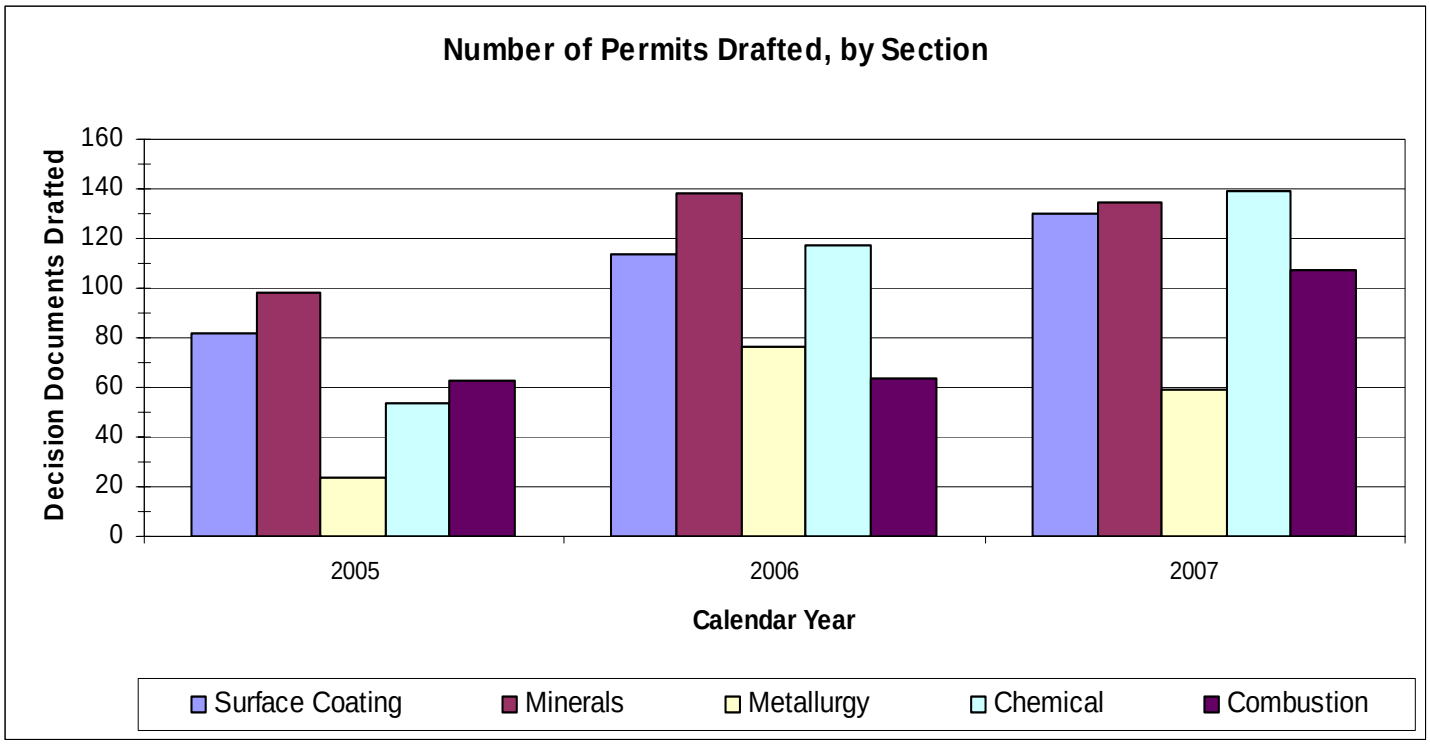

Figure 30: In calendar year 2007, the division drafted 609 permits, depicted here by section category. Examples of the kinds of businesses permitted within each section are found in the text below. The minerals section had the highest number of permits issued, followed by surface coating and chemical section permits.

Chemical Section - Chemical Plants (Organic and Inorganic), Petroleum Refineries, Coal to Liquids, Bulk Terminals, Brake Manufacturing, Plastic Products and Resins, Paper Mills/Pulp Mills, Electronic Components, Nonwoven Fabrics, Rubber Products, Paperboard Mills, Pharmaceuticals, Paint and Allied Products, Carbon and Graphite Products, and Battery Manufacturers.

Combustion Section - Brick and Tile Manufacturing, Charcoal Manufacturing, Combustion (Boilers), Distilleries, Glass Manufacturing, Incineration, Natural Gas Transmission Stations, Power Plants, Sawmills, Soil Remediation Units, Tobacco Processing Plants, Electric Utilities.

Minerals Section - Asphalt Plants (Portable and Stationary), Cement Storage Operations, Chicken Feed Manufacturing Plants, Coal Preparation Plants (Portable and Stationary), Coal Tipples (Portable and Stationary), Coal Terminals, Concrete Block Plants, Edible Oil Plants, Fertilizer Operations (Including Blending), Flour Mills, Grain Elevators, Lime Manufacturing Plants, Limestone Crushing Operations (Portable and Stationary), Limestone Terminals, Pet Food Manufacturers, Prestress Concrete Plants, Ready Mix Concrete Plants, Sandstone Crushing Operations, Sand and Gravel Operations (Portable and Stationary), Slag Coal Operations, Soybean Extraction Plants.

Surface Coating Section - Automobile and Light-Duty Trucks, Beverage Cans, Fabric, Vinyl and Paper, Flat Wood Paneling, Flexible Vinyl and Urethane, Large Appliances, Magnet Wire, Magnetic Tape, Metal Coil, Metal Furniture, Miscellaneous Metal Parts and Products, Plastic Parts for Business Machines, Polymeric Coating, Pressure Sensitive Tape and Labels, Publication Rotogravure and Flexography Printing.

Metallurgy Section - Primary Steel And Aluminum Producers, Mini-Steel Mills, Secondary Metal Plants, and Various Surface Treatments Of Metals

PRB Goals and Objectives

Currently, the Permit Review Branch has 134 pending applications in house. Twenty-three of the applications are beyond regulatory time frames (RTF); however, these are applications that were already beyond RTF prior to the department's 11/1/06 initiative to prevent future applications from going beyond RTF. It is projected that the majority of the remaining applications beyond RTF will be issued in the third quarter of 2008.

The graph below depicts the division's accomplishment in reducing the backlog since June 2006, at which time the division had 719 applications in house. The current number of pending applications represents a 81% reduction during this period. Further, applications beyond regulatory time frames have been reduced by 95%, from a high of 512 in June 2006, to 26 at the close of the 2008 fiscal year.

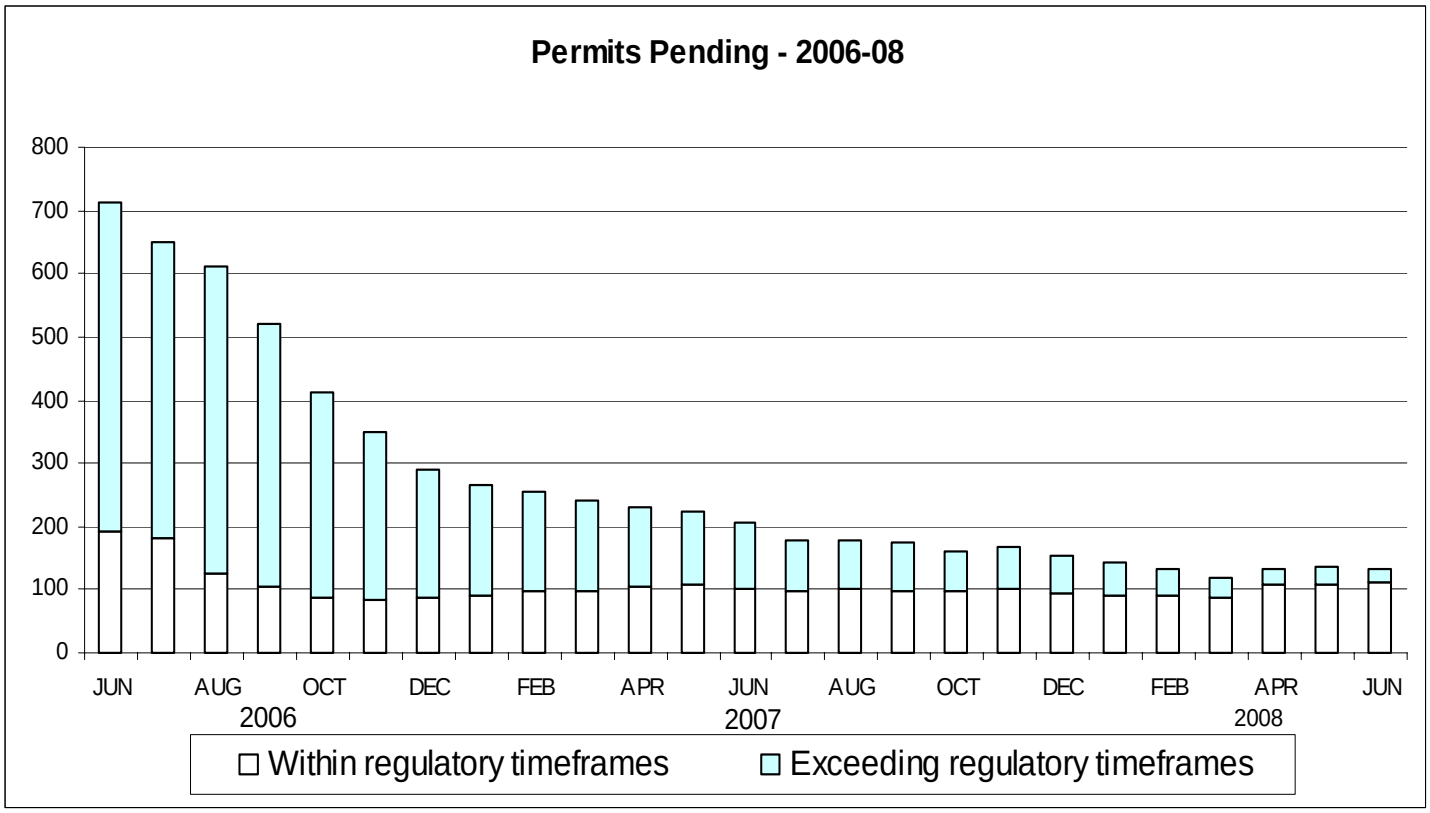

Figure 31: From June 2006 to June 2008, the Permit Review Branch has greatly reduced the amount of permit applications pending a final permit issuance as well as the percent of air permit applications that are beyond the Regulatory Time Frame (RTF), the allotted time for the complete permitting process. In June 2006 73% of the 716 permits in progress were beyond RTF compared to 17% of 134 permits in June 2008.

In order to achieve the cabinet objective of improving regulatory procedures and implementation, and making Kentucky's regulatory program rational, reasonable and user-friendly, the division has successfully implemented the permit backlog reduction plan originally implemented on June 15, 2006.

The surrounding charts highlight DAQ success in the following measures for permit backlogs:

- The total number of permits pending (see figure 31).
- The total number of permits pending that exceed regulatory time frames (see figure 31).
- The percentage of permit reviews completed within regulatory time frames (see figure 33).
- The percentage of permit reviews completed that exceed regulatory time frames (see figure 33).

