DEQ
OKLAHOMA
DEPARTMENT OF ENVIRONMENTAL QUALITY

Air Quality Division

Our **Environment.**
Our **Future.**

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The future is here for DEQ's Air Quality Division (AQD). From field work to air quality control strategies, the agency is using technology and innovative approaches to help meet the needs of citizens throughout Oklahoma.

DEQ constantly monitors the air to keep citizens safe. While the technology on air monitors continues to advance, the placement of observation sites and the way AQD uses data collected from the monitors is what keeps the state ahead of the curve. DEQ's air monitoring group completed a network assessment this year to determine the best placement for current and future monitoring sites. Air quality computer modeling at DEQ has also become more accurate through the use of data from the high-tech Oklahoma Mesonet, an advanced network of environmental monitoring stations.

Another new technological advance in AQD is a camera capable of seeing emissions that are invisible to the naked eye. The camera has the capability to detect leaks and confirm repairs, making it the perfect tool for air quality inspections.

DEQ is also employing a new way of looking at air quality permits not only to consider current air quality but to look ahead at future concerns. The data contained in permits can be mined to determine how AQD can help industries keep our air clean.

The air quality emissions inventory group continually makes technological advancements to the online Redbud reporting program. The emissions inventory reporting system eliminates the need for paper forms, saving trees and time.

AQD strives to offer a common sense solution to sometimes complex air pollution regulations. For example, the state plan to address haze in Class I wildlife areas was specifically crafted to meet the needs of Oklahomans in the most efficient and practical way possible. DEQ is also considering a plan to combine multiple air quality rules and develop one overarching rule, streamlining compliance for regulated industries.

The future is here, and AQD is committed to continued innovation as technology advances and encouragement of staff ingenuity to improve existing tools.

Environmental Policy: **What Will Oklahoma Look Like?**

DEQ faces challenges in developing and enacting future regulatory policy and is considering developing a more holistic approach for air pollution control. AQD is investigating ways to produce a more streamlined, multi-pollutant plan. Such a plan could include requirements associated with several new rules and regulations. When a number of new air quality requirements are to be issued at the same time, AQD would delay some and accelerate others, allowing the agency to release just one rule to meet multiple federal and state regulations. The restructured policies would provide predictability for industry.

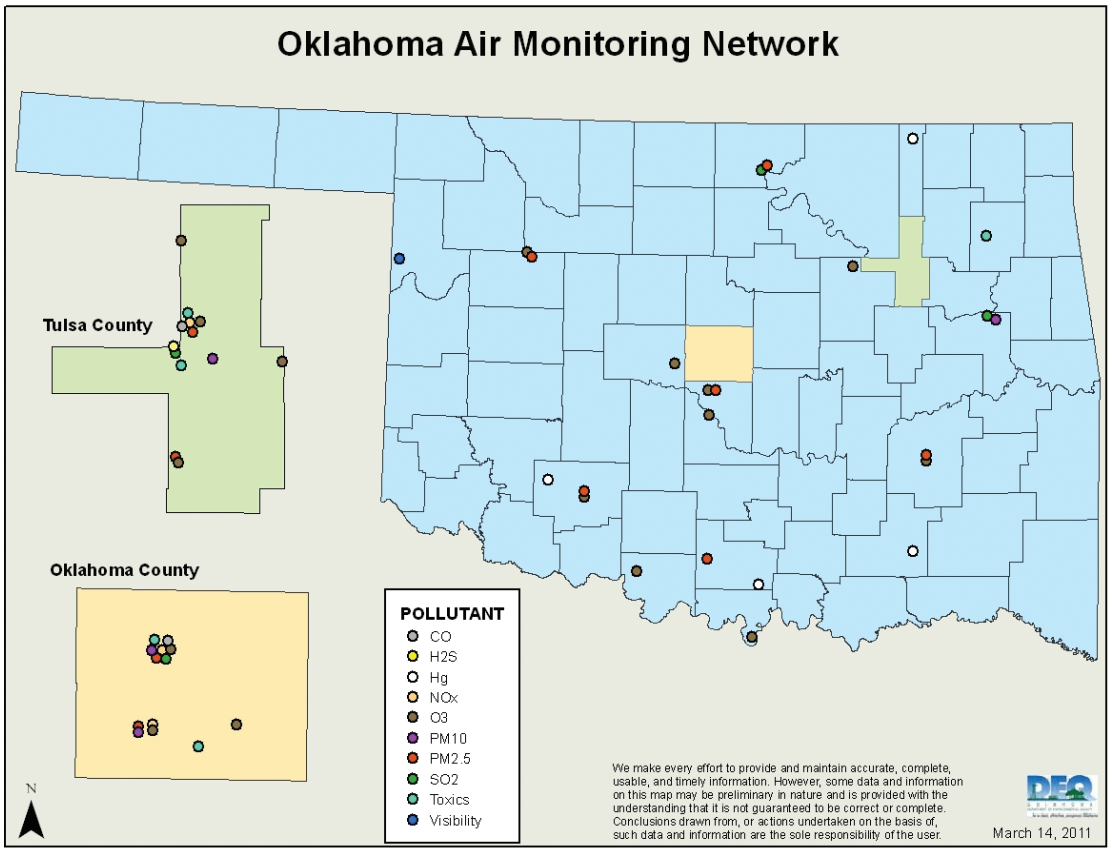
The approach makes sense based on the current proposed timelines for many of the upcoming regulatory requirements. For example, EPA is in the process of announcing a myriad of air quality regulations, often on a pollutant-by-pollutant basis, that sometimes require specific industry groups to meet separate timelines and requirements for similar controls. Several new rules are slated for implementation in the 2012 to 2014 time frame. AQD's proposed combined approach could save time and money and prevent duplication of efforts by allowing industry to focus on one set of air regulations at one time. For example, if a company planned to build a new facility under a potential restructured rule, the company could purchase the proper equipment needed to meet every air quality concern for years to come. Under the separate approach, technology that works for one kind of air pollutant might not work for another, forcing companies to upgrade equipment more often. The combined rule would provide a streamlined approach for industry officials. The rule would also benefit Oklahoma citizens by freeing up AQD staff to focus not on paperwork but on the agency's mission of enhancing the quality of life in Oklahoma and protecting the health of its citizens.

