Kentucky Division for Air Quality
Fiscal Year 2013 Annual Report

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

KENTUCKY DIVISION FOR AIR QUALITY

Kentucky
UNBRIDLED SPIRIT

FROM THE DIRECTOR

The FY 2013 annual report for the Kentucky Division for Air Quality (DAQ) outlines significant achievements of the division and also the challenges that Kentucky and the division face as we move forward into 2014.

Over the past decade, the division has seen many changes in regulatory requirements and technology advancements that have helped to further protect Kentucky's air quality and its citizens. I am proud of the work we do on a daily basis that has led to significant air quality improvements since the passage of the Clean Air Act more than 40 years ago. We strive to provide permits that are protective of the environment, assess and monitor the ambient air quality, and develop regulations that are reasonable and protective. Beyond what we are required to do by federal mandates, our staff work to educate the public and promote voluntary actions that reduce emissions into the air we breathe. We do this all in a manner that assures efficient and balanced use of state funds and resources.

With nearly 92 percent of Kentucky's electricity generation being coal-based[1], we recognize that Kentuckians face significant challenges in transitioning to cleaner fuels without crippling our economy. With revisions to National Ambient Air Quality Standards, development of air pollution transport regulations and pending climate change rulemaking, the impact in Kentucky will be significant. In an effort to lessen this impact we engage daily with state, regional and national stakeholders to ensure that Kentucky will have the utmost flexibility to reduce emissions while continuing to grow our economy. Diversity in our energy choices is inevitable but it will take time.

Our staff serve every Kentuckian and every institution or business throughout the state; but we can't do it alone. Through the everyday energy choices we make, every Kentuckian has a valuable role to play in protecting Kentucky's air quality. Together we can shape the future for improved public health and cleaner air.

Sincerely,

John S. Lyons

John S. Lyons, Director

1. Kentucky Energy Database

Kentucky Division for Air Quality
Annual Report
Fiscal Year 2013

TABLE OF CONTENTS

SELECTED FIGURES

SELECTED FIGURES

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 165 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 2013

- A broad assessment of statewide air quality over time (1982-2012) for six federally regulated air pollutants shows a trend of reduced air pollution (Figure 1). Better quality air in Kentucky is due to a combination of regulatory and voluntary programs put in place by local, state, and federal governments. These pollution reductions greatly benefit public health.

- New rules being promulgated at the federal level will present challenges to Kentucky's counties and industries as they strive to attain these new standards. Several Kentucky counties will face nonattainment with the implementation of more stringent National Ambient Air Quality Standards (NAAQS), such as those for particulate matter. In addition, Kentucky's electric generation sector will be challenged to meet new standards for mercury, air toxics, and greenhouse gases.



Environmental Education

DAQ's Environmental Education (EE) program has reached thousands of students, teachers, and citizens across the Commonwealth through a combination of presentations, exhibitions, and workshops, along with serving in a number of collaborative groups that work to improve air quality.

- Staff made direct contact with more than 7400 Kentuckians in FY 2013, educating about a variety of air quality topics including open burning, air quality and health, and energy conservation.

- DAQ's Environmental Education Specialist coordinated an Earth Day event, attended by First Lady Jane Beshear, to celebrate the Department for Environmental Protection's purchase of four plug-in electric vehicles. Purchase of the vehicles was made possible by a grant administered by the KY Clean Fuels Coalition.

Field Operations

Staff in the Field Operations Branch (FOB) eight regional offices continue to maintain a high productivity level as evidenced by the increase in total inspections. At the end of 2012, staff had inspected 99 percent (480/484) of major permitted air pollutant sources in the state.

- The total number of inspections in calendar year 2012 (3919) was higher than the number of inspections conducted in 2011 (3701.)

- FOB continues to retain a high percentage of employees over the last year, resulting in an increase in their technical capabilities and experience.

Permit Review

One of the biggest challenges for the Permit Review Branch (PRB) is to issue permits within the Regulatory Time Frames (RTF) set by state regulations and the EPA which incorporate increasingly complex regulations.

- PRB has essentially eliminated the long-standing permit back log, dropping the number of applications that went beyond allotted RTF from a high of 524 in June 2006, to 49 at the close of FY 2013.

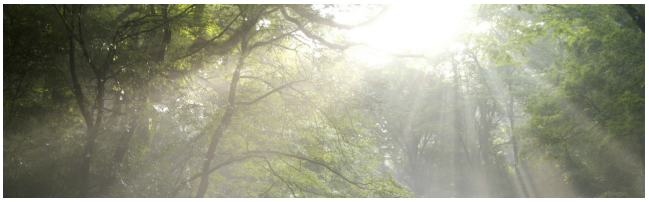
The last 40 years have seen dramatic improvement in Kentucky's air quality. Yet, work remains to ensure that Kentucky's air quality continues to be protected, our economy is growing, and our communities are healthy. With proposed regulations for greenhouse gases from new fossil-fueled power plants expected in the fall of 2013, pending ozone transport regulations, and ever strengthening National Ambient Air Quality Standards (NAAQS), Kentucky faces new challenges and opportunities in the months and years ahead.

Many of these air pollution issues extend beyond the boundaries of our state. As always, the Kentucky Division for Air Quality is working collaboratively with EPA and other state agencies to find solutions to these complex air pollution challenges.

At the same time, our staff understands that we still have Kentucky-specific issues to address. Several counties in Kentucky will be faced with the possibility of non-attainment for a NAAQS. DAQ staff stands ready to provide support and technical assistance to help bring those counties back into attainment.

One thing is clear as we look forward. The future of air pollution control extends beyond the traditional point sources that our staff permits and regulates. DAQ staff will be there to provide guidance, technical assistance, regulatory oversight, and education. These actions can empower every Kentuckian to help protect the air we breathe.

John S. Lyons,
DAQ Director



Program Planning and Administration

The Program Planning and Administration Branch (PPAB) continues to ensure counties attain the NAAQS established in the Clean Air Act, while simultaneously preparing for more stringent standards of ozone, particulate matter, and sulfur dioxide that will impact the ability of several counties to maintain compliance.

- On Jan. 5, 2013, EPA published a final rule for the 2010 $PM_{2.5}$ annual primary standard which reduced the annual standard from 15µg/m^3 to 12 µg/m^3 . PPAB will be required to recommend to EPA areas of Kentucky that do not meet this standard in December of 2013 using monitoring data from the years 2010-2012.

- Although beyond the timeframe for this report, on Aug. 5, 2013, EPA published final designations of the 2010 sulfur dioxide primary standard. The standard was reduced from a 24-hour, 140 ppb and an annual, 30 ppb, to a 1-hour, 75 ppb level. As a result, Campbell and Jefferson counties were designated as partial nonattainment for the 2010 sulfur dioxide standard.

Technical Services

The Technical Services Branch (TSB) continues to successfully operate a network of 99 ambient air quality monitors and 11 meteorological data towers, report to the Air Quality Index, observe compliance demonstrations at permitted facilities, and collaborate with the EPA and DAQ's Program Planning & Administration Branch on exceptional event data.

- In August 2012, TSB provided hands-on instrument training to personnel from EPA's Science and Ecosystem Support Division (SESD). EPA SESD personnel were trained on diagnostics, repair, and standard operation procedures for instruments that sample for nitrogen oxides, sulfur dioxide, ozone, and particulates. The request from the EPA for such training was a unique opportunity to showcase the division's air monitoring program.

- In September 2012, TSB staff conducted an ambient air monitoring workshop, which included presentation sessions as well as hands-on training. The workshop was a successful collaboration between multiple agencies, and was attended by personnel with the EPA, National Park Service (NPS), Louisville Metro Air Pollution Control District (LMAPCD), and Knox County, Tenn. air programs. Staff from the division's own FOB and PPA branches were also in attendance. Many of the guests who attended the workshop also gave presentations, which gave the workshop a broader scope than previous workshops.

- During 2012, the TSB successfully completed a plan in order to eliminate a backlog of compliance-test reviews, which was incurred in 2009 due to severe understaffing. The backlog reduction plan consisted of conducting 513 technical reviews of 2012 or earlier test reports. Elimination of the backlog is a significant accomplishment.

- Also in 2012, TSB upgraded its telemetry system (the system that is used to transfer certain ambient air data) by replacing analog modems with digital cellular-routers at all of the ambient air monitoring stations. The routers provide faster network-communications and allow TSB staff to remotely connect and control any continuous analyzer at a site.

Statewide Air Quality Trends

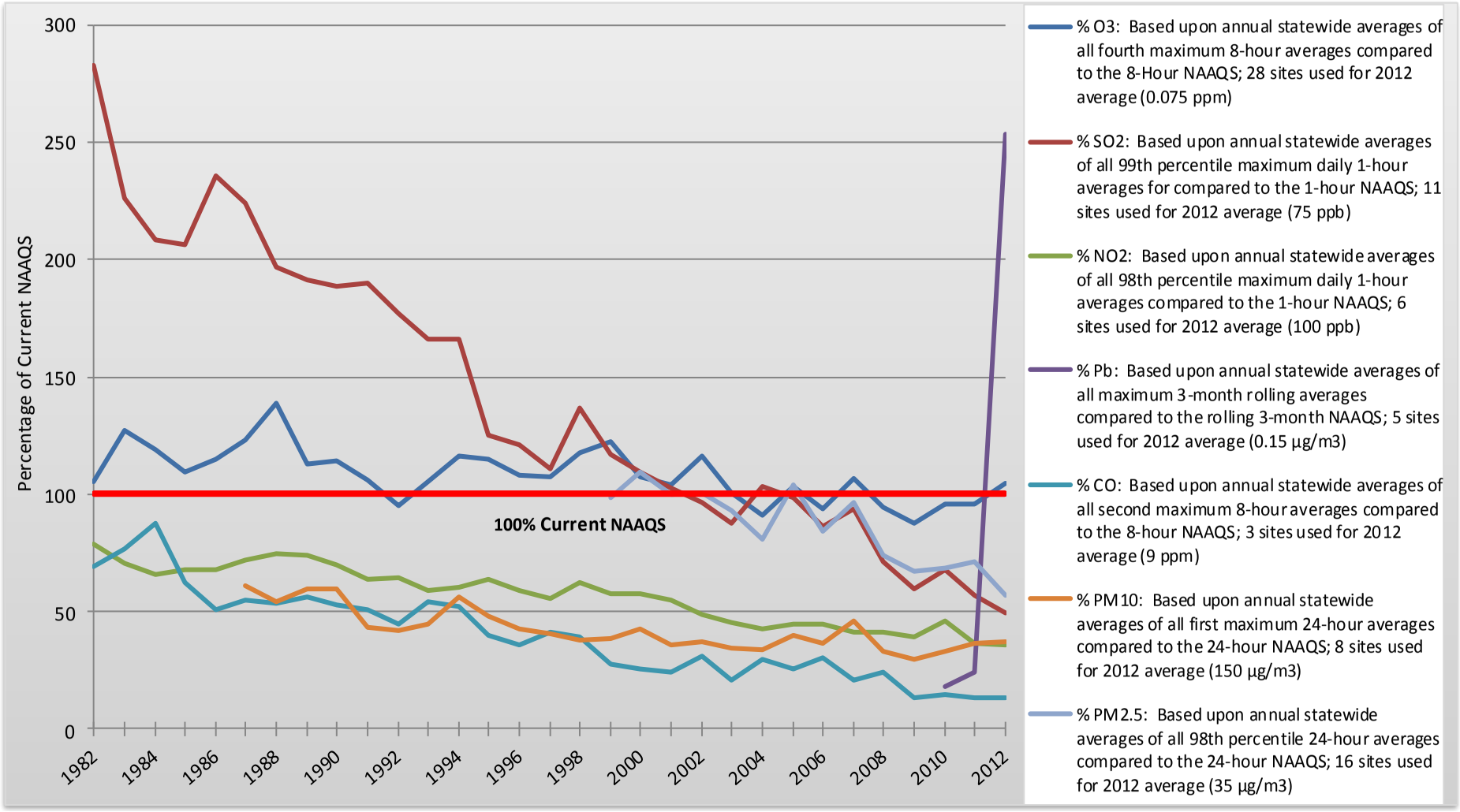


Figure 1: Air Quality Trends from 1982-2012. This chart shows generalized pollution trends through time. It does not show trends for specific sites nor does it demonstrate attainment for any particular area. The pollutants are shown in terms of percentage of the National Ambient Air Quality Standard (NAAQS) because different pollutants are measured in different units, which make direct comparisons difficult. While individual pollutants may spike in certain years, overall trends show declines in pollution levels. In 2012, two lead sites were affected by a compliance issue with a single stationary source; this issue has been resolved. More detailed information on individual pollutant trends can be found in the division's Annual Report. Graph created on 8/28/2013 for the Kentucky Division for Air Quality Fiscal Year 2013 Annual Report. Data was obtained from the EPA's AQS Database. Data obtained from the EPA's AQS database has been quality assured, but is subject to change.

Introduction

The Division for Air Quality (DAQ) is one of six divisions in the Department for Environmental Protection (DEP), which is housed in the Energy and Environment Cabinet. Each year the cabinet produces a strategic plan to be implemented by each department in the upcoming fiscal year. The objectives and tactics from DAQ's portion of the FY 2013 strategic plan are included in this section.

Today, as in its beginning, air pollution control is divided among a hierarchy of state, federal, and local programs.

Creating effective partnerships with air pollution sources and the public enables DAQ to carry out its goal of protecting human health and the environment by achieving and maintaining acceptable air quality. 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 NAAQS, which are set by the EPA.

Objective 1 – Issue technically sound and timely permit actions.

Tactic 1.1: Continue issuing appropriate, lawful permits in a timely manner to reduce and eliminate excess air pollution.

Objective 2 – Attain and maintain National Ambient Air Quality Standards.

Tactic 2.1: Continue to implement measures contained in the June 2008 annual $PM_{2.5}$ (15 $\mu g/m^3$ averaged over a calendar 3-year period) attainment demonstration State Implementation Plan (SIP).

Tactic 2.2: Develop recommendations and implement federal and state control strategies for areas of Kentucky that do not meet the 2008 8-hour ozone standard (0.075 ppm).

Tactic 2.3: Implement federal and state control strategies for areas of Kentucky that do not meet the 2010 1-hour SO_2 standard (75 ppb).

Tactic 2.4: Implement federal and state control strategies for 2010 1-hour NO_2 standard (100 ppb).

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

Objective 3 – Monitor ambient air quality.

Tactic 3.1: Operate an extensive, statewide ambient air monitoring network in order to ascertain the status of Kentucky's ambient air quality.

Tactic 3.2: Conduct quality measurement checks and data quality assessments on the ambient air monitoring network in order to ensure data accuracy and integrity.

Objective 4 – Inspect sources of air pollution and enforce air quality regulations.

Tactic 4.1: Assure compliance with air quality regulations and standards.

Objective 5 – Track air quality related litigation.

Tactic 5.1: Evaluate and participate, if necessary, in any legal challenges related to air quality issues.

Originally operating out of the state health department, the Kentucky Air Pollution Control Commission was the state's first air pollution control program, in operation as early as the 1940s. Kentucky's environmental cabinet was first formed in the early 1970s, in part due to national legislation which brought the Environmental Protection Agency (EPA) and the Clean Air Act (CAA) into being. Today, as in its beginning, air pollution control is divided among a hierarchy of state, federal, and local programs.

Federal Programs

The CAA 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 Amendments 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 1940s, 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.

Major Actions Affecting Climate Change Policy in FY 2013

On June 25, 2013, the Obama Administration released The President's Climate Action Plan, which outlined three elements to combat climate change: (1) Cut Carbon Pollution in America, (2) Prepare the United States for the Impacts of Climate Change, and (3) Lead International Efforts to Address Global Climate Change. To address carbon pollution in America, the plan targets the promotion of renewable energy coupled with cutting carbon pollution from power plants.

In a corresponding memo to the Environmental Protection Agency, the President directed EPA to reissue proposed standards for new power plants by **Sept. 20, 2013**. For existing power plants, the president outlined the following timeline for EPA under the authority of the Clean Air Act (CAA) section 111(d).

1. Issue proposed carbon pollution standards, no later than **June 1, 2014**;
2. Issue final standards no later than **June 1, 2015**; and
3. Require that states submit to EPA the implementation plans required under section 111(d) of the CAA no later than **June 30, 2016**.

EPA has identified six key greenhouse gases (GHGs), so-called because of their heat-trapping potential. Those six gases are listed below, in order from the highest to lowest emissions:

- Carbon dioxide (CO_2)
- Methane (CH_4)
- Nitrous Oxide (N_2O)
- Hydrofluorocarbons (HFC)
- Perfluorochemicals (PFC)
- Sulfur Hexafluoride (SF_6)

In April 2012, EPA published a notice of proposed rulemaking for New Source Performance Standards for Electric Generating Units. More than 2 million comments were received on that proposal and states await EPA's new proposal given the above directive from the president.

To date, the standard for existing power plants has not been developed; EPA is expected to draft the standard to follow closely the Natural Resource Defense Council (NRDC) proposal detailed in the March 2013 Report: *Closing the Power Plant Carbon Pollution Loophole*.

The NRDC proposal includes developing a target fossil fleet average emission rate with specific benchmarks for coal and oil/gas units. States like Kentucky with more carbon intensive fleets would have higher target emission rates but a greater differential between starting emission rates and their targets. The formula for calculating the state target emission rate is given below:

For 2020–2024, state/regional rate = [1,500 lbs/MWh] × [baseline coal generation share of state/region] + [1,000 lbs/MWh] × [baseline oil/gas generation share of state/region]

For 2025 and thereafter, state/regional rate = [1,200 lbs/MWh] × [baseline coal generation share of state/region] + [1,000 lbs/MWh] × [baseline oil/gas generation share of state/region]

The benchmarks established for 2020 include 1500 pounds of CO_2 per MWh for coal units and 1,000 pounds of CO_2 per MWh for natural gas and oil units.

Compliance options outlined in the NRDC proposal include (1) intrastate averaging among all fossil units, (2) credits for demand side energy efficiency programs, (3) banked compliance credits, (4) shift to lower emitting units, and (5) supply side efficiency improvements.

Photo: USDA NRCS

2012 Kentucky GHG Emissions

Although Kentucky and other states are not required to report GHG emissions on behalf of facilities, DAQ's Emissions Inventory section has collected GHG data when available through existing AP-42 emission factors. AP-42 emission factors are the numbers that industry and air quality agencies use to calculate emission rates in cases where other data are not available.

In calendar year 2012, data was collected for Kentucky emissions of carbon dioxide (106,395,291 tons annual emissions reported), methane (51,416 tons annual emissions reported), and nitrous oxide (4,001 tons annual emissions reported). In sum, there were 98,624,914 metric tons of CO_{2e} reported in calendar year 2012.

Driving both the NRDC proposal and the president's Climate Action Plan focusing on existing power plants is EPA's authority under CAA Section 111(d). Section 111 of the CAA authorizes EPA's powers to set performance standards for "source categories" (sectors) defined by the agency. Where emissions from existing sources are not controlled via other CAA regulation (and so far for GHG emissions, they are not), § 111(d) of the CAA authorizes EPA to regulate them with performance standards. Under this section, EPA sets guidelines for these standards, but the states implement them. This is accomplished through the submittal of a State Implementation Plan (SIP) to EPA for approval. States have broad flexibility to implement § 111(d) standards, though EPA retains approval power and the ability to regulate if a state fails to do so.

In light of the accelerated deadline outlined by the president, along with uncertainty around what a proposal for cutting carbon among Kentucky's existing power sector will look like, one thing is clear. Kentucky is on the cusp of significant changes that will have social, economic, and cultural impacts for every Kentuckian. Through the Division for Air Quality, Kentucky is well positioned to engage with EPA and the Obama Administration to ensure that we have the broadest flexibility possible as we move forward in meeting the challenges ahead.

NETWORKING & PARTNERSHIPS

DAQ recognizes that the environment and economy are intricately connected. That's why the division works in cooperation with the Cabinet for Economic Development on the permitting requirements for new and expanding businesses in Kentucky. For FY13, the division estimates that staff participated in approximately ten economic development projects. This represents over 2,000 new jobs with potential investments of over $500 million to Kentucky. These projects require division staff to evaluate emissions estimates, identify potential regulatory requirements, and prepare the business for permitting actions and timelines. Due to the compressed nature and economic impact of these projects, the division routinely evaluates and issues permitting actions well ahead of regulatory timeframes.

In addition to the Cabinet for Economic Development, division staff participates in several regional and national organizations. The participation in these organizations enables the division to stay connected to regional and national policy issues and gain valuable professional development opportunities. Often, division staff assume leadership roles within the organizations and are members of various subcommittees and groups. The most notable organizations that the division routinely engages are below:

SESARM: Southeastern States Air Resource Managers, Inc. is a non-profit corporation formed by the state air pollution control agencies located in the southeastern states of Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, West Virginia, and Virginia. SESARM exists to support and supplement the work of member agencies.

NACCA: The National Association of Clean Air Agencies represents air pollution control agencies in 45 states and territories and over 116 major metropolitan areas across the United States. The association serves to encourage the exchange of information among air pollution control officials, to enhance communication and cooperation among federal, state, and local regulatory agencies, and to promote good management of our air resources.

AAPCA: The Association of Air Pollution Control Agencies was formed in early 2013, representing 17 states: Alabama, Florida, Indiana, Kentucky, Louisiana, Mississippi, Nebraska, New Mexico, Nevada, North Dakota, Ohio, Pennsylvania, Tennessee, Texas, Virginia, West Virginia and Wyoming. AAPCA's main goal is to provide a technical forum for members and promote efficient and effective programs to implement the Clean Air Act.

ECOS: The Environmental Council of the States is the national non-profit, non-partisan association of state and territorial environmental agency leaders. The purpose of ECOS is to improve the capability of state environmental agencies and their leaders to protect and improve human health and the environment of the United States of America.

SEDC: The Southeast Diesel Collaborative is a voluntary, public-private partnership involving leaders from federal, state and local government, the private sector and other stakeholders throughout the southeast working to reduce diesel emissions. The Southeast Diesel Collaborative is part of the Environmental Protection Agency's National Clean Diesel Campaign.

KCFC: The Kentucky Clean Fuels Coalition is a non-profit organization whose mission is to link providers and users of fuels across Kentucky to the best information and education available about clean energy technologies. DAQ Director John Lyons served on the KCFC board in FY 2013. The Department for Environmental Protection participates in KCFC's Green Fleets of the Bluegrass program.

ENVIRONMENTAL EDUCATION

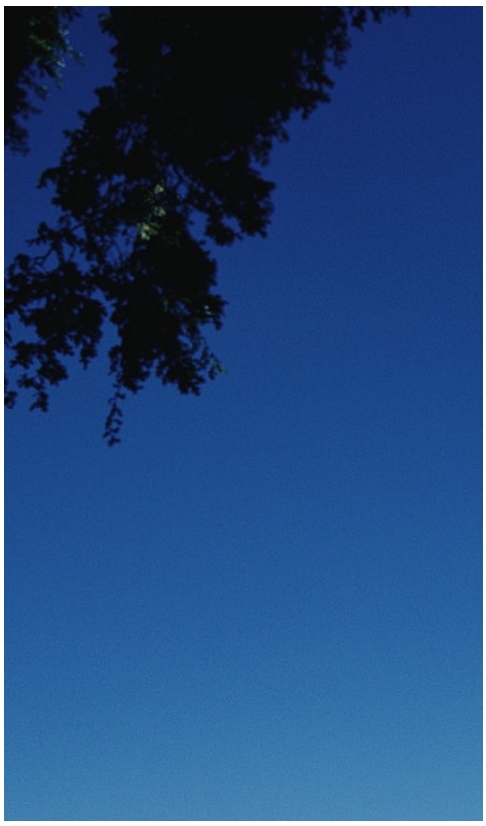
The DAQ EE program includes:
- Teacher training
- Classroom and camp programs
- Public events and festivals
- Fire fighter education
- School bus driver trainings (idle reduction)
- Community groups, forums, & conferences
- Media outreach

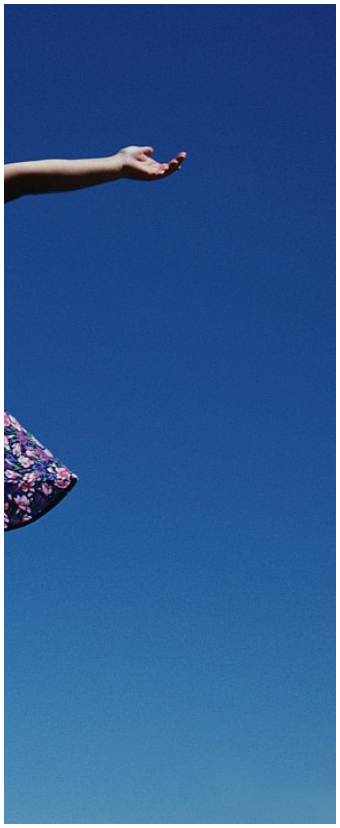
Air Quality EE program topic areas include:
- Air pollution sources & monitoring
- Open burning and waste reduction
- Indoor air quality
- Idle reduction
- Fuel economy and alternative fuels
- Hybrid-electric vehicles
- Energy conservation
- Climate change

Environmental Education (EE) is an essential tool in promoting environmental stewardship. The division utilizes EE in numerous ways to increase awareness of air quality and its importance in our lives. DAQ's EE programs promote critical thinking skills that enable individuals to make informed decisions and understand the impact of those decisions on the air we breathe.

Air quality can be a challenging topic to teach. Air is invisible, and most air pollutants are invisible too. Air is constantly in motion; light a match and the smoke soon blows away and seems to disappear. DAQ's environmental education programs seek to make the invisible *visible*, emphasizing experiential, hands-on learning whenever possible.

DAQ's EE program reaches a diverse audience across the Commonwealth including students, teachers, fire fighters, emergency management, asthma educators, businesses, and solid waste coordinators. In addition to the division's full-time EE Specialist, field office staff assist with regional outreach programs as requested. DAQ operates a toll-free Education Hotline to request educational materials or outreach: 800-928-0047.

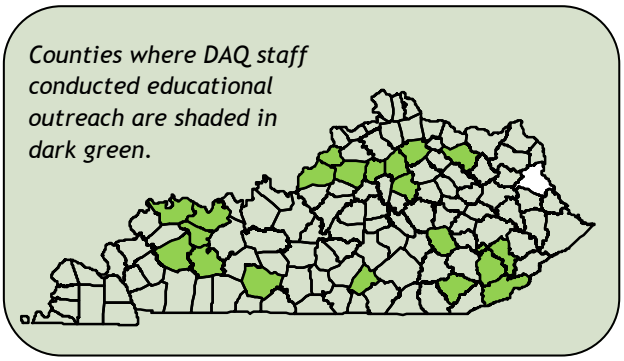




Environmental Education Outreach

DAQ's outreach program reached 7412 people in 20 counties during FY 2013. Figure 2 shows the audience and numbers for each category of outreach. Counties visited for environmental education outreach were:

Daviess	Hopkins	Oldham
Fayette	Jackson	Perry
Fleming	Jefferson	Russell
Franklin	Knox	Scott
Harlan	Leslie	Shelby
Harrison	McLean	Warren
Henderson	Muhlenberg	



DAQ's EE Specialist Roberta Burnes works with students of all ages investigating air quality topics. Photo: Deb Spillman.

School programs were by far the largest segment of our audience in FY 2013 with 3,562 students reached. The majority of these students (2,689) received direct, face-to-face contact with DAQ staff presenting educational programs about air quality and energy. DAQ staff also set up hands-on displays at school science fairs and festivals, reaching an additional 873 students. Most students were upper elementary to middle school-aged.

General public programs drew the second-largest audience (3125) as DAQ staff participated in several large festivals in April, including:

- Reforest Frankfort
- Earth Day, Hopkinsville
- Earth Day, Capitol Education Center in Frankfort
- Arbor Day, Lexington

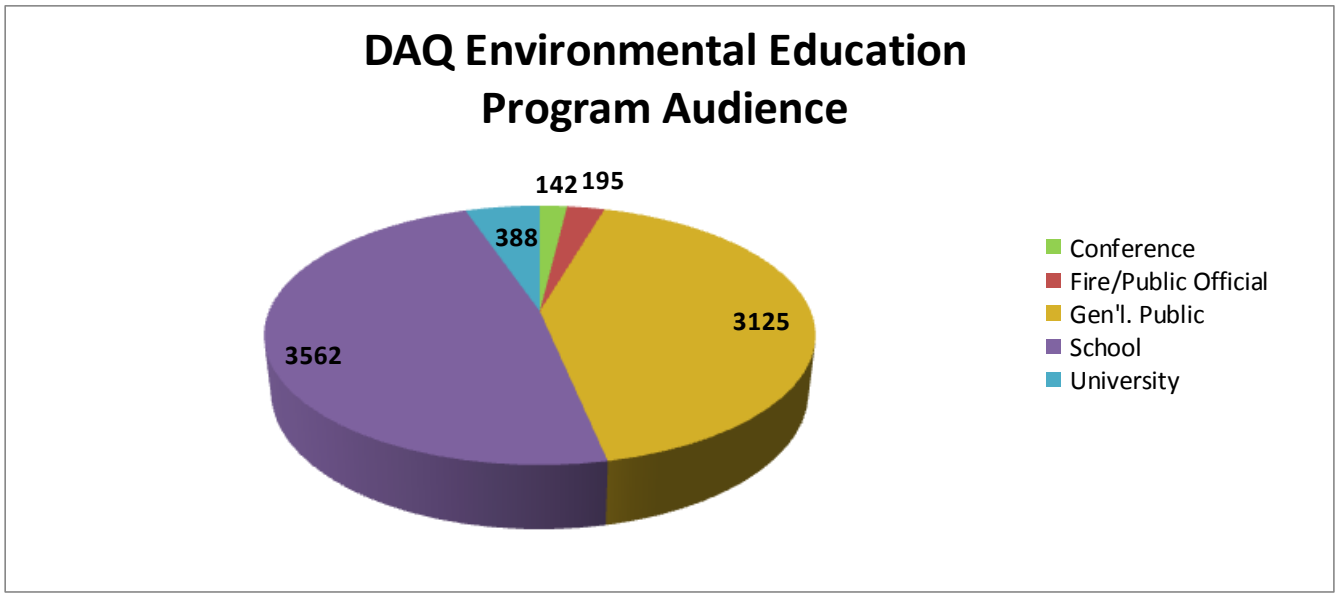


Figure 2: The Division for Air Quality's environmental education programs reached more than 7,400 people during FY 2013. School and public programs comprised 90 percent of the audience.

DAQ staff provided presentations on outdoor and indoor air quality, transportation and idle reduction, bioindicators, energy conservation, greenhouse gases, and open burning.

Students conducting an idle-reduction campaign. Photo: Julius Marks Elementary.

Idle-Reduction

DAQ continued its partnership with Fayette County Public Schools in supporting student-led, voluntary idle-reduction initiatives at five Lexington schools (Julius Marks Elementary, Morton Middle, School for the Creative & Performing Arts, Southern Elementary, and Southern Middle). Students at each school measured baseline data prior to the campaign by determining the number of idling vehicles in the carpool lane after school. Next, students conducted an awareness campaign aimed at encouraging drivers to voluntarily turn off the ignition while waiting in line. Finally, students collected data after the campaign to measure any change in idling behavior. Schools that submitted post-campaign data showed a significant reduction in idling behavior; two schools (Southern Elementary and Southern Middle) measured a more than 40 percent reduction in idling.

DAQ's open burning brochure explains Kentucky's open burning regulation in plain English.

DAQ also partnered with Commonwealth Credit Union to encourage idle reduction in the bank drive-through lanes. Idle-free messaging was added to the video kiosks in the drive-through lanes, encouraging customers to save gas and money by turning off the ignition while in line.

Open Burning

Illegal open burning continues to be a serious health concern in Kentucky. According to the EPA, backyard burning is now the leading quantified source of airborne dioxins in the U.S. Dioxins are clinically confirmed cancer-causing pollutants.

The division's primary educational tool for open burning awareness is a brochure that summarizes Kentucky's open burning regulation in plain English. The brochure lists legal and illegal burning activities, seasonal restrictions, and alternatives to open burning. In FY 2013, DAQ distributed nearly 10,000 of these brochures across the Commonwealth. Fire fighters, public officials, solid waste coordinators, and private citizens were among those requesting the brochures.

Citizens often contact local fire stations to ask about local burning ordinances or to register for burn permits. Educating these first responders about Kentucky's open burning regulation is a key part of DAQ's annual open burning awareness campaign. In areas where open burning complaints are more frequent, DAQ partners with local fire stations and media to educate the public about open burning and its connection to air quality.

Open burning billboards are funded by violators of Kentucky's open burning regulation.

DAQ's open burning awareness campaign continued at Kentucky campgrounds in FY 2013, with posters and brochures educating about the health hazards of campfire trash burning. The campfire trash burning awareness brochure was recognized by the Kentucky Association of Governmental Communicators with an Award of Merit at its annual meeting in 2013.

Violators of Kentucky's open burning regulation often wind up facing enforcement action, and for some that includes funding billboards with the "Learn before You Burn" message. The billboard was redesigned in 2013 and has been installed in Anderson, Madison, Mason, and Rowan counties. Posters, brochures, public service announcements, and other educational materials may be viewed on the division's open burning webpage at http://air.ky.gov/Pages/OpenBurning.aspx. Hard copies of posters and brochures are available upon request by calling DAQ's education hotline at 800-928-0047.

DAQ's campfire trash burning awareness brochure.

Hybrid Electric Plug-in Grant Award

In April, First Lady Jane Beshear welcomed the first electric vehicles into the state vehicle fleet in a ceremony that kicked off a day of Earth Day activities. Energy and Environment Cabinet Secretary Len Peters, Finance and Administration Cabinet Secretary Lori H. Flanery, and Division for Air Quality Director John Lyons joined the First Lady in the ribbon-cutting.

First Lady Jane Beshear and EEC Secretary Len Peters plug in one of the new Chevy Volts on Earth Day. Photo: Jon Trout.

The First Lady led the ceremony surrounded by four new Chevy Volts and two charging stations that were installed outside the headquarters for the Department for Environmental Protection.

The vehicles and charging stations are being used by state workers conducting official business on behalf of the Commonwealth. DAQ's environmental education program also uses the vehicles to demonstrate to students and the public the latest in green technologies.

Chevy Volts combine both hybrid and electric plug-in technology with a gasoline-powered generator, resulting in fewer tailpipe emissions and more miles per gallon than comparable, conventional vehicles.

Purchase of the vehicles and charging stations was made possible by grant funding administered by the Kentucky Clean Fuels Coalition.

DAQ wrote and received the grant on behalf of the Department for Environmental Protection. Funding paid for the cost differential between the Volt and a conventional, non-electric vehicle, as well as the total cost of two charging stations.

Two of the vehicles were wrapped with an eye-catching design to emphasize their eco-friendly potential. DAQ received an Honorable Mention award from the Kentucky Association for Governmental Communicators for the design concept of the Volt wrap. The Volts are in great demand for educational outreach and have made appearances at festivals, schools, and other events since they were purchased.

One of the Department for Environmental Protection's new hybrid-electric plug-in vehicles. Photo: DAQ

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 wide variety of strategies are utilized by SEDC partners to achieve these reductions, including idle reduction, alternative fuels, and engine retrofits, replacements and repowers. Federal funds, authorized by the Diesel Emissions Reduction Act (DERA), help SEDC partners employ the above strategies in the multiple diesel sectors involved. DAQ staff maintain an active presence in the SEDC. This year, DAQ's Laura Begin took on the role of an EPA-appointed member of the SEDC Strategic Planning Committee. The Strategic Planning Committee is responsible for developing the overarching goals and priorities for the SEDC, as well as providing support for the completion of the actions needed to achieve these goals and priorities.

Kentucky Clean Diesel Grant Program

Since 2008, the Division for Air Quality has received federal funding through DERA to help Kentucky schools, local governments, and businesses reduce diesel emissions from their fleets. In FY 2013, DAQ completed working with the EPA-issued FY 2008-2011 DERA grant. Over those four years, $986,257 was spent on clean diesel projects throughout Kentucky, such as retrofitting diesel vehicles with diesel particulate filters or auxiliary power units, and repowering or replacing old diesel engines.

As of December 2012, DAQ's Clean Diesel Grant program had resulted in lifetime reductions of:

- 215 tons of NO_x
- 14 tons of PM
- 20 tons of hydrocarbons
- 103 tons of carbon monoxide
- 193 tons of carbon dioxide

On Oct. 1, 2012, DAQ began working with the FY 12 DERA grant. Crittenden County Board of Education and Louisville Metro Government were selected to receive funding. Crittenden County used the funding to retrofit school buses and replace one old diesel bus with a new propane bus; Louisville Metro Government used its funding to retrofit refuse haulers.

In addition, DAQ worked to procure additional DERA funds by submitting a Notice of Intent to Participate and subsequent Work Plan and revised budget to EPA outlining the division's plan for utilizing FY-13 DERA funds. These funds, if awarded, will be made available to the division on October 1, 2013.

Green Fleets of the Bluegrass

Since July 2011, the department has been a Pioneering Member of the Green Fleets of the Bluegrass Program. Sponsored by the Kentucky Clean Fuels Coalition (KCFC), Green Fleets is a voluntary program that aims to improve the environmental performance of public and private vehicle fleets across Kentucky by reducing petroleum fuel use. Participating fleets are evaluated on an annual basis on seven criteria: Vehicles, Fuel, Maintenance, Operation, Partnerships, Strategy, and Transparency. Guiding DEP efforts are the fleet efficiency standards outlined in the Governor's 2007 Energy Plan, which aims for 50 percent improvement by 2025.

To help achieve this goal, the division led efforts within the DEP motor pool to downsize the fleet to the smallest and most fuel efficient vehicles. Leading the way in FY13, the department installed two charging stations and began operating four Chevy Volts (see *Hybrid Electric Plug-In Grant Award* on page 13). In just over 60 days of operation, the four Volts were driven for a total of 20,510 miles. This equates to approximately 6,000 pounds of CO_2 emission avoided and a fuel cost of $0.07 per mile, compared to a conventional, gasoline-only vehicle achieving $0.14 per mile.

Through "right-sizing" and converting to more fuel efficient vehicles, the department is driving a higher percentage of "green" miles. DEP's current fleet includes 23 light-duty hybrid-electric vehicles as well as the four hybrid-electric plug-ins. The division is constantly identifying ways to increase future performance and be a leader in the green fleet arena. Future efforts to improve the fleet include:

- Adopting an idle-reduction policy
- Establishing a renewable fuel standard for the fleet
- Improving maintenance of the fleet
- Education and outreach to staff on eco-driving

Kentucky Association for Environmental Education

DAQ is an Institutional Member of the Kentucky Association for Environmental Education (KAEE), sponsoring the organization's annual conference in September. This year, DAQ Environmental Education Specialist Roberta Burnes served as Vice-President of KAEE. DAQ also presented at KAEE's annual conference and at the annual meeting of the North American Association for Environmental Education.

FIELD OPERATIONS

The Field Operations Branch (FOB) is the largest branch of the division and is currently staffed by 65 employees that include supervisors, administrative staff, air source inspectors, asbestos inspectors, field support staff, and air monitoring specialists. The majority of FOB field staff are located in eight regional offices, and have the following primary duties:

1) Complete unannounced inspections to ensure that permitted facilities and non-permitted entities maintain compliance with federal and/or state air quality regulations;

2) Operate and maintain 110 air monitoring units located at 33 stations scattered throughout the state to measure ambient air quality and determine whether pollutant concentrations remain within EPA established limits; and

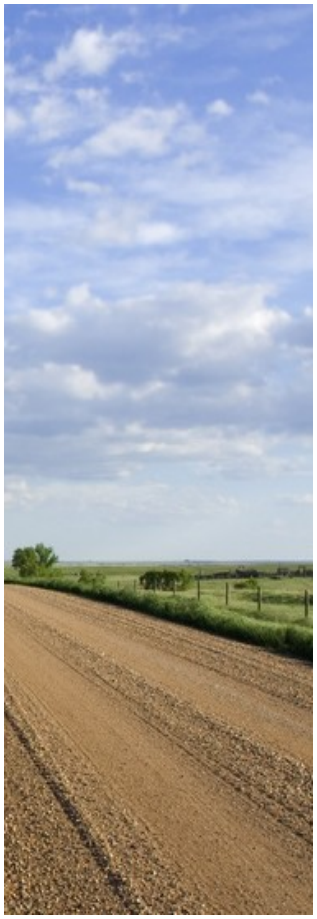
3) Investigate air quality complaints received from the general public and other sources each year.