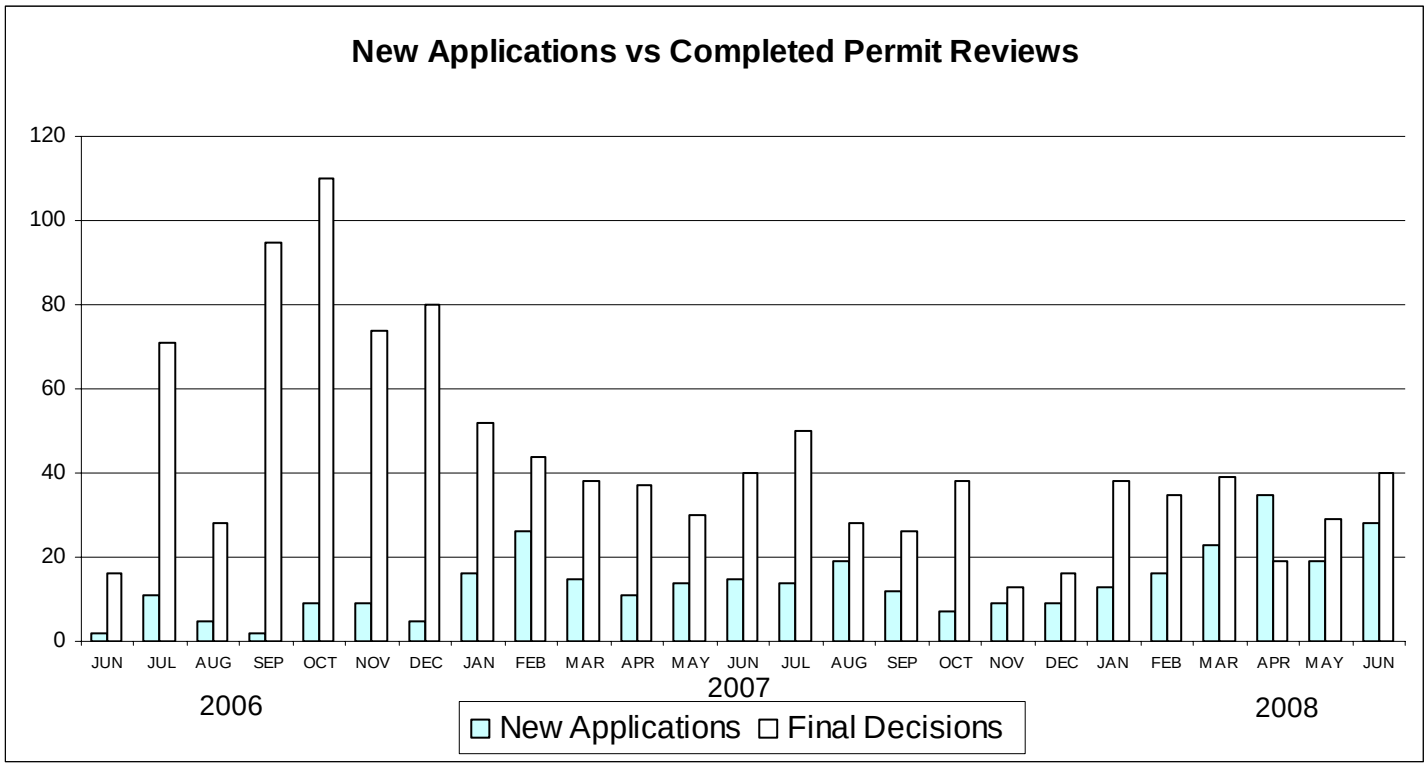

Figure 32: Over the past two years the number of completed reviews have exceeded the number of new applications received by the division. Consistent efficiency has led to a dramatic reduction in the backlog.

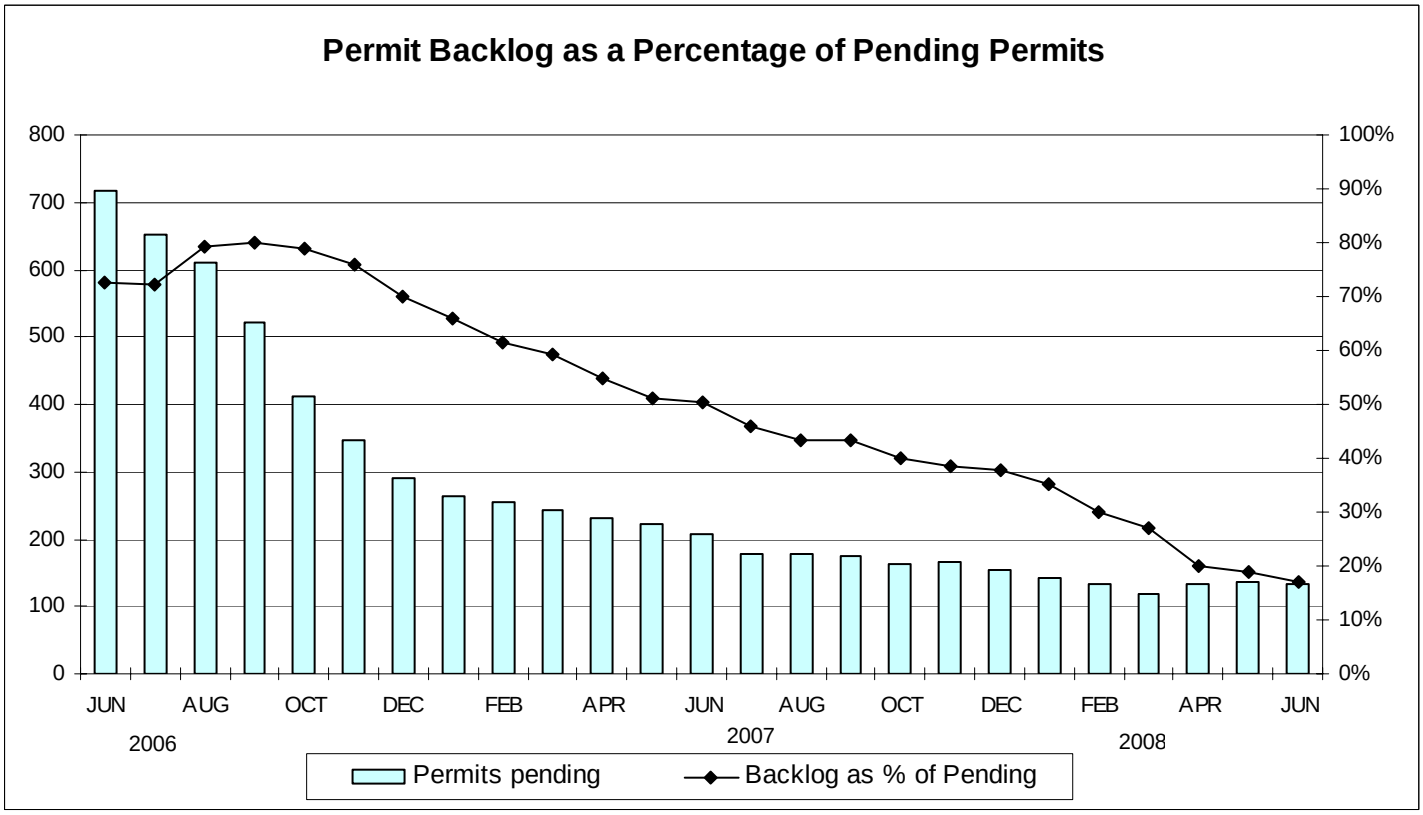

Figure 33: In June 2006, Only 192 of 524 pending permits were within the Regulatory Time Frame (RTF). By June 2008, 111 of the 134 pending permits were within RTF.

The division has established a number of tactics to meet the cabinet's objective of protecting and enhancing Kentucky's environment and public health, and measures to help us track our progress. In that respect, the division continued implementation of its air toxics program to evaluate and address any risks to public health associated with hazardous air pollutant emissions.

The following measures are tracked to determine the program's activity and success:

- The total tons of hazardous air pollutants reduced (see figures 34-37).

Fiscal year 2008 saw the implementation of a formal air toxics program for the division. Exercising authority granted under KRS 224 and operating within the scope promulgated in KAR 401 63:020, the program is designed to identify any air emissions that pose unacceptable risks to both the general public and the environment. The program will only consider inhalation as the pathway for exposure; however, the ability to take action relative to other receptors and other pathways is not ruled out, so that unusual or emergency situations can be evaluated.

Implementation of the program included forming the Air Toxics Section (ATS) within the Permit Review Branch. Three new positions were created and combined with a fourth, existing position to form the ATS. These positions require staff with highly diverse education and experience in meteorology, risk assessment, air dispersion modeling, biology, engineering and chemistry. The division

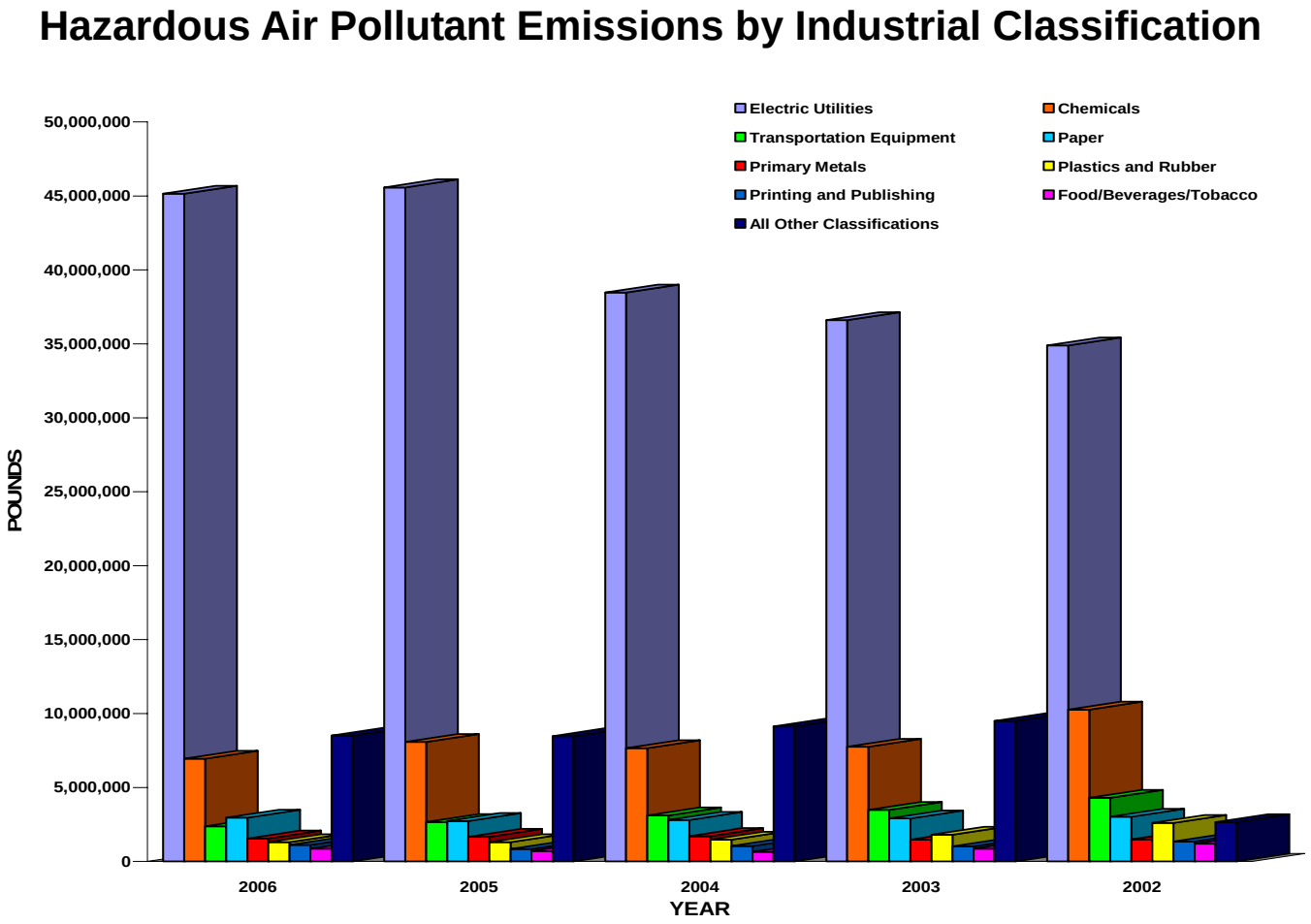

Figure 34: HAP emissions in Kentucky from 2002 through 2006 by industrial classification. Electric utilities (power plants) are the largest emitters in the state, and are responsible for the majority of the hydrochloric acid, sulfuric acid and hydrogen fluoride emitted. *Data Source: EPA Toxic Release Inventory*

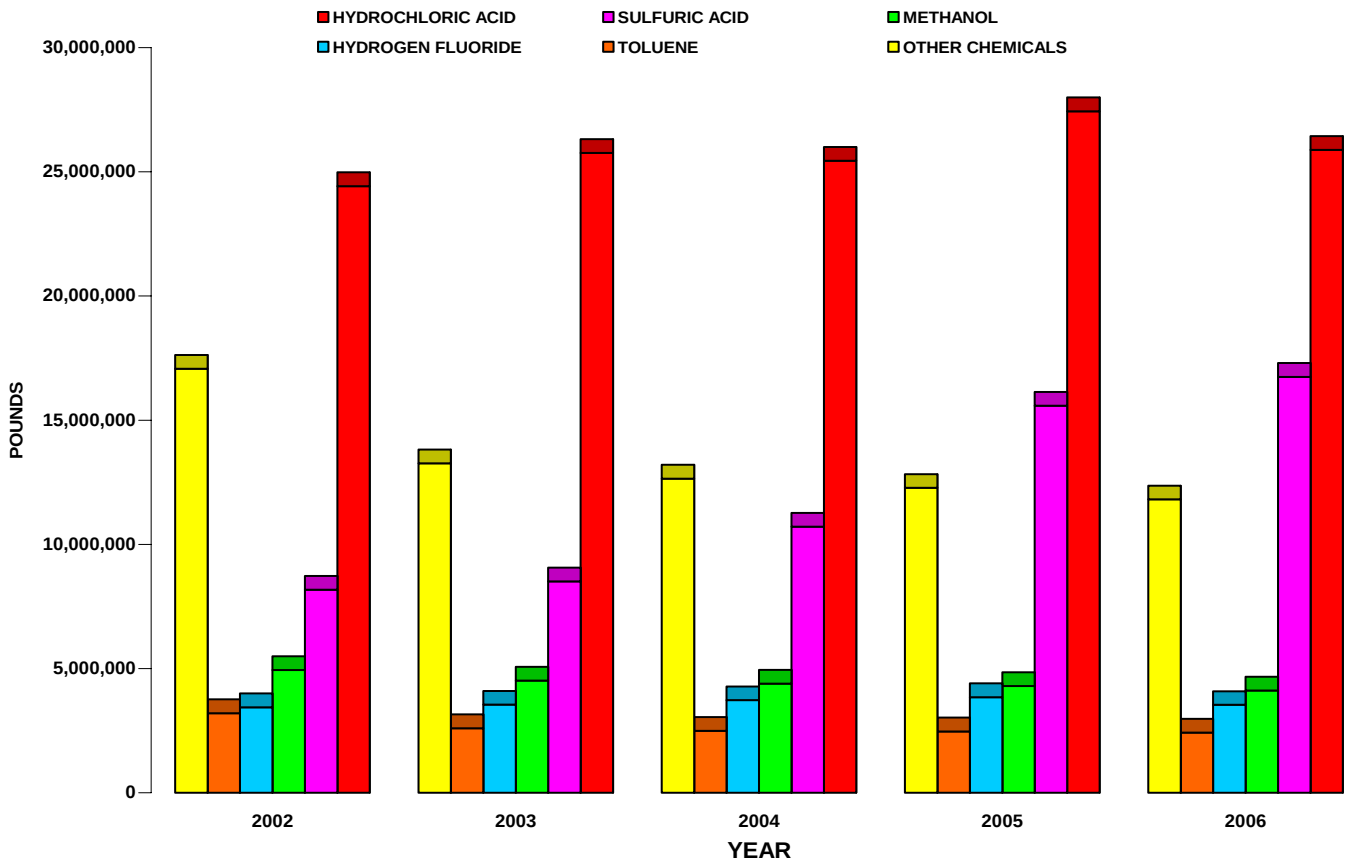

Figure 35: HAP emissions for selected individual chemicals. Hydrochloric and sulfuric acids are emitted in the largest quantities, with sulfuric acid showing an increasing trend over this time period. The increase may be due to increases in electrical production (thereby increasing fuel consumption) required by the increasingly vibrant economy during the period. *Data source: EPA Toxic Release Inventory*

has been fortunate to find such a multi-talented set of individuals to staff the ATS.

The ATS staff attended several training courses during the year to gain the expertise that is unique to the field of air quality risk assessment. Courses such as Risk Assessment for Air Toxics Workshop and the Regional, State and Local Air Modelers Workshop were sponsored by the EPA. Staff also attended an Air Dispersion Modeling Workshop presented by Lakes Environmental. This training was crucial in familiarizing the staff with EPA methods and protocols for assessing the potential dangers presented by airborne toxic chemicals.

The program is designed to evaluate potentially dangerous emissions of hazardous chemicals listed by the EPA. A tiered approach, beginning with screening of any such materials using an air dispersal model known as SCREEN-3, and continuing through more complex air dispersion models such as AIRMOD, and ultimately (if required) through a full risk assessment per EPA guidelines.

The initial screening of a facility is done by the PRB engineers. Only if the facility fails this initial screening is the ATS involved in the permitting process. Any additional evaluation required beyond the initial screening (AIRMOD, risk assessments, etc.) is done by the ATS staff.

The ATS completed several reviews during the year as well as initiate investigations into issues of interest. These include but are not limited to the emissions of hydrogen fluoride from brick manufacturing, numerous complaints of odor from a railroad tie treating facility, and the Calvert City Industrial Complex, a large chemical manufacturing complex of facilities.

Beginning in 1988, the EPA began requiring industrial facilities to report discharges of chemicals that had the potential to be hazardous to humans or the environment, or both. These discharges include discharges to air, water, and disposal to land. In 1988, there were 296 different chemicals reported. In 2006, 519 chemicals were reported.

The EPA's Toxic Release Inventory (TRI) database is the repository for this information. This database is useful for evaluating discharge trends relative to individual chemicals, individual industrial classifications, individual facilities and individual states. The data quality in TRI varies because facilities are allowed to base their release estimates on a combination of engineering estimates, manifests, and measured and modeled values. The method for deriving the release quantity is documented on the TRI reporting form. Due to these reporting requirements and methods of reporting, and the inherent lack of quality assurance for the data, the data available in TRI are not be utilized by DEP to render final conclusions.

Reported air discharges, a.k.a. emissions, have varied over the years, but have generally increased. This variance (and associated general increase) is due to an increase in the numbers of chemicals required to be reported, the number of industrial classifications that are required to report, and industry awareness of the reporting requirements and system. Reported levels of HAP emissions show an increasing trend, from over 58 million pounds in 2001 to over 64 million pounds in 2006 (see figure 34). Figure 34 illustrates total hazardous air pollutant emissions in Kentucky from 2001 through 2006.

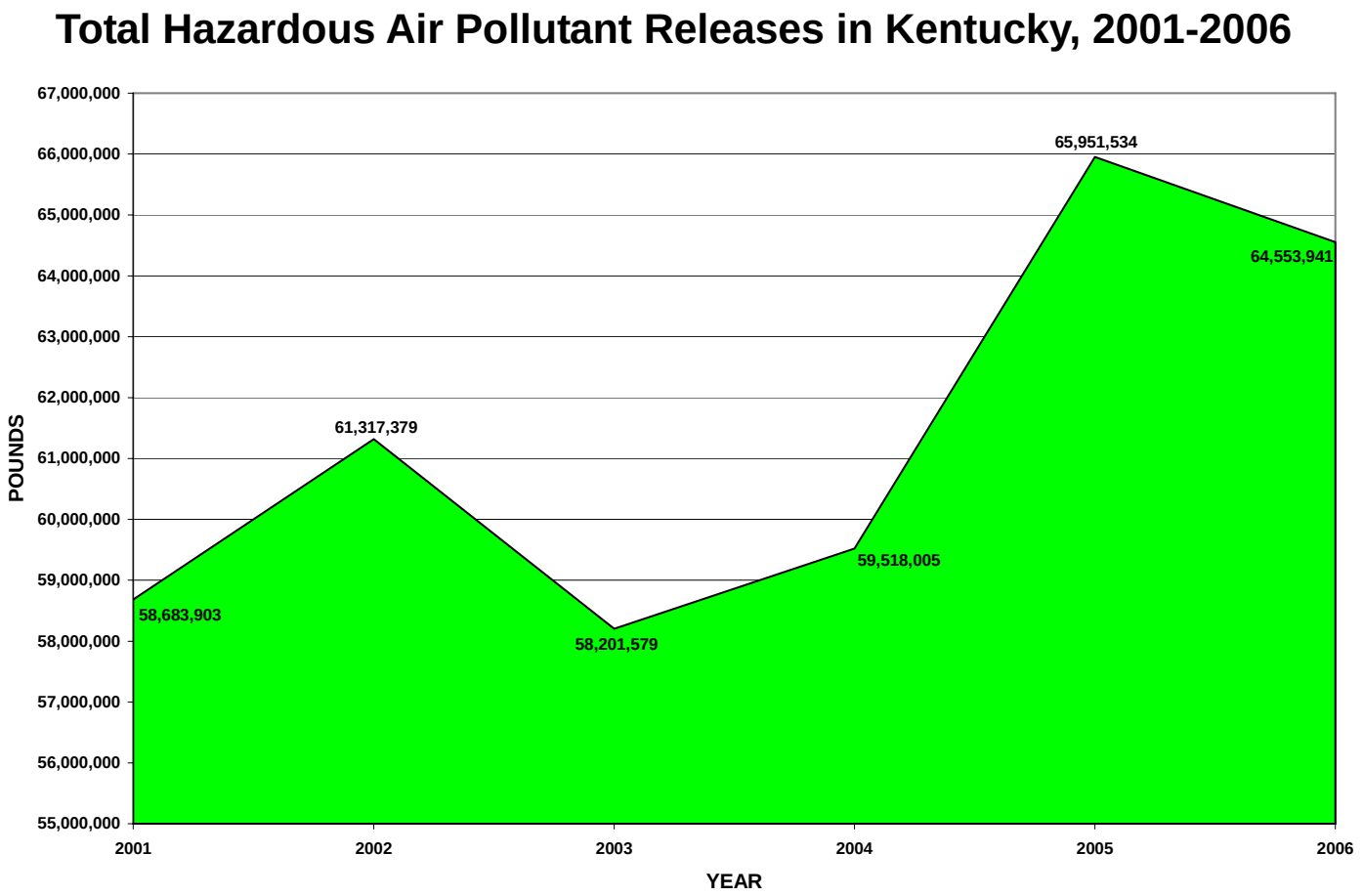

Figure 36: Total HAP releases in Kentucky, 2001-2006. The spike of roughly 6 million pounds of hazardous air pollutants in 2005 may be attributed to additional electricity generation due to increased economic growth that year. *Data source: EPA Toxic Release Inventory*