Inspections

One of the primary duties of the FOB is to inspect sources of air pollution for compliance with air quality regulations and if applicable, permit conditions. The measures for the success of FOB's compliance-monitoring program are:

"In the past year, excellent staff retention and experience have enabled the Field Operations Branch to conduct a high number of source inspections. This includes the highest-ever number of inspections at major sources of air pollution in one year. In addition, field staff respond to complaints and work with DAQ's education program to conduct community outreach."

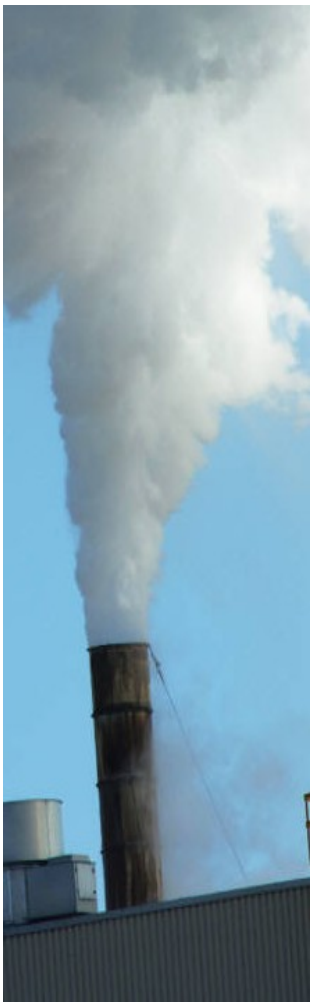
Kevin Flowers
Field Operations
Branch Manager



· Number of major stationary source inspections conducted (Figure 4);
· Number of minor stationary source inspections conducted (Figure 5);
· Number of asbestos inspections conducted (Figure 14);
· Compliance rate of stationary source inspections (Figure 6);
· Rate of compliance with 401 KAR 63:005 - open burning (Figures 8 & 9);
· Rate of compliance with 401 KAR 63:010 - fugitive emissions (Figures 10 & 11); and
· Rate of compliance with 401 KAR 53:010 - odor (Figures 12 & 13).

In calendar year 2012, FOB staff completed 3,919 compliance inspections of various types at either non-permitted or permitted sources (major Title V, minor). Types of inspections included full compliance evaluations, partial compliance evaluations, records reviews, compliance demonstrations (stack tests), asbestos inspections, follow-up inspections of documented violations, and self-initiated inspections of suspected violators.

The regional offices with more inspections for major facilities (Figure 4) are located in areas of the state with a higher number of major permitted facilities, which include power plants, manufacturing facilities and chemical processing plants. The regional offices with more inspections for minor sources tend to be located in areas of the state with a smaller population base, leading to more minor pollution sources, such as auto body/paint shops, dry cleaners, non-coal mineral processing facilities, and coal-mining related activities (Figure 5).



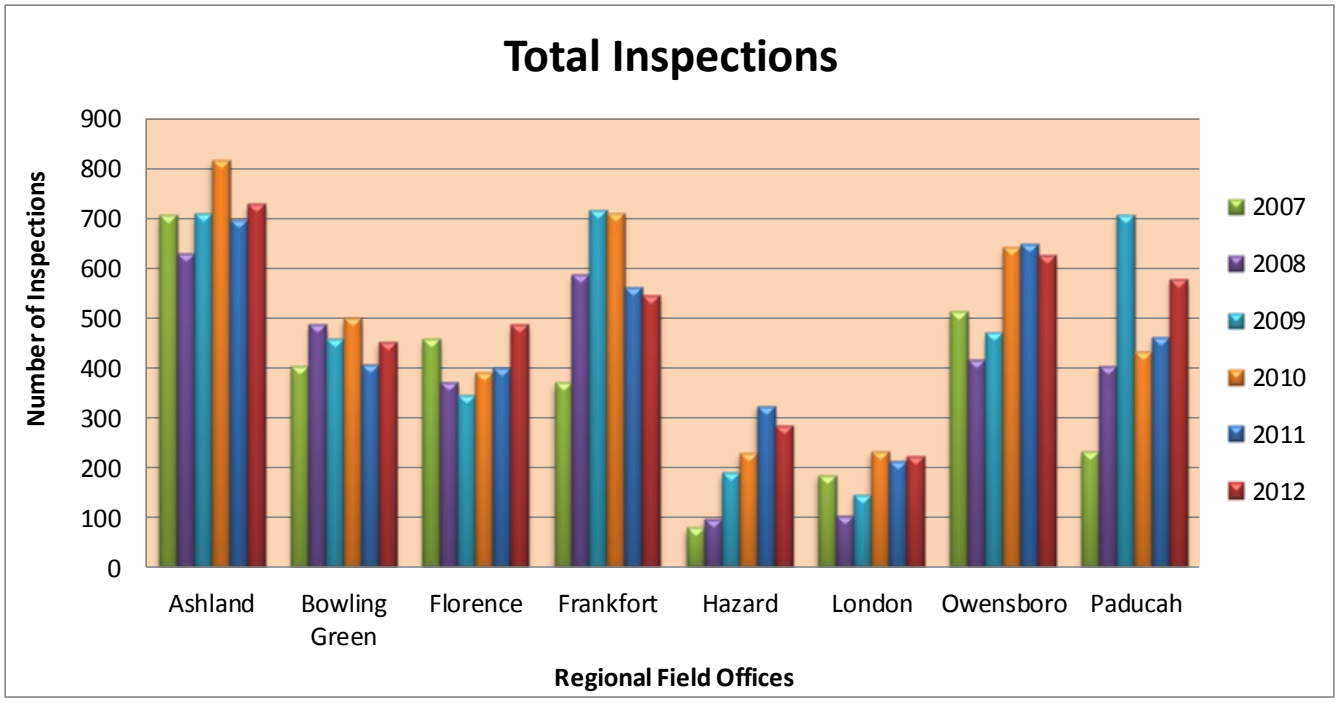


Figure 3: The total number of inspections at regulated facilities may vary based on vacancies in staffing or staff tenure in a particular office.

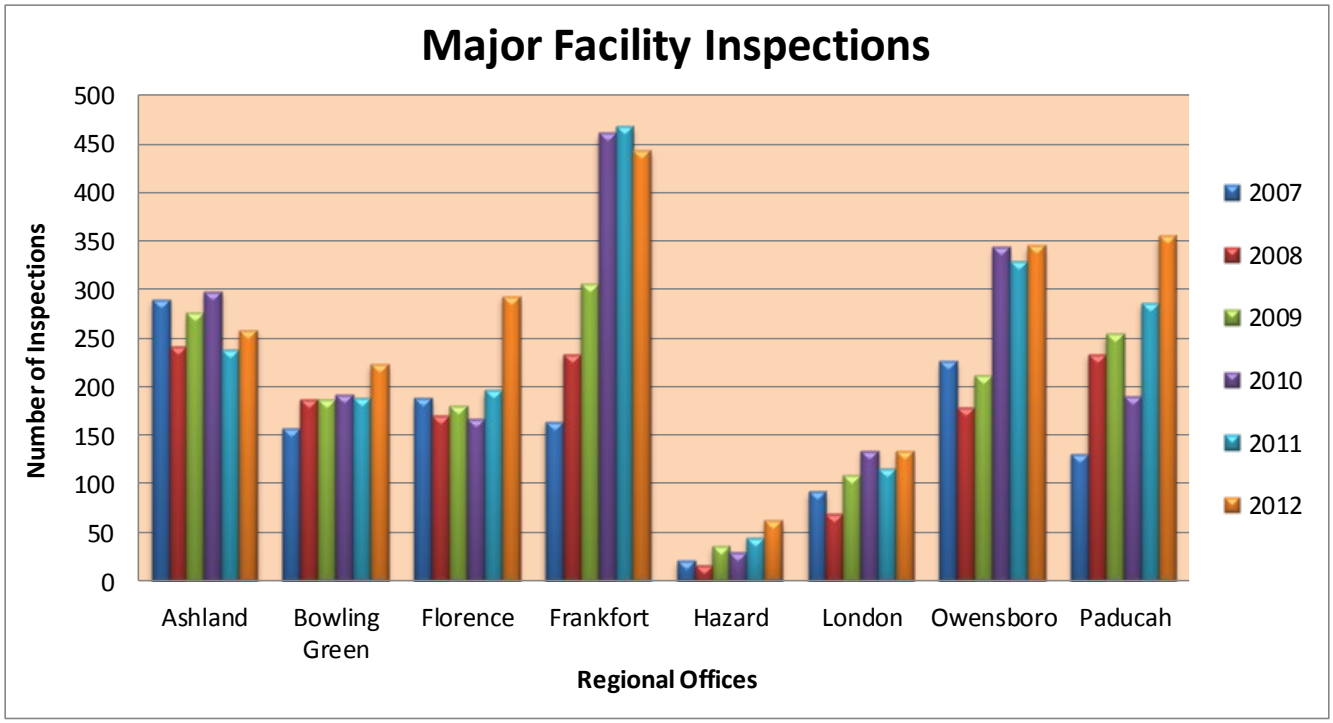


Figure 4: Number of major stationary facility inspections in Kentucky. The regional offices with more inspections are located in areas of the state with more major permitted facilities. Major permitted facilities include power plants, manufacturing facilities and chemical processing plants.

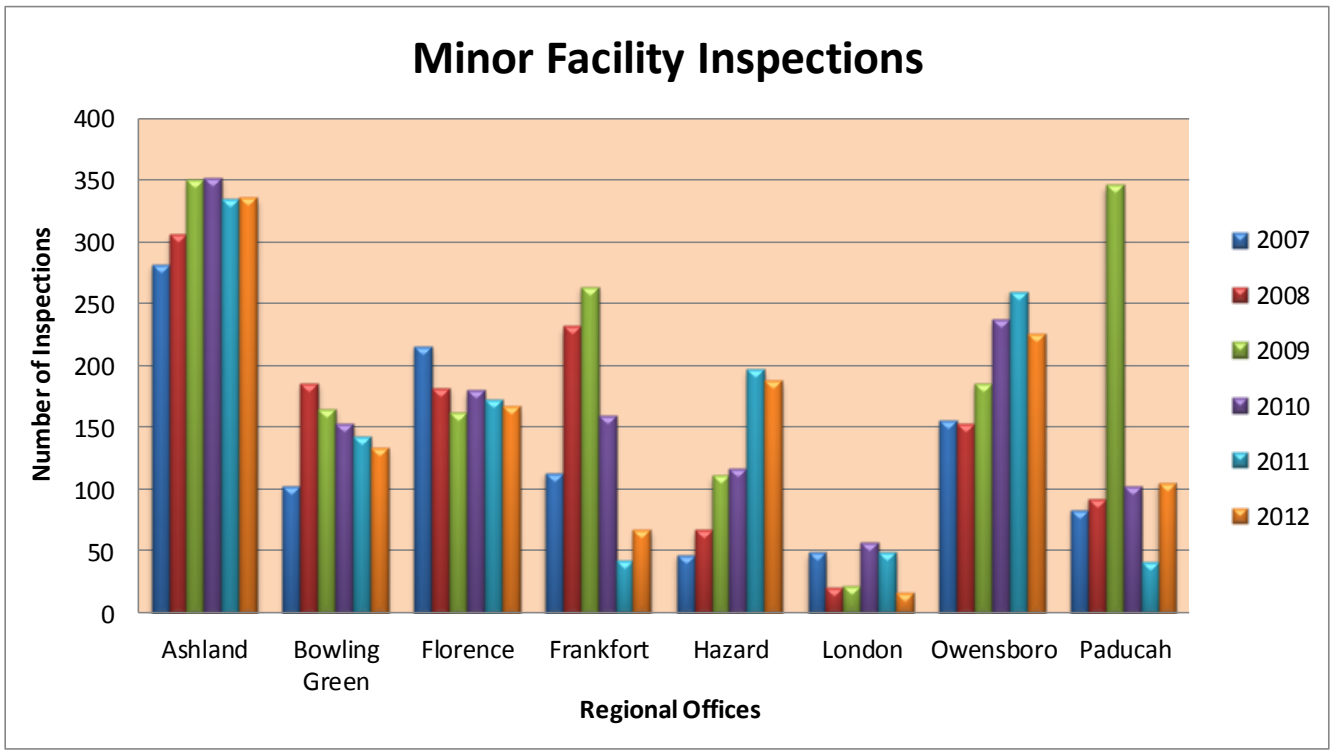


Figure 5: Number of minor stationary source inspections, 2007-2012. Minor pollution sources include auto body paint shops, dry cleaners, and non-coal mineral processing facilities.

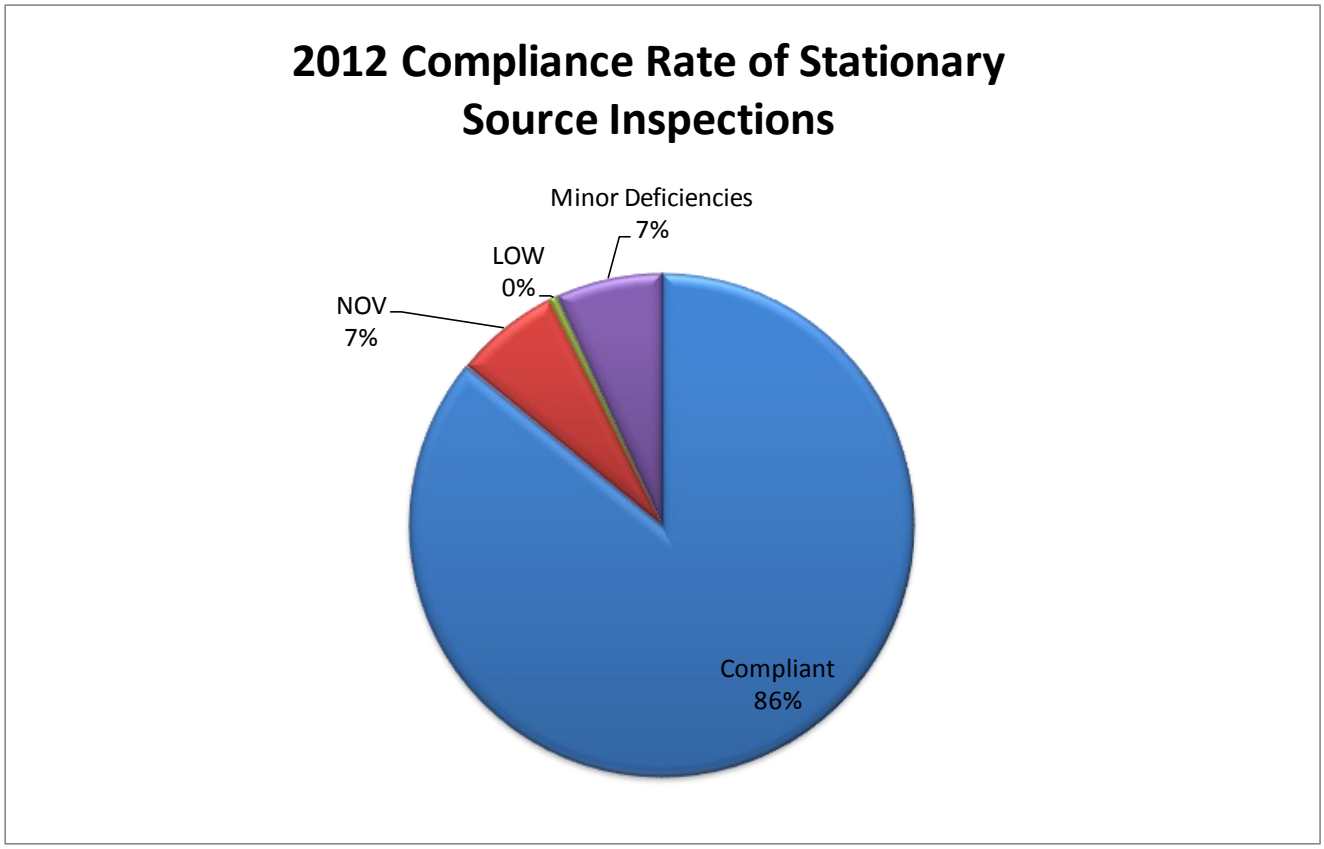


Figure 6: The compliance rate of regulated stationary sources inspected by field office staff in 2012 was 86 percent. Notices of Violation (NOV) were issued to 7 percent of Kentucky's stationary sources, while Letters of Warning (LOW) were below 1 percent. About 7 percent of violations were considered non-recurrent minor violations or violations that were quickly corrected, eliminating the need for any formal enforcement action.

Complaint Investigations

Investigating complaints continues to consume a significant portion of field office staff time. In 2012, field office inspectors received a total of 1,636 complaints resulting in 1,300 field investigations.

The 1,300 complaint investigations combined with the 3,919 facility inspections resulted in the issuance of 582 Notices of Violation and 57 referrals to the Division of Enforcement for additional enforcement action. Data on the rates of violations resulting from investigations are included in figures 9, 11, and 13. The violation rates for illegal open burning continue to be high, since staff only respond to citizen complaints of open burning or as we discover them in the course of other duties. Kentucky does not have a statewide open burn permit program, so total number of actual open burns is unknown. In 2012, 45 percent of 753 open burning complaints resulted in citations for illegal open burning.

Fugitive emissions complaints and violations are related to yearly precipitation patterns. During periods of prolonged drought periods, both the number of complaints and violations generally increases. For example, as observed in Figures 10 and 11, the highest number of fugitive emissions complaints (387) and greatest percentage of violations (34 percent) occurred in 2007 during which a very prolonged drought occurred and annual average precipitation in the state was 43.42 inches. During 2011, the average annual precipitation total of over 63 inches was most likely the cause of the lowest percentage (18 percent) of fugitive emissions violations in the last six years.

Odor complaints continue to vary through the years, with the number of odor complaints peaking in 2008 (492) as compared to 339 complaints in 2012 (Figure 12). The rate of violations per odor complaint received peaked in 2007 at 5 percent as compared to 2.9 percent in 2012.

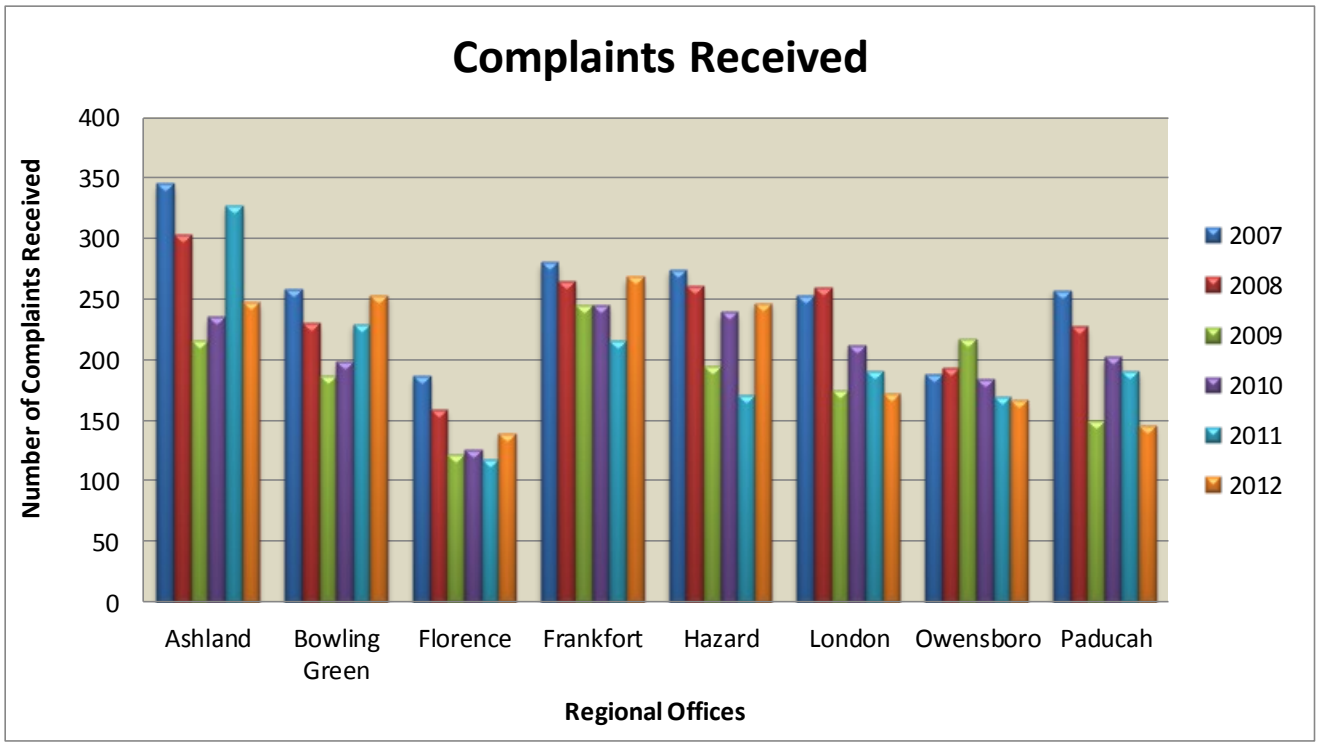


Figure 7: The numbers of complaints received during the last six years including open burning, fugitive emissions, odor, and asbestos complaints.

An example of illegal open burning. Burning illegal materials like trash and demolition debris releases toxic chemicals and particulate matter into the air.

Fugitive emissions from grain loading. State regulation requires control measures to reduce fugitive emissions and their impact on air quality.

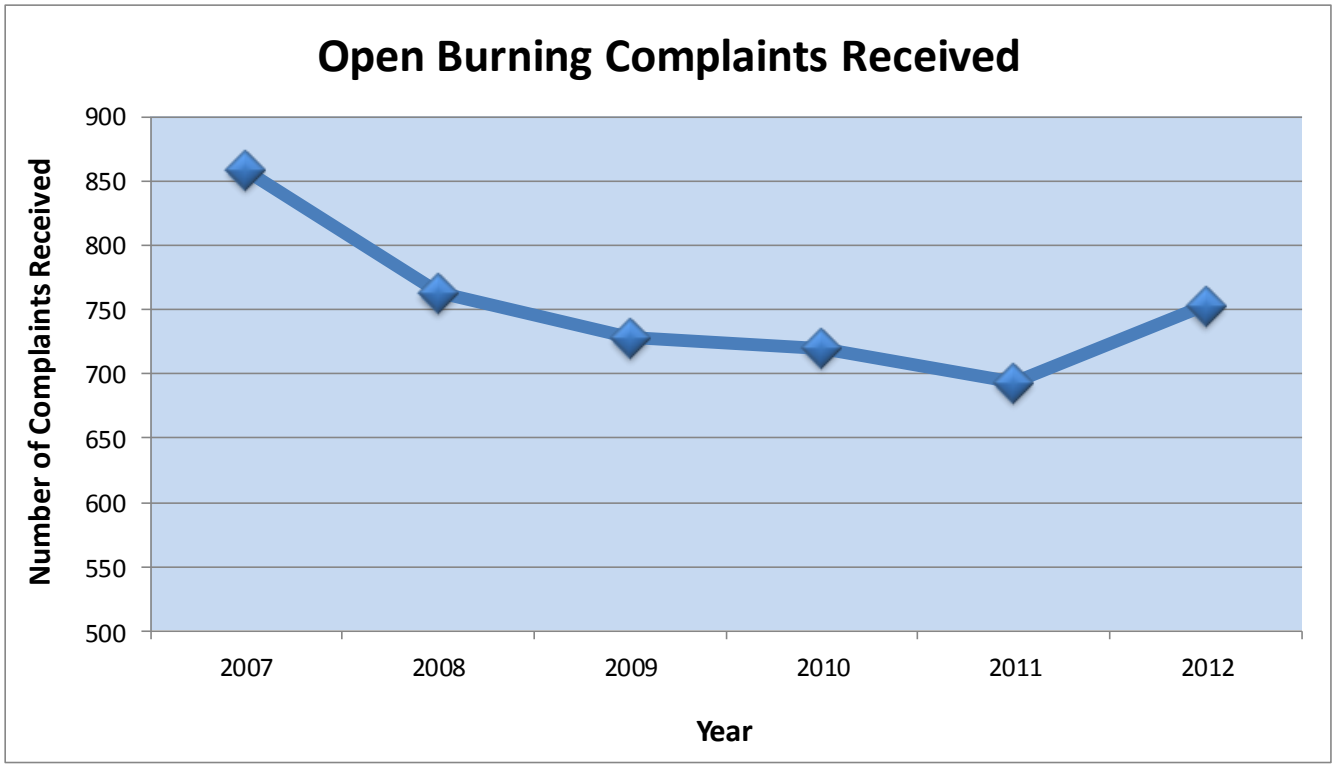


Figure 8: Complaints received about open burning. Education and outreach campaigns targeting illegal open burning may be responsible for the overall downward trend in open burning complaints.

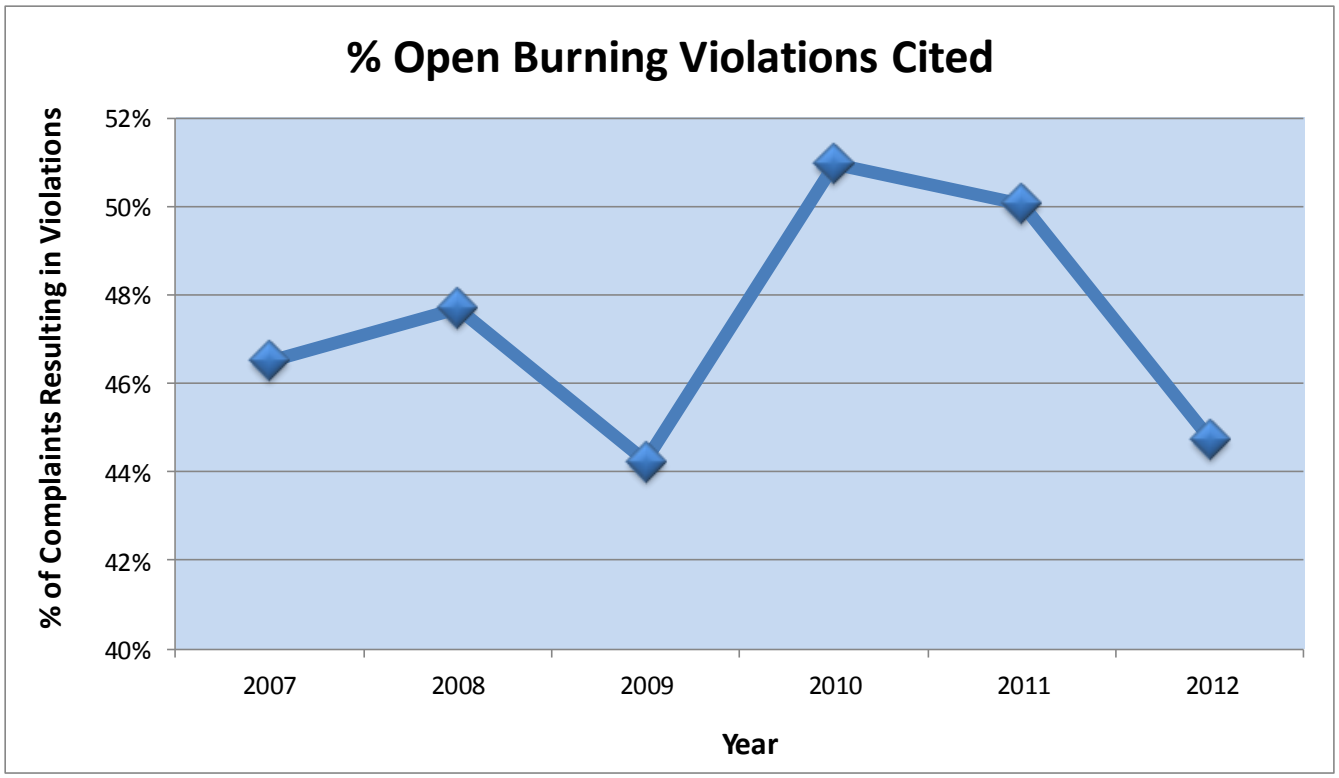


Figure 9: Non-compliance with the open burn regulation. While the number of open burn complaints has been decreasing since 2007 until 2012, the percentage of violations cited has remained fairly constant.

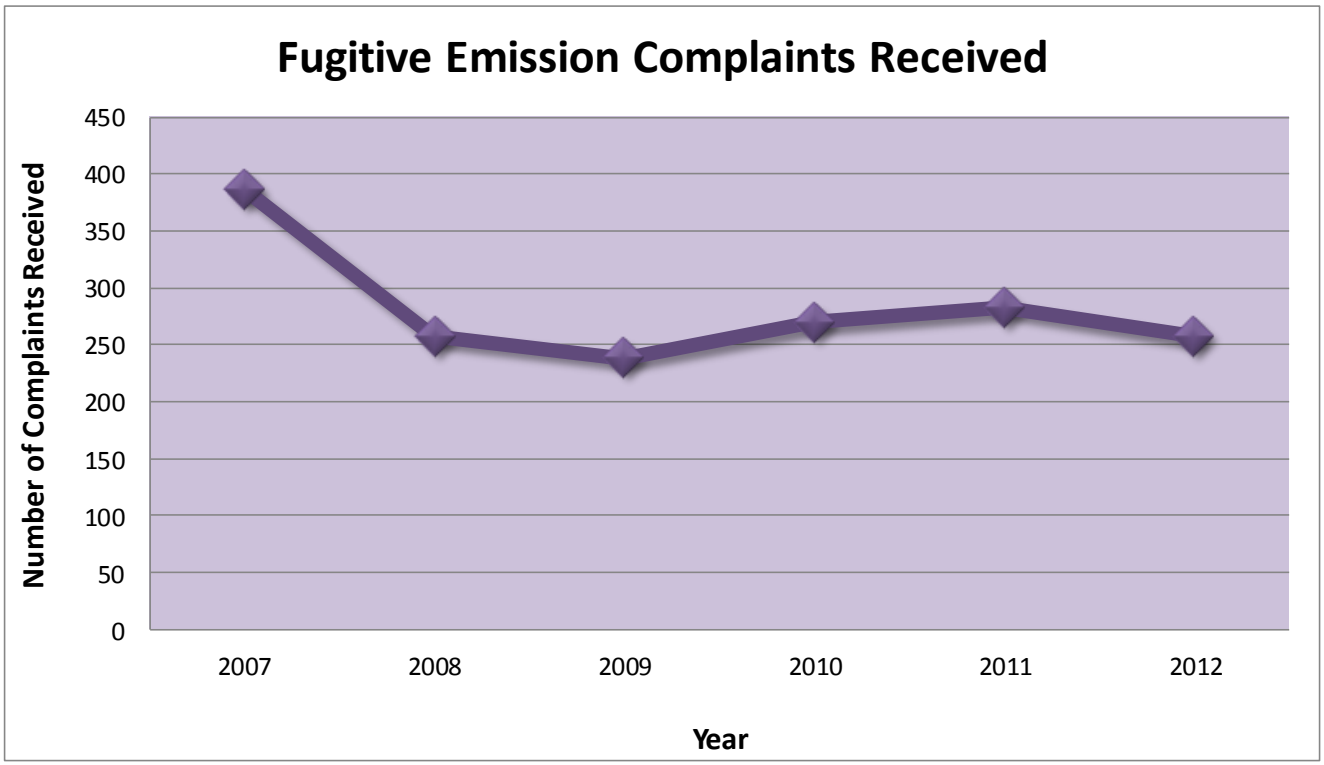


Figure 10: Complaints received about fugitive emissions. Fugitive emissions are those that do not come from a stack. Common fugitive emissions are dust from haul roads, quarries, conveyor systems, etc. The spike in 2007 is attributed to a significant drought that occurred during that year.

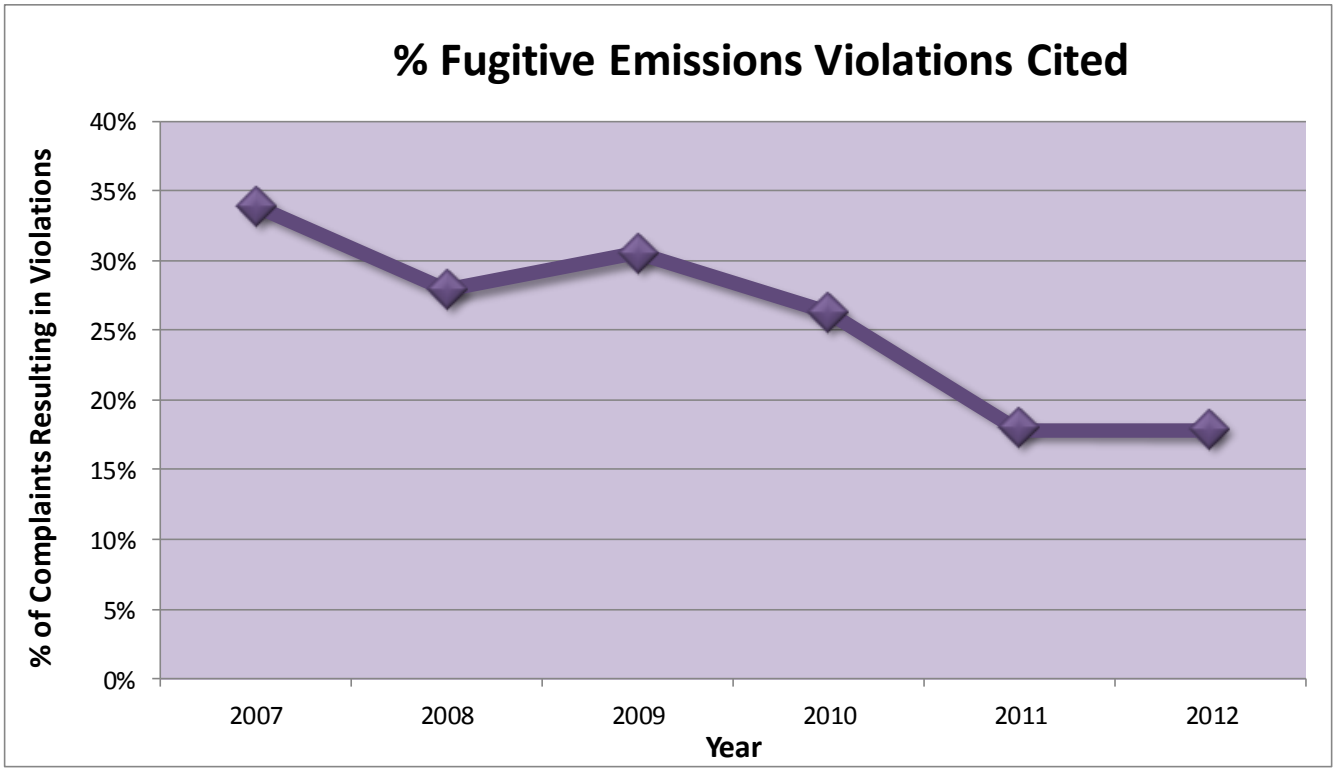


Figure 11: The percentage of fugitive emission violations cited per complaint received peaked in 2007 and has fallen since then. The drought of 2007 may have contributed to the spike in fugitive emission complaints and violations received in that year. Dry conditions contribute to the formation of fugitive dust.

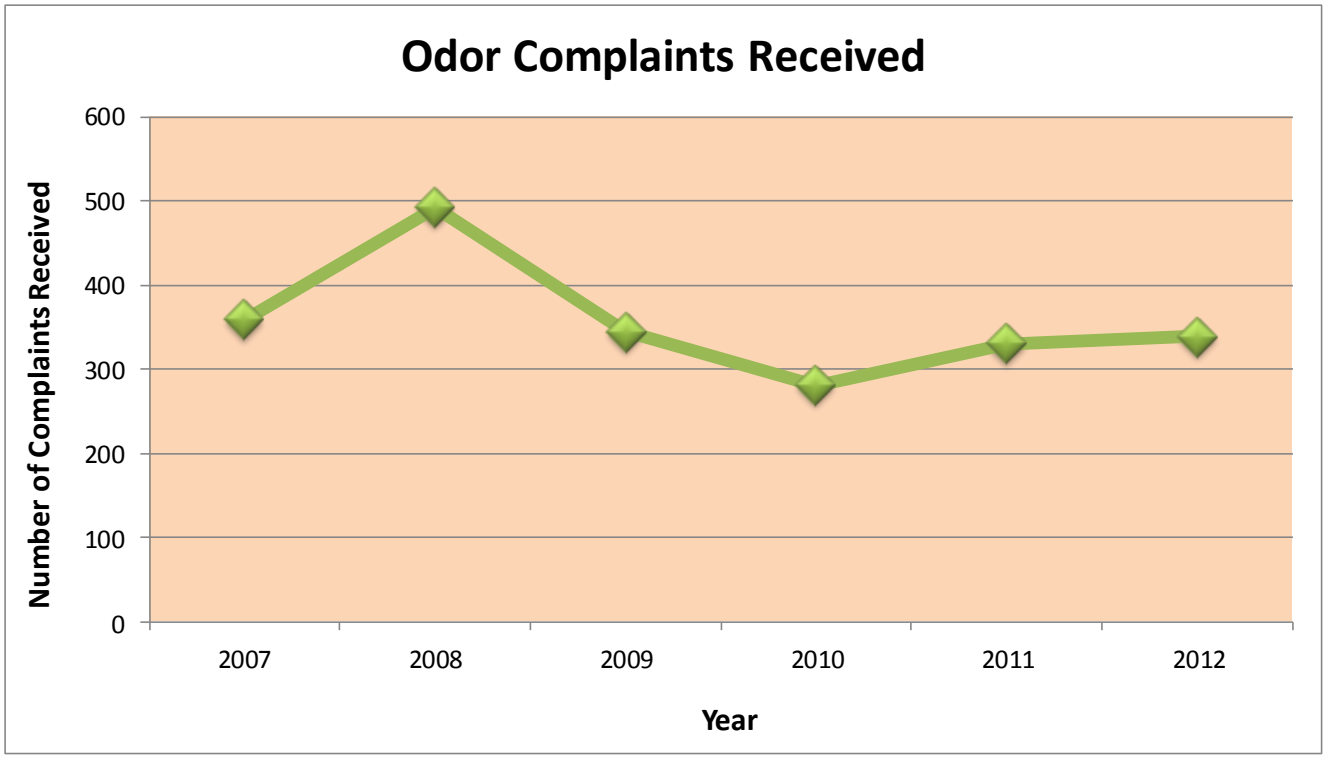


Figure 12: The number of odor complaints have varied throughout the years, with a peak experienced in 2008. Odor violations occur when an inspector can smell the odor through a "scentometer," which dilutes the ambient air at a ratio of seven to one.

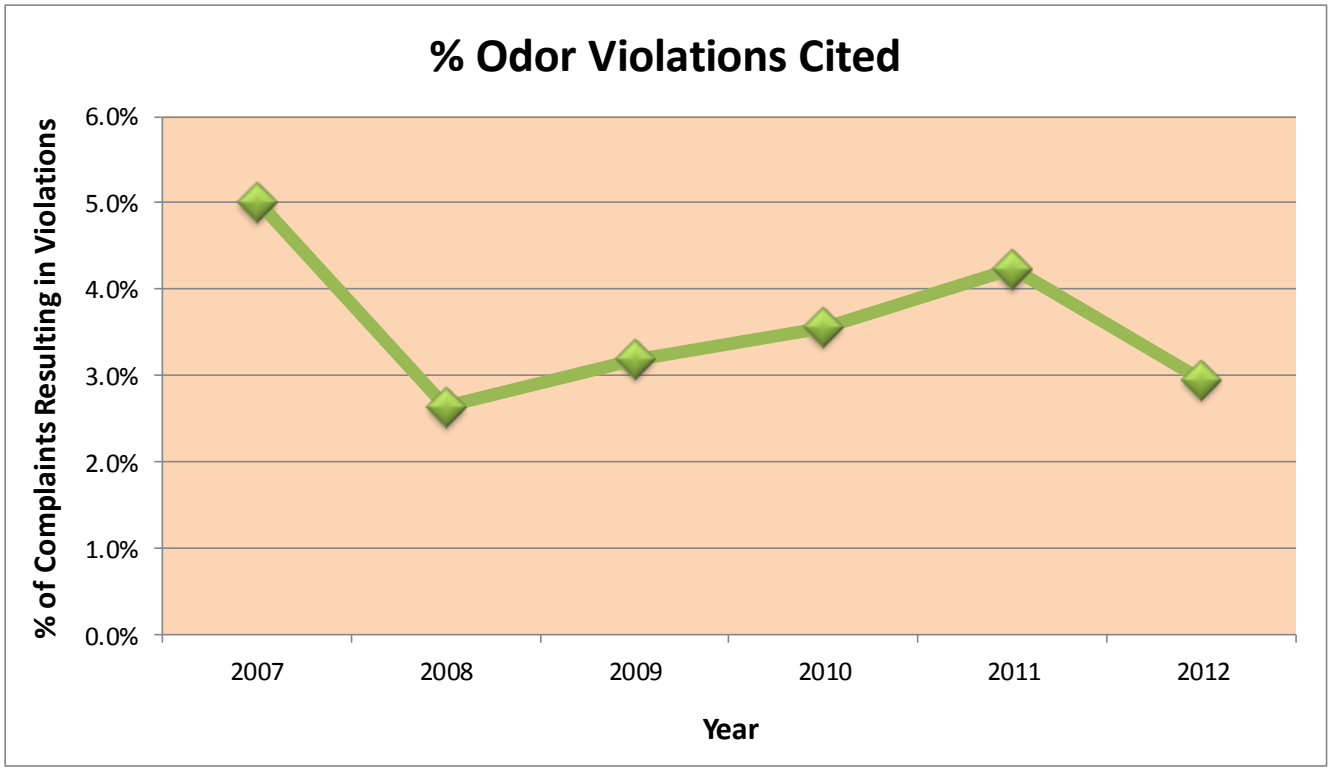
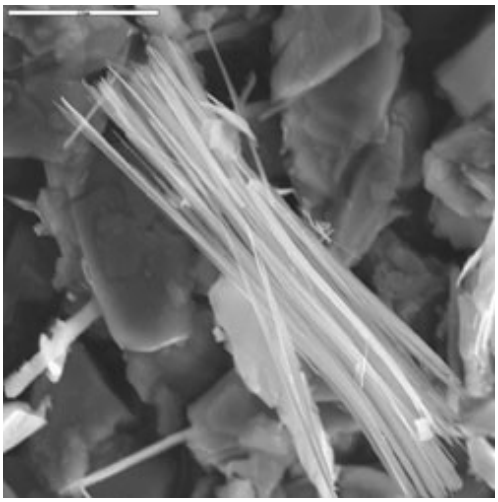


Figure 13: Though no steady trend is notable, the overall violation rate is very low. Strong and steady odors are often required to document a violation of the Kentucky odor standard. Many odors not rising to the level of a violation are, nevertheless, corrected through cooperative efforts between the inspector and responsible party.

Asbestos



Micrograph of tremolite asbestos fibers. Photo: U.S. Geological Survey.

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 most other asbestos-containing 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 material can be safely maintained if it is kept in good condition. Before renovating or demolishing a structure, it should be checked for asbestos by a qualified professional. If 160 square, 260 linear, or 35 cubic feet or more 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.

Asbestos removals associated with renovations and demolitions are regulated by the division 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 surveyed 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

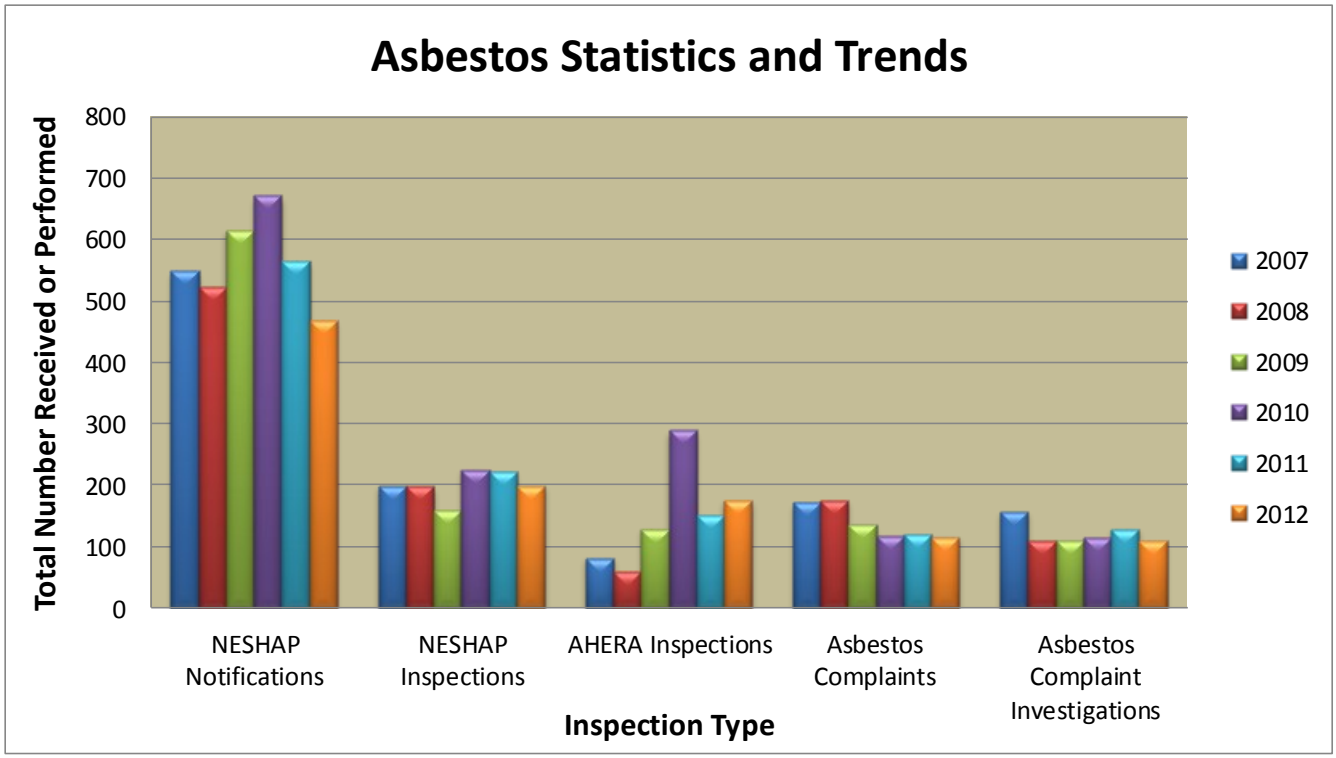


Figure 14: From 2007 to 2012, the average number of NESHAP inspections fluctuated slightly based on the number of demolition/renovation (NESHAP) notifications received by the regional offices. In recent years AHERA inspections have increased due to increased emphasis on AHERA inspections by management. In general, asbestos inspections are subject to vary more than non-asbestos inspections because there are much fewer asbestos inspectors.

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

Measures tracked by the division to evaluate the asbestos program's success (Figure 14) are as follows:

· Number of asbestos NESHAP and AHERA inspections conducted;
· Number of asbestos complaint investigations conducted; and
· Compliance rate of NESHAP and AHERA related inspections and investigations.

In the case of AHERA inspections, the division'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. In 2012, the compliance rate for NESHAP was 76 percent (Figure 15) while the compliance rate for AHERA was 52 percent (Figure 16).

Asbestos ceiling tile. Photo: Division for Air Quality

Torn asbestos pipe wrapping. Photo: Health and Safety Executive, United Kingdom.

Example of non-friable asbestos floor tile. Photo: Townsville Asbestos Pty Ltd.

What is Asbestos?

Asbestos is a silicate mineral fiber that occurs naturally in rock and soil. It has been widely used in manufacturing because of its fiber strength, low cost, and resistance to heat and acid. Asbestos has also been used in a wide range of manufactured goods including building materials (roofing shingles, ceiling and floor tiles, paper products, and asbestos cement products), friction products (automobile clutch, brake, and transmission parts), heat-resistant fabrics, packaging, gaskets, and coatings.

Breathing asbestos fibers can lead to an increased risk of asbestosis, lung cancer, and mesothelioma. The symptoms for these diseases often don't appear for 20 to 30 years after the first exposure.

Asbestos products can be categorized by the terms 'friable' and 'non-friable'. Non-friable asbestos products are not likely to release significant levels of fibers because the fibers are locked into the materials. In order to release fibers from non-friable asbestos products like floor tile you would need to cut, sand, grind or abrade the product.

Non-friable product examples (containing more than 1 percent asbestos) include:

- gaskets
- resilient floor covering
- asphalt roofing products
- floor mastics

Friable asbestos products, on the other hand, release fibers easily when disturbed or damaged because the asbestos fibers are not locked into a substrate material.

Friable product examples include:

- ceiling tile
- thermal systems insulation
- fire proofing
- sound proofing

It's important to remember that most asbestos products present little risk if they are in good condition and are not disturbed. Friable asbestos poses the most risk of fiber release when damaged or disturbed. Under these conditions the material should be handled by trained individuals using proper Personal Protective Equipment. Non-friable products pose little threat of fiber release unless the products are subjected to cutting, sanding, grinding or abrading.

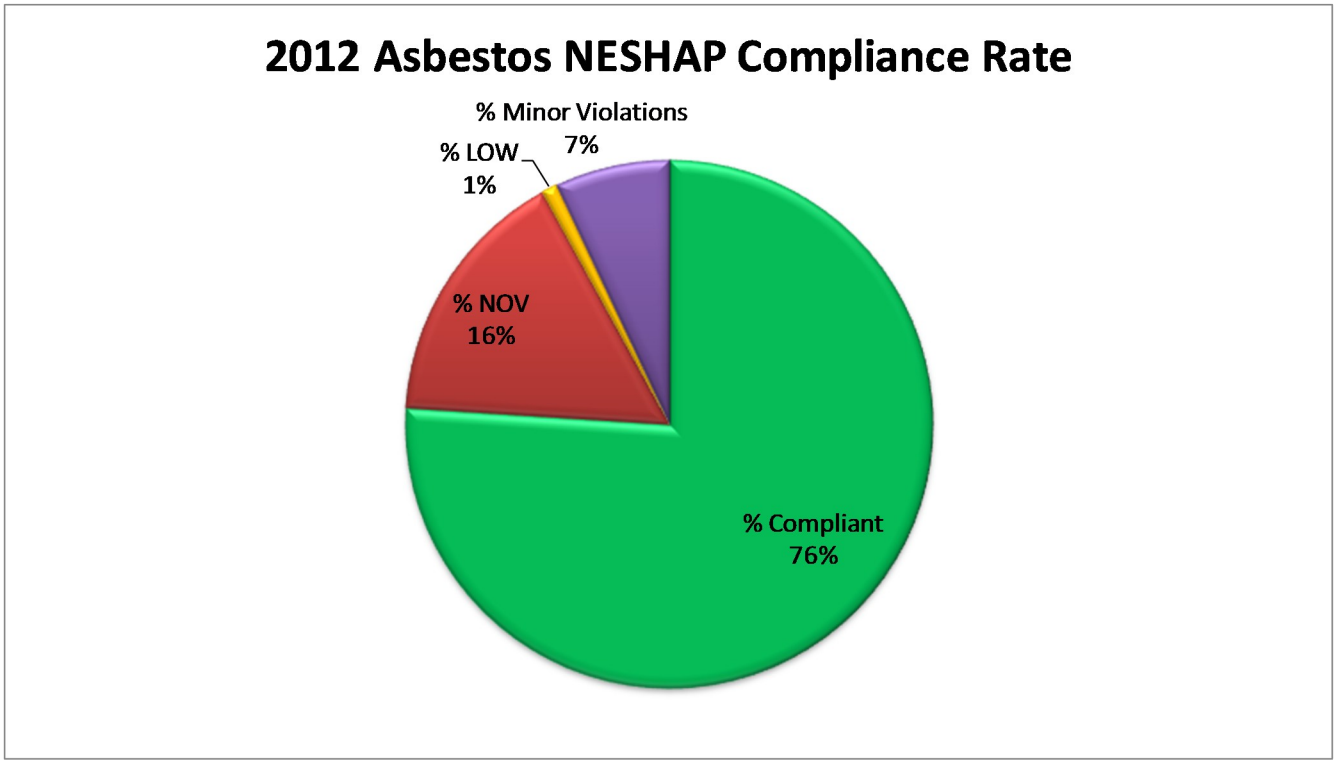


Figure 15: Compliance rate of asbestos removal and/or demolition operations regulated under the National Emission Standards for Hazardous Air Pollutants (NESHAP).

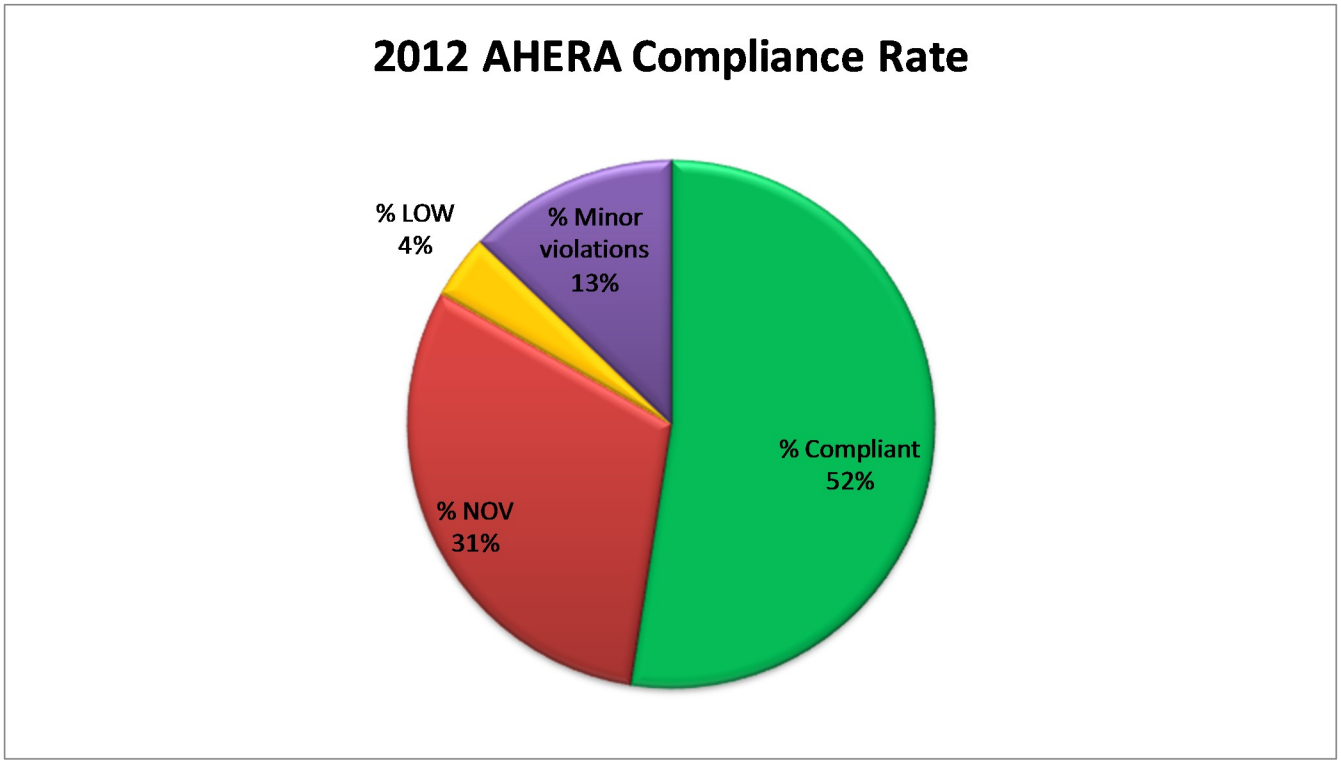


Figure 16: Compliance rate of school inspections for asbestos under the Asbestos Hazard Emergency Response Act (AHERA). The lower percentage of compliance with the AHERA program (52 percent) as compared to the NESHAP (76 percent) is possibly due to lack of AHERA training for school staff or frequent turnover of staff responsible for implementing the program. This is one reason the division has increased its inspection oversight in an effort to improve the compliance rate.

PERMIT REVIEW

The Permit Review Branch is divided into several specialized sections:

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.

"DAQ's Permit Review Branch has the challenging task of reviewing applications in a timely manner while incorporating increasingly complex regulations."

Rick Shewekah
Permit Review
Branch Manager

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, Pre-stress 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

Air Toxics Section - Provide branch with support in the field of air toxics.

Permit Review Branch: Goals and Objectives

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. To date, the backlog of permits beyond the regulatory time frame (RTF) remains at a manageable level.

At the close of Fiscal Year 2013, PRB had 187 pending applications in-house. Forty-nine of the applications were beyond RTF. It is projected that the majority of the current applications beyond RTF will be issued by December 2013.

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

- The total number of permits pending (Figure 18).
- The total number of permits pending that exceed RTF (Figure 18).
- A comparison between the numbers of new applications versus completed reviews (Figure 19).
- The on-going percentage of permit reviews that exceed and are within RTF (Figure 20).

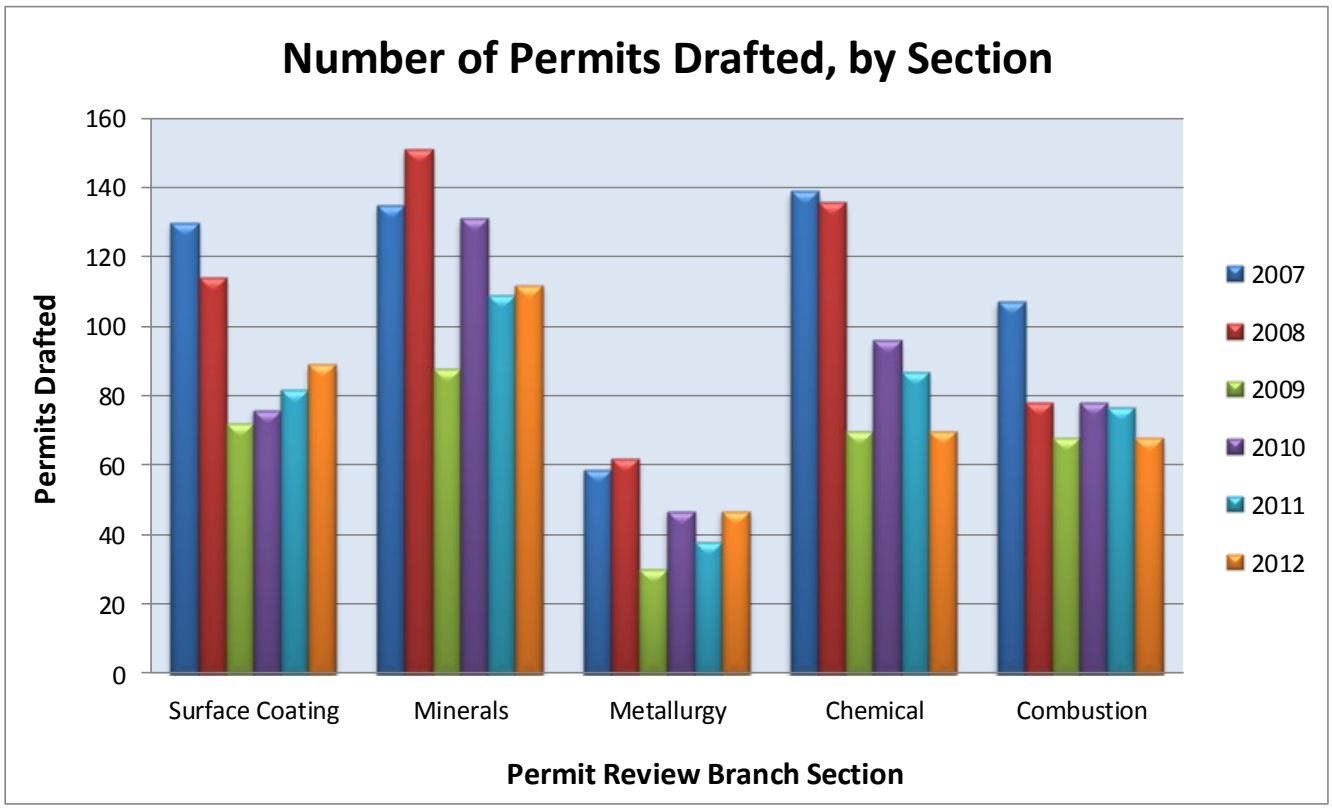


Figure 17: In calendar year 2012, the division drafted 386 permits, depicted here by section category. The minerals section issued the highest number of permits followed by chemical and surface coating sections.

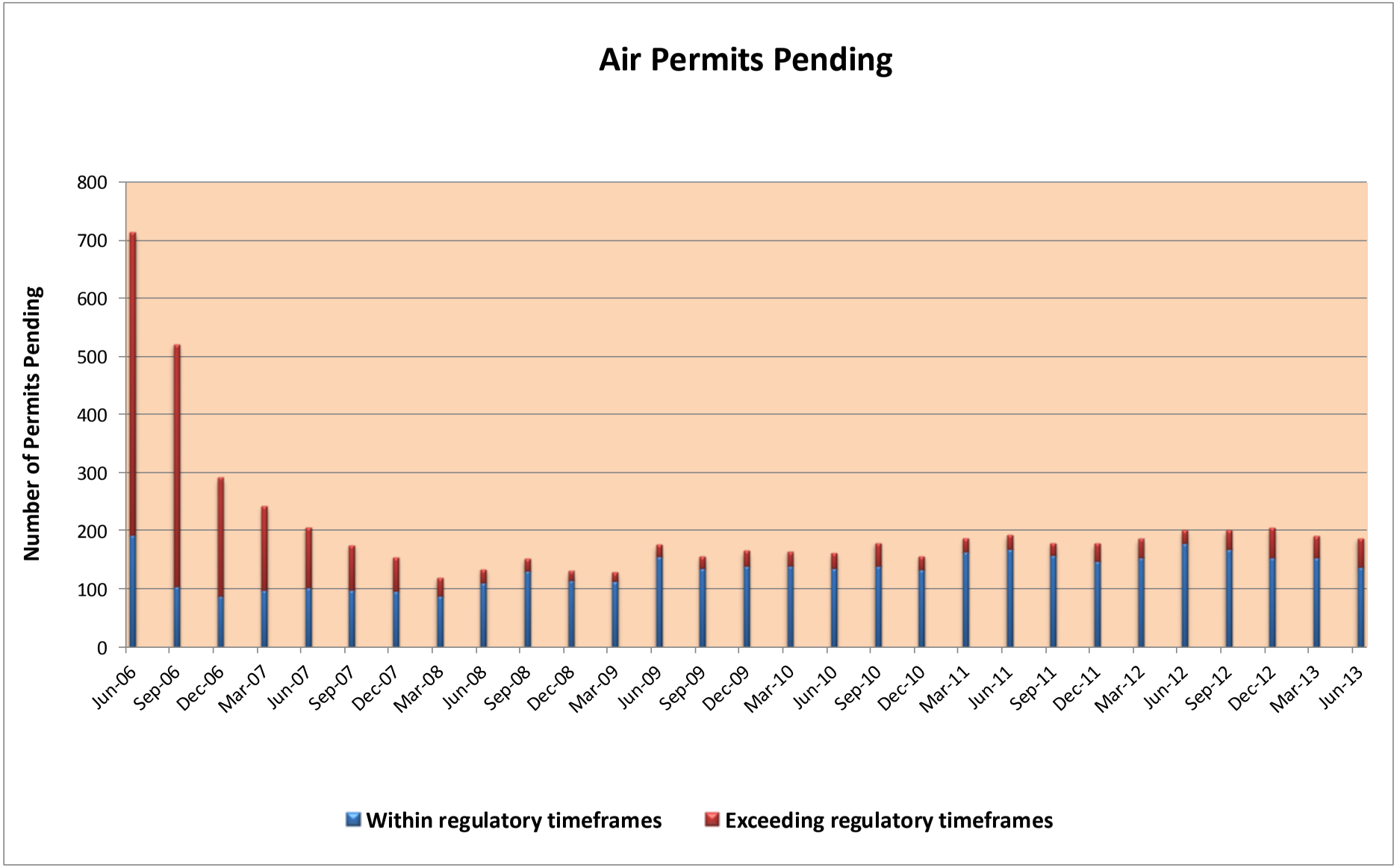


Figure 18: From June 2006 to June 2013, the Permit Review Branch has greatly reduced the amount of permit applications pending a final permit issuance as well as the percent of air permit applications that are beyond the Regulatory Time Frame (RTF), the allotted time for the complete permitting process. In June 2006, 521 of 716 pending permits were beyond RTF. By June of 2013, only 49 of the 187 pending permit applications were beyond RTF.

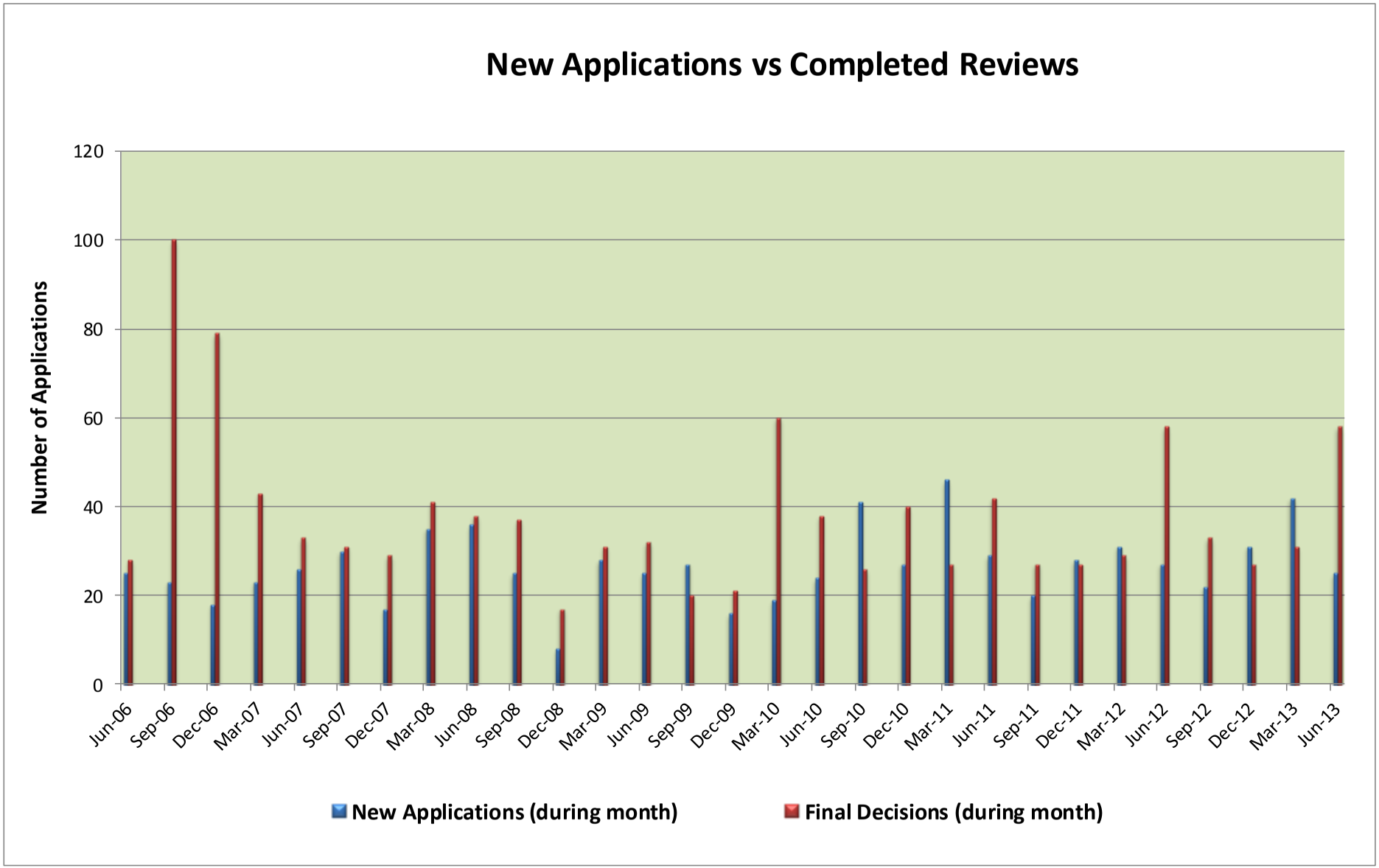


Figure 19: Over the past seven years the number of completed reviews have exceeded the number of new applications received by the division. Consistent efficiency has led to a dramatic reduction in the backlog.

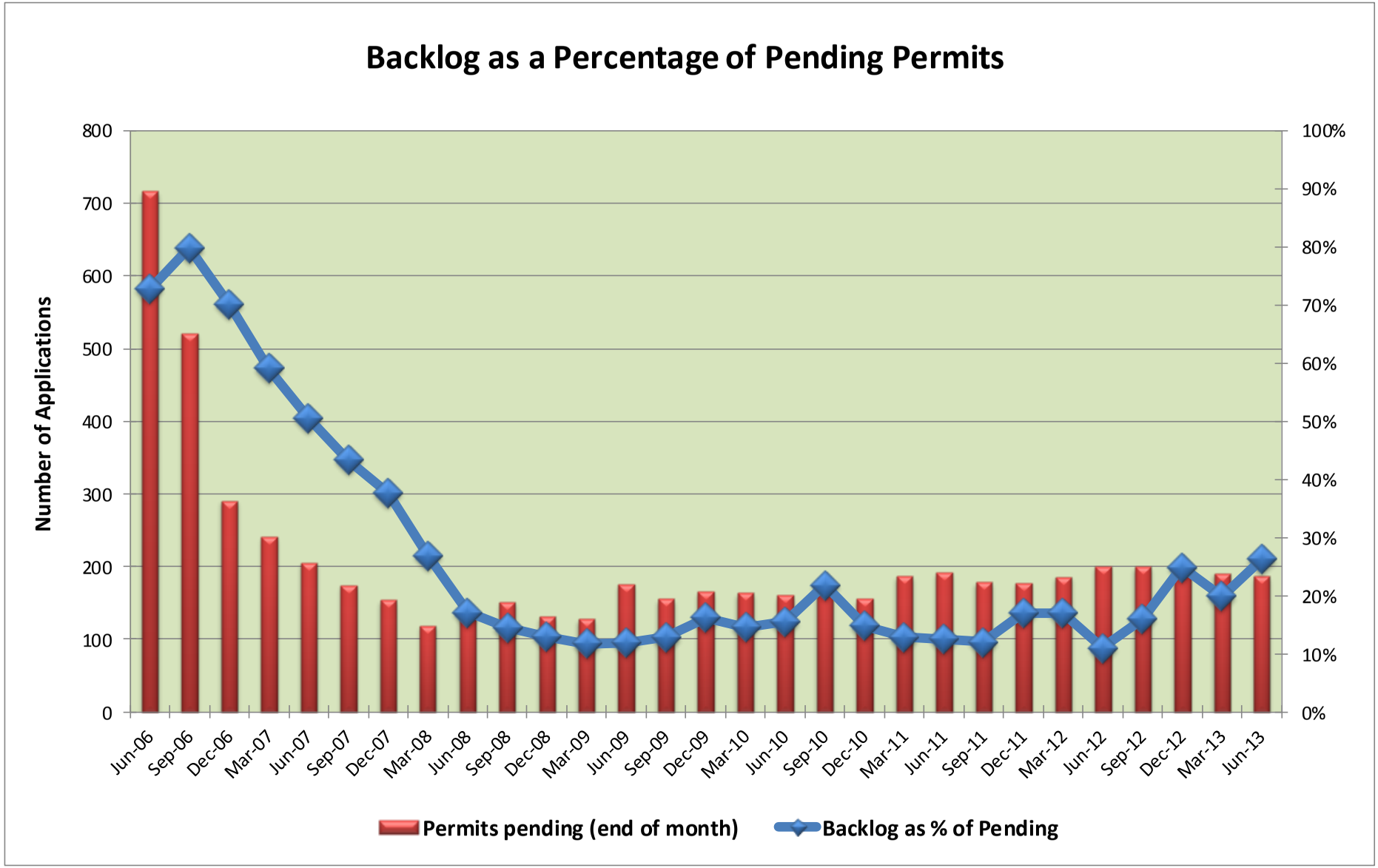


Figure 20: DAQ has significantly reduced the permit backlog since June 2006, at which time the division had 716 applications in house. The current number of pending applications represents a 74 percent reduction since that time.

Air Toxics Program

Air toxics are chemicals emitted from industry and transportation sources such as cars, trucks, and buses. The Clean Air Act lists 187 of these pollutants (also known as Hazardous Air Pollutants, or HAPS), which have the potential to harm human health over long-term exposure, and have been linked to increased risk of cancer as well as respiratory and neurological effects. Risk levels for these pollutants are based on health impacts over 70 years of continuous exposure.

The Division for Air Quality established the Air Toxics Section in FY 2008. The section's main objective is to provide the division with expertise in airborne toxic pollutants by means of risk assessment and air dispersion modeling.

Exercising the authority granted under KRS 224 and operating within the scope of 401 KAR 63:020, the Air Toxics Section is specifically charged with identifying air emissions which pose an unacceptable risk to human health and the environment. The regulatory authority primarily relied on by the Air Toxics Section is found in 401 KAR 63:020, which states that "No owner or operator shall allow any affected facility to emit potentially hazardous matter or toxic substances in such quantities or duration as to be harmful to the health and welfare of humans, animals and plants." Risk assessment and risk-based analysis are the standard means by which the section quantifies how harmful a toxic substance may be and the associated impact to human health.

The EPA's Toxic Release Inventory database provides a means of tracking emissions of toxics, including HAPs. Figures 21-22 represent the trends in hazardous air pollutant emissions over the 2007-2011 period. Figure 23 shows the total statewide HAP releases in Kentucky from 2007 through 2011. More information can be found at http://www.epa.gov/TRI/.

In FY 2013, the Air Toxics Section completed 53 air toxics assessments and 4 HAP - related complaint investigations. The section frequently uses modeling to refine the initial estimates from screening analyses performed by the PRB. These refined modeling runs have yielded data which has been used to verify, adjust or establish limits in permits, justify permit conditions, and protect public health and air quality.

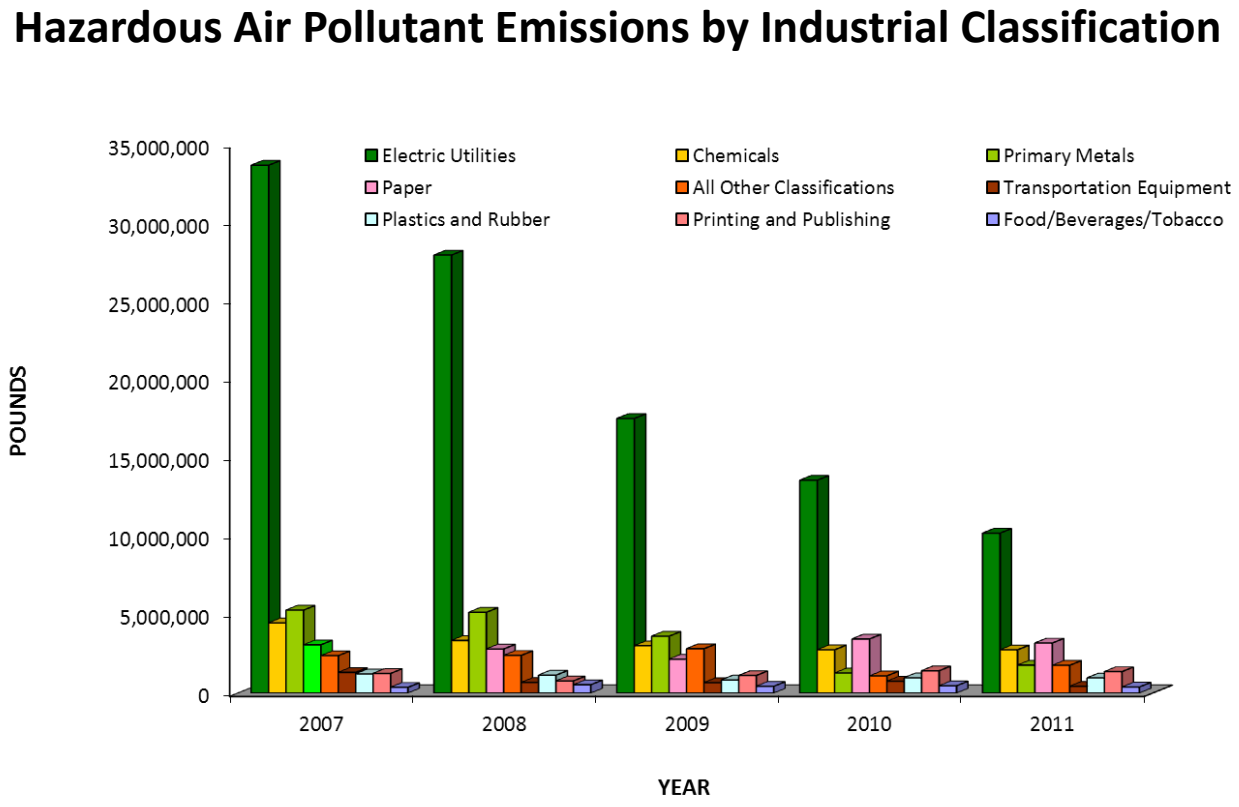


Figure 21: Toxic emissions in Kentucky from 2006 through 2010 by industrial classification.

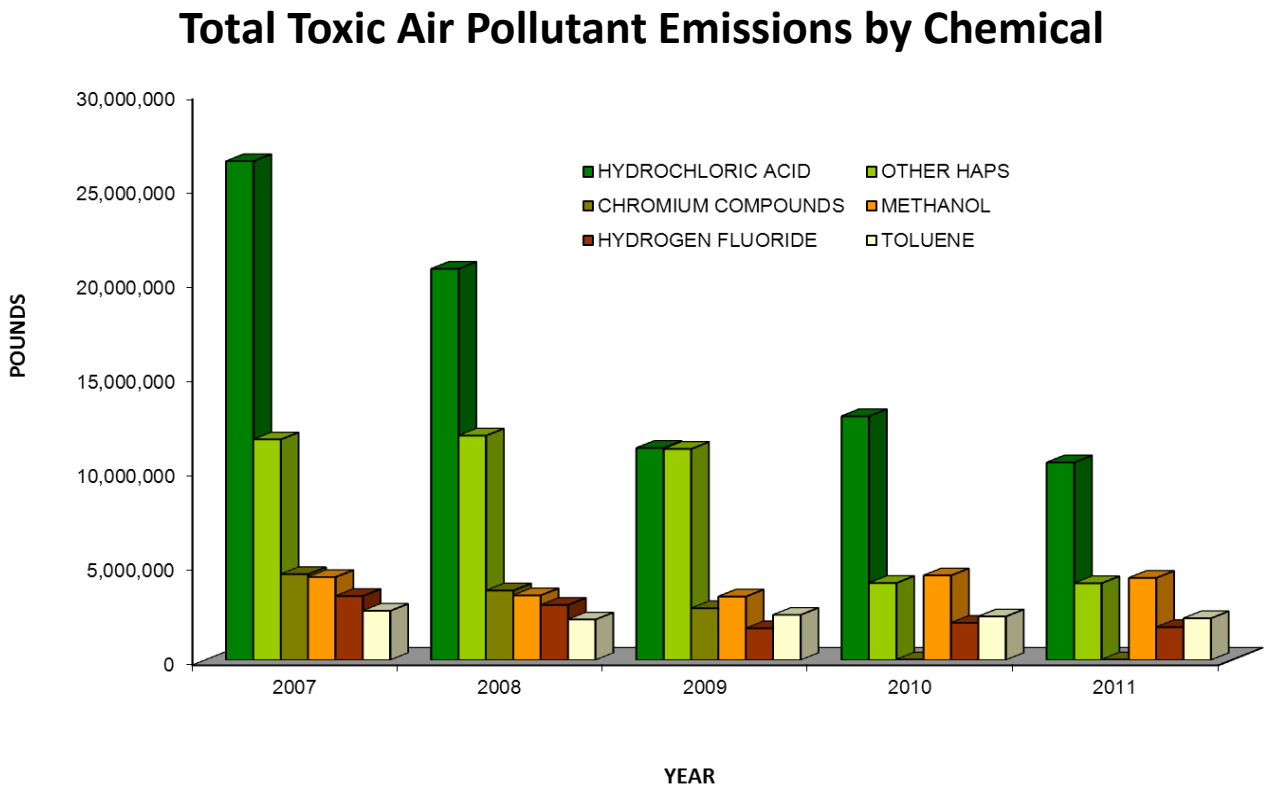


Figure 22: Emissions for selected individual chemicals. Data source: EPA Toxic Release Inventory.