Given the overwhelming prevalence of emissions from electric generating facilities as compared to other industrial classifications, it is beneficial to consider the reduction in toxic air pollutants by these other industrial sectors. Figure 37, below, depicts toxic air emissions without the inclusion of hydrochloric acid, sulfuric acid, and hydrogen fluoride, primarily emitted from electric generating facilities. The emission levels clearly indicate a downward trend, from over 25 million pounds in 2001 to under 19 million pounds in 2006.

Total Hazardous Air Pollutant Emissions—Minus Electric Generation Facility Emissions

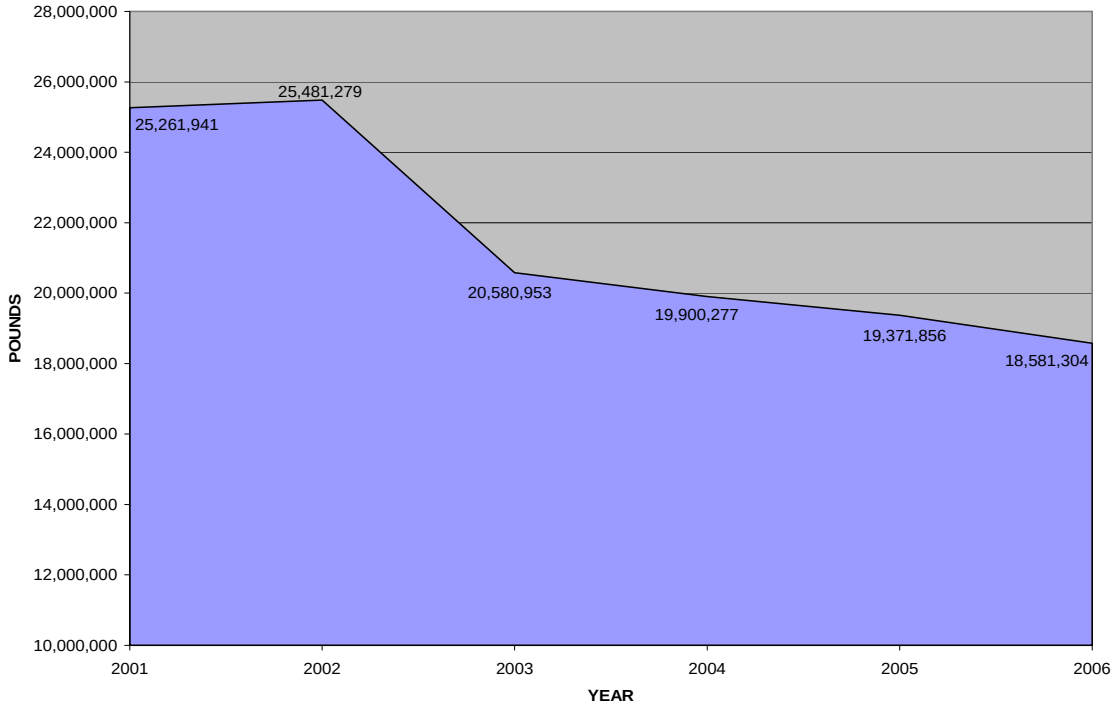

Figure 37: With the influence of electric generation facilities removed, a downward trend in emissions from all other HAP emitting sectors is clearly evident, dropping from over 25 million pounds in 2001 to under 19 million pounds in 2006. *Data Source: EPA Toxic Release Inventory*

One can conclude from the above chart that hazardous air pollutant emissions in Kentucky are generally decreasing, thereby improving air quality. Much of the improvement appears to be due to the Maximum Achievable Control Technology (MACT) standards implementation. Additional MACT standards due to be promulgated in the coming years should continue to improve air quality in the commonwealth.

PROGRAM PLANNING and ADMINISTRATION

The Program Planning and Administration Branch (PPAB) is the planning and implementation cornerstone of the Division for Air Quality. This branch has the responsibility of ensuring that:

- The agency has adequate budget and staffing resources to meet federal and state requirements for the operation of an air quality control program;
- A comprehensive emissions inventory is performed annually on sources within Kentucky, both to ensure the best information is used to develop and evaluate air quality plans and for use in determining air emission fees required under the federal Clean Air Act;
- Appropriate regulations are researched and promulgated within Kentucky to meet federal and state mandates to control air pollution; and
- Comprehensive plans to attain and maintain the National Ambient Air Quality Standards (NAAQS) are developed and submitted to U.S. EPA for approval. These plans are part of Kentucky's State Implementation Plan (SIP).

Fiscal Management

The Division for Air Quality operates primarily on Title V emissions fees and federal grant funds.

Funding under the Title V program (mandated by the 1990 CAA) is through emission fees assessed to air pollution sources in the state that meet specific criteria. Further authorized in Kentucky by state statute in KRS 224.20-050, and regulation KAR 50:038, the division is mandated to charge fees sufficient to cover the cost of implementing and carrying out the requirements of the Title V program annually.

The division surveys permitted sources subject to the Title V fee program each year. Once the agency has determined the overall cost of the program for the fiscal year, the number of tons of pollutants that will be emitted in Kentucky will be divided into the projected operating costs to develop a per ton cost. Each source within the Title V program will then be issued a bill based on that per ton cost.

The agency also receives federal grants in support of the air quality program. The "general" air quality grant, known as the 105 grant, is in support of the general air quality program and covers such activities as minor (or smaller emitting) source inspections and permitting. It also covers such vital

activities as public outreach and transportation coordination in relation to air quality issues. Additionally, the agency also receives specific grants for the operation of the $PM_{2.5}$ monitoring network and asbestos activities within the state.

A smaller portion of the agency's funding comes from direct fees used to offset the cost of specific agency activities. The agency collects a fee for the issuance of gasoline tank truck stickers, to ensure that gasoline delivery tanks meet vapor tightness and do not leak harmful gasoline vapors. Asbestos fees are assessed for the review of asbestos abatement plans in our schools and to certify and accredit asbestos contractors and professionals who remove asbestos in the state.

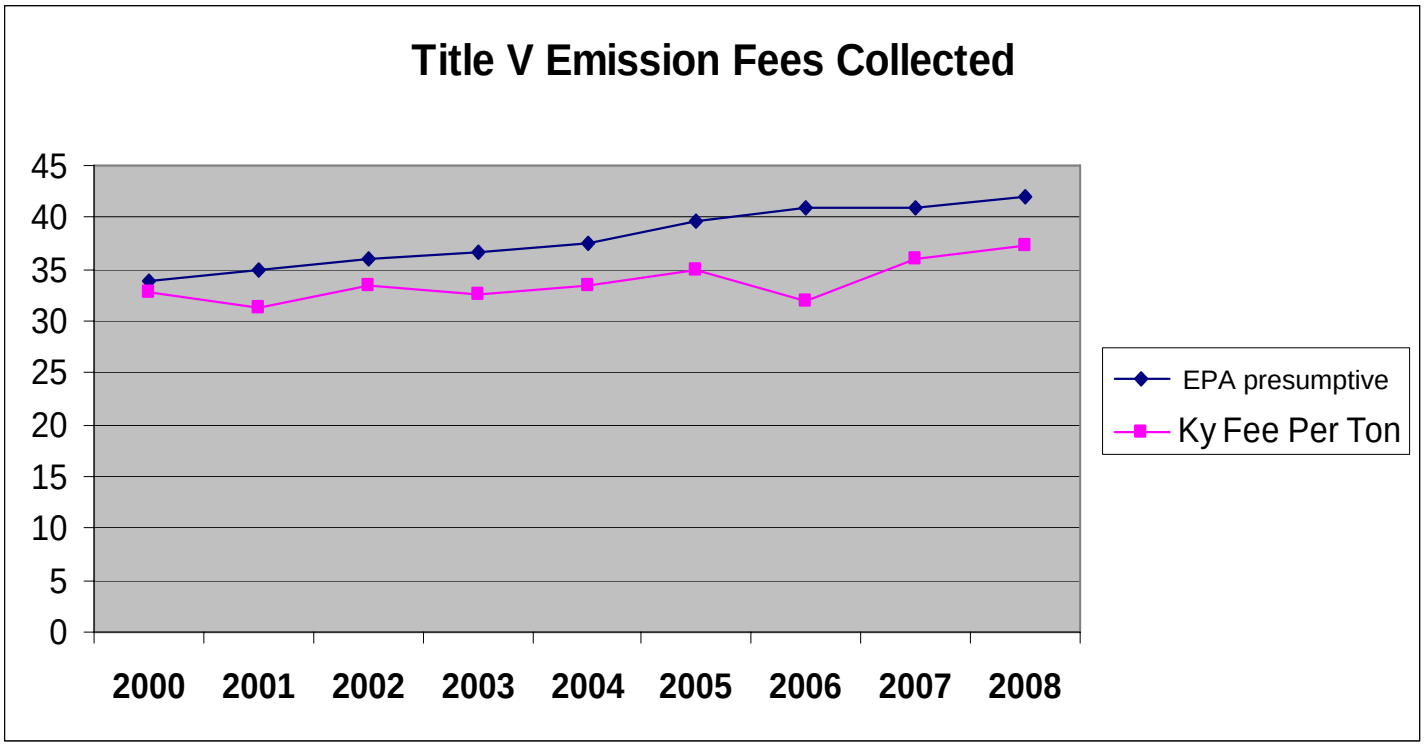

Figure 38: Title V Emission Fees Collected. DAQ surveys regulated entities to determine actual tons emitted by those sources, and charges them a standard Cost per Ton (CPT), according to Clean Air Act and state statute protocol.