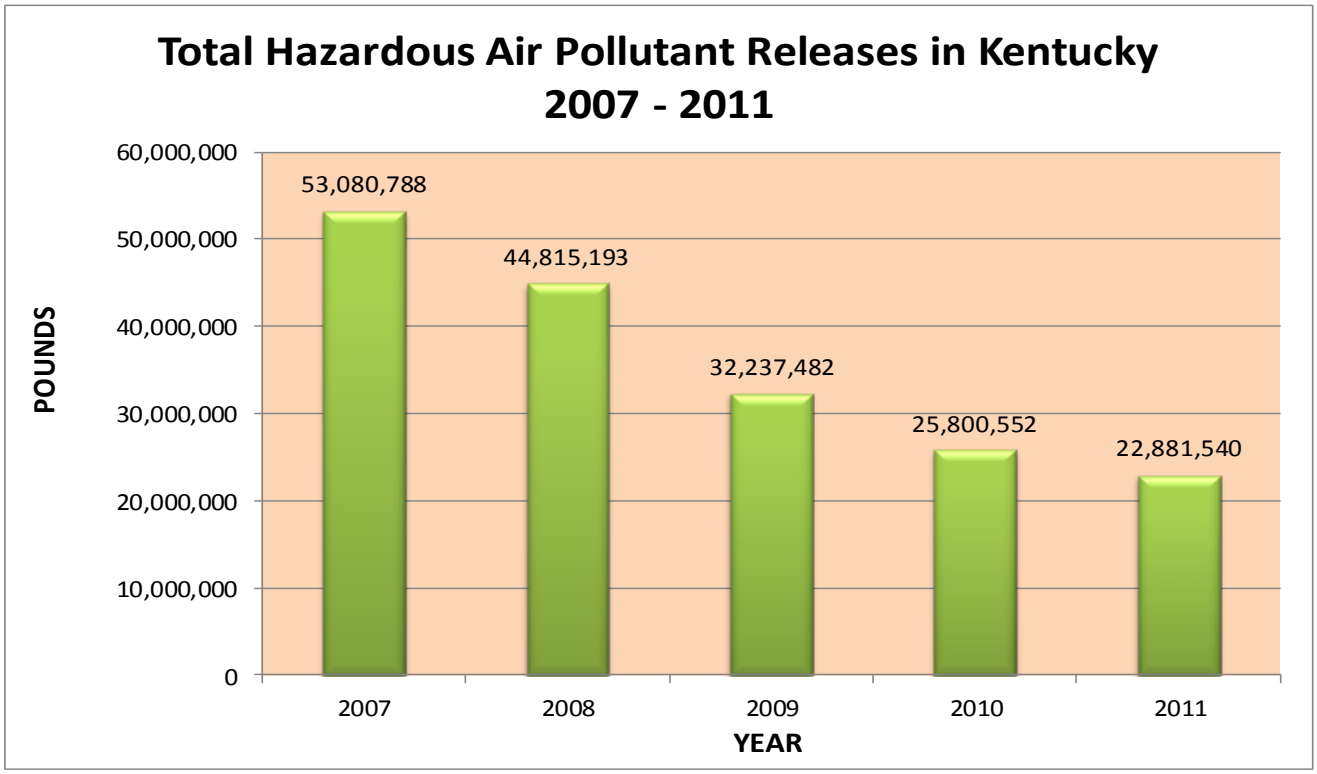


Figure 23: Total HAP releases in Kentucky, 2007-2011. In comparison to 2007 data, the values reported for the past three years are drastically lower. This is partially due to the metric used in calculating emissions prior to 2008, which included sulfuric acid along with the HAPs in the toxic section. Sulfuric acid is not considered a HAP under the Clean Air Act and is no longer included as a HAP in emissions data. Data Source: EPA Toxic Release Inventory.

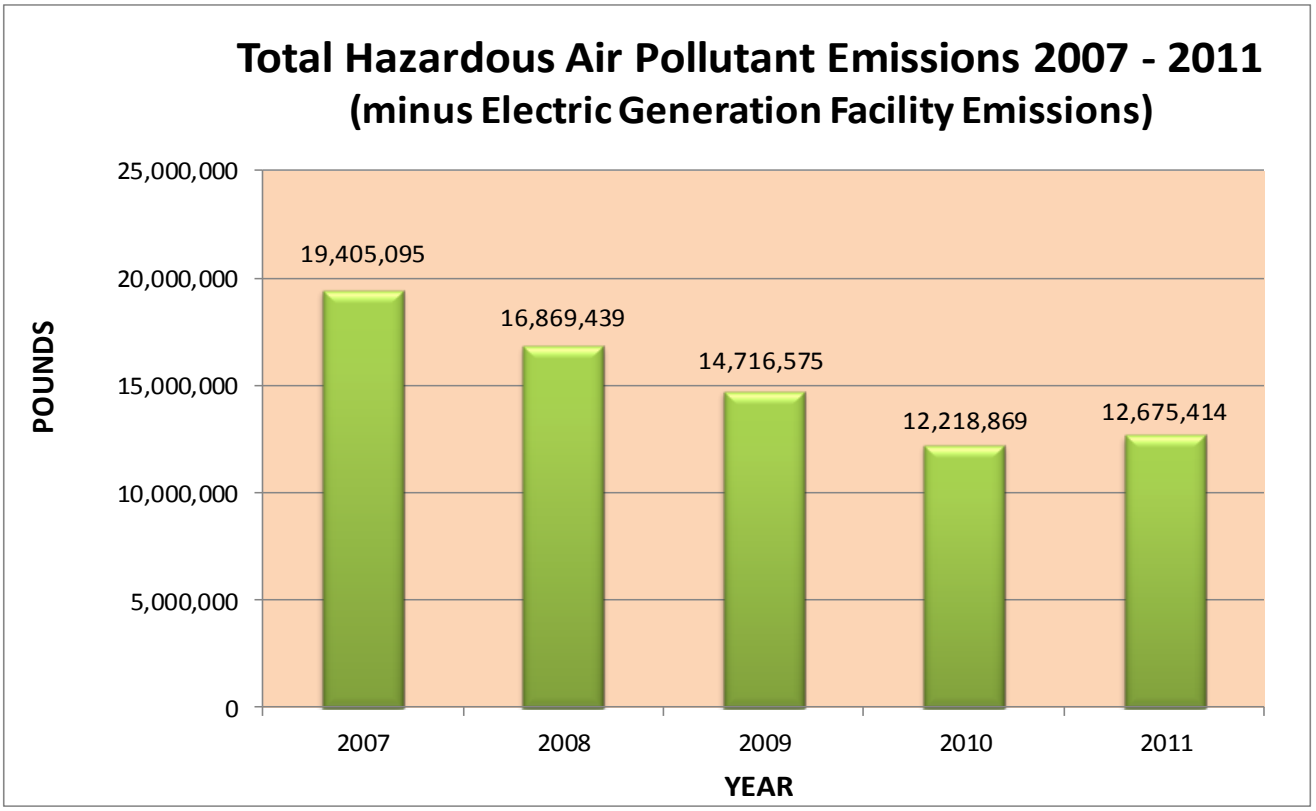


Figure 24: Total HAP releases in Kentucky, 2007-2011, minus electric generation facilities. With the influence of electric generation facilities removed, a downward trend in emissions from all other HAP-emitting sectors is clearly evident, dropping from over 25 million pounds in 2001 to less than 13 million pounds in 2011. Data Source: EPA Toxic Release Inventory.

PROGRAM PLANNING & 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 are developed and submitted to the EPA for approval. These plans are part of Kentucky's State Implementation Plan.

"The Division for Air Quality's FY 2013 operating budget was structured to cover cost for personnel, operating, and equipment purchases. Throughout the year DAQ has been mindful of all spending decisions and all programs were evaluated to reduce cost in specific categories due to federal sequestration and budget constraints."

Joy Moll
Administration Section Supervisor

Fiscal Management

The division operates primarily on Title V emissions fees and federal grant funds.

Funding under the Title V program (mandated by the 1990 Clean Air Act Amendments) is through air pollutant 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 401 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.

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. Concurrently, EPA determines a minimum cost per ton of pollutant that an agency should charge to fund the Title V permitting program. This is referred to as the *presumptive minimum*, or the minimum fee, that an agency should charge to fully fund the Title V program. Figure 25 below shows the comparison between the EPA presumptive minimum and the actual cost per ton that the division has charged.

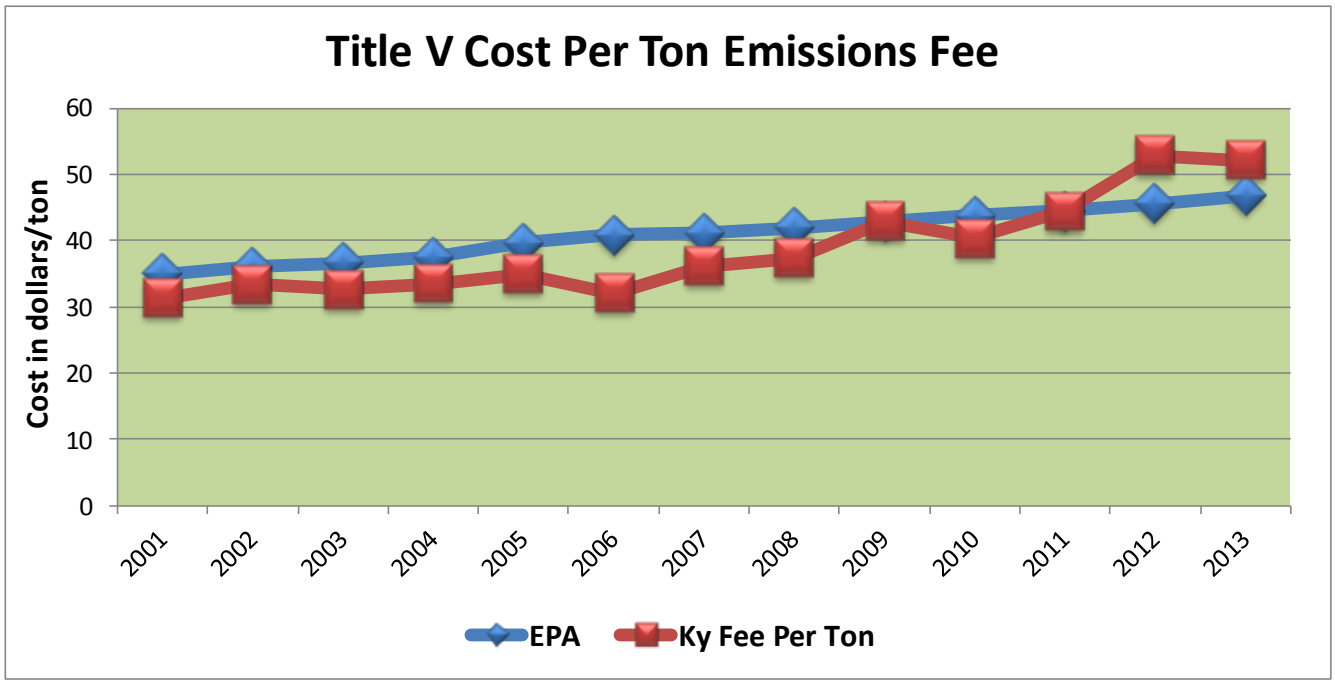


Figure 25: Title V Emission Fees Collected. DAQ surveys regulated entities to determine actual tons emitted by those sources, and charges them a standard cost per ton, according to Clean Air Act and state statute protocol. This chart compares Kentucky's actual fees with EPA's "Presumptive Minimum," which is a suggested minimum fee per ton that states should charge.

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 receives specific grants for the operation of the $PM_{2.5}$ monitoring network (103 grant) and asbestos activities (Asbestos Hazard Emergency Response Act) 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. A breakdown of the division's revenue for FY 2013 is provided in Figure 26.

During FY 2013, the division continued to ensure that state and federal program mandates were met and our level of customer service was maintained, even though we operated with less personnel staffing and resources. In FY 2014 Title V emission fees are projected to exceed the federal presumptive amount for the third year in a row in order to meet costs associated with maintaining that program and a high level of customer service.

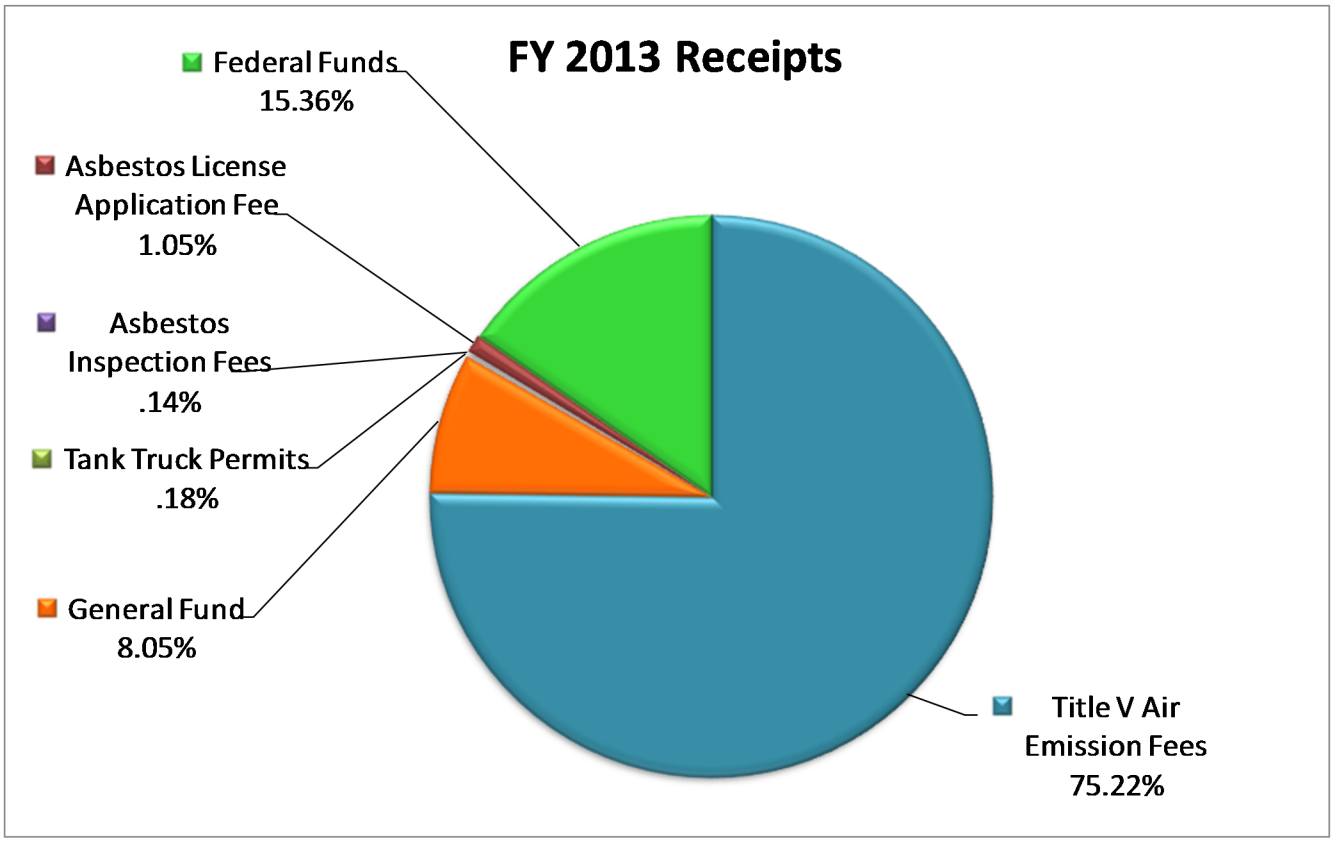


Figure 26: Division for Air Quality FY 2013 Receipts. The division operates primarily on Title V emission fees and federal grant funds. Other funds are derived from non-state insurance recovery, proceeds from recyclable sales, and proceeds from asset sales.

Emissions Inventory

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. These data are then 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 industrial sources at fixed locations;

- The **area source inventory** includes information on other pollution causing activities in a given area and documents the contribution of emissions from numerous small entities, or human activities. 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.

Point sources in Kentucky are surveyed annually to determine actual air pollutant emissions for the previous year (Figure 27). This process begins in January and continues through October. The emissions inventory section surveys nearly 1,200 plants per year using the following survey criteria to determine the sources that are surveyed in the state:

- Any major source (potential to emit 100 tons or more of a criteria pollutant which includes CO, NO_2, PM, SO_2, and 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 New Source Performance Standard (NSPS), National Emissions Standards for Hazardous Air Pollutants (NESHAP), or Maximum Achievable Control Technology (MACT) for hazardous air pollutants;
- Sources of Nitrogen Dioxide (NO_2) or Volatile Organic Compounds (VOCs) greater than 25 tons 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; and
- All sources where the actual or potential emissions of combined hazardous air pollutants are equal to or greater than 25 tons per year.

The responsibility for assembling the other portions of the emission inventory for specific areas falls to the Evaluation Section. These inventories are typically performed for areas that are not meeting a federal air quality standard for a particular pollutant or when a control program has been put in place for a particular pollutant and the overall effectiveness of that control program is being evaluated.

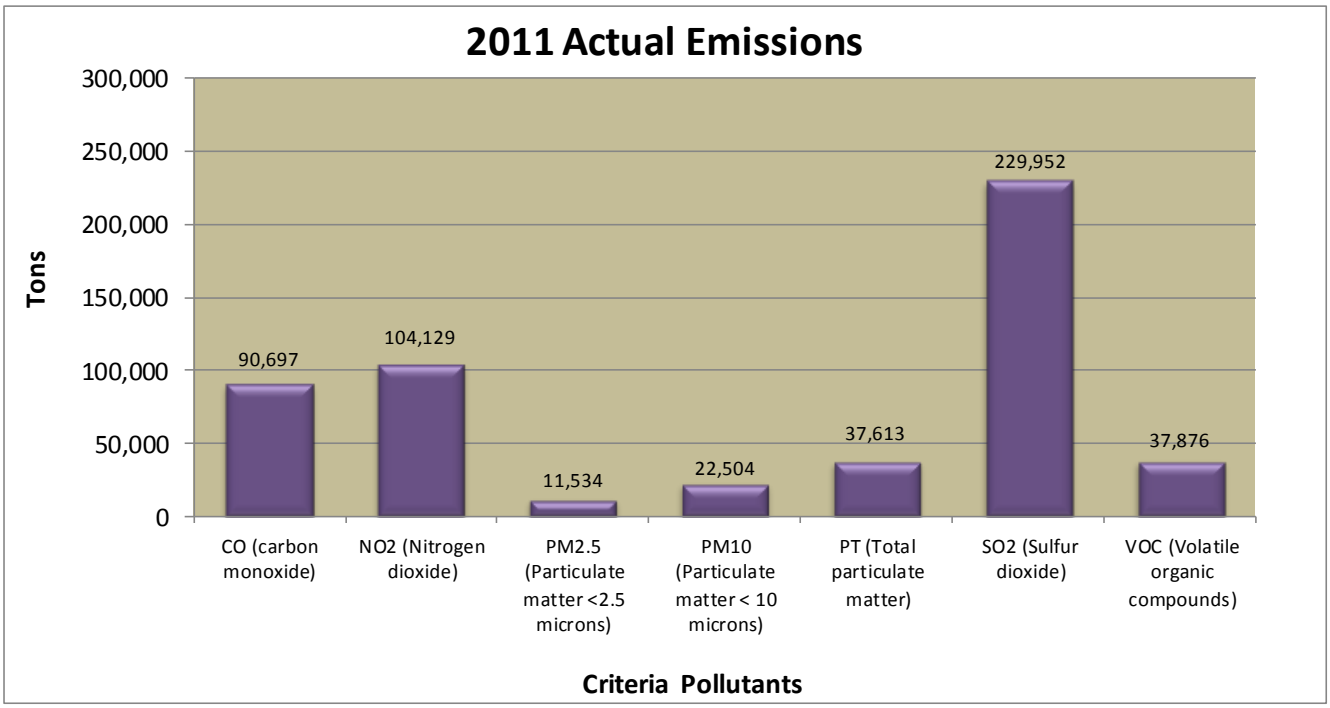
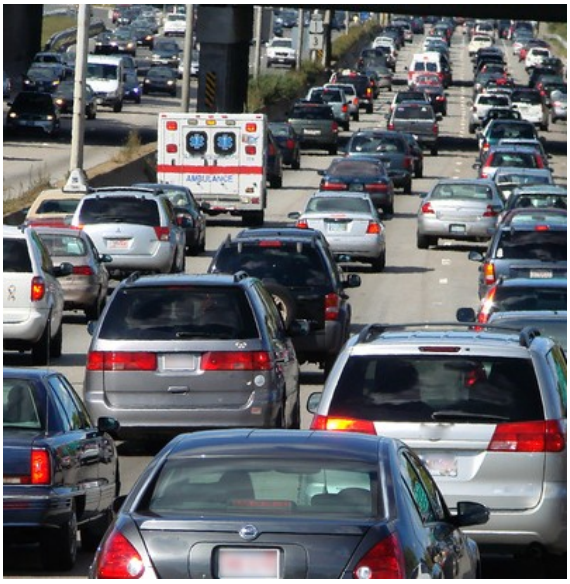


Figure 27: Actual tons of pollutants emitted by surveyed, regulated entities in Kentucky for the calendar year 2011. Although DAQ receives inventory emission data at the beginning of each calendar year, it takes approximately nine months to verify and complete the inventory.

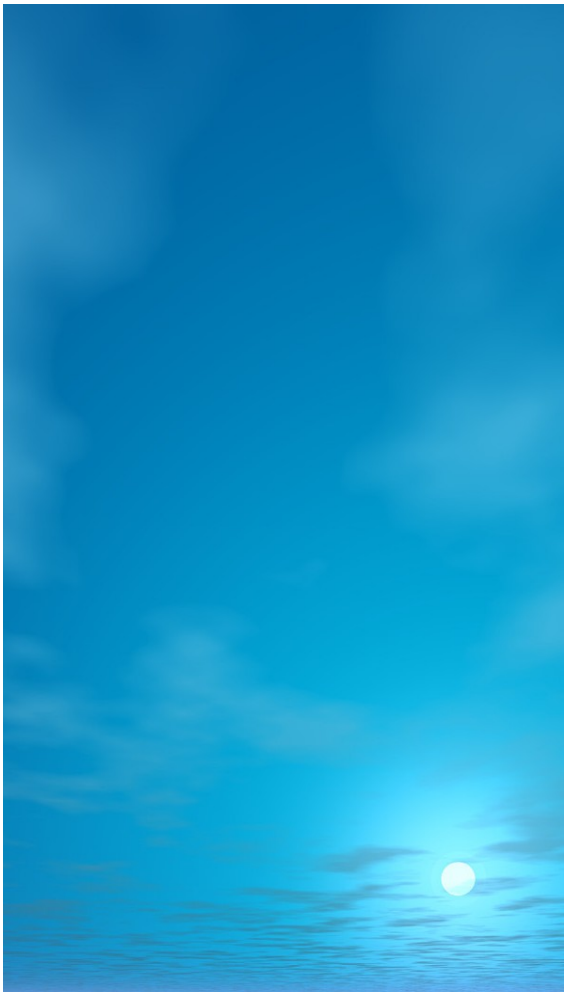
For area sources (smaller businesses and mobile sources), federally supplied emissions factors are used and adjusted based on population data for a given area. For mobile source-related emissions, mathematical models are used to determine emissions contributions. For on-road mobile emissions, data gathered 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.



More than 132 million miles are driven on Kentucky roads every year. Transportation is a "mobile source" of CO, NOx, PM, VOCs, and is a major contributor to ground-level ozone formation.

Regulation Development

The Regulation Development Section 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 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.

From July 2012 through June 2013, amendments were made to Regulations 401 KAR 51:001, Definitions for 401 KAR Chapter 51; 51:017, Prevention of significant deterioration of air quality: and 51:052, Review of new sources in or impacting upon nonattainment areas.

The amendments to these regulations adopted revisions to the New Source Review (NSR) program that were made at the federal level to implement the $PM_{2.5}$ National Ambient Air Quality Standards (NAAQS). The amendments included the tools and mechanisms necessary to determine whether a construction project's emissions will cause or contribute to a violation of the $PM_{2.5}$ NAAQS. These regulatory actions established significant impact levels, significant monitoring concentrations, and baseline dates for the $PM_{2.5}$ NAAQS. The amendments adopted the significant emissions rates to determine NSR applicability for $PM_{2.5}$ and $PM_{2.5}$ precursors. Also, the definition of "regulated NSR pollutant" was amended for consistency with the corresponding federal definition. These amendments became effective in Kentucky on Dec. 7, 2012.

"For 2013, the division was successful in meeting all Clean Air Act requirements for State Implementation Plan updates. This included documenting that the agency has the programs, regulations, and resources in place to address newly enacted National Ambient Air Quality Standards as well as existing ones."

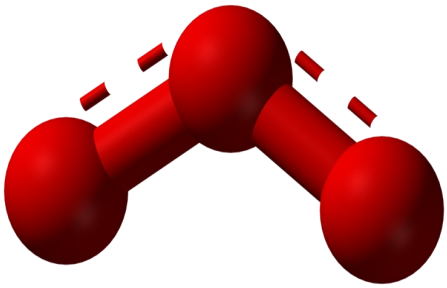
John Gowins
Evaluation Section Supervisor

State Implementation Plan

The State Implementation Plan (SIP) is a state-specific plan to ensure attainment and maintenance of the various National Ambient Air Quality Standards within a state or region. 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, the 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 forward in 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;
- Development of goals or objectives for an area (typically air quality standards that must be met or maintained); and
- Development of control strategies 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 coordination with the local communities that have a stake in how a plan is to be implemented.



Ozone molecule, composed of three oxygen atoms. Image: Wikimedia Commons.

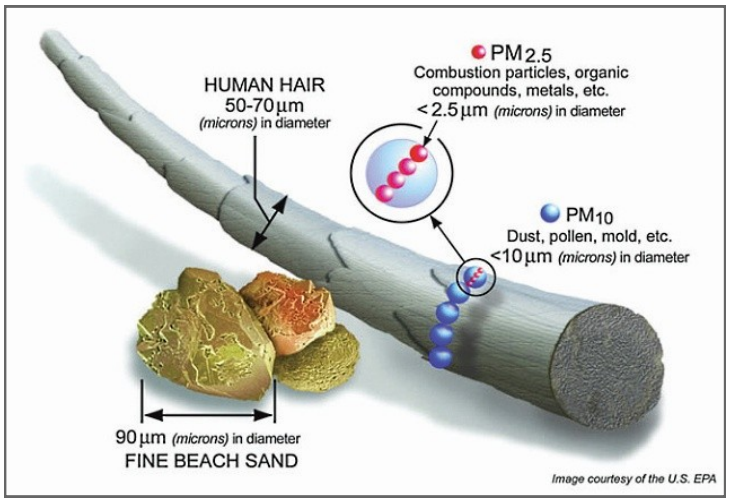
Ozone (O_3)

Ground-level ozone is different than the ozone found in Earth's protective ozone layer, which is located far from earth's surface in the stratosphere. Ground-level ozone is a secondary, man-made pollutant and is the primary component of smog. Secondary pollutants are not emitted directly from a stack, but rather are formed when two or more primary pollutants mix in the atmosphere. In this case, ground-level ozone is formed when volatile organic compounds (VOCs) and nitrogen oxides (NO_x) combine in the presence of heat and strong sunlight. This makes ozone a summertime pollutant.

On Sept. 2, 2011, the president directed the EPA to begin implementing the originally proposed 2008 8-hour ozone standard of 75 ppb. On May 21, 2012, EPA published final designations to be effective July 20, 2012. Certain portions of Boone, Campbell, and Kenton counties were designated as nonattainment for the 2008 8-hour ozone standard. The portions are approximately the northern half of each county. This nonattainment designation was initially made due to several violating monitors in the Cincinnati, Ohio area. Due to the inclusion of these Kentucky counties in the Metropolitan Statistical Area, EPA indicated that these Kentucky counties contribute to the violations in Ohio. However, with the unique weather patterns the area experienced last summer, a monitor in Kentucky also violated the standard.

Fine Particulate Matter ($PM_{2.5}$ and PM_{10})

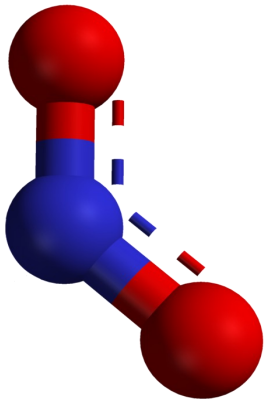
There are actually two standards set for fine particulate matter. In addition to the 24-hour standard of 35 micrograms per cubic meter of air ($\mu g/m^3$), there is an annual standard set at 12 $\mu g/m^3$. In June 2008 the division submitted an attainment demonstration that relied on projected changes from the court-remanded Clean Air Interstate Rule (CAIR). The division has monitored compliance with these standards in Kentucky for the years 2007-2010. On Jan. 27, 2011, the division requested redesignation of the Cincinnati-Hamilton PM 2.5 Nonattainment Area which includes the Northern Kentucky counties of Boone, Campbell, and Kenton. EPA approved this redesignation on Dec. 15, 2011.



Particle size of PM 2.5 and PM 10 as compared to a human hair. Image: U.S. EPA

The division submitted redesignation requests for the two remaining nonattainment areas in the state: the Louisville area on March 5, 2012, and the Huntington-Ashland area on Feb. 9, 2012. EPA finalized approval of the Huntington-Ashland redesignation on Dec. 26, 2012. It is uncertain at what point EPA will approve the Louisville submittal since the submittal utilized CAIR's replacement, the Cross State Air Pollution Rule (CSAPR), which was vacated by the U.S. Court of Appeals on Aug. 21, 2012. On June 24, 2013, the Supreme Court agreed to review the D.C. Circuit's 2012 decision. CAIR remains in place while the court considers the merits of the case.

EPA finalized the change in the annual PM 2.5 standard from 15 $\mu g/m^3$ to 12.0 $\mu g/m^3$, calculated on an annual average, effective March 18, 2013. As of July 2013, only Jefferson County had a monitor that registered a value above 12.0 $\mu g/m^3$.



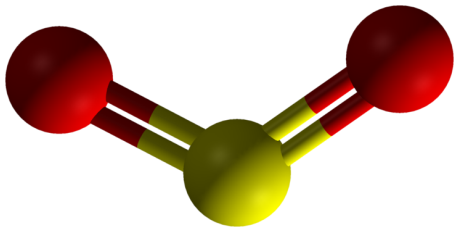
Nitrogen dioxide molecule. Image: Wikimedia Commons.

Nitrogen Dioxide (NO_2)

On Jan. 22, 2010, the EPA strengthened the standard for nitrogen dioxide (NO_2). The new standard is set at a 1-hour level of 100 parts per billion (ppb). This level will protect against the health effects associated with short-term exposure of NO_2. The EPA also retained the annual average standard for NO_2 at 53 ppb. On Jan. 11, 2011, the division submitted a letter to EPA recommending that the areas in the state which have monitors be designated as attainment, and the rest of the state be designated as attainment/ unclassifiable. In a letter dated June 28, 2011, EPA concurred with the division's recommendations.

The EPA is establishing new ambient air monitoring and reporting requirements for NO_2. These requirements will require a shift in the division's current monitoring network. For example, monitors will now be required near major roads in urban areas, where currently there are no monitors in these areas. PPAB and the Technical Services Branch are working together to address these

new requirements. The division has determined that one new monitor will be required in the Northern Kentucky area, and it must be operational by Jan. 2014. Once the monitoring system is in place, the state will likely have to reevaluate the areas and modify the recommendations if necessary.



Sulfur dioxide molecule. Image: Wikimedia Commons.

Sulfur Dioxide (SO_2)

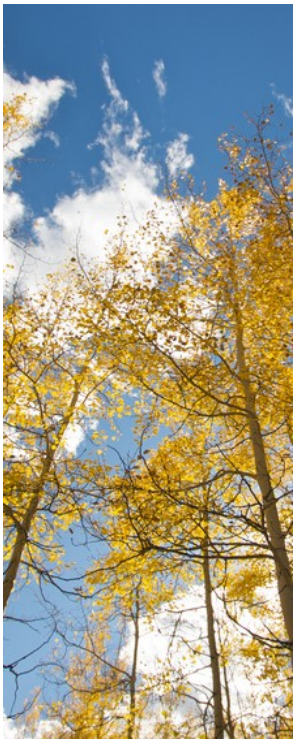
On June 22, 2010, the EPA strengthened the NAAQS for sulfur dioxide (SO_2). This standard had not been changed since 1971 and the EPA was required under a judicial consent decree to review the primary standard. On July 13, 2011, the EPA announced the proposed secondary standard which addresses public welfare. The rule was finalized on April 3, 2012.

The 2010 primary standard, similar to the NO_2 standard, is a 1-hour standard of 75 ppb. This new standard will protect public health by reducing exposure to high short-term levels of SO_2. The EPA revoked the two existing 1971 primary standards of 140 ppb evaluated over 24 hours, and the annual standard of 30 ppb, because current health evidence indicated little association between long-term exposure to SO_2 and health effects.

On Dec. 20, 2012, the division submitted a letter to EPA recommending partial areas in Jefferson County near violating monitors and large SO2 sources as nonattainment instead of the entire county. Prior to publishing this report, EPA finalized the designations on Aug. 5, 2013. In that final designation, EPA designated the recommended portion of Jefferson County as well as a portion of Campbell County as nonattainment. The portion of Campbell County was designated because there is a monitor in that portion that registers a violation of the standard.

Lead

The EPA revised the NAAQS for lead to 0.15 µg/m^3 in Nov. of 2008, and simultaneously established the current monitoring threshold for lead of 1.0 tpy. However, before monitors were put in place to comply with this new monitoring threshold by the state, the EPA issued a proposal to lower the monitoring threshold for lead to 0.5 tpy. This proposal was issued Dec. 23, 2009 and finalized on Dec. 27, 2011. Air quality monitoring agencies would use this threshold to determine if an air quality monitor is required to be placed near a facility emitting lead.



Kentucky has been monitoring for lead as required, and all areas are in compliance. No final designations have been made.

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. As part of the Clean Air Act Amendments and further regulations adopted by the EPA, states must develop plans to restore natural visibility conditions in the 156 Class I areas throughout the nation by the year 2064. Kentucky’s Mammoth Cave National Park is included in the list of areas.

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.

Good Visibility Day
Visual Range: 144 miles

Above and right: Regional haze affects visibility over large regions including national parks, forests, and wilderness areas. These photos show the Houchins River Valley at Mammoth Cave National Park. Photos: National Park Service Air Resources Division.

The division submitted the final Kentucky Regional Haze SIP to the EPA in June 2008. In May 2010, the division also submitted to EPA a formal SIP revision to amend the June 2008 Regional Haze SIP on two technical issues.

Per a consent decree agreement with the Sierra Club requiring EPA to take final action on Kentucky's Regional Haze SIP by March 15, 2012, EPA signed a final rule. This final rule provided EPA's limited approval and limited disapproval of the Kentucky Regional Haze SIP. The reason for the delay in EPA taking action on the regional haze SIP and for the limited disapproval was that the SIP was based on emission reductions provided by the Clean Air Interstate Rule (CAIR). CAIR was remanded back to EPA without vacature by the D.C. Circuit Court in December 2008, for failing to adequately address interstate transport of pollutants. Thus, EPA did not take final action on any states' regional haze SIPs due to the consent decree agreements.

Bad Visibility Day
Visual Range: 16 miles

EPA published the Cross-State Air Pollution Rule (CSAPR) on Aug. 8, 2011, which was to have replaced CAIR on Jan. 1, 2012. However, CSAPR was stayed pending judicial review by the D.C. Circuit Court on Dec. 30, 2011, which left CAIR in effect. Since issuing the final CSAPR, EPA has made several revisions and rulemakings regarding CSAPR. Specifically, a final ruling published in the June 7, 2012 determined that CSAPR is better than Best Available Retrofit Technology for Electric Generating Units for SO_2 and NO_x emissions. The final rule also addresses EPA's limited disapproval of Kentucky's Regional Haze SIP whereby EPA under a Federal Implementation Plan will replace reliance on CAIR with reliance on CSAPR in the SIP, if the court upholds the regulation.

In light of the Aug. 2012 Court decision to vacate CSAPR and its instruction that EPA must continue administering CAIR until a valid replacement is promulgated, EPA in a Nov. 19, 2012, memorandum indicated that it will be appropriate to approve a submitted state regional haze plan that relies on CAIR emission reductions. This EPA position will hopefully allow future regional haze SIP submittals to be acted on by EPA in a more timely manner.

As required by the Clean Air Act and Regional Haze Rule, the division has developed a draft Kentucky Regional Haze Five-Year Periodic Report, which evaluates progress being made toward meeting the reasonable progress goals for visibility established in the Kentucky Regional Haze SIP for Mammoth Cave National Park. On June 27, 2013, the division submitted the report to the Federal Land Managers for review and comment. Additionally, the division provided a copy to EPA for review and comment. The division will address comments provided by the FLMs and EPA during the 60-day consultation period, submit a proposed periodic report to EPA for review and for public comment, and then submit a final report to EPA for approval.

TECHNICAL SERVICES

Air monitoring is the key to understanding how clean the air is in a particular area. In order to do this, each state must operate a network of monitoring stations. Since July 1967, the Technical Services Branch (TSB) has operated an air quality monitoring network in Kentucky. The 2012 network included 41 monitoring stations in 27 counties; this total includes monitors operated by the Louisville Metro Air Pollution Control District (LMAPCD) and the National Park Service (NPS) at Mammoth Cave.

Locations of ambient air monitoring stations are selected in accordance with EPA regulations (40 CFR 58, Appendix D). In general, monitors are placed in densely populated areas or near sources of pollution, whether it's a busy highway or a stationary source with a smokestack. Each year, the site locations are reviewed to ensure that adequate coverage is being provided and regulatory requirements are met.

Depending on the pollutant, samples may be collected in a canister, drawn through a filter, or continuously sampled and analyzed. Continuous air monitors operate 24/7, continuously analyzing the air for specific pollutants. Manual samplers require air samples and filters to be collected and analyzed in a lab.

Ambient air monitoring 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 any possible need to initiate emergency control procedures.

Many staff hours are devoted to the operation of the monitoring network. Division staff routinely visit air monitoring 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 on a quarterly basis to ensure that each is operating properly. This audit process includes monitors operated by the LMAPCD and the NPS, as well as monitors operated by industrial networks.

In addition to operating the division's ambient air monitoring network, the Technical Services Branch is also responsible for ensuring that facilities demonstrate compliance through the review and observation of source stack tests.

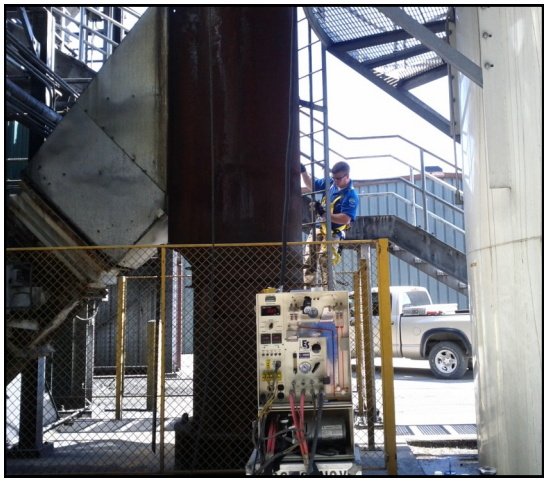
Stack tests are used to demonstrate that a facility is operating within its emissions limits, as allowed by a division-approved permit. While section staff aren't required to observe all tests, they spend many hours traveling to attend as many tests as possible.

TSB is staffed by employees that include managers, supervisors, administrative staff, technicians, scientists and engineers. The branch is comprised of three specialized sections: Quality Assurance, Technical Support, and Source Sampling.

Quality Assurance Section

The Quality Assurance Section conducts performance and systems audits of all air monitoring stations within Kentucky's air monitoring network, as well as four industrial sites within Kentucky. The section is responsible for validating all data generated from the air monitors located throughout the state's network. Data audits ensure that all data is in compliance with the state and federal monitoring regulations, particularly 40 CFR Part 58, Appendix A. The section is also responsible for certifying all equipment used within the network.

TSB operates a series of air monitoring stations throughout the state.



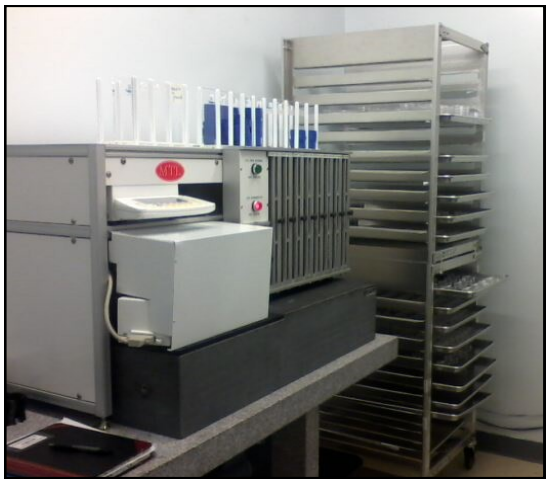
TSB staff preparing to climb a stack during an observed source test.

Source Sampling Section

The Source Sampling Section provides technical guidance to the division and facilities through the review of compliance demonstration test protocol forms, observation of compliance tests, and technical review of compliance and Relative Accuracy Test Audit (RATA) test reports. The Source Sampling Section's review ensures that approved EPA test methods are used and proper engineering principles are followed for source tests throughout the Commonwealth. A facility may be required to test their emissions at a source based on regulation, permit requirements, or upon a division request.

Technical Support Section

The Technical Support Section repairs, modifies, and maintains instrumentation and equipment associated with the Kentucky air monitoring network, which includes continuously operating monitors for particulates, sulfur dioxide, oxides of nitrogen, and ozone, as well as intermittent particulate and air toxic samplers. The section also maintains a statewide computerized data acquisition network that automatically retrieves air monitoring data and makes information available to the public in the form of an Air Quality Index, which is regularly posted on the division's website. They also maintain a $PM_{2.5}$ weigh-lab operation, which has the responsibility of handling and conditioning sample filters, weighing $PM_{2.5}$ filters, and reporting the analytical results.



The TSB's particulate weigh lab contains a robotic device called an "autohandler," which is used to weigh $PM_{2.5}$ and PM_{10} filters.

Compliance and RATA Tests

Facilities throughout the Commonwealth are required by federal regulations, state regulations, permits, and/or division directives to sample the emissions being released from identified point sources. Samples must be collected and analyzed in accordance with federally promulgated test procedures and methods, as referenced in:

- 40 CFR Part 51 - Requirements for Preparation, Adoption, and Submittal of Implementation Plans;
- 40 CFR Part 60 - Standards of Performance for New Stationary Sources;
- 40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants;
- 40 CFR Part 63 - National Emission Standards for Hazardous Air Pollutants for Source Categories; and
- 40 CFR Part 75 - Continuous Emission Monitoring.

In general, a compliance source test consists of three sample runs that are averaged together for a single test result. During the test, a sample is pulled, at a constant rate, from gases that are emitted from a stack. The sample is collected on a filter, in a solution, or in a canister for analysis. Some samples may be continuously analyzed during the test using an analyzer that is calibrated for the pollutant of concern.

A sample run can last between one and 24 hours, depending upon the facility's production operations. Prior to a test, a facility is required to submit a test protocol explaining the methods and procedures that will occur during the source test. The Source Sampling Section, in conjunction with the Field Operations Branch and Permit Review Branch, reviews test protocols prior to the test to ensure proper procedures and methods will be followed. The Source Sampling Section also makes every effort to observe scheduled source tests throughout the Commonwealth. Following a test, a report is submitted to the division where it is reviewed for accuracy and completeness. The compliance status of the facility is also determined based on the approved reported test results.

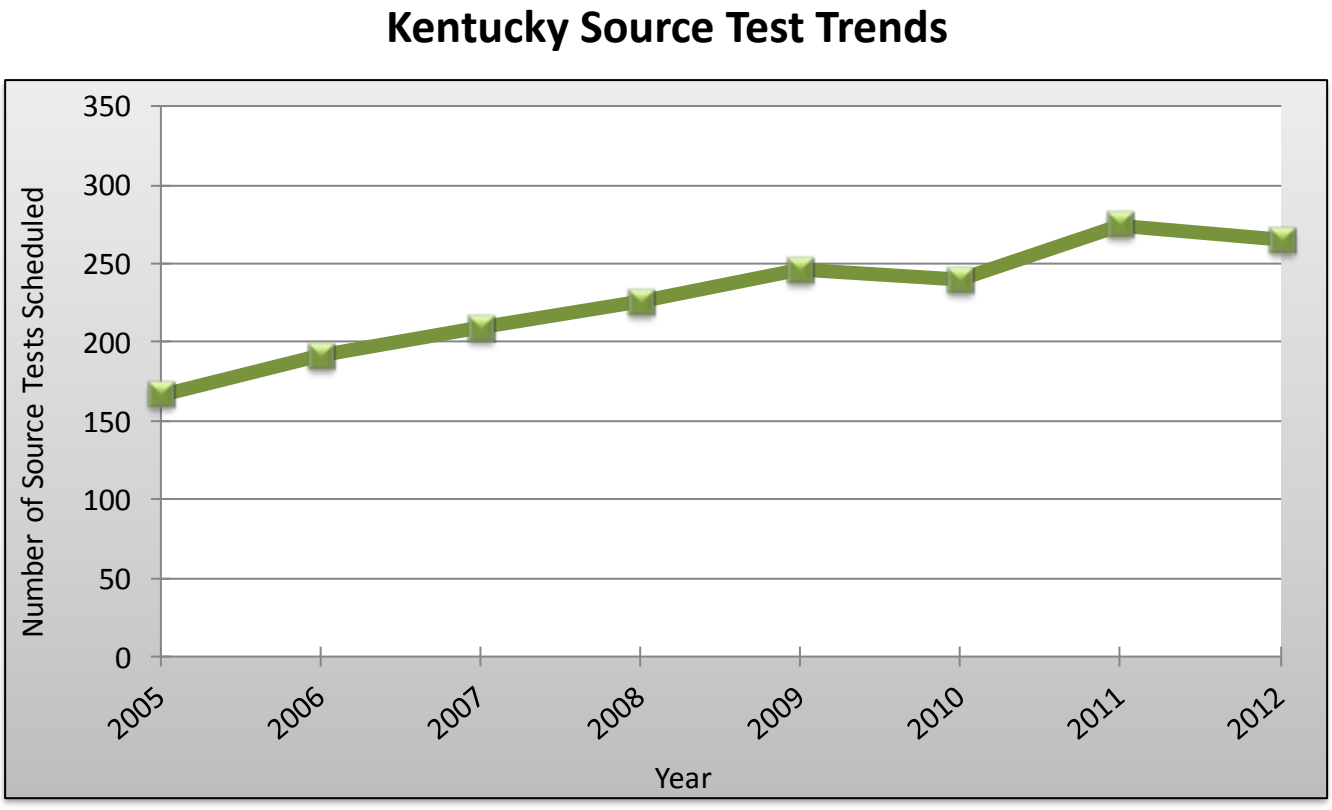


Figure 28: The last seven years have shown an increase in source testing throughout the state.

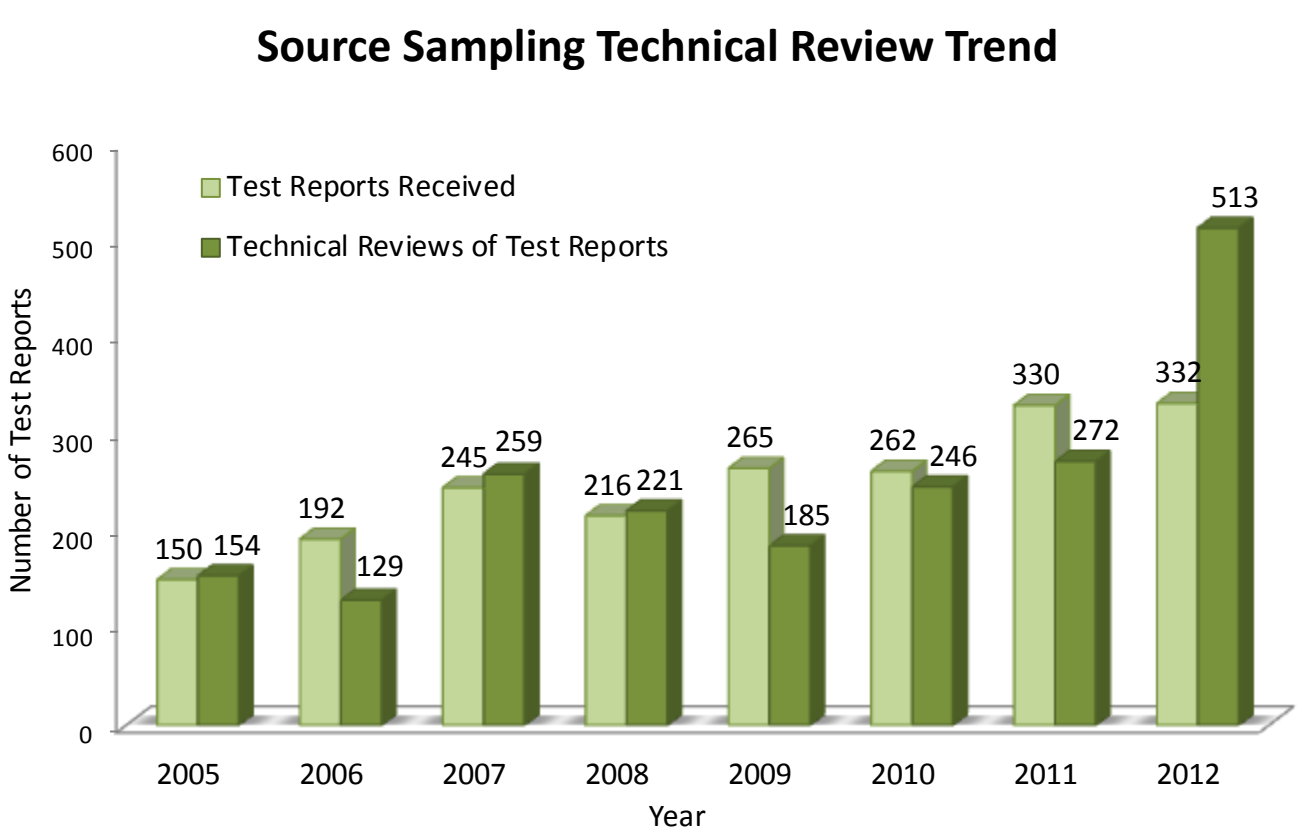
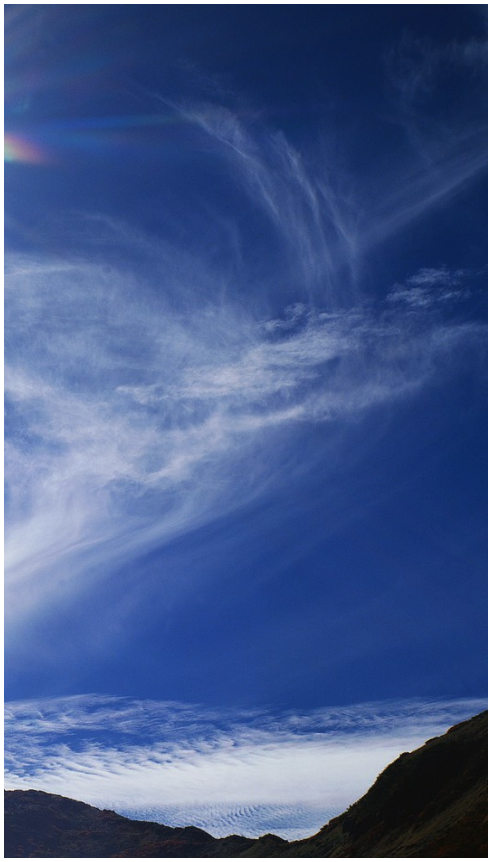


Figure 29: The Source Sampling Section successfully completed a backlog reduction plan in 2012. The backlog was incurred in 2009 due to the section being severely understaffed.

In 2012, the Source Sampling Section received 331 Compliance and RATA test protocols by Kentucky facilities; 176 tests were scheduled compliance tests. The section observed 123 (69 percent) of the scheduled compliance tests. Additionally, the Source Sampling Section received 332 RATA and Compliance test reports.

The Source Sampling Section also achieved a significant accomplishment during the 2012 calendar year by completing a backlog reduction plan. The backlog reduction consisted of conducting 513 technical reviews of 2012 or earlier test reports.



Ambient Air Monitoring Network

According to federal regulation (40 CFR Part 58, Appendix D), the ambient air monitoring network must be designed to meet three basic air monitoring objectives:

- The network must provide air pollution data to the general public in a timely manner.
- The network must support compliance with ambient air quality standards and emissions strategy development.
- The network must support air pollution research studies.

In order to meet these three basic monitoring objectives, the network must be designed with a variety of types of monitoring sites. In essence, the network design must be capable of illustrating the peak air pollution levels, typical levels in populated areas, air pollution transported into and outside of a city or region, and air pollution levels near specific emissions sources.

In 2012, TSB completed the Kentucky Ambient Air Monitoring Network Plan; an extensive document that details Kentucky's air monitoring network in terms of scales of representativeness and specific designations (e.g., monitors sited for source impacts, regional transport, background, and so forth). The Ambient Air Monitoring Network Plan was submitted to the EPA by the July 1 regulatory deadline; the document underwent a 30-day public comment period prior to submission. The Ambient Air Monitoring Network Plan is available for review on the division's website at http://air.ky.gov/Pages/DivisionReports.aspx.

Pages 56-99 of this Annual Report contain tables and graphs that summarize the concentrations of pollutants measured in Kentucky during the calendar 2012 year, as well as 2012 design values. A **design value** is a calculated metric that is used to determine compliance with each particular NAAQS. For many pollutants, a design value is calculated for each year and then averaged over a three-year period before being compared to a standard. However, some design values use alternate intervals of time for the calculation. For example, lead uses a 3-month rolling average and one (of the two) primary NAAQS for nitrogen dioxide uses an annual average.

Maps of each pollutant network are representative of the air monitoring network, as submitted to the EPA in the 2012 Ambient Air Monitoring Network Plan. Regulations require that annual network plans be representative of a fiscal year (July-June); however, attainment decisions are typically based upon the data available within a calendar year (January-December). Thus, the actual number of sites in operation in a calendar year may differ slightly from the network represented in the Network Plan and by network maps.

It's important to note that an *exceedance* of a particular pollutant is not the same as a *violation* of the NAAQS for that pollutant. Violations are determined according to the formula for each standard and involve the average of multiple measured values over a specified amount of time.

Any data contained in this report is subject to change. The most current quality assured dataset can be obtained through a Kentucky Open Records Act request to the Technical Services Branch of DAQ.

Data Quality Assurance

TSB assures quality and validates all ambient data collected by the monitors and samplers in the network. Upon completing its review of 2012 data, the division submitted its annual data certification request to EPA prior to the May 1 regulatory deadline. This data certification package includes reports that summarize all the hours of valid data collected, as well as the quality control measures taken to ensure the accuracy of that data, and the number of annual performance evaluations completed. The information obtained in the annual data certification request is available to the public through open records requests.

TSB maintains a library of Quality Assurance Project Plans (QAPPs) and Standard Operating Procedures (SOPs) for each instrument operated in the monitoring network. There are four active and current QAPPs, as well as 29 SOPs in the DAQ library. In 2012, TSB staff drafted two new SOPs and finalized revisions to six additional SOPs.

In 2012, personnel within the TSB conducted a total of 357 performance audits of the division's air monitoring equipment. Performance audits also were conducted on monitors operated by Mammoth Cave National Park, Louisville Metro Air Pollution Control District, and the University of Louisville, as well as monitors operated by local industry. Such audits are crucial to ensuring data quality and verifying instrument function. Additionally, a total of 42 technical systems audits were performed to ensure that operational procedures at each site were followed.

TSB staff also completed a total of 146 instrument-service trips in the field and repaired an additional 73 monitors in-house in 2012. The Technical Support Section spearheaded a task to replace analog modems with digital cellular-routers at each of the ambient air monitoring stations. The routers provide faster network-communications and allow TSB staff to remotely connect and control any continuous analyzer at a site.

In August 2012, TSB provided hands-on instrument training to personnel from EPA's Science and Ecosystem Support Division (SESD). EPA SESD personnel were trained on diagnostics, repair, and standard operating procedures for instruments that sample for nitrogen oxides, sulfur dioxide, ozone, and particulates.

TSB staff conducted an ambient air monitoring workshop in September 2012, which included a presentation session as well as hands-on training. The workshop was a successful collaboration between multiple agencies, and was attended by personnel with the EPA, the NPS, LMAPCD, and Knox County, Tenn. air programs, as well as staff from the division's own FOB and PPA branches. Many of these guests also presented at the workshop.

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

What is the AQI?

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 you may experience within a few hours or days after breathing polluted air. The 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 a value over 300 signifies 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 air.ky.gov, as well as via a toll-free telephone number, **1-800-AIR-IN-KY**. Forecasted AQI data can be viewed at EPA's AirNOW website (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 Metro Air Pollution Control District forecasts due to its population size as required by the Clean Air Act.

NATIONAL AMBIENT AIR QUALITY STANDARDS (NAAQS)

POLLUTANT	MAXIMUM CONCENTRATION	
	Primary Standard	Secondary Standard
Carbon Monoxide		
8-Hour Average	9 ppm (1)	----------
1-Hour Average	35 ppm (1)	----------
Lead		
Rolling 3-Month Average	0.15 µg/m^3 (2)	Same as primary
Nitrogen Dioxide		
Annual Average	53 ppb (3)	Same as primary
1-Hour Average	100 ppb (4)	----------
Particulate Matter (measured as PM_{10})		
24-Hour Average	150 µg/m^3 (5)	Same as primary
Particulate Matter (measured as $PM_{2.5}$)		
Annual Average	12.0 µg/m^3 (6)	15.0 µg/m^3 (6)
24-Hour Average	35 µg/m^3 (7)	Same as primary
Ozone		
8-Hour Average	0.075 ppm (8)	Same as primary
Sulfur Dioxide		
1-Hour Average	75 ppb (9)	----------
3-Hour Average	----------	0.5 ppm (1)

Figure 31: 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).

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 to establish National Ambient Air Quality Standards defining maximum allowable ambient (outdoor) concentrations for criteria pollutants. Through the Clean Air Act, the Environmental Protection Agency established federal standards for six criteria air pollutants that are considered harmful to human health and the environment. Known as the National Ambient Air Quality Standards or "NAAQS" (pronounced "nacks"), the standards establish limits for each of the criteria pollutants. The term "criteria pollutants" derives from the requirement that EPA must set criteria or standards for each pollutant in the table at left.

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. 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 ($\mu g/m^3$), parts of pollutants per million (ppm) parts of air, and parts per billion (ppb) parts of air.

Footnotes:

(1) Not to be exceeded more than once per year.

(2) In addition to the 2008 lead standard (final rule signed Oct. 15, 2008), the 1978 lead standard (1.5 $\mu g/m^3$ as a quarterly average) also remains in effect until one year after an area is designated for the 2008 standard.

(3) The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

(4) To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 100 ppb (effective Jan. 22, 2010).

(5) The estimated number of exceedances must be equal to or less than one, on average over 3 years.

(6) To attain this standard, the 3-year average of weighted annual means must not exceed 12.0 $\mu g/m^3$ (final rule signed on Dec. 14, 2012; rule effective on March 18, 2013). The previous primary standard was set to 15.0 $\mu g/m^3$, as a 3-year average of annual weighted means, and was instead retained as a secondary standard.

(7) To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 $\mu g/m^3$.

(8) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm (effective May 27, 2008).

(9) To attain this standard, the 3-year average of the 99th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 75 ppb (final rule signed June 22, 2010).

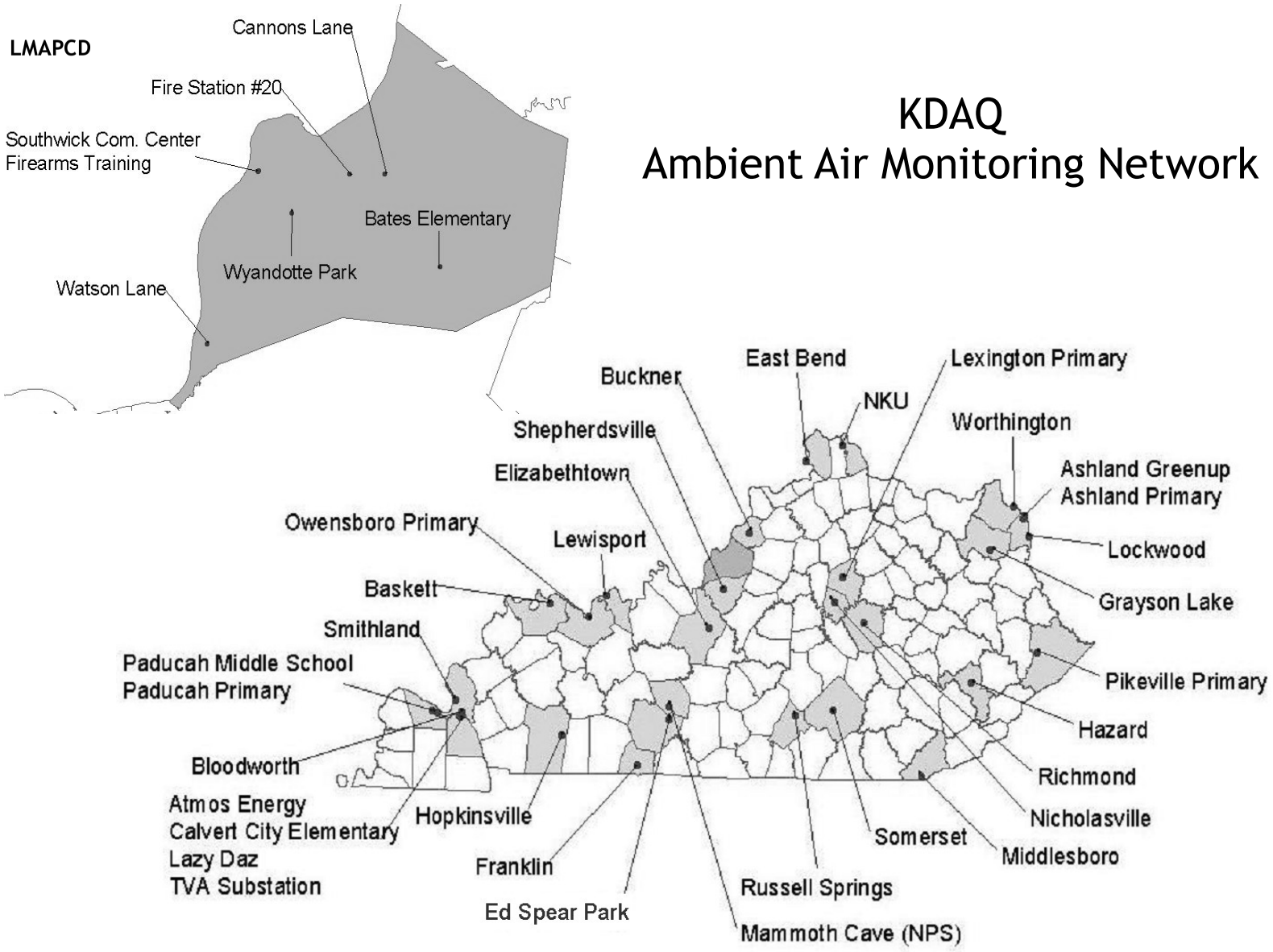


Figure 32: The KDAQ, NPS, and Louisville Metro Air Pollution Control District monitoring network. Inset shows the Louisville Metro Air Pollution Control District monitoring network.

Metropolitan Statistical Area	Number of Sites	$PM_{2.5}$		PM_{10}		SO_2	NO_2	NO_y	CO	O_3	Pb	VOC	Carb -onyl	PAH	Cr^{+6}	$PM_{2.5}$ Speciation	Carbon Speciation	Rad net	Met
Bowling Green, KY	2	4	CT	0		1	0	1	1	2	0	0	0	0	0	0	0	0	1
Cincinnati-Middletown, OH-KY-IN	2	2	T	0		1	1	0	0	2	0	0	0	0	0	0	0	0	1
Clarksville, TN-KY	1	1		0		1	0	0	0	1	0	0	0	0	0	0	0	0	0
Elizabethtown, KY	1	3	CB	0		0	0	0	0	1	0	0	0	0	0	0	0	0	0
Evansville, IN-KY	1	2	T	1	*	1	0	0	0	1	0	0	0	0	0	0	0	0	0
Huntington-Ashland, WV-KY-OH	4	2	T	2	C*	2	1	0	0	2	1	1	1	0	0	1	1	0	1
Lexington-Fayette, KY	2	2	T	1	*	2	1	0	0	2	0	1	1	0	0	1	1	1	1
Louisville-Jefferson County, KY-IN	9	9	CTB	5	CT B Pb*	3	1	1	2	5	0	0	0	0	0	1	1	1	4
Owensboro, KY	2	2	T	0		1	1	0	0	2	0	0	0	0	0	0	0	0	1
Micropolitan Statistical Area																			
Paducah, KY-IL	4	2	T	1		1	1	0	0	2	0	1	0	0	0	0	0	0	1
Somerset, KY	1	1		0		0	0	0	0	1	0	0	0	0	0	0	0	0	0
Middlesboro, KY	1	1		0		0	0	0	0	1	0	0	0	0	0	0	0	0	1
Richmond-Berea, KY	2	1		0		0	0	0	0	0	3 C	0	0	0	0	0	0	0	0
Not in a MSA																			
Carter County	1	1		2	C*	0	0	0	0	1	0	1 D	1 D	1	2 C	1	1	0	1
Marshall County	4	0		1	*	0	0	0	0	0	0	5 C	0	0	0	0	0	0	1
Perry County	1	1	T	0		0	0	0	0	1	0	0	0	0	0	0	0	0	1
Pike County	1	3	CB	0		0	0	0	0	1	0	0	0	0	0	0	0	0	0
Russell County	1	0		0		0	0	0	0	0	1	0	0	0	0	0	0	0	0
Simpson County	1	0		0		0	0	0	0	1	0	0	0	0	0	0	0	0	1
TOTALS	41		37		13	13	6	2	3	26	5	9	3	1	2	4	4	2	16

C=Collocated monitors; D=Duplicate monitor; T or B= Continuous PM2.5 monitors or continuous PM10 monitors; *=Multiple analysis: PM10 Teflon filters used for PM10 metals and/or PM10LC monitoring; Pb= PM10LC Teflon filter used for lead analysis

2012 Carbon Monoxide Ambient Air Monitoring Network (Louisville Metro Air Pollution Control District and National Park Service)

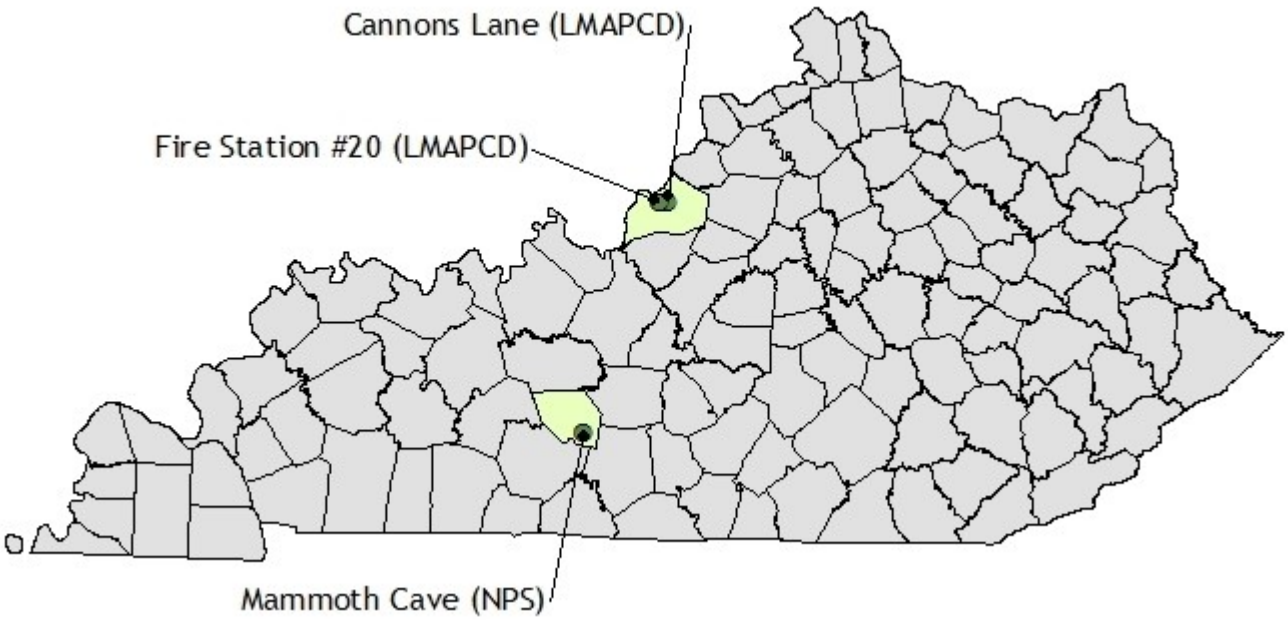


Figure 33: Carbon monoxide monitoring in Kentucky is currently conducted only in the Louisville Metro region due to statewide compliance. Jefferson County historically has had higher levels of CO than elsewhere in the state, perhaps due to the high levels of vehicle traffic in the area.

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 including highway and off-road vehicles, such as construction equipment. Other sources include industrial processes, and kerosene or 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 the sample. 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 2012, the Louisville Metro Air Pollution Control District operated two monitors, while the National Park Service operated one CO monitor at Mammoth Cave National Park.

Results

There were no exceedances of the CO standards in 2012. 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 uptrend from 2003 to 2008, as seen in the graph below, because the annual average had been based on data only from Jefferson County. Jefferson County has historically had higher CO levels than the rest of the state. In 2009, another dramatic shift, this time downward, can be attributed to the establishment of monitoring at Mammoth Cave, a rural area with fewer mobile sources.

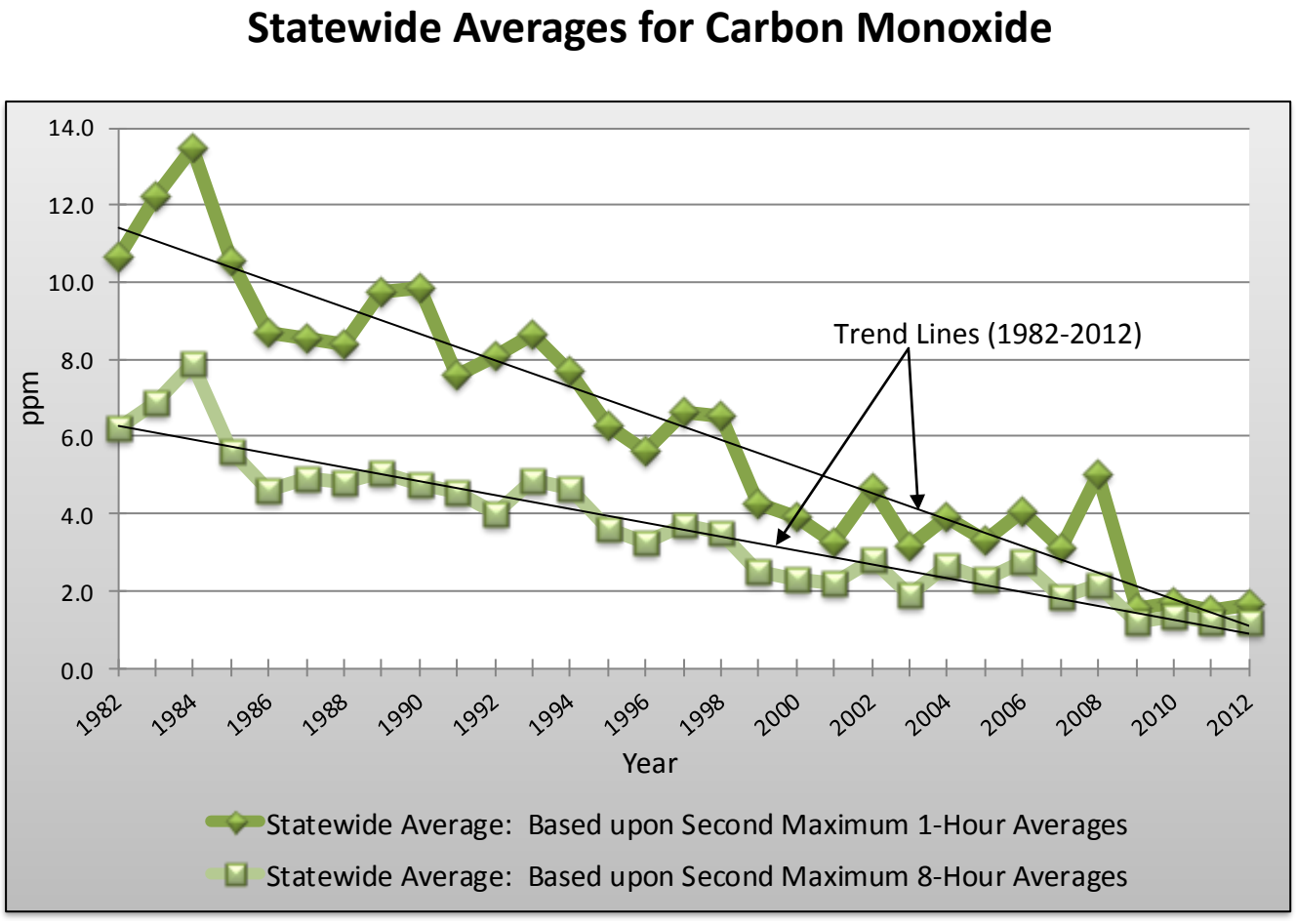


Figure 34: Statewide averages for CO monitoring indicate pollution reductions.

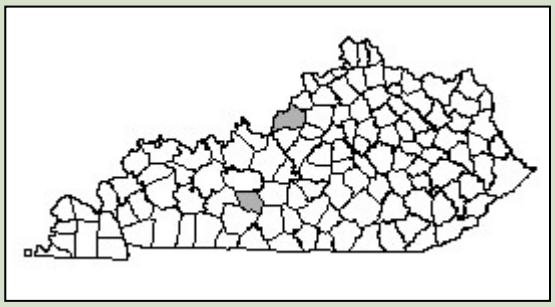
National Ambient Air Quality Standards for Carbon Monoxide

Primary NAAQS: 8-hour average not to exceed 9 ppm more than once per year
1-hour average not to exceed 35 ppm more than once per year

Secondary NAAQS: None

Criteria Pollutant Summary Report – 2012

Pollutant: **Carbon Monoxide**
Method: Instrumental/Non-Dispersive Infrared Photometry
Data Interval: Hourly
Units: Parts-per-million (ppm)



County	Site Address	AQS-ID	# Obs	1-Hr Averages			8-Hr Averages		
				1st max	2nd max	Obs> 35.0	1st max	2nd max	Obs> 9.0
Edmondson[1]	Alfred Cook Rd Mammoth Cave	21-061-0501	8014	0.3	0.3	0	0.3	0.3	0
Jefferson[2]	2730 Cannons Ln Louisville	21-111-0067	8014	1.8	1.8	0	1.7	1.6	0
Jefferson[2]	1735 Bardstown Rd Louisville	21-111-1019	8701	3.0	2.9	0	1.7	1.7	0

[1] Monitor operated by the National Park Service
[2] Monitors operated by the Louisville Metro Air Pollution Control District

LEAD (Pb)

2012 Lead Ambient Air Monitoring Network

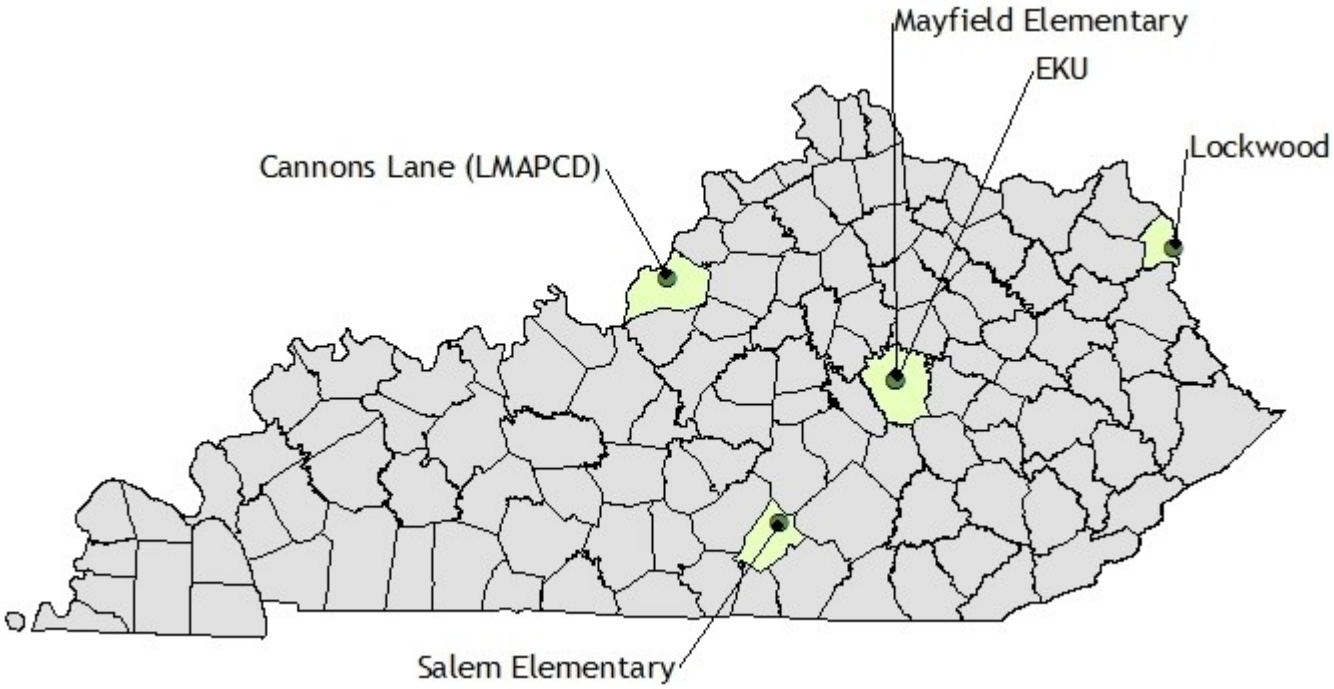


Figure 35: Lead monitoring locations in Kentucky.

Lead is a soft, blue-gray metal that occurs naturally. However, the historical use of lead in gasoline, paint, and plumbing, along with modern use in batteries, bridge paint, and plastic has caused lead to accumulate in the environment. The accumulation of lead in the environment is the reason lead can be found in everyone's body today.