Emissions Inventory

The main thrust of an air quality program is the effort to achieve or secure desired standards of air quality though controlling emissions of contaminants in the air. Clearly, management of these programs must be based on knowledge of actual air quality and actual pollutant emissions. The ambient air monitoring program is designed to measure the quality of the air our citizens breathe, and use it to gauge whether that air meets the federal standards. The emissions inventory systems are designed to document and track actual and potential air pollutant emissions and those data are used to develop air quality improvement programs when necessary.
In its most basic form, an emissions inventory is a list of sources of air pollutants, and for each source, or source type, the amount of each pollutant emitted, or has the potential to be emitted. Kentucky's emissions inventory is maintained in three parts:

- The point source inventory includes all actual and potential emissions from typically industrial sources at fixed locations;
- An area source inventory includes information on other pollution causing activities in a given area and documents the contribution of emissions from typically numerous small entities, or human activi-

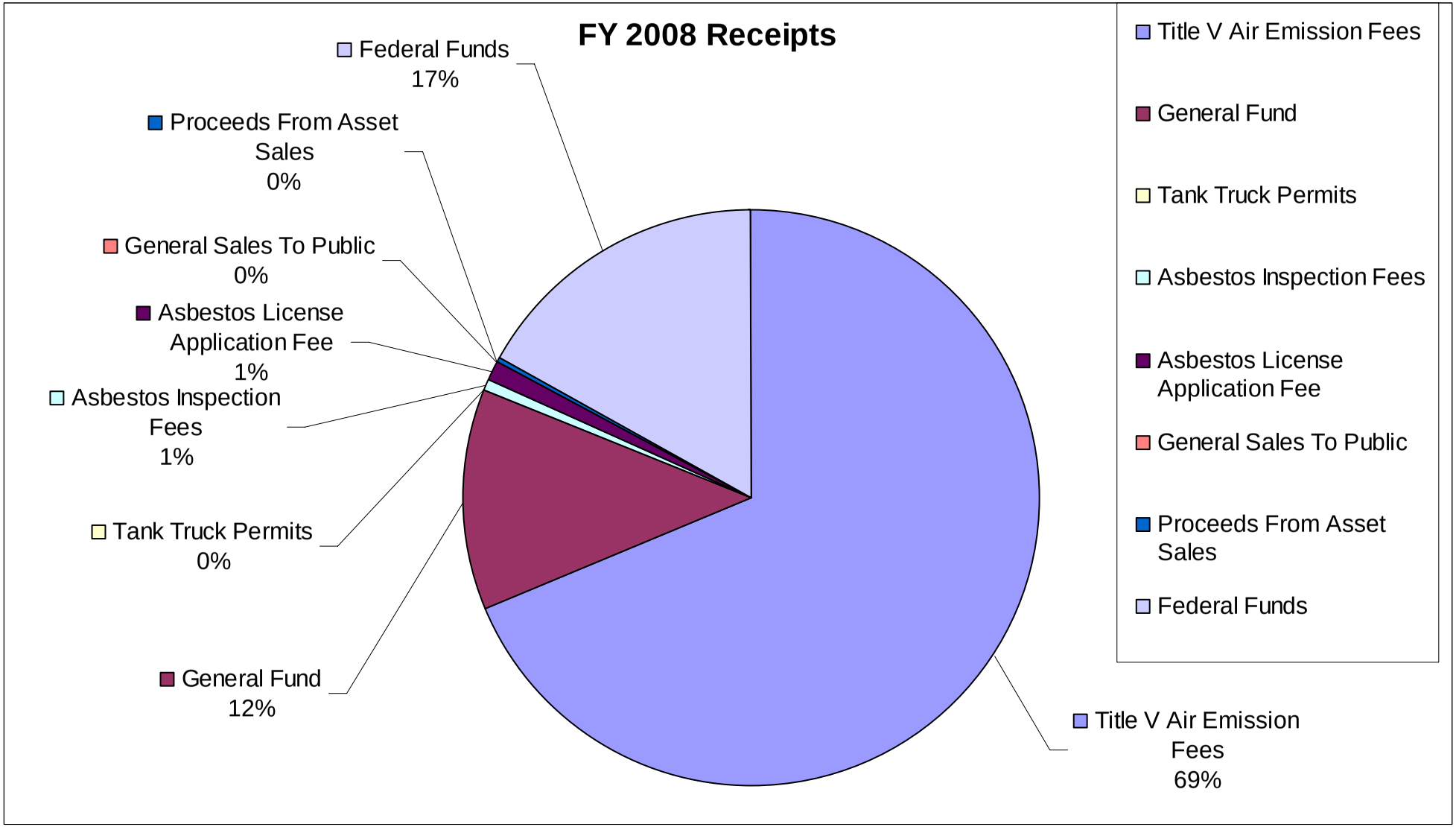

Figure 39: DAQ Fiscal Year 2008 Receipts. The division operates primarily on Title V Emission Fees and federal grant funds. Other funds are derived from tank truck fees, asbestos fees, and general fund dollars.

ties. These include activities such as home heating, small print shops, agricultural activities, structure fires, road striping, and consumer products consumption;
• The third sector of the emissions inventory includes information on emissions from mobile sources. This sector is then broken down even further by estimating the contributions by on-highway vehicles and off-highway mobile sources such as construction equipment, lawn equipment, airplanes and locomotives.

The point source emissions inventory is performed and maintained by the Emissions Inventory Section. The main function of this section is to continue to improve the comprehensiveness and accuracy of point source emissions information and ensure the information is up to date and useable by the Administration Section for billing calculations; the Program Evaluation Section for developing and evaluating control programs; and the Permit Review Branch for permitting additional large sources within a given geographic area.

As mentioned previously, point sources in Kentucky are surveyed annually to determine actual air pollutant emissions for the previous year. The following criteria is used to determine the sources that are surveyed in the state:

• Any major source (potential to emit 100 tons or more of a criteria pollutant – criteria pollutants are CO, NO2, PM, SO2, VOC (as a precursor for ozone));
• Any conditional major source (a source that has taken permitted limits to keep it below the 100 tons potential noted above);
• Any source subject to a federal regulation such as a NSPS (New Source Performance Standard), NESHAP (New Emission Source of Hazardous Air Pollutant), or MACT (Maximum Achievable Control Technology – for hazardous air pollutants);
• Any source of Volatile Organic Compounds (VOCs) in areas of the state not meeting the federal ozone standards or that had previously been designated as not meeting those standards. (Boone, Boyd, Campbell, Christian, Daviess, Edmonson, Fayette, Greenup, Hancock, Kenton, Livingston, Marshall, or Scott);
• All sources where the actual or potential emissions of an individual hazardous air pollutant is equal to or greater than 10 tons per year;
• All sources where the actual or potential emissions of combined hazardous air pollutants are equal to or greater than 25 tons per year.

The emissions inventory section surveys approximately 1100 plants per year using the current survey criteria. This process begins in January and continues through October.

The responsibility for assembling the other portion of the emission inventories for specific areas falls in the Evaluation Section of the Program Planning and Administration Branch.

These inventories are typically performed for areas that are not meeting a federal air quality standard or when a control program has been put in place and the overall effectiveness of that control program is being evaluated.

The pollutants being inventoried, and therefore the source of pollutants being documented, changes based on the air quality problems of an area. Typically for the last several years, pollutants contributing to either fine particulate or ozone problems are those that have comprehensive, consolidated inventories performed.

For area sources (those smaller businesses or human activities) typically federally supplied emissions factors are used and adjusted based on population data for a given area.

For mobile source related emissions, mathematical models are used to determine emissions contri-

butions. For on-road mobile emissions, data gathered by the Kentucky Transportation Cabinet is used to determine “vehicle miles traveled” for a given area. This information is used in conjunction with any mobile controls, such as fuel programs, or gasoline pump controls to determine the mobile source contribution in an area. For off-highway mobile emissions, such as airplanes, another mathematical model is used, with flight landing and take-off data used to calculate emissions.

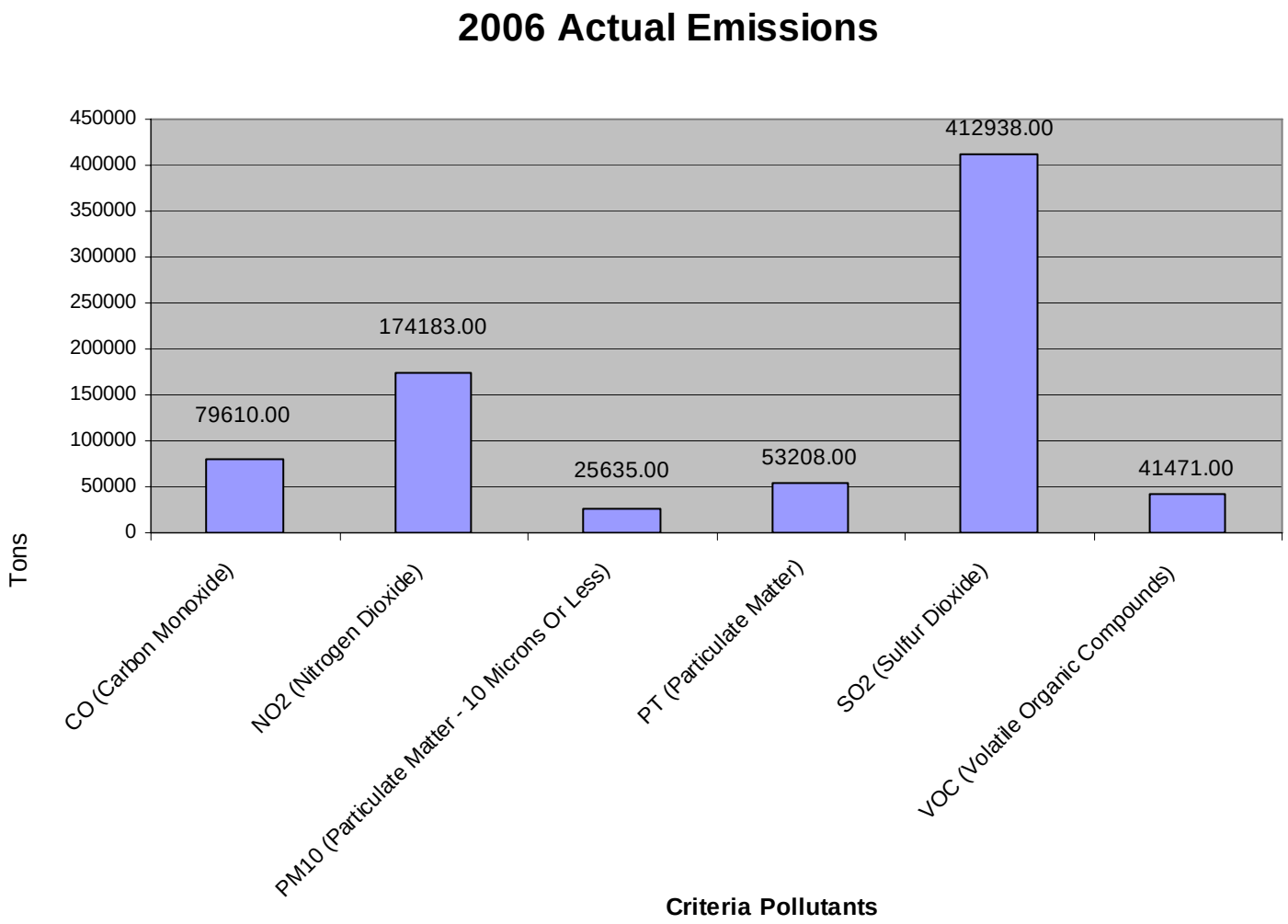

Figure 40: Actual tons of pollutants emitted by regulated entities in Kentucky for the calendar year 2006. DAQ receives inventory emission data at the beginning of each calendar year; it takes approximately nine months to verify and complete the inventory.