On Nov. 12, 2008, the NAAQS for lead was lowered from 1.5 $\mu g/m^3$ to 0.15 $\mu g/m^3$. Unlike the other NAAQS pollutants, the lead NAAQS required state, tribal, and local agencies to monitor near sources that emit more than one ton of lead per year. The division identified three sources that emitted over one ton of lead annually and began monitoring near the sources in 2010. In December 2010, the EPA released a new set of monitoring requirements. The new monitoring rule requires lead monitoring near sources that emit more than 0.5 tons per year. The new rule also requires lead monitoring at sites designated as NCore in core-based statistical areas with populations greater than 500,000. LMAPCD operates one such NCore site. New lead monitors were established in 2011.

Environmental Impacts

Ingestion of lead is the first major pathway of exposure. Inhalation is the second leading pathway of exposure for lead. Only 20 percent to 70 percent of ingested lead is absorbed into the body whereas almost all of the lead inhaled is absorbed into the body. Children absorb lead into their system faster than an adult.

Lead can accumulate in soil, water, and sediments through deposition from air sources. The accumulation can damage ecosystems through the loss of biodiversity, changes in community composition, and decreased growth and reproductive rates in plants and animals.

Lead contamination can cause nervous system and kidney damage, learning disabilities, poor muscle coordination, decreased bone and muscle growth, and hearing damage in children. Lead can also affect adult nervous systems. However, most adults require a much larger exposure than a child to have a negative health impact.

How is lead monitored?

At most sites, lead concentrations are determined from the analysis of suspended particulates collected by federal reference method high volume particulate samplers. These samplers use a brushless motor and a critical flow orifice in order to achieve a sampling flow rate between 1.10 and 1.70 cubic meters per minute (m^3/min) over the course of 24 hours. Samples are collected on 8x10 glass fiber filters. Upon collection, the filters are sent to an EPA-certified laboratory for analysis. The sample filters are cut into strips, acid digested according to 40 CFR Part 50, Appendix G, and analyzed by Inductively Coupled Plasma with Mass Spectroscopy Detection (ICP-MS).

Lead samples at the LMAPCD NCore site are collected using a manual PM_{10LC} sampler, which is an approved federal equivalent method for lead sampling. These low-volume instruments maintain a flow-rate of 16.7 liters per minute to collect a sample onto a PTFE filter. PM_{10LC} filters are first analyzed to obtain the mass-difference and are subsequently sent to a laboratory for lead analysis via x-ray fluorescence.

Results

In 2012, the Mayfield Elementary site in Richmond registered multiple three-month rolling averages above the 0.15 µg/m^3 standard beginning with the January-March 2012 time-period. Resultantly, a second monitoring site was established in Richmond on the campus of Eastern Kentucky University, which also recorded 3-month rolling averages above the standard. However, both sites were recording 3-month rolling averages below the level of the standard with the conclusion of 2012. All other sites recorded averages below the level of the NAAQS.

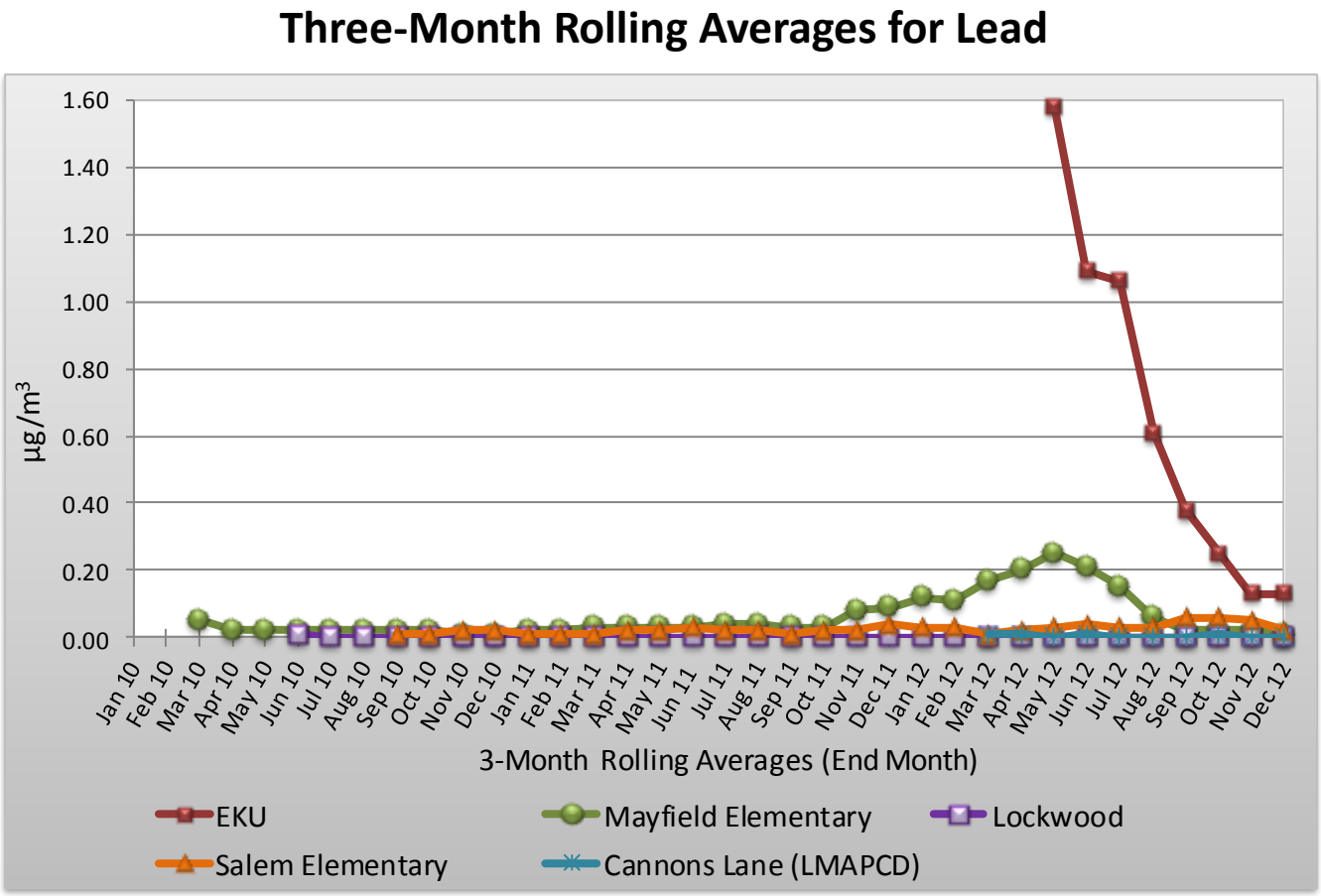


Figure 36: Three-month rolling averages for lead by site. Each three-month average is plotted on the month that the three-month period ended. Monitoring data is only available for 2010-2012.

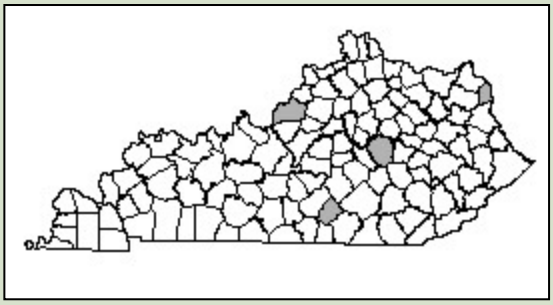
National Ambient Air Quality Standards for Lead

Primary NAAQS: Rolling 3-month average not to exceed 0.15 µg/m^3

Secondary NAAQS: Same as primary standard

Criteria Pollutant Summary Report – 2012

Pollutant: **Lead**
Method: High volume sampler; Inductively Coupled Plasma-Mass Spectroscopy
Data Interval: 24-hour
Units: Micrograms per cubic meter (µg/m^3)



County	Site Address	AQS-ID	# Obs	Rolling 3- Month Average				
				1st max	2nd max	3rd max	4th max	Obs > 0.15
Boyd	Lockwood Estates Catlettsburg	21-019-0016	59	0.00	0.00	0.00	0.00	0
Jefferson[1] NCore	2730 Cannons Ln Louisville	21-111-0067	58	0.01	0.01	0.01	0.01	0
Madison	Mayfield Elem, Bond St Richmond	21-151-0003	58	0.25	0.21	0.20	0.17	4
Madison	EKU, Van Hoose Dr Richmond	21-151-0005	44	1.58	1.09	1.06	0.61	6*
Russell	1409 S. Highway 76 Russell Springs	21-207-0001	61	0.06	0.06	0.05	0.04	0

Values in red represent an exceedance of the NAAQS.
[1] Monitor operated by the Louisville Metro Air Pollution Control District
NCore Samples collected with a low-volume manual $PM10_{LC}$ sampler and analyzed via x-ray fluorescence
*** Incomplete dataset**

2012 Nitrogen Dioxide Ambient Air Monitoring Network

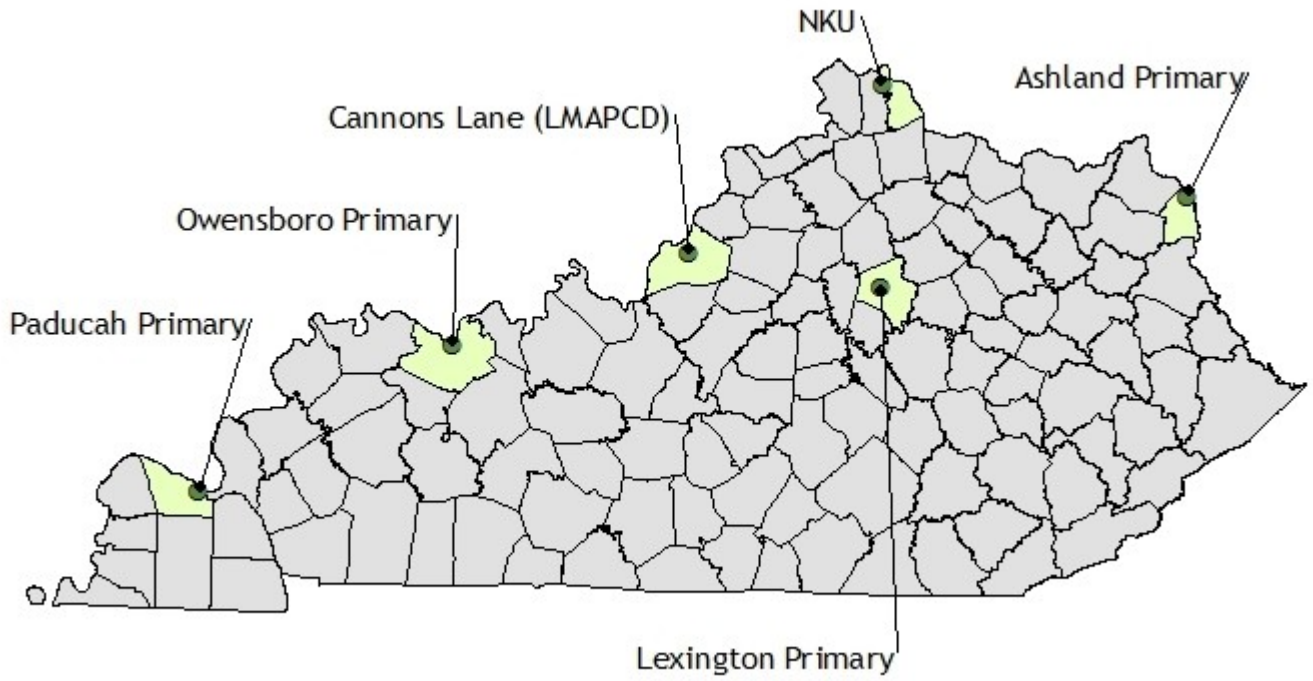


Figure 37: Nitrogen dioxide monitoring locations in Kentucky.

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 (NO_x), 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 NO_2 is as a lung irritant, which can cause an increase in respiratory rate, a decrease in lung function, and an increase in 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.

NO_2 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 (NO_x) in the sample.

The assumption is that the majority of the NO_x value is not NO_2. By subtracting the second air stream NO concentration from the first stream NO_x concentration, an NO_2 value is obtained. Data from the analyzer is transmitted into an automated data storage system. In 2012, the division and the LMAPCD operated six nitrogen dioxide monitors in Kentucky.

Results

There were no exceedances of the NO_2 standard in 2012. There have been no recorded exceedances of a NO_2 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.

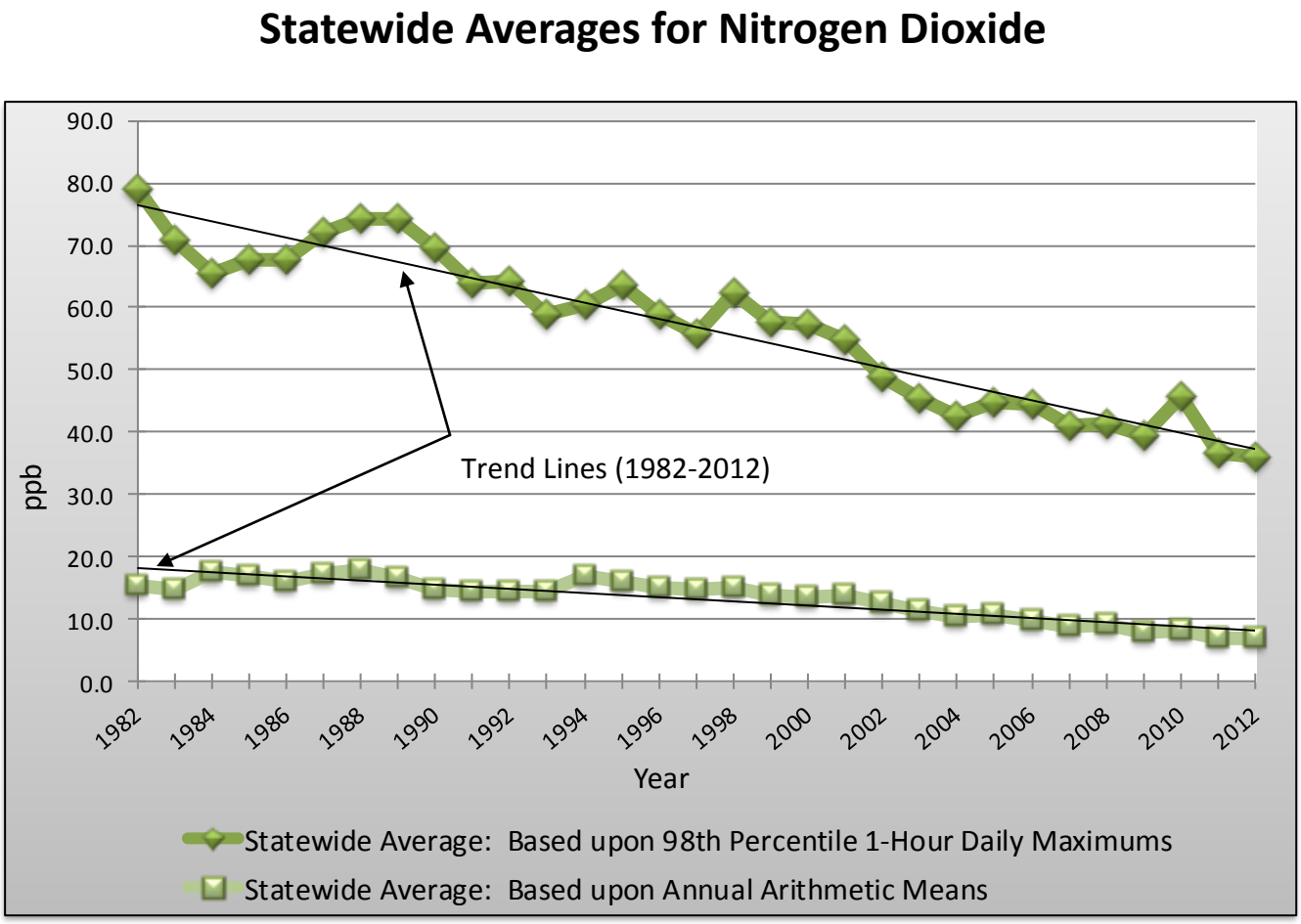


Figure 38: Statewide averages for nitrogen dioxide monitoring indicate pollution reductions.

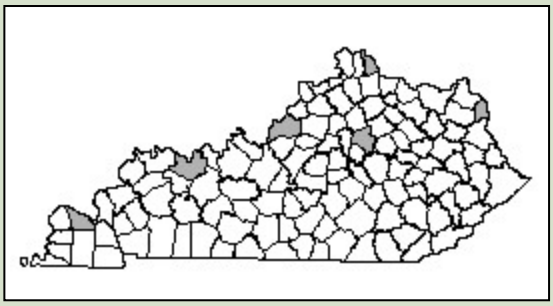
National Ambient Air Quality Standards for Nitrogen Dioxide

Primary NAAQS: Annual arithmetic mean must not exceed 53 ppb
3-year average of the 98th percentile of daily maximum one-hour averages must not exceed 100 ppb

Secondary NAAQS: Annual arithmetic mean must not exceed 53 ppb

Criteria Pollutant Summary Report – 2012

Pollutant: **Nitrogen Dioxide**
Method: Instrumental/Gas-Phase Chemiluminescence
Data Interval: Hourly
Units: Parts-per-billion (ppb)



County	Site Address	AQS-ID	# Obs	1-Hr Daily Maximum			Annual Mean
				1st max	2nd max	Obs > 100	
Boyd	2924 Holt Street Ashland	21-019-0017	8275	35.0	34.0	0	6.23
Campbell	524A John Hill Rd Highland Heights	21-037-3002	8147	36.0	35.0	0	3.58
Daviess	US60 & Pleasant Valley Rd Owensboro	21-059-0005	8219	42.0	38.0	0	6.03
Fayette	650 Newtown Pike Lexington	21-067-0012	8300	51.0	47.0	0	8.05
Jefferson[1]	2730 Cannons Ln Louisville	21-111-0067	8590	51.1	49.5	0	11.34
McCracken	2901 Powell Street Paducah	21-145-1024	8203	41.0	40.0	0	6.41

[1] Nitrogen dioxide monitors located in Jefferson County are operated by the Louisville Metro Air Pollution Control District.

NO_2 Criteria Pollutant Multi-Year Summary Report – 2012
98th Percentile Daily 1-Hour Maximum, 3-Year Average

County	Site Address	AQS-ID	98th Percentile Daily Maximum 1-Hr Averages				
			2010	2011	2012	3-Yr Avg	Obs > 100
Boyd	2924 Holt Street Ashland	21-019-0017	37.0	30.0*	30.0	32*	0
Campbell	524A John Hill Road Highland Heights	21-037-3002	39.0	28.0	29.0	32	0
Daviess	US 60 & Pleasant Valley Rd Owensboro	21-059-0005	38.0	33.0	31.0	34	0
Fayette	650 Newtown Pike Lexington	21-067-0012	56.0	47.0	45.0	49	0
Jefferson[1]	2730 Cannons Lane Louisville	21-111-0067	58.0*	45.1	44.8	49*	0
McCracken	2901 Powell Street Paducah	21-145-1024	47.0	37.0	36.0	40	0

*** Incomplete data set. The mean does not satisfy summary criteria.**

[1] Nitrogen dioxide monitors located in Jefferson County are operated by the Louisville Metro Air Pollution Control District.

2012 Ozone Ambient Air Monitoring Network

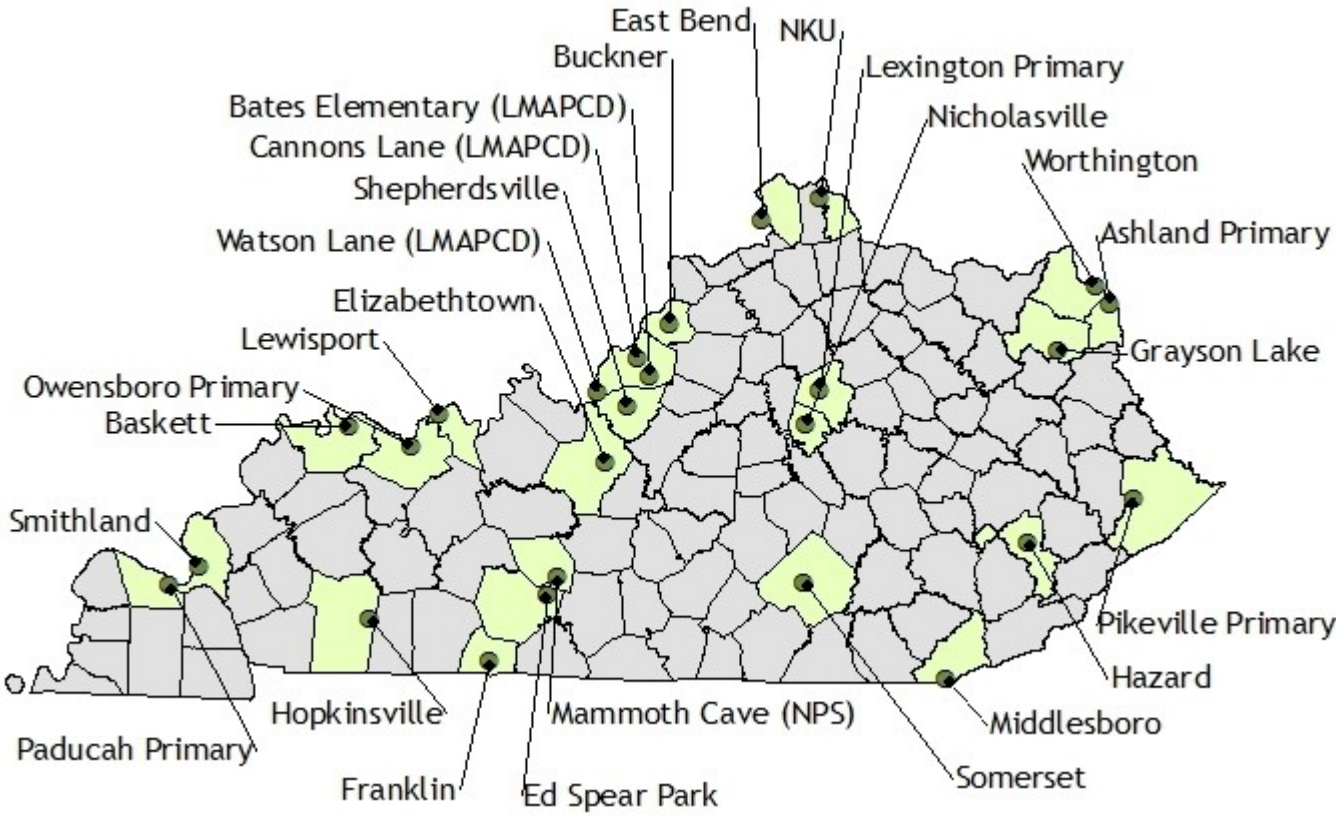


Figure 39: Ozone monitoring locations in Kentucky.

Ozone (O_3) is a colorless gas that is not emitted directly into the atmosphere from sources, but rather forms in the atmosphere from a photochemical reaction between volatile organic compounds (VOCs) and nitrogen oxides (NO_x) 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 NO_x 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. However, 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 can damage ecosystems.

How is O_3 monitored?

Ozone is monitored from March 1st through Oct. 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 2012, DAQ, the National Park Service at Mammoth Cave, and the Louisville Metro Air Pollution Control District operated a total of 26 ozone monitors in Kentucky.

Results

In November 1997, the 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. On May 27, 2008, the EPA adopted a new 8-hour standard set at 0.075 ppm. On Sept. 16, 2009, EPA notified the Court of its decision to initiate a rulemaking to reconsider the 2008 ozone standard. However, on Sept. 16, 2011, the EPA announced their plans to implement the 2008 ozone NAAQS of 0.075 ppm.

In 2012, there were 174 daily maximum eight-hour averages that were greater than 0.075 ppm. Seventeen sites showed fourth highest daily maximums in exceedance of the eight-hour standard. High ozone concentrations can be at least partially attributed to anomalously high temperatures and arid conditions that occurred during the summer. According to NOAA, summer 2012 was the third warmest ever documented for the contiguous U.S. since national recordkeeping began in 1895. (*http://www.climate.gov/news-features/understanding-climate/summer-2012-recap*)

Generally, there has been a decline in ozone levels over the past 25 years based on one-hour data. This downward trend is the result of emission controls on vehicles and a regional strategy controlling of NO_x emissions from large stationary internal combustion engines, large boilers and turbines used in power plants, and other industrial applications.

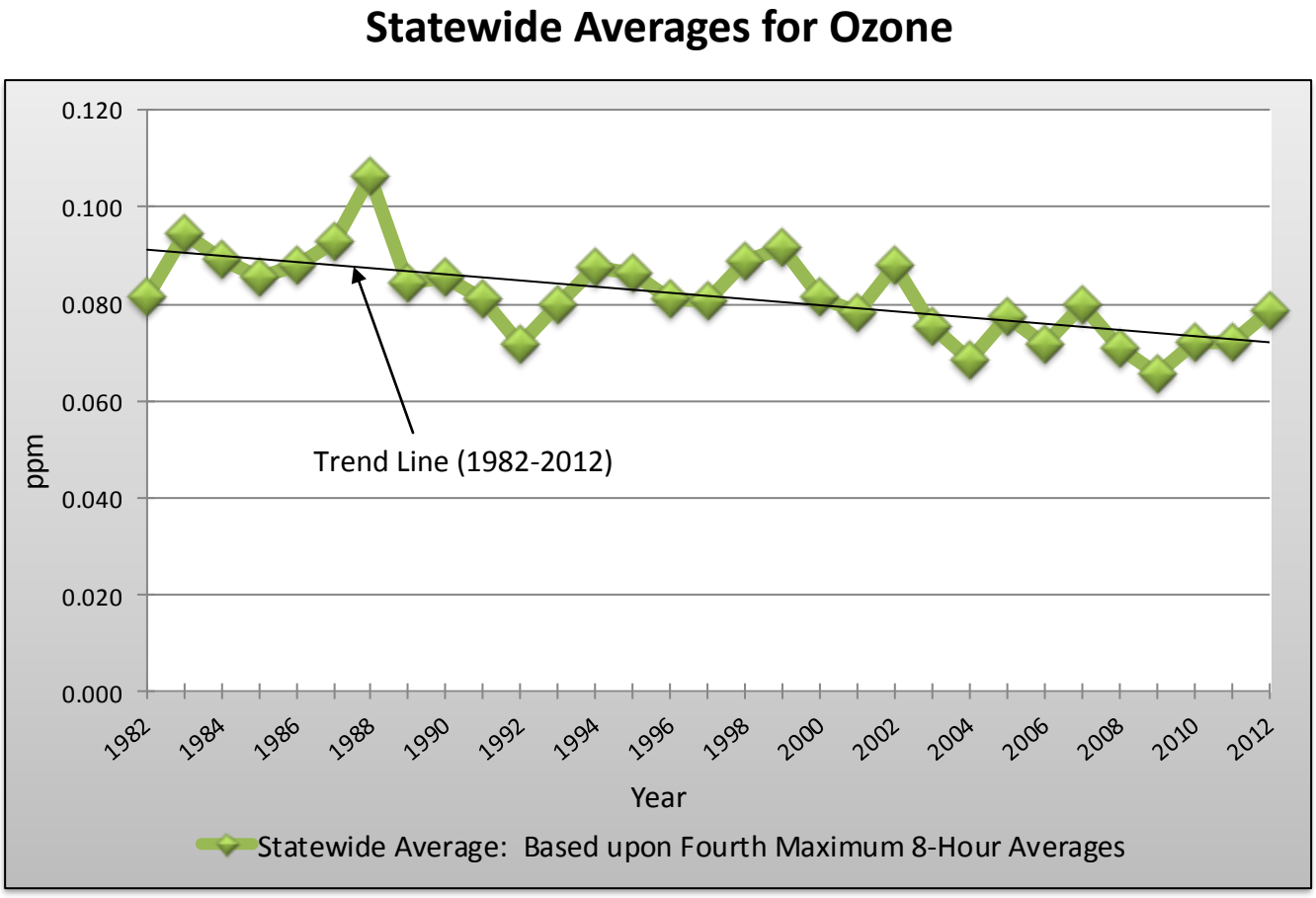


Figure 40: Statewide averages for ozone monitoring indicate pollution reductions.

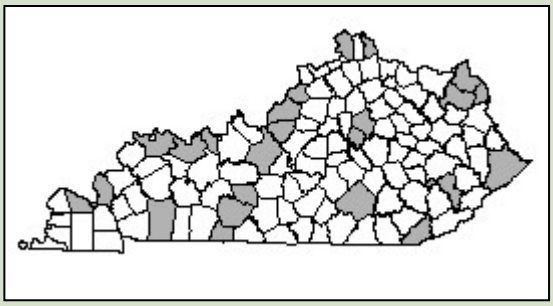
National Ambient Air Quality Standards for Ozone

Primary NAAQS: 3-year average of the 4th highest daily maximum 8-hr concentration not to exceed 0.075 ppm

Secondary NAAQS: Same as Primary Standard

Criteria Pollutant Summary Report - 2012

Pollutant: **Ozone**
Method: Ultra-Violet Photometry
Data Interval: Hourly
Units: Parts-per-million (ppm)



County	Site Address	AQS-ID	Valid Days	Daily Maximum 8-Hr Average				
				1st max	2nd max	3rd max	4th max	Obs > 75
Bell	34th & Dorchester Middlesboro	21-013-0002	239	0.072	0.067	0.067	0.066	0
Boone	KY 338 & Lower River East Bend	21-015-0003	245	0.085	0.083	0.078	0.074	3
Boyd	2924 Holt Street Ashland	21-019-0017	245	0.083	0.079	0.075	0.074	2
Bullitt	2nd & Carpenter St Shepherdsville	21-029-0006	245	0.086	0.083	0.081	0.080	4
Campbell	524A John Hill Rd NKU	21-037-3002	242	0.106	0.089	0.084	0.084	12
Carter	Camp Webb Grayson Lake	21-043-0500	239	0.085	0.077	0.072	0.071	2
Christian	10800 Pilot Rock Hopkinsville	21-047-0006	245	0.077	0.077	0.076	0.075	3
Daviess	US60 & Pleasant Valley Owensboro	21-059-0005	245	0.101	0.090	0.088	0.087	13
Edmonson[1]	Alfred Cook Rd Mammoth Cave	21-061-0501	241	0.090	0.081	0.081	0.081	9
Fayette	650 Newtown Pike Lexington	21-067-0012	243	0.086	0.080	0.078	0.078	5
Greenup	Scott & Center St Worthington	21-089-0007	235	0.087	0.081	0.079	0.076	5
Hancock	2nd & Caroline Lewisport	21-091-0012	244	0.097	0.093	0.082	0.081	11

Ozone Criteria Pollutant Summary Report – 2012 Continued

County	Site Address	AQS-ID	Valid Days	Daily Maximum 8-Hr Average				
				1st max	2nd max	3rd max	4th max	Obs > 75
Hardin	801 North Miles St Elizabethtown	21-093-0006	186	0.090	0.086	0.082	0.079	4
Henderson	Baskett Fire Dept. Baskett	21-101-0014	243	0.091	0.089	0.088	0.087	12
Jefferson[2]	7601 Bardstown Rd Louisville	21-111-0027	244	0.106	0.098	0.089	0.086	6
Jefferson[2]	7201 Watson Lane Louisville	21-111-0051	242	0.098	0.090	0.083	0.081	11
Jefferson[2]	2730 Cannons Lane Louisville	21-111-0067	245	0.100	0.098	0.094	0.090	13
Jessamine	DOT, Etter Drive Nicholasville	21-113-0001	242	0.081	0.079	0.078	0.077	4
Livingston	DOT 811 US 60E Smithland	21-139-0003	239	0.104	0.096	0.089	0.087	12
McCracken	2901 Powell Street Paducah	21-145-1024	243	0.107	0.098	0.092	0.087	14
Oldham	DOT, 3995 Morgan Buckner	21-185-0004	245	0.109	0.095	0.093	0.092	14
Perry	Perry Co Horse Park Hazard	21-193-0003	245	0.078	0.072	0.072	0.070	1
Pike	101 North Mayo Trail Pikeville	21-195-0002	241	0.084	0.072	0.070	0.068	1
Pulaski	Clifty Street Somerset	21-199-0003	245	0.080	0.076	0.076	0.075	3
Simpson	DOT, HWY 1008 Franklin	21-213-0004	239	0.079	0.078	0.074	0.071	2
Warren	Oakland Elementary Oakland	21-227-0008	70	0.061	0.059	0.058	0.058	0
Warren	Ed Spear Park Smiths Grove	21-227-0009	173	0.085	0.083	0.082	0.079	8

[1] Monitor operated by the National Park Service.
[2] Monitors operated by the Louisville Metro Air Pollution Control District.
Values in red represent an exceedance of the NAAQS.

Ozone Criteria Pollutant Multi-Year Summary Report – 2012
8-hour 4th Maximum, 3-year Average

County	Site Address	AQS-ID	4th Maximum 8-hr Average			
			2010	2011	2012	3-Yr Avg
Bell	34th & Dorchester Middlesboro	21-013-0002	0.068	0.062	0.066	0.065
Boone	KY 338 & Lower River Road East Bend	21-015-0003	0.067	0.070	0.074	0.070
Boyd	2924 Holt Street Ashland	21-019-0017	0.072	0.070	0.074	0.072
Bullitt	2nd & Carpenter Streets Shepherdsville	21-029-0006	0.074	0.072	0.080	0.075
Campbell	524A John Hill Highland Heights	21-037-3002	0.073	0.080	0.084	0.079
Carter	Camp Webb Grayson Lake	21-043-0500	0.071	0.066	0.071	0.069
Christian	10800 Pilot Rock Road Hopkinsville	21-047-0006	0.074	0.070	0.075	0.073
Daviess	US 60 & Pleasant Valley Rd Owensboro	21-059-0005	0.072	0.080	0.087	0.079
Edmonson[1]	Alfred Cook Road Mammoth Cave	21-061-0501	0.075	0.071	0.081	0.075
Fayette	650 Newtown Pike Lexington	21-067-0012	0.071	0.075	0.078	0.074
Greenup	Scott & Center Streets Worthington	21-089-0007	0.071	0.071	0.076	0.072
Hancock	2nd & Caroline Streets Lewisport	21-091-0012	0.073	0.075	0.081	0.076
Hardin	801 North Miles Street Elizabethtown	21-093-0006	0.071	0.069	0.079	0.073
Henderson	Baskett Fire Dept Baskett	21-101-0014	0.074	0.077	0.087	0.079
Jefferson[2]	7601 Bardstown Road Louisville	21-111-0027	0.075	0.081	0.086	0.080
Jefferson[2]	7201 Watson Lane Louisville	21-111-0051	0.074	0.082	0.081	0.079
Jefferson[2]	2730 Cannons Lane Louisville	21-111-1021	0.085	0.082	0.090	0.085

[1] Monitor operated by the National Park Service.
[2] Monitors operated by the Louisville Metro Air Pollution Control District.
Values in red represent an exceedance of the NAAQS.

Ozone Criteria Pollutant Multi-Year Summary Report - 2012 Continued
8-hour 4th Maximum, 3-year Average

County	Site Address	AQS-ID	4th Maximum 8-hr Average			
			2010	2011	2012	3-Yr Avg
Jessamine	DOT, Etter Drive Nicholasville	21-113-0001	0.069	0.072	0.077	0.072
Livingston	DOT, 811 US 60 East Smithland	21-139-0003	0.067	0.071	0.087	0.075
McCracken	2901 Powell Street Paducah	21-145-1024	0.073	0.071	0.087	0.077
Oldham	DOT, 3995 Morgan Rd Buckner	21-185-0004	0.078	0.090	0.092	0.086
Perry	Perry County Horse Park Hazard	21-193-0003	0.071	0.063	0.070	0.068
Pike	101 North Mayo Trail Pikeville	21-195-0002	0.070	0.066	0.068	0.068
Pulaski	Clifty Street Somerset	21-199-0003	0.066	0.067	0.075	0.069
Simpson	DOT, Hwy 1008 Franklin	21-213-0004	0.073	0.071	0.071	0.071
Warren	Oakland Elementary Oakland	21-227-0008	0.068	0.066	0.058*	0.064*
Warren	Ed Spear Park Smiths Grove	21-227-0009	n/a	n/a	0.079*	0.079*

[1] Monitor operated by the National Park Service.
[2] Monitors operated by the Louisville Metro Air Pollution Control District.
Values in red represent an exceedance of the NAAQS.

2012 Particulate Matter ($PM_{2.5}$) Ambient Air Monitoring Network

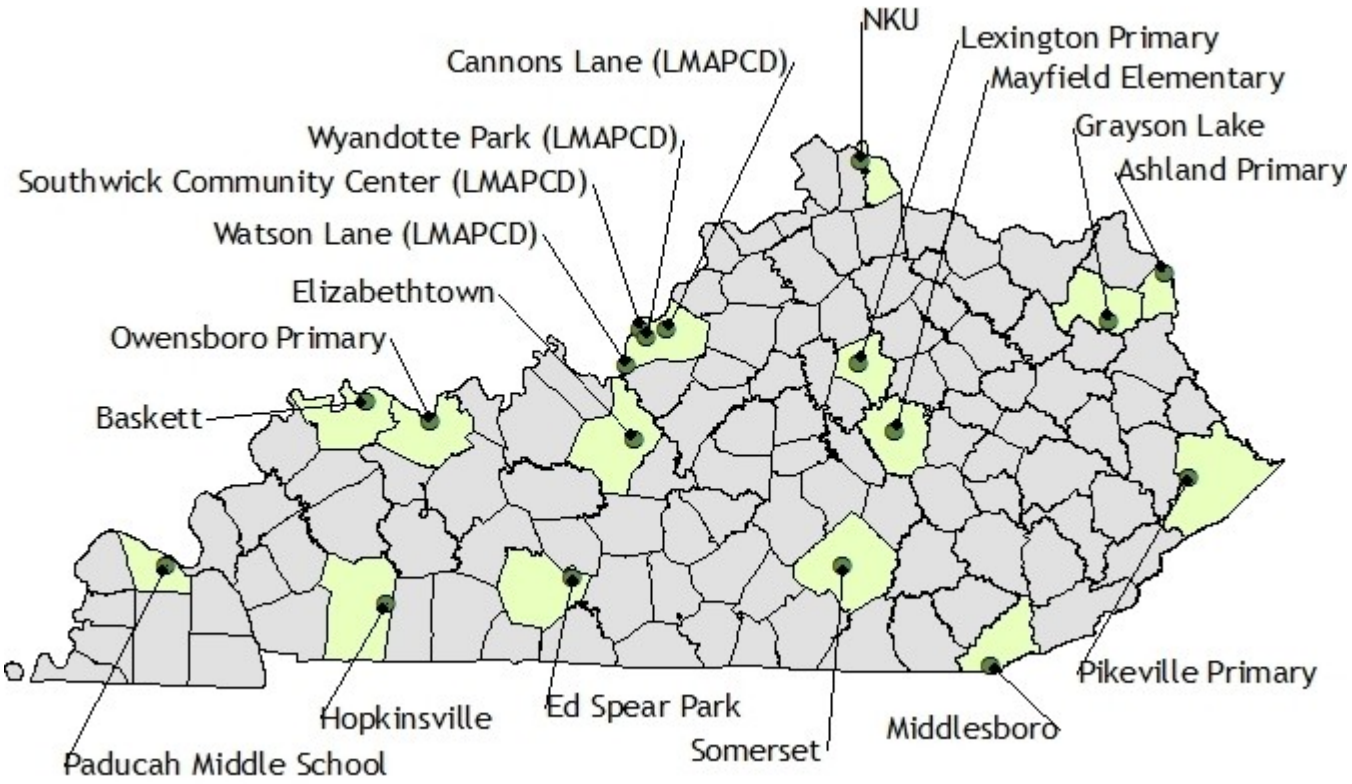


Figure 41: $PM_{2.5}$ monitoring locations in Kentucky.

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 percent in some areas of the U.S.) and contributing to acid rain.

How is $PM_{2.5}$ monitored?

The division currently operates continuous Tapered Element Oscillating Microbalance (TEOM) monitors, continuous Federal Equivalent Monitor (FEM) Beta Attenuation Monitors (BAM), and manual intermittent Federal Reference Method (FRM) and FEM samplers. However, only the FRM and FEM manual intermittent samplers are used for comparisons to the NAAQS. The BAM and TEOM monitors continuously report $PM_{2.5}$ Air Quality Index (AQI) results. The FRM and FEM manual samplers are used for calculation of the AQI for historic data.