Regulation Development

The Regulation Development Section in the PPAB drafts and adopts regulations to control air pollution in the state. This section is responsible for reviewing federally adopted regulations and recommending whether or not to adopt and/or request delegation of those regulations in Kentucky.

Regulations can either be drafted in response to:
- Federal mandates to control air pollution or specific air pollution sources;
- A state mandate made by either the governor or the legislature to control air pollution within the commonwealth; or
- An action identified by the cabinet as necessary to protect human health and the environment.

Regulations can be adopted for specific controls to address specific air quality concerns within the state.

While the agency receives its authority to draft and adopt air quality regulations under KRS Chapter 224, it is also governed on the drafting of those regulations by KRS 13A, which specifies regulatory drafting procedures as well as public participation in the regulatory promulgation process.

After the need for a new regulation or a regulatory amendment has been identified, it becomes the responsibility of the Regulation Development Section to compile all input and policy decisions into a regulatory draft and guide the process through promulgation. The promulgation process could include gaining inter-agency and federal U.S. EPA input into the regulation content, advertising the regulation or regulatory amendment for public comment, responding to those comments and making any subsequent changes found necessary, and tracking the regulation through final legislative approval.

Several regulations were adopted or revised in Kentucky from June 2007 through June 2008:

- Mercury Budget Trading Program – 401 KAR 60:020 – This regulation established requirements for the control of mercury emissions from coal-fired electric generating units, pursuant to the federal mandate published under the federal Clean Air Mercury Rule (CAMR).

- Clean Air Interstate Rule (CAIR) NOx Ozone Season Trading Program – 401 KAR 51:220 – An amendment to the original regulation, which became effective on February 2, 2007, was necessary to expand the applicability to include any new non-EGU sources that met the 250 mm/BTU applicability level found in the previous NOx SIP Call regulations.

- The following regulations were amended to adopt federal rules for each of the categories. This allows Kentucky to continue to receive delegation of authority to implement and enforce the provisions of the federal rules.

- 401 KAR 57:002 -- 40 CFR Part 61 – National Emission Standards for Hazardous Air Pollutants

- 401 KAR 58:025 – 40 CFR Part 61 -- National Emission Standard for Asbestos

- 401 KAR 60:005 – 40 CFR Part 60 -- Standards of Performance for New Stationary Sources

- 401 KAR 60:670 – 40 CFR Part 60 – Standards of Performance for Nonmetallic Mineral Processing Plants

- 401 KAR 63:002 – 40 CFR Part 63 – National Emission Standards for Hazardous Air Pollutants

Other Notes

The Clean Air Mercury Rule (CAMR) promulgated by U.S. EPA as a federal program to control mercury emissions from coal-fired electric generating units was vacated (declared null and void) by the D.C. Circuit Court of Appeals on February 8, 2008.

This rule had set a nationwide cap on mercury emissions allowed to be emitted and set the provisions for states to opt into a nationwide allowance trading program for mercury allowances. Kentucky's portion of this nationwide cap would have been 1.525 tons per year in 2010, with a further drop in 2018 to .6 tons per year. Current estimated annual emissions of mercury from coal-fired power plants in Kentucky, according to the EPA's 2007 Toxic Release Inventory, is 1.771 tons per year.

Since Kentucky had adopted the provisions of CAMR prior to the court's vacating the rule, action had to be taken to also repeal Kentucky's regulation, 401 KAR 60:020. The repeal of Kentucky's

regulation was final in September 2008. The U.S. EPA is said to be drafting another regulation under other provisions found in the Clean Air Act to address mercury emissions from coal-fired electric generating units. However, a definitive time frame has not been established by the EPA.

Additional work is also ongoing to adopt the revised NAAQS and designations of areas meeting or not meeting those revised standards. Complications on this process include the court's vacature of U.S. EPA's implementation rules for both the ozone and fine particulate standards.

State Implementation Plan

The State Implementation Plan (SIP) is a federally mandated plan to ensure attainment and maintenance of the NAAQS within a state or region within a state. Once regulations or programs are adopted into the SIP, they become federally enforceable. This means that if for some reason a state cannot or will not enforce the regulations included in a respective SIP, U.S. EPA can step in and enforce those provisions.

Overall, the framework and components of the SIP are designed to ensure that states continue to move toward all areas achieving air quality that meets the national standards, and once achieved, that air quality continues to maintain those standards. In short, the SIP is the mechanism for air resource management. Air resource management begins with:

- A determination of existing conditions – air quality, meteorological conditions, and an inventory of emissions;
- Goals or objectives for an area must be developed (typically air quality standards that must be met or maintained); and
- Control strategies developed, that may include emission reduction measures or measures to ensure no further degradation of air quality occurs.

A key component of air resource management, or SIP development, is the coordination of plan development with the local communities who have a stake in how a plan is to be implemented.

Of notable mention during the last fiscal year are issues and submittals pertaining to both the changes in the ozone and fine particulate standards, as well as conclusion of the regional haze plan designed to improve visibility conditions at our national parks and recreation areas.

Ozone

In 2004, the U.S. EPA designated areas as nonattainment (not meeting) the 1997 8-hour ozone NAAQS. These designations were based on 2001, 2002, and 2003 monitoring data and were the first designations made under this revised standard. Effective June 2004, Bullitt, Jefferson, Boone, Campbell, Kenton, Boyd and Christian counties were designated as not meeting this standard (see Figure 41). Therefore, a new air quality plan had to be developed to bring them back into compliance. This plan was due in June 2007, three years after the designations became effective.

During that time, monitoring data showed that several Kentucky counties came back into compliance with the 8-hour ozone standard. Kentucky requested that EPA redesignate those areas as meeting the new standard. Prior to the attainment demonstration being submitted, EPA redesignated Bullitt, Jefferson, Boyd and Christian counties as in attainment (compliance) with the standard. The plans submitted to EPA, with the request to redesignate those counties, documented that the areas should continue to have emission levels that would allow them to remain in compliance with the standard.

In June 2007, Kentucky submitted the required attainment demonstration to the EPA for Boone, Campbell and Kenton counties, part of the Cincinnati-Hamilton metropolitan area. That area contin-

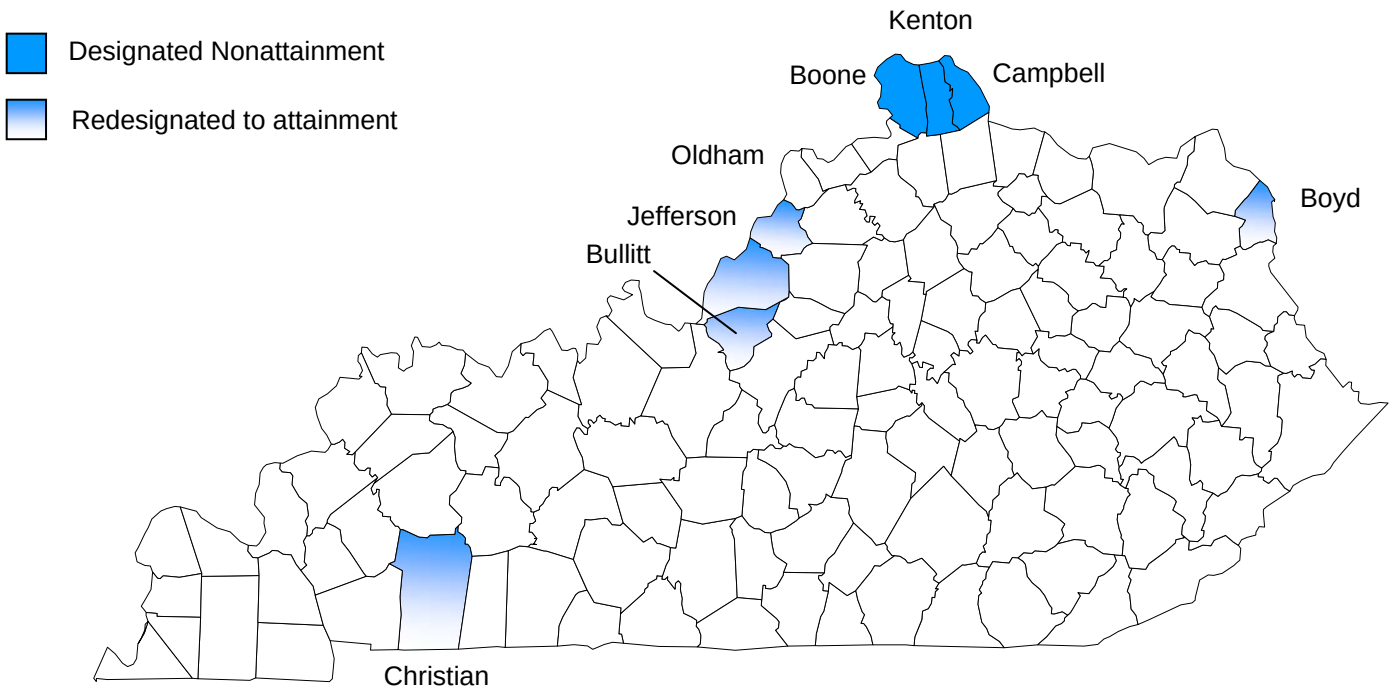

Figure 41: All counties highlighted on the map were in violation of the 1997 8-hour ozone standard. The shaded counties (Boyd, Bullitt, Christian, Jefferson and Oldham) have been redesignated as meeting that standard.

ued to show violations of the 8-hour ozone standard. The modeling demonstration submitted as part of the attainment demonstration showed that the entire area would come back into compliance with the standard by 2009. The modeling that the attainment demonstration was based upon was conducted as part of the work being performed by the Visibility Improvement State and Tribal Association of the Southeast (VISTAS) in conjunction with other initiatives such as $PM_{2.5}$ modeling and regional haze modeling.

On March 12, 2008, EPA significantly strengthened the NAAQS for ground-level ozone, the primary component of smog, to better protect public health. The previous standard was set at .08 ppm (parts per million). The new standard is set at .075 ppm. Both standards use three years of monitoring data and the 4th highest recorded 8-hour average to determine compliance.

EPA will make designations under the 2008 8-hour standard in 2010, and studies are underway to determine which areas states believe should be designated as not meeting the standard. States must submit proposals for these designations to EPA in March, 2009. Work is already in progress to determine emission contributions, any changes in monitoring levels from one year to another, population density differences, emission impacts from down-wind sources and transportation impacts on areas. EPA will make designation decisions using monitoring data from 2009 and possibly even 2010. However, based on monitoring data available for the last three full ozone seasons (2005-2007) Figure 42, below, depicts the counties in the state that would not meet the new 8-hour standard if designations were made today.