The manual intermittent FRM-type monitors collect a sample over a 24-hour run cycle. While most samplers operate every third day, some samplers operate every sixth day and others operate every twelfth day. These samplers operate by drawing a measured volume of air through a pre-weighed filter. 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 weighed to determine the mass of the particulates collected. In 2012, KDAQ and LMAPCD operated FRM-type samplers for NAAQS comparisons at nineteen sites in fifteen counties.

Results

On Dec. 14, 2012, the EPA finalized a new particulate NAAQS, which lowered the annual $PM_{2.5}$ standard from 15.0 µg/m^3 to 12.0 µg/m^3. The EPA retained 15.0 µg/m^3 annual limit as a secondary standard. The 24-hour standard was retained as both a primary and secondary standard. Since changes to the NAAQS did not become effective until March 18, 2013, all annual data summaries for this annual report are compared to original 15.0 µg/m^3 standard.

There were no exceedances of either the 24-hour or annual $PM_{2.5}$ standards in 2012. Furthermore, no sampler exceeded either the three-year 24-hour (2010-2012) standard or the three-year (2010-2012) annual standard. This is a significant accomplishment.

Generally, statewide $PM_{2.5}$ levels declined during the 1999-2012 time period.

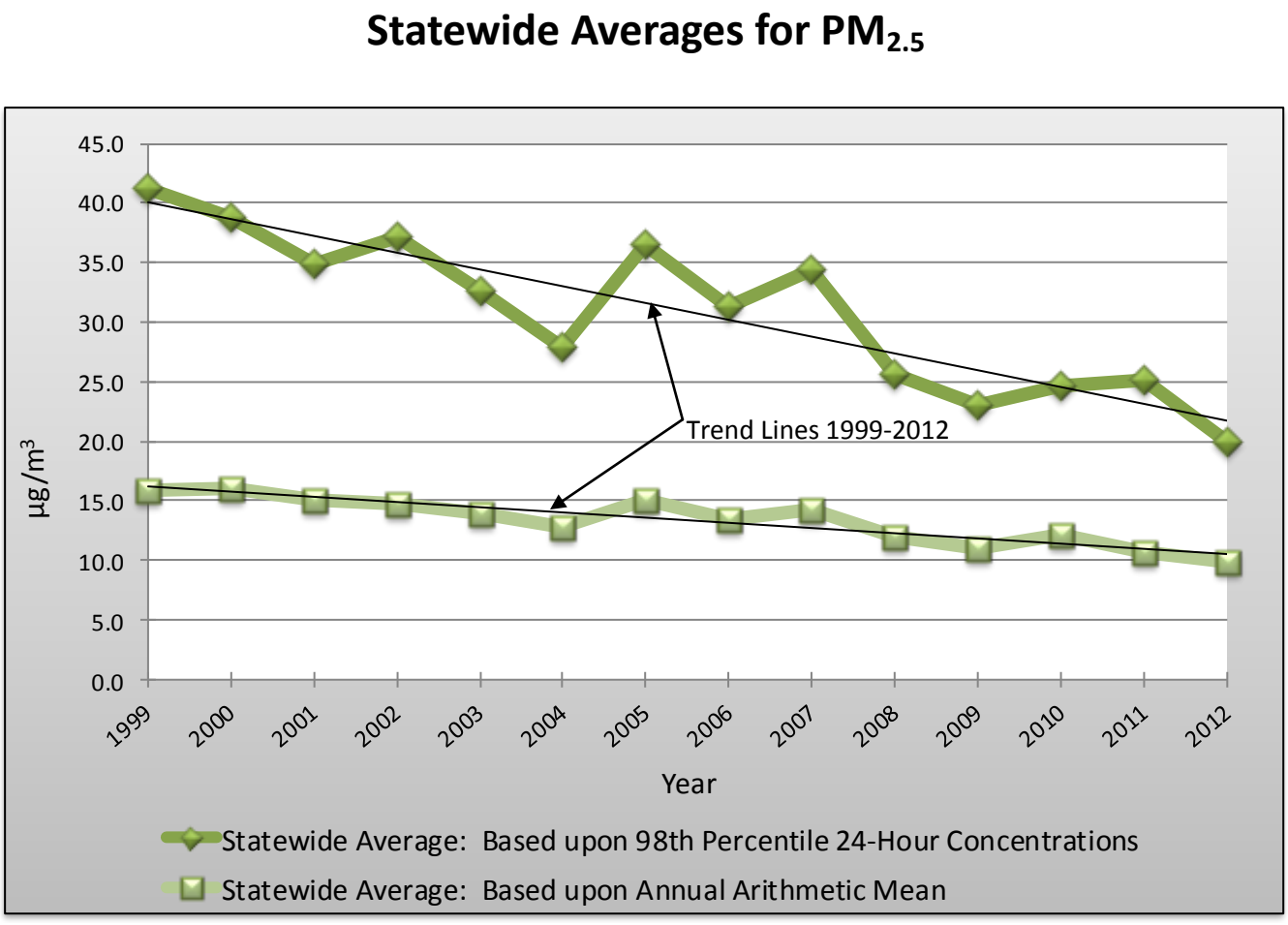


Figure 42: Statewide averages for $PM_{2.5}$ monitoring indicate pollution reductions.

National Ambient Air Quality Standards for Particulate Matter $PM_{2.5}$

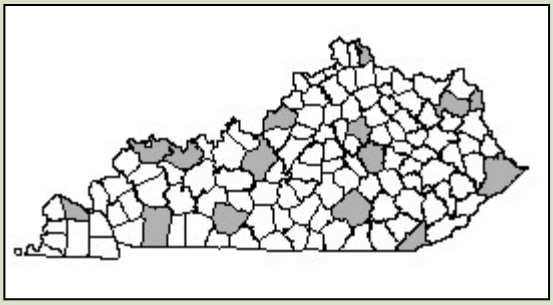
Primary NAAQS: 3-year average of the weighted annual mean not to exceed 15.0 µg/m^3 *
3-year average of the 98th percentile of 24-hour concentrations not to exceed 35 µg/m^3

Secondary NAAQS: Same as Primary

*Annual standard in effect during 2012; Standard lowered to 12.0 µg/m^3 in December 2012.

Criteria Pollutant Summary Report – 2012

Pollutant: **Particulate Matter $PM_{2.5}$**
Method: Gravimetric
Data Interval: 24-hour
Units: Micrograms per cubic meter (µg/m^3)



County	Site	AQS-ID	# Obs	Mean	24-Hour Average				
					1st max	2nd max	3rd max	4th max	Obs > 35
Bell	34th & Dorchester Middlesboro	21-013-0002	56	10.32	22.7	19.8	19.7	19.7	0
Boyd	2924 Holt Street Ashland	21-019-0017	121	10.18	24.8	22.7	22.4	22.1	0
Campbell	524A John Hill Rd Highland Heights	21-037-3002	113	9.68	21.2	20.9	20.7	17.6	0
Carter	Camp Webb Grayson Lake	21-043-0500	115	8.29	19.5	18.8	17.6	17.4	0
Christian	10800 Pilot Rock Hopkinsville	21-047-0006	118	9.92	21.2	19.7	19.6	18.3	0
Daviess	US60 & Pleasant Valley Rd Owensboro	21-059-0014	117	10.82	26.8	24.0	22.3	22.2	0
Fayette	650 Newtown Pike Lexington	21-067-0012	118	9.76	23.5	21.4	19.1	19.1	0
Hardin	801 North Miles Street Elizabethtown	21-093-0006	92	11.66*	23.5	20.0	19.3	18.8	0
Henderson	Basket Fire Dept. Baskett	21-101-0014	117	10.40	24.2	20.5	20.2	20.2	0

*** Incomplete data set. The mean does not satisfy summary criteria.**

$PM_{2.5}$ Criteria Pollutant Summary Report – 2012 Continued

County	Site	AQS-ID	# Obs	Mean	24-Hour Average				
					1st max	2nd max	3rd max	4th max	Obs > 35
Jefferson[1]	37th & Southern Avenue Louisville	21-111-0043	122	9.71	25.7	23.9	22.3	21.6	0
Jefferson[1]	1032 Beecher Avenue Louisville	21-111-0044	353	10.31	29.3	25.4	25.0	24.3	0
Jefferson[1]	7201 Watson Lane Louisville	21-111-0051	56	10.25	22.2	20.6	17.9	16.9	0
Jefferson[1]	2730 Cannons Lane Louisville	21-111-0067	120	9.85	21.8	19.7	19.5	19.2	0
McCracken	342 Lone Oak Road Paducah	21-145-1004	115	9.96	21.2	20.5	19.3	17.8	0
Madison	Mayfield School Richmond	21-151-0003	115	8.80	19.9	18.3	17.5	17.2	0
Pike	101 North Mayo Trail Pikeville	21-195-0002	114	9.20	19.5	19.2	18.9	18.6	0
Pulaski	305 Clifty Street Somerset	21-199-0003	93	9.56*	22.4	19.9	18.7	18.0	0
Warren	Oakland Elementary Oakland	21-227-0008	39	8.23*	17.1	15.6	13.0	12.4	0
Warren	Ed Spear Park Smiths Grove	21-227-0009	76	10.37*	23.0	19.0	18.9	18.0	0

[1] **Monitors operated by the Louisville Metro Air Pollution Control District.**
*** Incomplete data set. The mean does not satisfy summary criteria.**

$PM_{2.5}$ Criteria Pollutant Multi-Year Summary Report – 2012
24-Hour 98th Percentile, 3-Year Average

County	Site	AQS-ID	24-Hour, 98th Percentile			
			2010	2011	2012	3-Yr Avg
Bell	34th & Dorchester Middlesboro	21-013-0002	28.3	26.0	19.8	25
Boyd	2924 Holt Street Ashland	21-019-0017	26.2	22.5	22.4	24
Campbell	524A John Hill Highland Heights	21-037-3002	25.6	25.8	20.7	24
Carter	Camp Webb Grayson Lake	21-043-0500	20.2	19.6	17.6	19
Christian	10800 Pilot Rock Road Hopkinsville	21-047-0006	21.8	23.2	19.6	22
Daviess	US60 and Pleasant Valley Rd Owensboro	21-059-0005	28.1	27.2	22.3	26
Fayette	650 Newtown Pike Lexington	21-067-0012	22.8	24.0	19.1	22
Hardin	801 North Miles Street Elizabethtown	21-093-0006	21.1	24.7	20.0*	22*
Henderson	Baskett Fire Dept Baskett	21-101-0014	24.4	26.2	20.2	24
Jefferson[1]	37th & Southern Avenue Louisville	21-111-0043	33.1	29.6	20.3	28
Jefferson[1]	1032 Beecher Avenue Louisville	21-111-0044	28.8	26.8	22.1	26
Jefferson[1]	7201 Watson Lane Louisville	21-111-0051	26.1	31.3	20.6	26
Jefferson[1]	2730 Cannons Lane Louisville	21-111-0048	25.8	27.0	19.5	24
McCracken	342 Lone Oak Road Paducah	21-145-1004	25.0	23.2	19.3	23
Madison	Mayfield School Richmond	21-151-0003	20.8	21.8	17.5	20
Pike	101 North Mayo Trail Pikeville	21-195-0002	23.6	23.7	18.9	22
Pulaski	305 Clifty Street Somerset	21-199-0003	n/a	n/a	19.9*	20*
Warren	Oakland Elementary Oakland	21-227-0008	20.7	24.0	17.1*	21*
Warren	Ed Spear Park Smiths Grove	21-227-0009	n/a	n/a	19.0*	19*

[1] **Monitors operated by the Louisville Metro Air Pollution Control District.**
*** Incomplete data set. The mean does not satisfy summary criteria.**

$PM_{2.5}$ Criteria Pollutant Multi-Year Summary Report – 2012
Annual Weighted Mean, 3-Year Average

County	Site	AQS-ID	Annual Weighted Mean			
			2010	2011	2012	3-Yr Avg
Bell	34th & Dorchester Middlesboro	21-013-0002	12.9	10.6	10.3	11.3
Boyd	2924 Holt Street Ashland	21-019-0017	11.2	10.74	10.2	10.6
Campbell	524A John Hill Highland Heights	21-037-3002	11.8	10.3	9.7	10.6
Carter	Camp Webb Grayson Lake	21-043-0500	9.9	8.6	8.3	8.9
Christian	10800 Pilot Rock Road Hopkinsville	21-047-0006	11.2	11.2	9.9	10.7
Daviess	US60 and Pleasant Valley Rd Owensboro	21-059-0005	12.9	12.1	10.8	11.9
Fayette	650 Newtown Pike Lexington	21-067-0012	12.2	10.3	9.8	10.8
Hardin	801 North Miles Street Elizabethtown	21-093-0006	11.8	10.6	11.7*	11.3*
Henderson	Baskett Fire Dept Baskett	21-101-0014	12.5	11.0	10.4	11.3
Jefferson[1]	37th & Southern Avenue Louisville	21-111-0043	13.5	12.1	9.7	11.8
Jefferson[1]	1032 Beecher Avenue Louisville	21-111-0044	13.8	12.3	10.3	12.1
Jefferson[1]	7201 Watson Lane Louisville	21-111-0051	14.8	11.8	10.3	12.3
Jefferson[1]	2730 Cannons Lane Louisville	21-111-0048	13.3	11.5	9.8	11.5
McCracken	342 Lone Oak Road Paducah	21-145-1004	11.4	10.4	10.0	10.6
Madison	Mayfield School Richmond	21-151-0003	10.7	9.2	8.8	9.6
Pike	101 North Mayo Trail Pikeville	21-195-0002	10.4	9.5	9.2	9.7
Pulaski	305 Clifty Street Somerset	21-199-0003	n/a	n/a	9.6*	9.6*
Warren	Oakland Elementary Oakland	21-227-0008	11.6	10.8	8.2*	10.2*
Warren	Ed Spear Park Smiths Grove	21-227-0009	n/a	n/a	10.4*	10.4*

[1] Monitors operated by the Louisville Metro Air Pollution Control District.
* Incomplete data set. The mean does not satisfy summary criteria.
All data compared to the annual standard of 15.0 µg/m^3.

2012 Particulate Matter ($PM_{2.5}$) Speciation
Ambient Air Monitoring Network

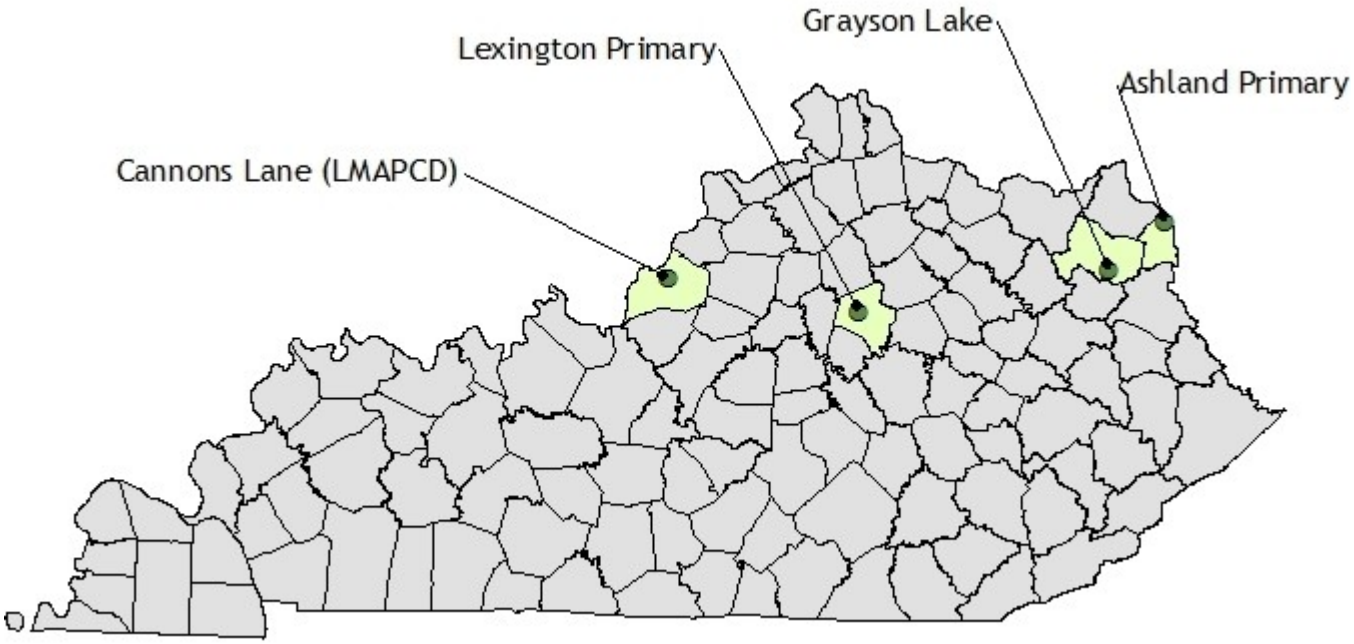


Figure 43: $PM_{2.5}$ speciation monitoring locations in Kentucky.

The promulgation of the new $PM_{2.5}$ standards may require all future areas not meeting the standards to reduce emissions of fine particulates and their precursors. Efficient air quality management requires knowing which sources contribute to the problem and estimating how much. However, determining $PM_{2.5}$ source contributions is complicated due to the fact that often half or more of the $PM_{2.5}$ mass is comprised of secondarily formed species, therefore hiding their point of origin. In addition, $PM_{2.5}$ may remain in the atmosphere for several days enabling sources several hundred miles away to affect an area. Realizing this, the EPA established the Speciation Trends Network designed to assist in identifying the compounds associated with fine particulates. The network is used to provide data on a target group of chemical species known to be significant contributors to $PM_{2.5}$ mass. The data provided by the network can be used to support several areas that include:

- Assisting the implementation of the $PM_{2.5}$ standard by using speciated data as input to air quality modeling analyses and as indicators to track progress of controls.
- Aiding the interpretation of health studies by linking effect to $PM_{2.5}$ constituents.
- Understanding the effect of atmospheric constituents on visibility impairment.
- Using the speciated particulate data to aid in monitoring network design and siting adjustment.

How is $PM_{2.5}$ speciation monitored?

The approach to be used for chemical speciation involves both sampling and analysis components. The target groups of chemical species include a list of analytes that consist of an array of cations, anions, carbon species, and trace elements. Because no one sample media is capable of providing the appropriate sample collection for all of the target analytes, each series of analytes requires sample collection on the appropriate media and utilization of the appropriate analytical techniques. One instrument collects $PM_{2.5}$ speciation samples. Samples are collected on a set of two filters, one comprised of Teflon and one comprised of nylon, over a 24-hour sampling period. A second instrument collects a sample on a quartz filter over a 24-hour sampling period. The quartz filter is used to collect a speciated carbon sample.

$PM_{2.5}$ speciation samples are sent to an EPA contract laboratory for analysis. Listed below are the target analytes and the analytical techniques used:

- Trace Elements: X-ray fluorescence and particle induced X-ray emission
- Anion and Cations: Ion chromatography
- Carbon: Controlled-combustion/thermal optical

Once analysis is complete, the analytes are grouped into the target chemical species listed below. These species in turn can be linked to source categories that ultimately can be used to assist in understanding $PM_{2.5}$ and developing control strategies needed to reduce ambient levels.

- Nitrate (total)
- Sulfate
- Ammonium
- Organic Carbon
- Elemental Carbon
- Crustal Component (trace elements, fine soil)
- Other ($PM_{2.5}$ mass unaccounted for by analytical methods)

Results

In 2012, the Kentucky Division for Air Quality operated a network of three Speciation Trends Network monitors and the Louisville Metro Air Pollution Control District operated one monitor. The sites are strategically located to address different types of land-use ranging from heavy industrial, urban, and rural. The charts on the following pages provide a visual representation of the major components of speciation data collected at each site during 2012. The data suggests that particulates identified as non-crustal species and other elements, along with sulfates and organic carbon are the primary contributors to $PM_{2.5}$ in Kentucky. Sulfates are formed from sulfur dioxide emissions with the major sources of those emissions being coal-fired power plants. Organic carbon comes from a combination of mobile and stationary combustion sources.

2012 $PM_{2.5}$ Speciation: Average Distributions of Major Species

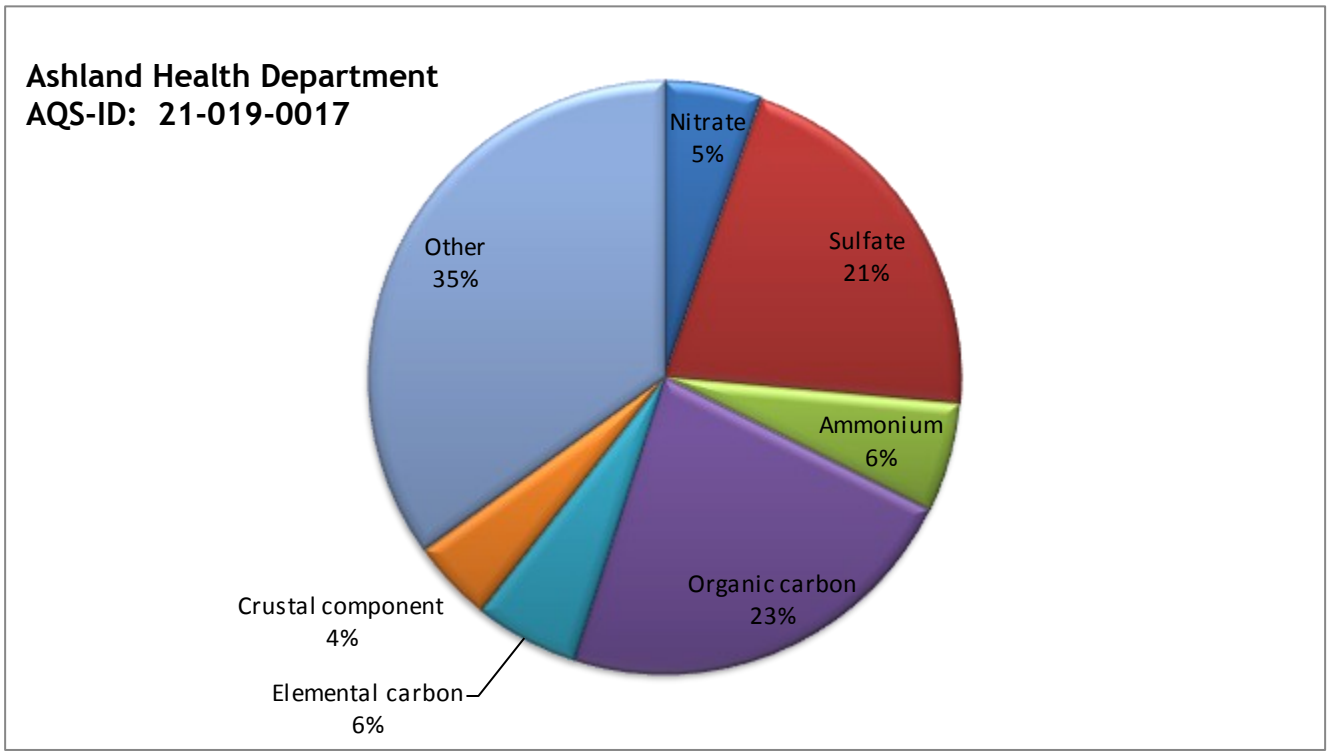


Figure 44: Average species distribution of major elements from the Ashland Health Department $PM_{2.5}$ speciation monitor (AQS I.D.: 21-019-0017). "Other" represents the percentage of mass not characterized as a major element or crustal component.

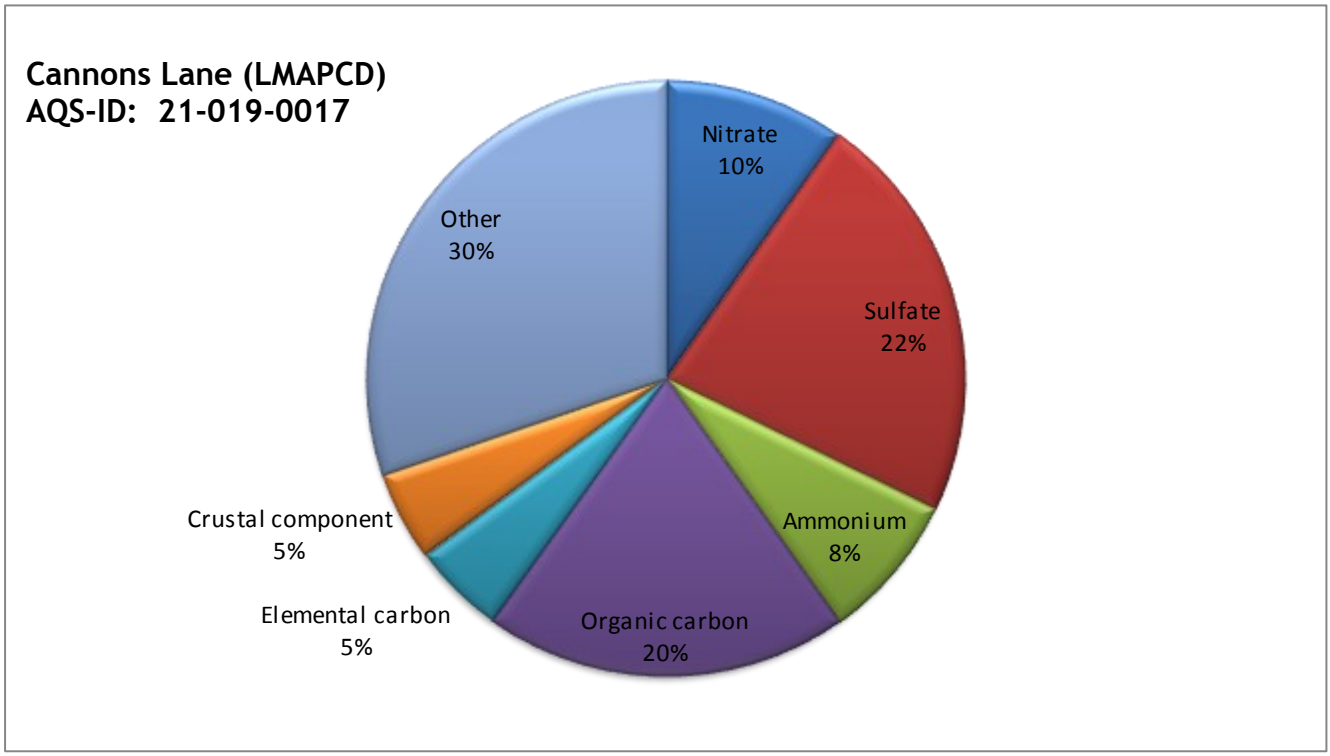


Figure 45: Average species distribution of major elements from the Louisville Metropolitan Air Pollution Control District $PM_{2.5}$ speciation monitor at the Cannons Lane site (AQS I.D.: 21-111-0067). "Other" represents the percentage of mass not characterized as a major element or crustal component.

2012 $PM_{2.5}$ Speciation: Average Distributions of Major Species

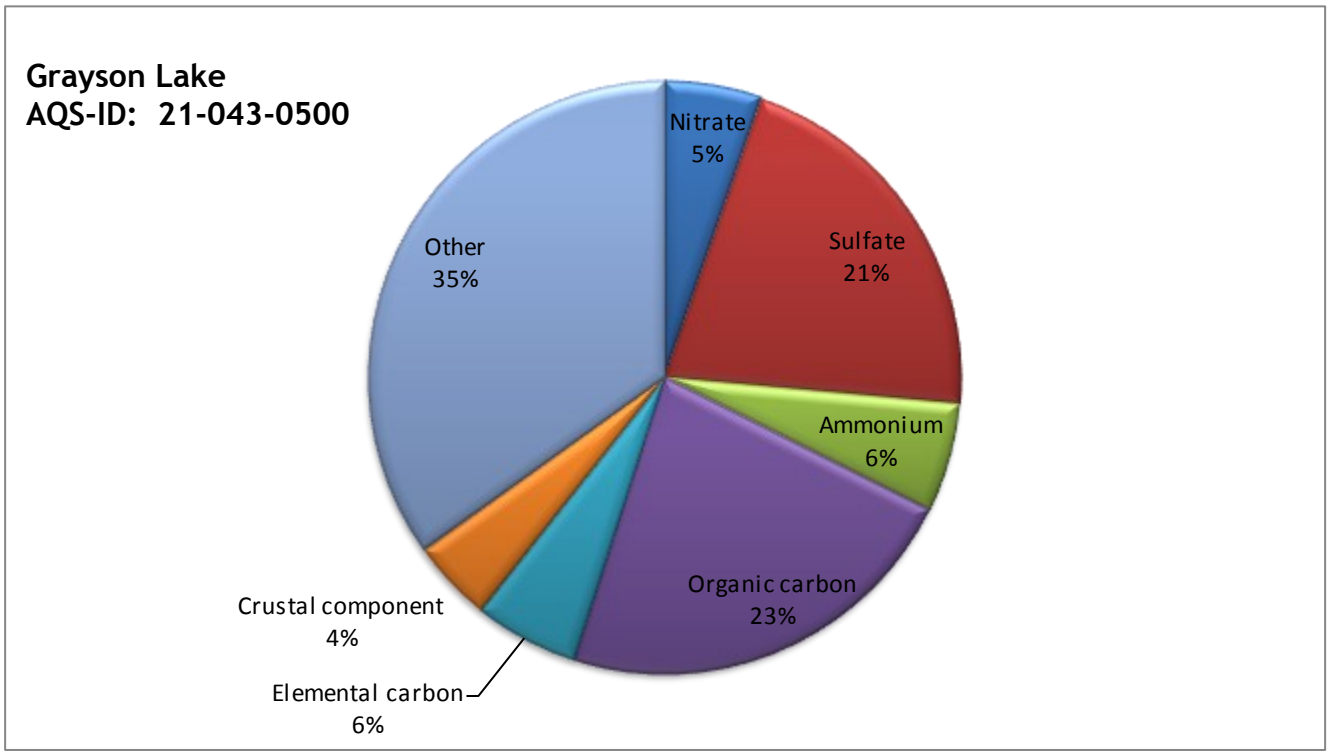


Figure 44: Average species distribution of major elements from the Grayson Lake $PM_{2.5}$ speciation monitor (AQS I.D.: 21-043-0500). "Other" represents the percentage of mass not characterized as a major element or crustal component.

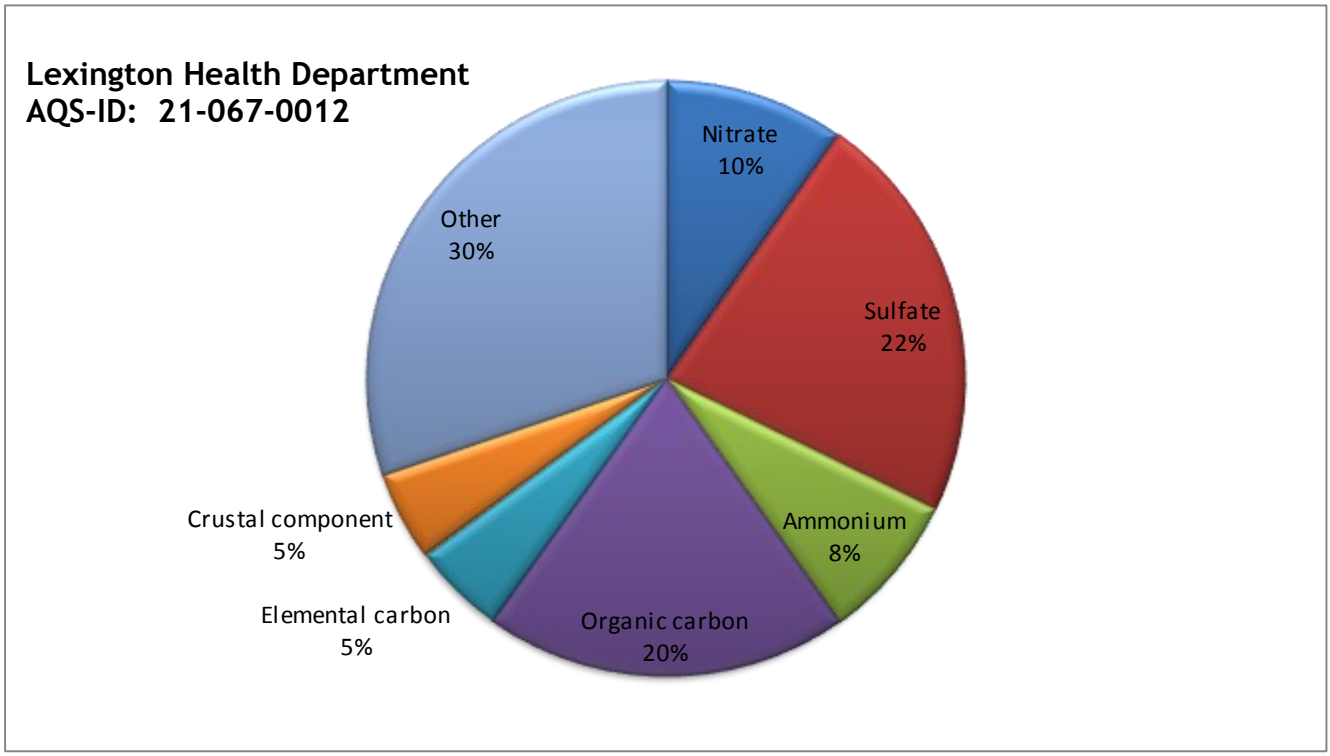


Figure 45: Average species distribution of major elements from the Lexington Health Department $PM_{2.5}$ speciation monitor (AQS I.D.: 21-067-0012). "Other" represents the percentage of mass not characterized as a major element or crustal component.

2012 Particulate Matter (PM_{10}) Ambient Air Monitoring Network

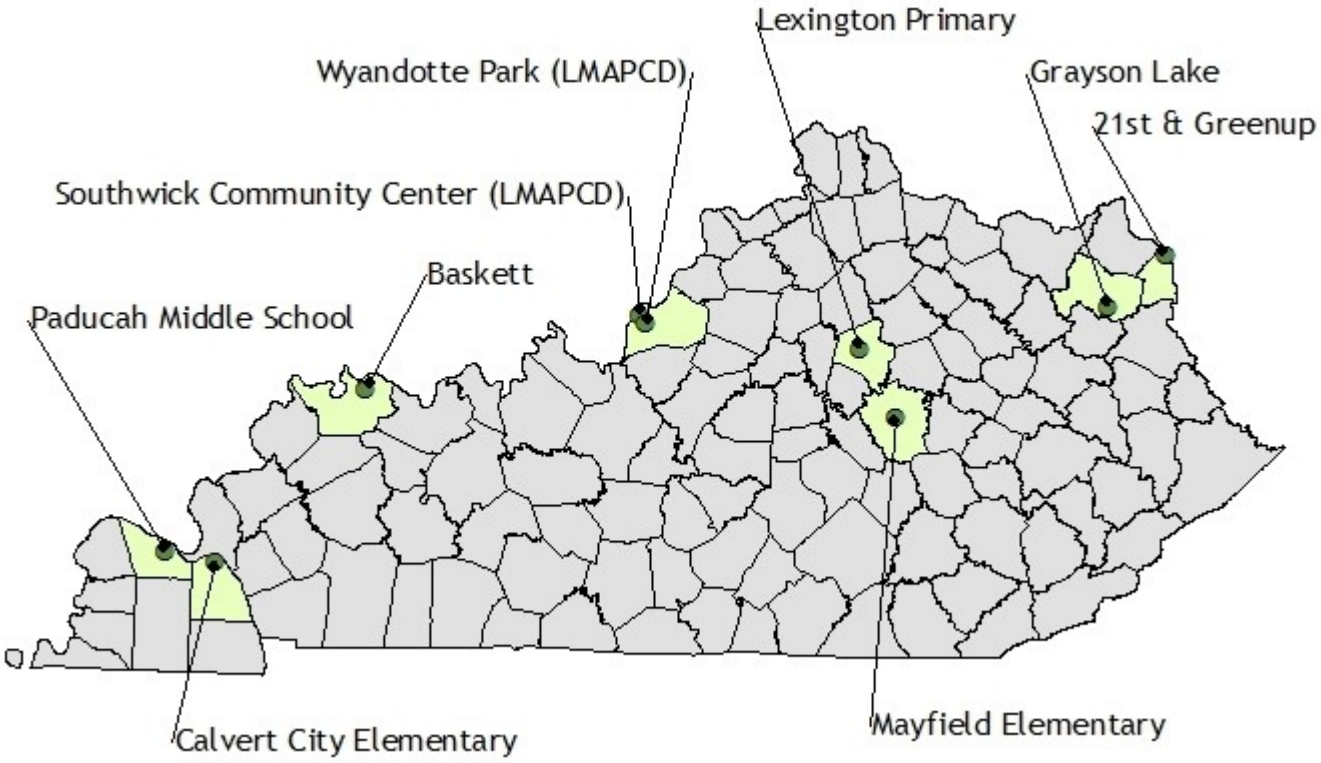


Figure 48: PM_{10} monitoring locations in Kentucky.

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 smoke-stacks.

Environmental Impacts

The primary health effects of particulates are they aggravate respiratory and cardiovascular disease, and large amounts can 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 comparisons, both intermittent and continuous monitor types may be used because they are both FRM or FEM equivalents. Most PM_{10} samplers are the intermittent type that operates for 24 hours, every sixth day. Some intermittent samplers may operate on more frequent schedule in order to investigate localized concerns. Intermittent 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 ten 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 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 2012, the DAQ and the LMAPCD operated a combined network of eight PM_{10} intermittent and continuous samplers in Kentucky.

Results

The annual PM_{10} standard is attained when the expected number of days per year with a 24-hour concentration greater than 150 ug/m^3 is less than or equal to one, when averaged over a three-year period. When a site samples on an everyday frequency, the expected number of exceedances is equal to the number of actual exceedances. However, when the sampling frequency does not occur everyday, the number of days expected to be greater 150 ug/m^3 is obtained via a calculation. Poor data recovery can also impact the expected number of exceedances per year.

There was one exceedance of the annual PM_{10} standard in 2012. The exceedance occurred at the Ashland site, which is located next to a metals recycler. In response, the frequency of the Ashland PM_{10} monitor was increased from collecting one sample every six days to daily sample collection. No further exceedances were recorded.

Prior to 2012, only two previous exceedances of the PM_{10} NAAQS have been recorded. The last PM_{10} exceedance occurred on Jan. 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.

Statewide and regional PM_{10} levels have shown declining trends. This downward trend is the result of controls on industrial sources for particulate matter.

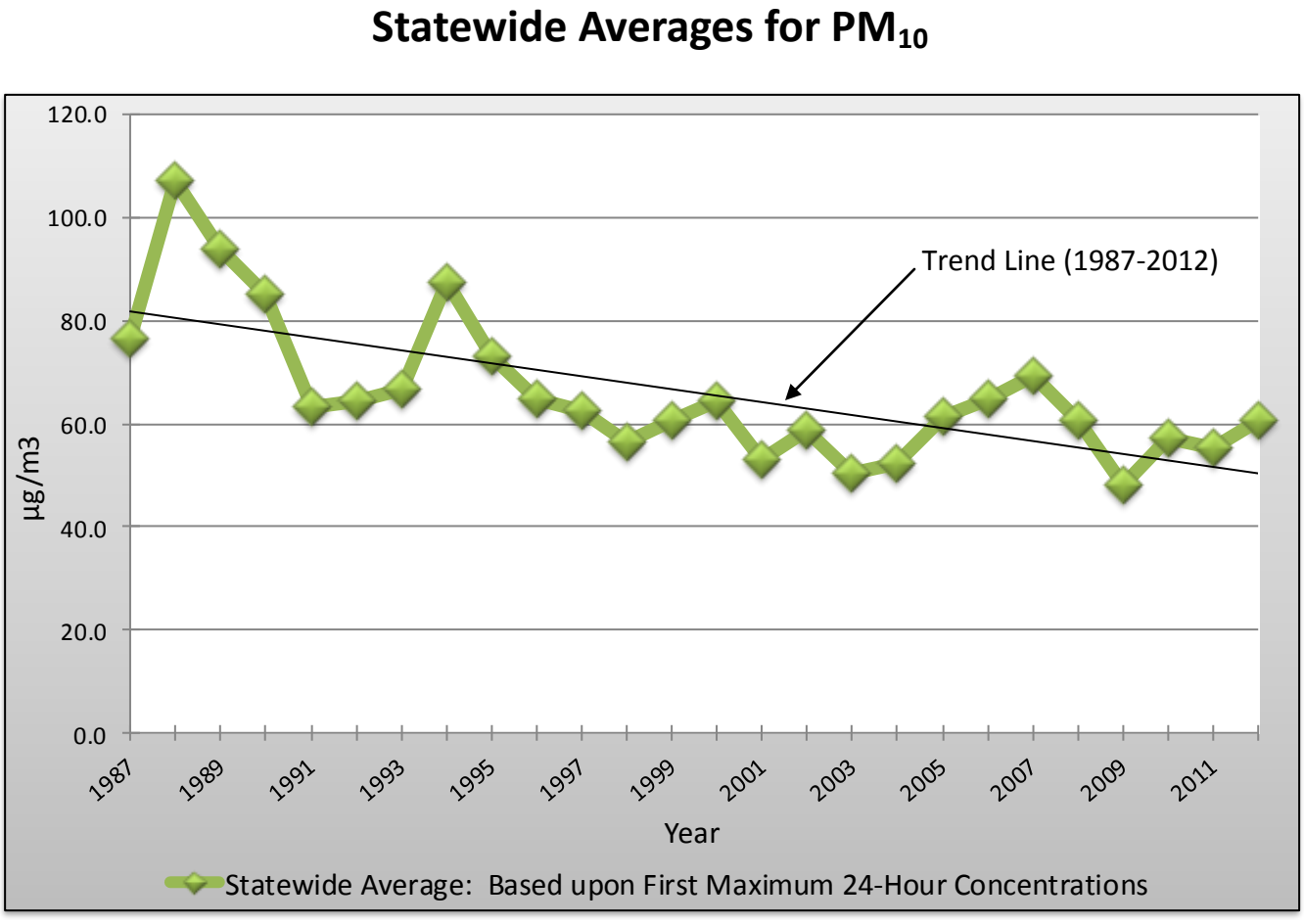


Figure 49: Statewide averages for PM_{10} monitoring indicate pollution reductions.

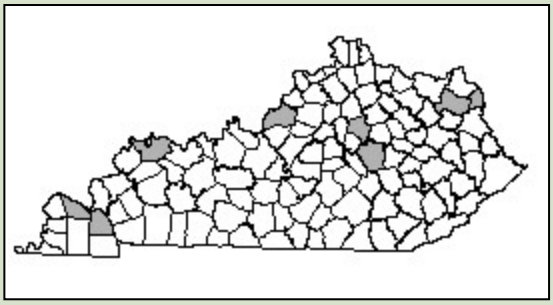
National Ambient Air Quality Standards for Particulate Matter (PM_{10})

Primary NAAQS: Expected number of days with a maximum 24-hour concentration greater than 150 $\mu g/m^3$ must be less than or equal to one, on average over three years.

Secondary NAAQS: Same as Primary Standard

Criteria Pollutant Summary Report – 2012

Pollutant: **Particulate Matter PM_{10}**
Method: Gravimetric
Data Interval: 24-hour
Units: Micrograms per cubic meter ($\mu g/m^3$) (25°C)



County	Site	AIRS-ID	# Obs	Mean	24-hour Average				Act Obs > 150	Exp Obs > 150
					1st Max	2nd Max	3rd Max	4th Max		
Boyd	21st & Greenup Ashland	21-019-0002	174	31.0	155	92	82	74	1	6.5
Carter	Camp Webb Grayson Lake	21-043-0500	59	11.1	24	23	21	20	0	0
Fayette	650 Newtown Pike Lexington	21-067-0012	57	16.9	41	30	28	27	0	0
Henderson	Baskett Fire Dept Baskett	21-067-0014	60	17.3	31	30	29	27	0	0
Jefferson[1]	37th & Southern Ave Louisville	21-111-0043	8565	18.7	47	45	42	40	0	0
Jefferson[1]	1032 Beecher Ave Louisville	21-111-0044	8617	18.7	56	43	41	39	0	0
McCracken	342 Lone Oak Rd Paducah	21-145-1004	58	19.3	58	57	45	41	0	0
Marshall	24 Main Street Calvert City	21-157-0018	57	15.6	32	28	26	25	0	0

[1] Monitors operated by the Louisville Metro Air Pollution Control District.
Values in red represent an exceedance of the NAAQS.

PM_{10} Criteria Pollutant Summary Report – 2012

County	Site	AIRS-ID	Estimated Number of Exceedances			
			2010	2011	2012	Expected 3-Year Avg.
Boyd	21st & Greenup Ashland	21-019-0002	0	0	6.5	2.2
Carter	Camp Webb Grayson Lake	21-043-0500	0	0	0	0
Fayette	650 Newtown Pike Lexington	21-067-0012	0	0	0	0
Henderson	Baskett Fire Dept Baskett	21-067-0014	0	0	0	0
Jefferson[1]	37th & Southern Ave Louisville	21-111-0043	0	0	0	0
Jefferson[1]	1032 Beecher Ave Louisville	21-111-0044	0	0	0	0
McCracken	342 Lone Oak Rd Paducah	21-145-1004	0	0	0	0
Marshall	24 Main Street Calvert City	21-157-0018	0	0	0	0

[1] **Monitors operated by the Louisville Metro Air Pollution Control District.**
Values in red represent an exceedance of the NAAQS.

2012 Sulfur Dioxide Ambient Air Monitoring Network

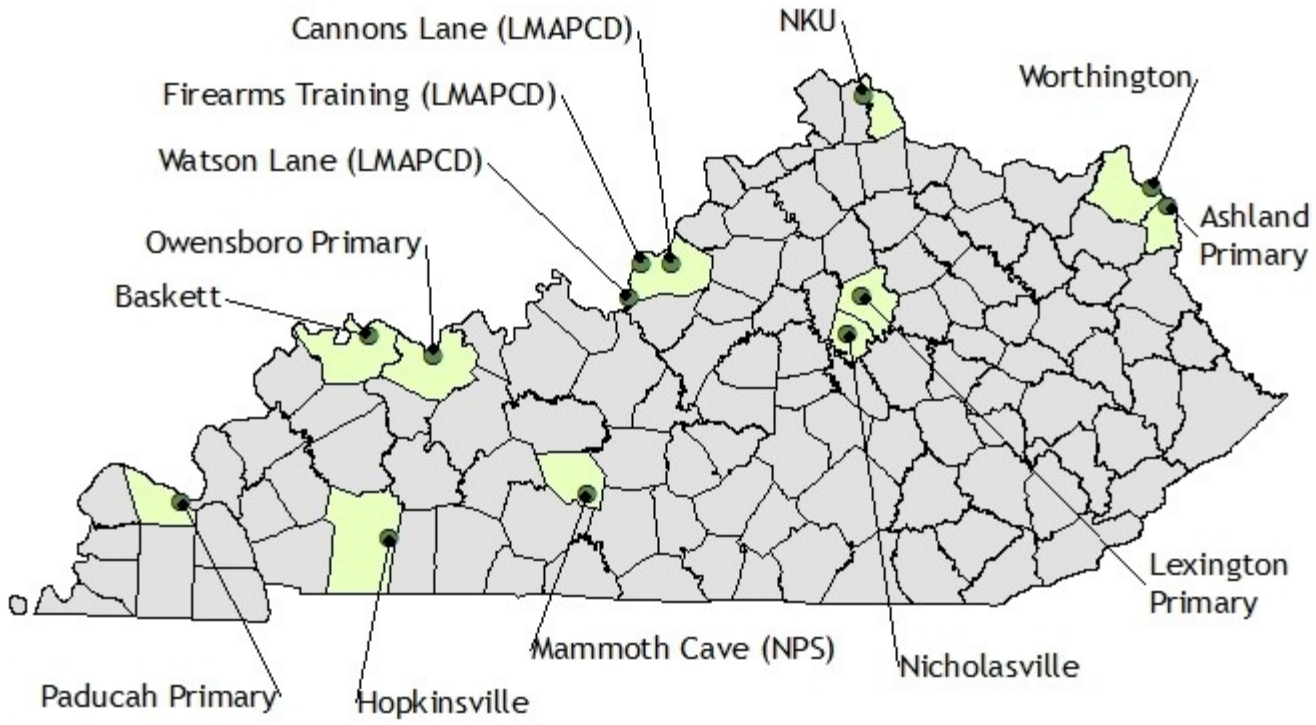


Figure 50: Sulfur dioxide monitoring locations in Kentucky.

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 combines with SO_2 to 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 2012, the division, the NPS at Mammoth Cave, and LMAPCD operated 13 SO_2 monitors in Kentucky.

Results

On June 22, 2010, the EPA promulgated a new primary SO_2 NAAQS. The NAAQS was set to 75 ppb, measured as the three-year average of the 99th percentile of the daily maximum one-hour averages. The EPA revoked the original 24-hour and annual NAAQS standards. Prior to the establishment of the new NAAQS, an exceedance of a SO_2 standard had not occurred since November 1981, when the monitor at a Louisville site (21-111-0032) recorded a 24-hour average of 0.159 ppm.

In 2012, two sites were in exceedance of the primary NAAQS. Based upon the three-year average of 99th percentile daily maximum one-hour concentrations, these same two sites are also in violation of the NAAQS.

Statewide and regional sulfur dioxide levels have declined over the past twenty years. The SO_2 allowances component of the Acid Rain Program provides an opportunity for electric 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 have directly contributed to the decline in ambient SO_2 concentrations.

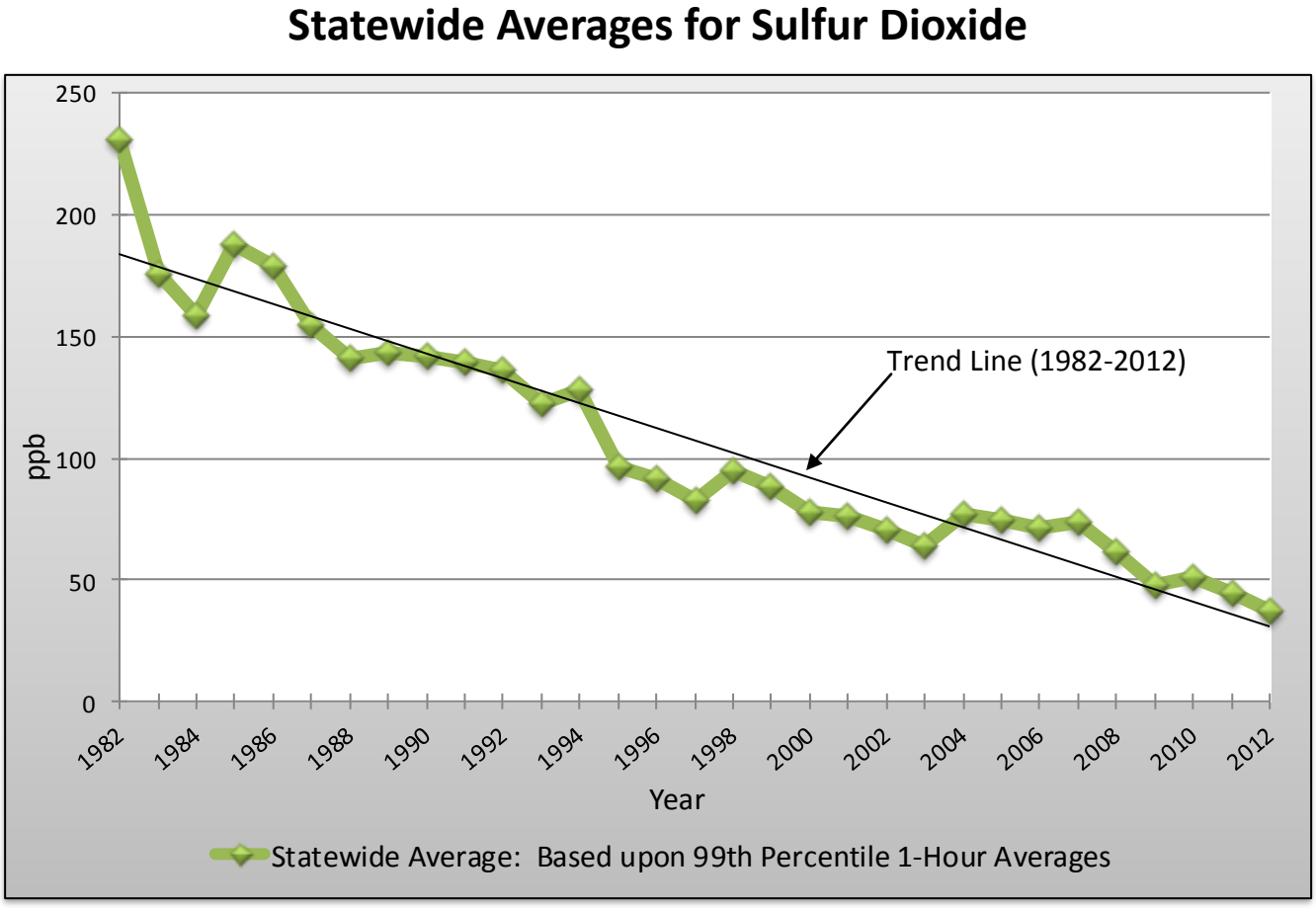


Figure 51: Statewide averages for SO_2 monitoring indicate pollution reductions.

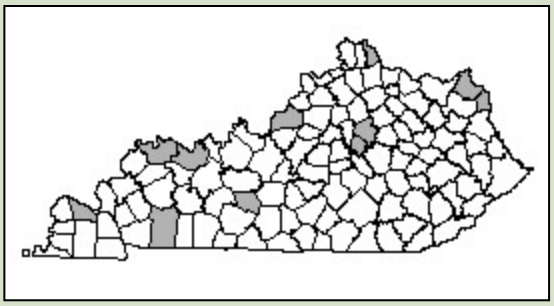
National Ambient Air Quality Standards for Sulfur Dioxide

Primary NAAQS: 3-year average of the 99th percentile of the daily maximum 1-hour average not to exceed 75 ppb

Secondary NAAQS: 3-hour concentrations not to exceed 0.5 ppm (500 ppb) more than once per year

Criteria Pollutant Summary Report - 2012

Pollutant: **Sulfur Dioxide**
Method: Instrumental
Ultra-Violet Fluorescence
Data Interval: Hourly
Units: Parts-per-billion (ppb)



County	Site Address	AQS-ID	# Obs	Daily Maximum 1-Hr Avg			Annual Maximum 3-Hr Block Avg		
				1st max	2nd max	Obs > 75	1st max	2nd max	Obs > 500
Boyd	2924 Holt Street Ashland	21-019-0017	8665	17.0	14.0	0	10.6	9.3	0
Campbell	524A John Hill Rd Highland Heights	21-037-3002	8675	156.0	99.0	7	92.0	64.6	0
Christian	10800 Pilot Rock Rd Hopkinsville	21-047-0006	7094	21.0	15.0	0*	12.6	11.0	0*
Daviess	US60 & Pleasant Valley Owensboro	21-059-0005	8523	42.0	42.0	0	32.3	31.0	0
Edmonson[1]	Alfred Cook Road Mammoth Cave	21-061-0501	8166	14.3	11.0	0	9.1	7.4	0
Fayette	650 Newtown Pike Lexington	21-067-0012	8451	18.0	16.0	0	13.6	11.6	0
Greenup	Scott & Center Streets Worthington	21-089-0007	8571	19.0	16.0	0	13.0	12.0	0
Henderson	Baskett Fire Dept Baskett	21-101-0014	8664	25.0	25.0	0	20.0	17.7	0

[1] Monitor operated by the National Park Service.
[2] Monitors operated by the Louisville Metro Air Pollution Control District.
* Incomplete data set. The mean does not satisfy summary criteria.
Values in red represent an exceedance of the NAAQS.

SO_2 Criteria Pollutant Summary Report – 2012 Continued

County	Site Address	AQS-ID	# Obs	Daily Maximum 1-Hr Avg			Annual Maximum 3-Hr Block Avg		
				1st max	2nd max	Obs > 75	1st max	2nd max	Obs > 500
Jefferson[2]	7201 Watson Lane Louisville	21-111-0051	8720	221.7	163.9	26	131.3	116.4	0
Jefferson[2]	2730 Cannons Lane Louisville	21-111-0067	8620	47.6	38.2	0	25.5	21.1	0
Jefferson[2]	4201 Algonquin Pkwy Louisville	21-111-1041	7322	52.6	36.3	0*	38.9	25.8	0
Jessamine	KYDOT, Etter Drive Nicholasville	21-113-0001	8632	35.0	21.0	0	17.6	15.6	0
McCracken	2901 Powell Street Paducah	21-145-1024	8668	31.0	30.0	0	23.0	19.6	0

[1] Monitor operated by the National Park Service.
[2] Monitors operated by the Louisville Metro Air Pollution Control District.
* Incomplete data set. The mean does not satisfy summary criteria.
Values in red represent an exceedance of the NAAQS.

SO_2 Criteria Pollutant Multi-Year Summary Report – 2012
Daily Maximum 1-hour 99th Percentile, 3-Year Average

County	Site Address	AQS-ID	Daily Maximum 1-Hr Average 99th Percentile			
			2010	2011	2012	3-Year Avg
Boyd	2924 Holt Street Ashland	21-019-0017	34	33	13	27
Campbell	524A John Hill Rd Highland Heights	21-037-3002	99	109	85	98
Christian	10800 Pilot Rock Rd Hopkinsville	21-047-0006	n/a	n/a	14*	14*
Daviess	US60 & Pleasant Valley Rd Owensboro	21-059-0005	68	40	37	48
Edmonson[1]	Alfred Cook Road Mammoth Cave	21-061-0501	15	12	9	12
Fayette	650 Newtown Pike Lexington	21-067-0012	40	23	15	26
Greenup	Scott & Center Streets Worthington	21-089-0007	14	49	41	35
Henderson	Baskett Fire Dept Baskett	21-101-0014	22	30	23	25
Jefferson[2]	7201 Watson Lane Louisville	21-111-0051	107	114	147	123
Jefferson[2]	2730 Cannons Lane Louisville	21-111-0067	45*	51	31	42*
Jefferson[2]	4201 Algonquin Pkwy Louisville	21-111-1041	100	35	35*	57*
Jessamine	KYDOT, Etter Drive Nicholasville	21-113-0001	48	16	13	26
McCracken	2901 Powell Street Paducah	21-145-1024	25	27	24	25

[1] Monitor operated by the National Park Service.
[2] Monitors operated by the Louisville Metro Air Pollution Control District.
* Incomplete data set. The mean does not satisfy summary criteria.
Values in red represent an exceedance of the NAAQS.

HAZARDOUS AIR POLLUTANTS

2012 Hazardous Air Pollutant Ambient Air Monitoring Network

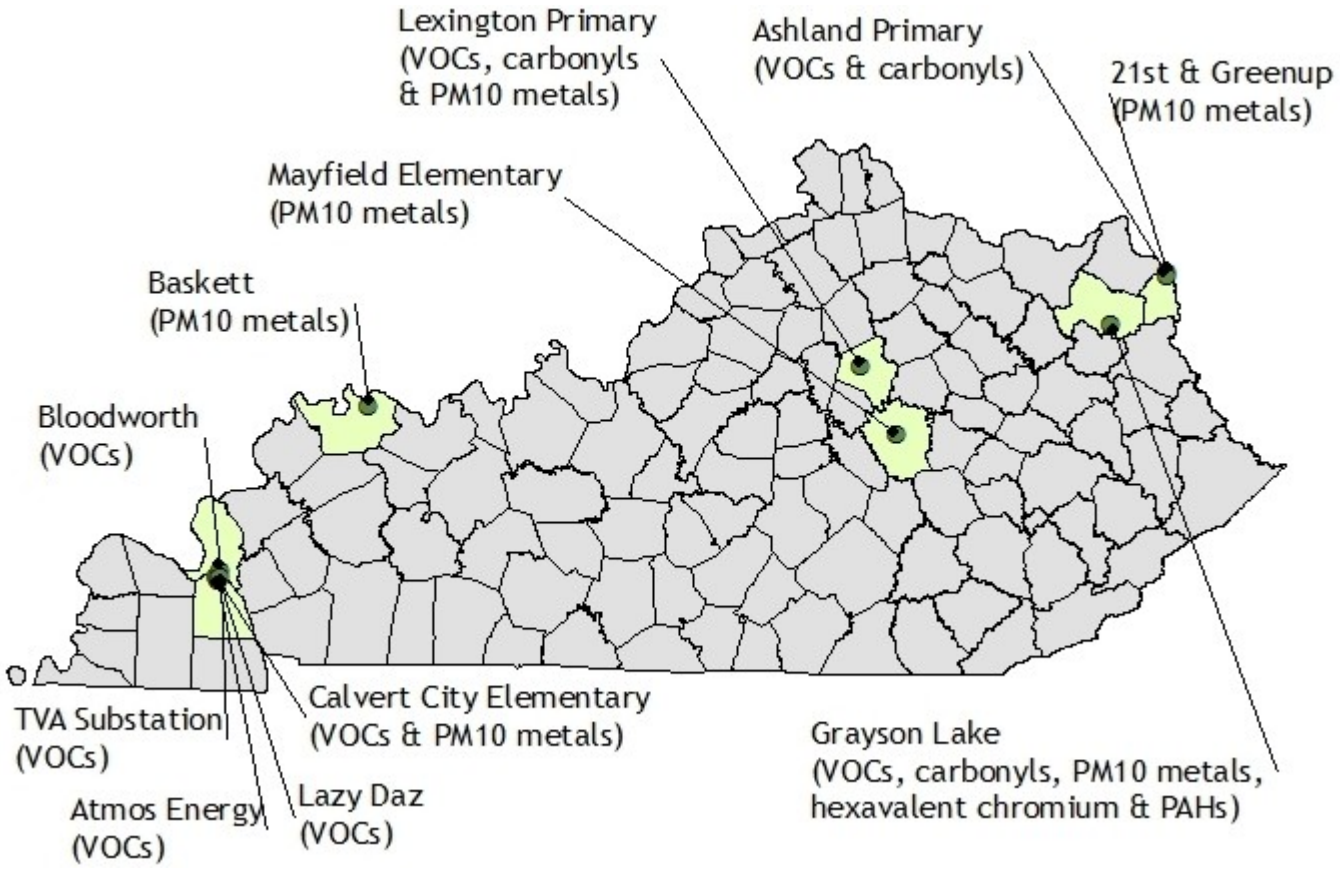


Figure 52: Hazardous air pollutant monitoring locations in Kentucky.

Hazardous air pollutants (HAPs) include 187 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 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, the EPA designated the Division for Air Quality's Hazard air monitoring site as part of the NATTS network. The Hazard site was in the Rural Trends Network, and along with its Urban Trends counterpart, was 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 in a rural setting and meets the criteria for a rural NATTS location.

In 2012, the division operated 11 hazardous air pollutant stations throughout the Commonwealth using the NATTS monitoring objectives; however, only samplers operated at Grayson Lake are a part of the NATTS network. The EPA has identified 19 required hazardous air pollutants that are to be monitored in the National Air Toxics Trends study.

HAPS can be subdivided into five monitoring groups: carbonyls, metals, volatile organic compounds (VOC), polycyclic aromatic hydrocarbons (PAH), and hexavalent chromium (Cr^{6+}). The compounds are sampled using the following media:

- Carbonyls: Dinitrophenylhydrazine (DNPH) adsorbent cartridges
- PM_{10} metals: Teflon® filters
- VOCs: passivated SUMMA canisters
- PAHs: polyurethane foam (PUF)/XAD-2® sorbent
- Cr^{6+}: Bicarbonate-impregnated ashless cellulose filter

While most samplers collect a 24-hour sample every sixth day, some samplers operate every twelfth day, and a few samplers only collect six samples per year. On occasion, instruments may be set-up to collect samples more frequently in order to investigate localized air quality concerns.

VOC, carbonyl, and PM_{10} metals samples were sent to either Kentucky's Environmental Services Branch (ESB) laboratory or the EPA national contract laboratory for analysis. PAH and Cr^{6+} samples were sent to the EPA national contract laboratory 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.
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.

For more information about air toxics in Kentucky, see the Permit Review Branch section of this report.

Carbonyls

Air Toxics Summary Report - 2012

Pollutant: Acetaldehyde
Method: TO-11A; Carbonyl sampler with DPNH cartridges
Data Interval: 24-hour
Units: micrograms per cubic meter (μ/m^3)

County	Site	AQS-ID	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Boyd	2924 Holt Street Ashland	21-019-0017	57	1.5	3.7	2.8	2.8	2.7
Carter	Camp Webb Grayson Lake	21-143-0500	61	0.7	2.3	1.7	1.4	1.4
Fayette	650 Newtown Pike Lexington	21-067-0012	56	1.3	3.1	2.7	2.4	2.4

Air Toxics Summary Report - 2012

Pollutant: Formaldehyde
Method: TO-11A; Carbonyl sampler with DPNH cartridges
Data Interval: 24-hour
Units: micrograms per cubic meter (μ/m^3)

County	Site	AQS-ID	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Boyd	2924 Holt Street Ashland	21-019-0017	57	2.9	10.5	6.4	5.6	5.3
Carter	Camp Webb Grayson Lake	21-143-0500	61	1.6	5.9	5.3	4.3	4.1
Fayette	650 Newtown Pike Lexington	21-067-0012	56	2.9	9.4	7.9	6.7	6.7

Metals

Air Toxics Summary Report - 2012

Pollutant: Antimony

Method: IO-3.5; Metals low volume PM_{10} monitor

Data Interval: 24-hour

Units: Nanograms per cubic meter (ng/m^3)

County	Site	AQS-ID	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Boyd	21st & Greenup Ashland	21-019-0002	76	3.47	24.30	16.10	12.50	9.00
Carter	Camp Webb Grayson Lake	21-143-0500	59	0.93	2.99	2.98	2.84	2.83
Fayette	650 Newtown Pike Lexington	21-067-0012	57	1.45	5.24	4.64	3.24	3.22
Henderson	Baskett Fire Dept. Baskett	21-101-0014	60	0.96	6.36	4.45	3.11	2.23
Marshall	24 Main Street Calvert City	21-157-0018	57	0.72	1.94	1.80	1.53	1.53

Air Toxics Summary Report - 2012

Pollutant: Arsenic

Method: IO-3.5; Metals low volume PM_{10} monitor

Data Interval: 24-hour

Units: Nanograms per cubic meter (ng/m^3)

County	Site	AQS-ID	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Boyd	21st & Greenup Ashland	21-019-0002	76	1.69	5.90	4.70	4.70	4.50
Carter	Camp Webb Grayson Lake	21-143-0500	59	0.60	1.93	1.84	1.83	1.59
Fayette	650 Newtown Pike Lexington	21-067-0012	57	0.87	2.35	2.28	2.18	2.14
Henderson	Baskett Fire Dept. Baskett	21-101-0014	60	0.90	3.71	2.79	2.41	2.33
Marshall	24 Main Street Calvert City	21-157-0018	57	0.79	5.86	4.20	1.91	1.60

Metals

Air Toxics Summary Report - 2012

Pollutant: Beryllium

Method: IO-3.5; Metals low volume PM_{10} monitor

Data Interval: 24-hour

Units: Nanograms per cubic meter (ng/m^3)

County	Site	AQS-ID	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Boyd	21st & Greenup Ashland	21-019-0002	76	0.02	0.20	0.10	0.10	0.10
Carter	Camp Webb Grayson Lake	21-143-0500	59	0.01	0.03	0.02	0.02	0.02
Fayette	650 Newtown Pike Lexington	21-067-0012	57	0.03	0.55	0.06	0.06	0.05
Henderson	Baskett Fire Dept. Baskett	21-101-0014	60	0.01	0.10	0.04	0.04	0.04
Marshall	24 Main Street Calvert City	21-157-0018	57	0.01	0.04	0.04	0.03	0.02

Air Toxics Summary Report - 2012

Pollutant: Cadmium

Method: IO-3.5; Metals low volume PM_{10} monitor

Data Interval: 24-hour

Units: Nanograms per cubic meter (ng/m^3)

County	Site	AQS-ID	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Boyd	21st & Greenup Ashland	21-019-0002	76	0.58	4.50	2.50	2.20	2.20
Carter	Camp Webb Grayson Lake	21-143-0500	59	0.12	2.07	0.30	0.30	0.30
Fayette	650 Newtown Pike Lexington	21-067-0012	57	0.10	0.47	0.26	0.26	0.24
Henderson	Baskett Fire Dept. Baskett	21-101-0014	60	0.13	0.76	0.38	0.24	0.23
Marshall	24 Main Street Calvert City	21-157-0018	57	0.10	0.34	0.27	0.22	0.17

Metals

Air Toxics Summary Report - 2012

Pollutant: Chromium

Method: IO-3.5; Metals low volume PM_{10} monitor

Data Interval: 24-hour

Units: Nanograms per cubic meter (ng/m^3)

County	Site	AQS-ID	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Boyd	21st & Greenup Ashland	21-019-0002	76	3.43	21.40	11.30	9.00	8.90
Carter	Camp Webb Grayson Lake	21-143-0500	59	1.09	5.03	4.50	4.40	4.36
Fayette	650 Newtown Pike Lexington	21-067-0012	57	1.04	4.85	4.58	4.46	4.08
Henderson	Baskett Fire Dept. Baskett	21-101-0014	60	0.62	3.75	3.15	2.97	2.65
Marshall	24 Main Street Calvert City	21-157-0018	57	0.78	4.80	4.67	3.97	3.24

Air Toxics Summary Report - 2012

Pollutant: Lead

Method: IO-3.5; Metals low volume PM_{10} monitor

Data Interval: 24-hour

Units: Nanograms per cubic meter (ng/m^3)

County	Site	AQS-ID	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Boyd	21st & Greenup Ashland	21-019-0002	76	0.014	0.101	0.045	0.044	0.042
Carter	Camp Webb Grayson Lake	21-143-0500	59	0.002	0.009	0.006	0.005	0.005
Fayette	650 Newtown Pike Lexington	21-067-0012	57	0.003	0.015	0.011	0.008	0.006
Henderson	Baskett Fire Dept. Baskett	21-101-0014	60	0.003	0.009	0.009	0.008	0.006
Marshall	24 Main Street Calvert City	21-157-0018	57	0.002	0.007	0.006	0.005	0.005

Metals

Air Toxics Summary Report - 2012

Pollutant: Manganese

Method: IO-3.5; Metals low volume PM_{10} monitor

Data Interval: 24-hour

Units: Nanograms per cubic meter (ng/m^3)

County	Site	AQS-ID	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Boyd	21st & Greenup Ashland	21-019-0002	76	32.2	234.0	110.0	82.6	79.4
Carter	Camp Webb Grayson Lake	21-143-0500	59	3.7	24.3	13.7	13.10	8.4
Fayette	650 Newtown Pike Lexington	21-067-0012	57	6.4	16.6	13.7	11.9	10.0
Henderson	Baskett Fire Dept. Baskett	21-101-0014	60	6.4	18.8	13.5	12.7	11.7
Marshall	24 Main Street Calvert City	21-157-0018	57	5.8	17.9	12.8	12.1	11.6

Air Toxics Summary Report - 2012

Pollutant: Nickel

Method: IO-3.5; Metals low volume PM_{10} monitor

Data Interval: 24-hour

Units: Nanograms per cubic meter (ng/m^3)

County	Site	AQS-ID	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Boyd	21st & Greenup Ashland	21-019-0002	76	2.89	17.40	12.70	8.20	8.20
Carter	Camp Webb Grayson Lake	21-143-0500	59	0.24	0.63	0.59	0.58	0.58
Fayette	650 Newtown Pike Lexington	21-067-0012	57	0.55	5.32	1.22	1.06	0.98
Henderson	Baskett Fire Dept. Baskett	21-101-0014	60	0.51	1.57	1.41	1.36	1.22
Marshall	24 Main Street Calvert City	21-157-0018	57	0.38	0.98	0.98	0.93	0.93

Volatile Organic Compounds

Air Toxics Summary Report - 2012

Site: Camp Webb-Grayson Lake, Boyd County
AQS ID: 21-043-0500
Method: TO-15; Passivated SUMMA Canister
Data Interval: 24-hour
Units: Parts per billion (ppb)

Pollutant	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Benzene	60	0.144	0.334	0.321	0.252	0.231
1,3-Butadiene	60	0.029	0.097	0.096	0.094	0.088
Carbon tetrachloride	60	0.109	0.172	0.150	0.137	0.126
Chloroform	60	0.001	0.020	0.018	0.015	0.014
1,2 Dichloropropane	60	ND	ND	ND	ND	ND
cis-1,3 Dichloropropene	60	ND	ND	ND	ND	ND
trans-1,3 Dichloropropene	60	ND	ND	ND	ND	ND
Ethylene dibromide	60	0.000	0.008	0.007	ND	ND
Ethylene dichloride	60	0.016	0.034	0.026	0.024	0.024
Methylene chloride	60	0.139	0.480	0.356	0.321	0.304
Tetrachloroethylene	60	0.004	0.013	0.012	0.012	0.012
1,1,2,2 Tetrachloroethane	60	0.001	0.010	0.008	0.007	0.007
Trichloroethylene	60	0.000	0.008	0.007	0.000	0.000
Vinyl chloride	60	0.000	0.005	ND	ND	ND

Polycyclic Aromatic Hydrocarbons

Air Toxics Summary Report - 2012

Site: Camp Webb-Grayson Lake, Boyd County
AQS ID: 21-043-0500
Method: TO-13; PUF-ZAD2 GC-MS
Data Interval: 24-hour
Units: Nanograms per cubic meter (ng/m^3)

Pollutant	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Napthalene	61	16.590	57.800	55.200	54.800	40.600
Benzo(a)pyrene	61	0.031	0.262	0.160	0.158	0.142

Hexavalent Chromium

Air Toxics Summary Report - 2012

Site: Camp Webb-Grayson Lake, Boyd County

AQS ID: 21-043-0500

Method: Ashless cellulose filters; IC UV-VIS

Data Interval: 24-hour

Units: Nanograms per cubic meter (ng/m^3)

Pollutant	# Obs	Annual Mean	1st max	2nd max	3rd max	4th max
Hexavalent Chromium	61	0.0076	0.0504	0.0425	0.0333	0.0206

FIELD OFFICES

Division for Air Quality
Regional Office Boundaries

air.ky.gov

Environmental Emergency, 24-hour; (502) 564-2380 or (800) 928-2380
Open burn complaints: 888-BURNLAW (888-287-6529)

Florence Region
Clay Redmond, Supervisor
8020 Veterans Memorial Dr.
Suite 110
Florence, KY 41042
(859) 525-4923
Fax: (859) 525-4157

Frankfort Region
Jarrod Bell, Supervisor
200 Fair Oaks Ln., 3rd FL
Frankfort, KY 40601-1134
(502) 564-3358
Fax: (502) 564-5043

Ashland Region
Karen Deskins, Supervisor
1550 Wolohan Drive, Suite 1
Ashland, KY 41102-8942
(606) 929-5285
Fax: (606) 928-1267

Louisville Metro
Air Pollution Control District
Lauren Anderson, Director
850 Barret Ave. STE 200
Louisville, KY 40204-1745
(502) 574-6000
Fax: (502) 574-5306

Owensboro Region
Mac Cann, Supervisor
3032 Alvey Park Dr. W.
STE 700
Owensboro, KY 42303-2191
(270) 687-7304
Fax: (270) 687-7204

Paducah Region
Charley Stangle
130 Eagle Nest Drive
Paducah, KY 42003
(270) 898-8468
Fax: (270) 898-8640

Bowling Green Region
Troy Tabor, Supervisor
1508 Westen Avenue
Bowling Green, KY 42104-3356
(270) 746-7475
Fax: (270) 746-7865

London Region
David Shivel, Supervisor
875 S. Main Street
London, KY 40741
(606) 330-2080
Fax: (606) 330-2097

Hazard Region
Steven Hall, Supervisor
233 Birch Street, STE 2
Hazard, KY 41701-2179
(606) 435-6022
Fax: (606) 435-6230

Revised: 08/22/13

APPENDIX B: GLOSSARY OF TERMS

Analyte A chemical substance that is the subject of chemical analysis.

Anion A negatively-charged particle, having more electrons than protons.

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.

Cation A positively-charged particle, having more protons than electrons.

Chemiluminescence The emission of light by a substance as a result of a chemical reaction that does not involve an increase in its temperature.

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.

Exceedance (of NAAQS) One occurrence of a measured or modeled concentration that exceeds the specified concentration level of a NAAQS for the averaging period specified by that standard.

Hazardous Air Pollutant Any pollutant listed in 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 Ambient Air Quality Standards (NAAQS) Standards established by the United States Environmental Protection Agency (EPA) under authority of the Clean Air Act (42 U.S.C. 7401 et seq.) that apply for outdoor air throughout the country.

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 Ambient Air Quality Standard set by the U.S. 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).

Primary Standard A National Ambient Air Quality Standard which establishes limits on specific criteria pollutants to protect public health, including the health of sensitive populations such as children, asthmatics, and the elderly.

Promulgate To officially announce, publish, make known to the public; to formally announce a statute or decision by the court.

Secondary Standard A National Ambient Air Quality Standard which establishes limits on specific criteria pollutants to protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings.

Speciation The process of determining the physical and chemical makeup of pollutants such as particulate matter, which may be composed of droplets and particles of various compounds.

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 Pollutants by the U.S. EPA.

APPENDIX C: GLOSSARY OF ABBREVIATIONS

AHERA Asbestos Hazard Emergency Response Act

AQI Air Quality Index

BACT Best Available Control Technology

CAA Clean Air Act

CO Carbon Monoxide

CO_2 Carbon Dioxide

CPT Cost per Ton

CSAPR Cross-State Air Pollution Rule

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 Greenhouse Gas

HAP Hazardous Air Pollutant

HPV High Priority Violation

KAR Kentucky Administrative Regulation

KORA Kentucky Open Records Act

KRS Kentucky Revised Statute

LMAPCD Louisville Metropolitan Air Pollution Control District

LOW Letter of Warning

MACT Maximum Achievable Control Technology

NAAQS National Ambient Air Quality Standard

NATTS National Air Toxics Trends Stations

NESHAP National Emission Standard for Hazardous Air Pollutants

NO_x Nitrogen Oxides

NOV Notice of Violation

NPS National Park Service

NSR New Source Review

O_3 Ozone

Pb Lead

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

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

PTE Potential to Emit

QAPP Quality Assurance Project Plan

RATA Relative Accuracy Test Audit

RTF Regulatory Time Frame

SEDC Southeast Diesel Collaborative

SIP State Implementation Plan

SO_2 Sulfur Dioxide

SOP Standard Operating Procedure

TEMPO Tools for Environmental Management and Protection Organizations

TPY Tons per year

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:

Kentucky Division for Air Quality
200 Fair Oaks Lane, 1st Floor
Frankfort, KY 40601
Phone: 502-564-3999
Fax: 502-564-4666
Web site: air.ky.gov
Acting Director: Sean Alteri

Kentucky Department for Environmental Protection
300 Fair Oaks Lane
Frankfort, KY 40601
Phone: 502-564-2150
Fax: 502-564-4245
Web site: dep.ky.gov
Commissioner: R. Bruce Scott, P.E.
Deputy Commissioner: Aaron Keatley

The 2013 DAQ Annual Report was edited by Roberta Burnes and Jennifer Miller. We gratefully acknowledge the contributions of the staff and management of the Division for Air Quality in the production of this report.

Director's Office	John Lyons, Sean Alteri, Roberta Burnes, Kenya Stump
Program Planning and Administration	Andrea Smith, Melissa Duff, John Gowins, Martin Luther, Joy Moll
Field Operations	Kevin Flowers and Deanna Pickleseimer
Permit Review	Rick Shewekah, Michael Kennedy, Kevin Davis
Technical Services	Stephanie McCarthy and Jennifer Miller

Printed with state funds on recycled paper
September 2013