Fine Particulate Matter

In 2006, EPA strengthened the NAAQS for the 24-hour fine particulate standard ($PM_{2.5}$) from 65 ug/m^3 to 35 ug/m^3. There are actually two standards set for fine particulate. In addition to the 24-hour

Potential Ozone Nonattainment Areas
2008 8-Hour Ozone Standard

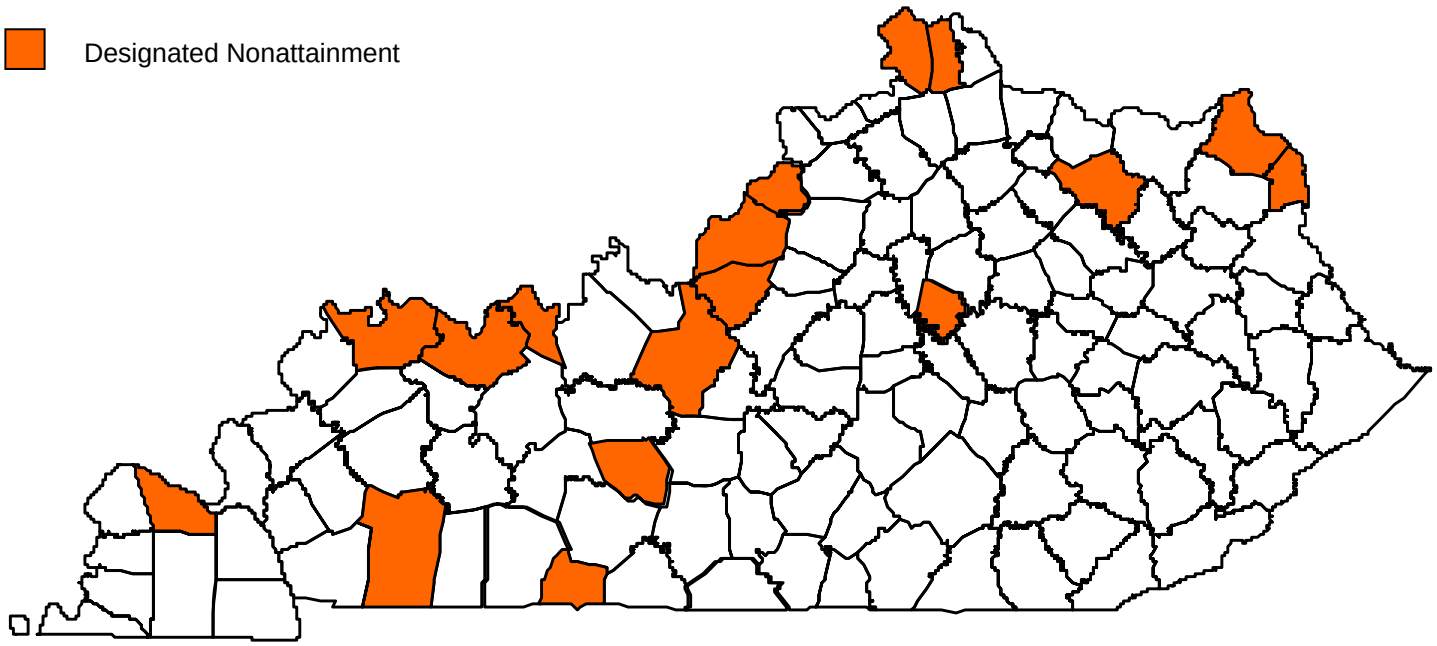

Figure 42: Potential nonattainment counties for the 2008 8-Hour Ozone Standard. The chart above shows what counties would not meet the standard based on data for 2005-2007. The data that will be used for state attainment recommendations to EPA will be for years 2006-2008. For 2010 final designation, EPA will use data from years 2007-2009. The counties shown in orange are: Boone, Boyd, Bullitt, Christian, Daviess, Edmonson, Fleming, Greenup, Hancock, Hardin, Henderson, Jefferson, Jessamine, Kenton, McCracken, Oldham and Simpson.

average, there is a standard for an annual average, set at 15 ug/m^3, which was not changed in 2006.

Kentucky and all other states were required to submit proposals to EPA in December 2007 for areas to be designated as meeting or not meeting the newly revised 24-hour standard. EPA anticipates making final decisions on these designations in December 2008. Kentucky proposed that no counties should be listed as nonattainment for the newly revised standard. This proposal was based on a combination of 2004-2006 monitoring data, and an exceptional events package that was submitted to EPA. The exceptional events package is a request from DAQ to EPA that EPA not use certain air monitoring data, due to impacts from forest fires and other exceptional events.

In March 2008, EPA indicated that a closer look and more detailed analysis were required for some areas of the state. Kentucky submitted the requested information in June and will be having continuing dialogue with EPA prior to the official designations taking place.

Figure 43 indicates counties that may be impacted by the more stringent rule, based on air monitoring data from 2005-2007.

Annual $PM_{2.5}$ Attainment Demonstration

As mentioned previously, there are two fine particulate ($PM_{2.5}$) standards. The first is the 24-hour standard, for which EPA is preparing to make designations. The second is the annual standard, for which designations were made in 2005. In Kentucky, there were three areas of the state which were designated as not meeting the annual standard of 15 ug/m^3, based on monitoring data from 2001-

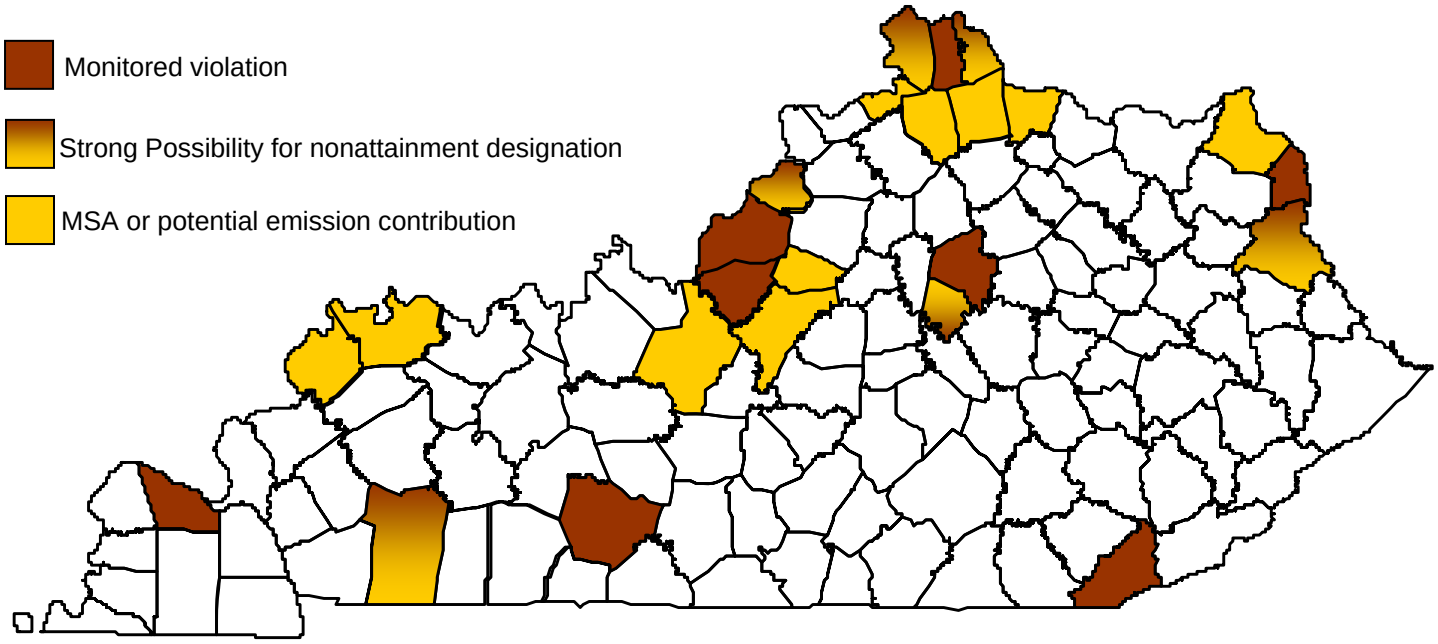

Figure 43: Potential areas impacted by the 2005 standards for fine particulate matter. Counties listed with monitored violations are: Bell, Bullitt, Fayette, Jefferson, Kenton, McCracken and Warren. Those listed as having a strong possibility for nonattainment designation are Boone, Campbell, Christian, Jessamine, Lawrence and Oldham. MSA or potential contribution counties are Bracken, Daviess, Gallatin, Grant, Greenup, Hardin, Henderson, Nelson, Pendleton and Spencer.

2003. They were Jefferson, Bullitt, Boone, Campbell, Kenton, Boyd and a portion of Lawrence counties (see Figure 44). All areas of the state met the 24-hour standard set in 2005 at 65 ug/m^3.

In July 2008, Kentucky submitted a draft attainment demonstration to EPA that covers all of the above mentioned areas. This demonstration showed that, based on modeling performed through the VISTAS workgroup and other regional planning organizations, all areas would come back into compliance with the annual fine particulate standard by 2010. A final submittal will be made to EPA before the end of 2008.

Visibility

Regional haze is pollution that impairs visibility over a large region, including national parks, forests, and wilderness areas (many termed “Class I” areas). An easily understood measure of visibility to most people is visual range. Visual range is the greatest distance, in kilometers or miles, at which a dark object can be viewed against the sky (see Figure 45).

As part of the Clean Air Act Amendments and further regulations adopted by the U.S. EPA, states must develop plans to restore natural visibility conditions in the 156 Class I areas throughout the nation. Mammoth Cave National Park is included in the list of areas.

Although the goal to achieve natural visibility conditions is slated for 2064, states had to develop the first phase and demonstrate reasonable progress toward meeting the national goal. In addition, states also had to determine if emissions from within their boundaries were having an adverse impact on other Class I areas. Figure 46 depicts the Class I areas in the southeast as well as others in

2007 Nonattainment Counties
1997 Annual $PM_{2.5}$ Standard (15 µg/m^3)

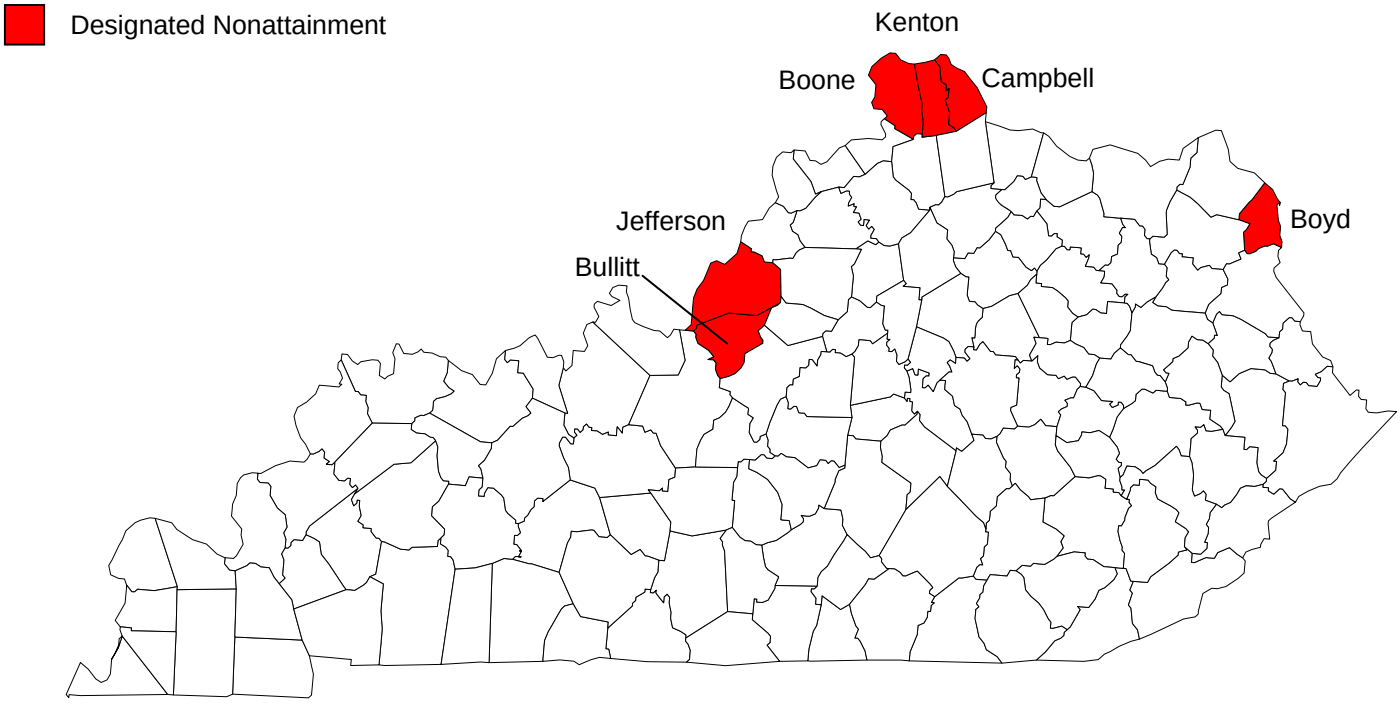

Figure 44: All counties highlighted on the map were in violation of the 1997 Annual $PM_{2.5}$ standard in 2007.

nearby states.

Regional haze is typically caused by sources and activities emitting fine particles and their precursors, often transported over large regions. Particles affect visibility through the scattering and absorption of light. Reducing fine particles in the atmosphere is an effective method of improving visibility.

The development of these Regional Haze plans was accomplished through coordinating information and modeling conducted by a regional planning organization (RPO). VISTAS was the organizational means for performing the modeling and emissions analysis that allowed the states to develop these plans. VISTAS included representation from Kentucky, Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, West Virginia, and the eastern band of the Cherokee Indians (see Figure 46).

As federally required, the DAQ submitted Kentucky's draft plan to the Federal Land Managers for review in December 2007. After receiving comments on the draft document, and making necessary revisions, the agency posted the plan for public review and submitted it to U.S. EPA in March 2008. The public hearing was held in April.

Figure 45: Hazy (left photo, visibility range less than 10 miles) and clear (right photo, visibility range less than 190 miles) days at Mammoth Cave National Park. Historical and real time images from this and other national parks can be viewed by clicking the Webcam link at www.airnow.gov. *Photos Courtesy of Mammoth Cave National Park*

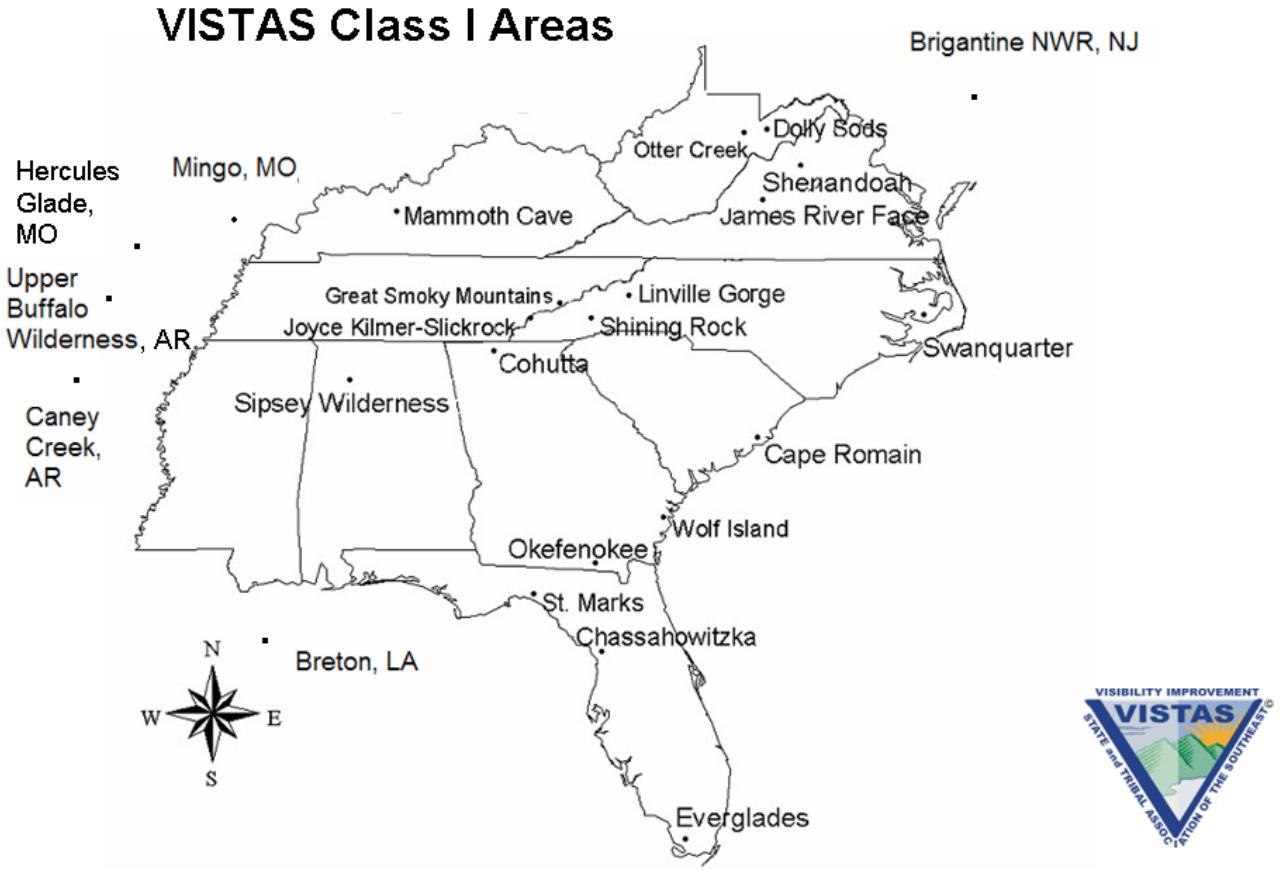

Figure 46: The Clean Air Act seeks to prevent significant deterioration of air quality. Areas of special natural, scenic, or historic importance are known as "Class 1 Areas," and are protected to maintain long distance, panoramic views.

GLOSSARY OF TERMS

Asbestos Hazard Emergency Response Act AHERA requires schools to inventory their asbestos materials and document strategies for dealing with these materials.

Air Toxics See Toxic Air Pollutant

Ambient air quality The level of pollution present in the air outside

Attainment When an area meets the national air quality standard set by the federal EPA for a particular pollutant

Clean Air Act Federal clean air program established by Congress in 1963

Class I Area Areas of special natural, scenic, or historic importance are known as "Class 1 Areas," and are protected to maintain long distance, panoramic views.

Criteria Pollutant A regulated air pollutant. Currently, there are six criteria pollutants under the Clean Air Act. They are carbon monoxide, lead, ozone, particulate matter, nitrogen oxides and sulfur dioxide

Emissions Inventory A list of sources of air contaminants, containing for each source the amount of each contaminant emitted.

Hazardous Air Pollutant Any pollutant listed in pursuant to Subsection B of Section 112 of the Clean Air Act

Inspection A *scheduled* determination of compliance with an existing regulation.

Investigation A *complaint driven* determination of compliance with an existing regulation.

National Emissions Standards for Hazardous Air Pollutants NESHAP, with respect to asbestos, governs renovation and demolition activities and requires safe handling, removal (when applicable), and disposal of asbestos from facilities (everything except for single private homes).

Nonattainment When an area does not meet the national air quality standard set by the federal EPA for a particular pollutant

Notification Required reporting by facilities of regulated activities. For example, facilities are required to notify DAQ of certain air emission releases or upcoming asbestos disturbance (removal/ demolition activities).

Synthetic Minor A facility that has the PTE that could exceed major Title V thresholds, but they have agreed to control emissions below major threshold. Synthetic minors includes conditional major facilities.

Title V Any source that has the PTE of greater than 100 Tons of criteria pollutants or 10/25 TPY of a single HAP or any combined HAP

Toxic Air Pollutant A subset of the pollutants listed as Hazardous Air Pollutant

GLOSSARY OF ABBREVIATIONS

AHERA Asbestos Hazard Emergency Response Act

BACT Best Available Control Technology

CO Carbon Monoxide

CPT Cost per Ton

DAQ Division for Air Quality

DEP Department for Environmental Protection

DERA Diesel Emissions Reduction Act

EEC Energy and Environment Cabinet

EGU Electric Generating Unit

EPA Environmental Protection Agency

GHG Green House Gas

HAP Hazardous Air Pollutant

HPV High Priority Violation

LOW Letter of Warning

MACT Maximum Achievable Control Technology

NAAQS National Ambient Air Quality Standard

NESHAP National Emission Standard for Hazardous Air Pollutants

NO_x Nitrogen Oxides

NOV Notice of Violation

O_3 Ozone

Pb Lead

PM_{10} Particulate Matter, also known as course particles, measure between 2.5-10 microns in diameter

$PM_{2.5}$ Fine Particulate Matter, also known as fine particles, measure 2.5 microns in diameter

PTE Potential to Emit

SEDC Southeast Diesel Collaborative

SIP State Implementation Plan

SO_2 Sulfur Dioxide

TEMPO Tools for Environmental Management and Protection Organizations

TRI Toxics Release Inventory

VISTAS Visibility Improvement State and Tribal Association of the Southeast

VOC Volatile Organic Compound

ACKNOWLEDGMENTS

Governor Steven L. Beshear **Secretary Leonard K. Peters**

This Annual Report is intended to provide a concise set of facts and measurements to support environmental decision-making. We welcome your questions and comments to the contacts below:

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We acknowledge the contributions of the staff and management of the Division for Air Quality.

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Program Planning and Administration	Lona Brewer
Field Operations	Kevin Flowers
Permit Review	Ralph Gosney
Technical Services	Sean Alteri and Andrea Keatley

Printed with state funds on recycled paper
September 2008