Our Monitoring **Network**

DEQ continuously keeps Oklahoma citizens informed about air quality by monitoring pollutants and analyzing information for the Air Quality Health Advisory Program. Air Quality staff monitors equipment readings and analyzes data regularly to identify potential hazards. If specific criteria are met, an air quality advisory is triggered and information is delivered via e-mail to advisory program subscribers. The messages are only sent when concentrations reach levels considered unhealthy to sensitive individuals. Each notification identifies areas of concern, indicates populations at risk and suggests safety measures to prevent exposure. To sign up for the program, enter an e-mail address in the "Health Advisory Signup" section on the "What's New" page in the Air Quality section of the DEQ website, www.deq.state.ok.us.

The ambient air monitoring network, the system that makes air quality advisories possible, has undergone many changes since its inception. The Oklahoma Air Monitoring Network map shows the 2011 air monitoring network and the pollutants measured, which include:

- particulates,
- ozone,
- carbon monoxide,
- nitrogen dioxide,
- sulfur dioxide and
- lead.



Visibility, toxics, other metals and volatile organic compounds are also measured by the air monitoring network. DEQ monitors ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide and particulate matter 24 hours a day, 7 days a week.

Data from the continuous monitors is gathered every hour by a computer located at the DEQ central office. This data is then made available to the

public almost immediately on the DEQ website. A map that appears on the page can access pollutant or site-specific data. Other pollutants are monitored on different schedules, such as once every three days or once every six days. For each sample, the collection period lasts 24 hours. The data from these monitors is also available to the public after analysis is complete.

The Importance of Air Monitoring Site Location

The state's air monitoring sites vary greatly based on pollutants measured and types of geographical site locations. For example, site number 035 in Oklahoma City consists of four particulate monitors situated on the roof of an Oklahoma City Fire Station. Site number 174 in Glenpool includes an ozone monitor and a continuous inhalable particulate monitor placed in a freestanding building.

Monitoring site locations are chosen to achieve the most accurate readings. Some sites are located near areas with high population to identify levels of human exposure, such as ozone monitoring sites in Oklahoma City and Tulsa. Other sites are near industry to determine the levels of pollution a source is emitting. For example, most of the sulfur dioxide monitoring sites and the lead site are located near large emission sources. Some sites are located many miles downwind of highly populated areas to determine how far the pollution from these areas is traveling, such as the Red River ozone monitoring sites in Burneyville and Waurika. Sites are also located in remote areas to improve state and national maps of near real-time pollution levels, like the ozone sites in McAlester and Seiling.

Air Monitoring Data

Annually, DEQ reviews the air monitoring network to determine if modifications are needed. Any changes to the National Ambient Air Quality Standards (NAAQS) or air monitoring rules could affect network requirements, causing DEQ to modify the air monitoring network. For example, the NAAQS for lead monitoring were modified in 2009, resulting in two new lead monitoring sites added in Oklahoma. In 2010, changes made to the NAAQS for carbon monoxide and nitrogen dioxide will result in the addition of monitoring sites to the state network in the near future.

Last year, the first five-year comprehensive network assessment was completed and submitted to EPA. The assessment determines if the air quality surveillance systems of all air agencies meet the monitoring objectives defined in the Clean Air Act. Shifts in population density or urban growth are among the factors considered in the network assessment and may indicate the need to move or add air monitoring sites to better serve the public. The assessment also provides an extended plan to maximize resources and upgrade monitoring technologies to collect data of the highest quality.

As demographic conditions and monitoring priorities change, DEQ is committed to modifying the state's monitoring network to provide citizens with the best air quality data available.

State Tree Namesake Continues to Bloom for **Emissions Inventory Reporting**

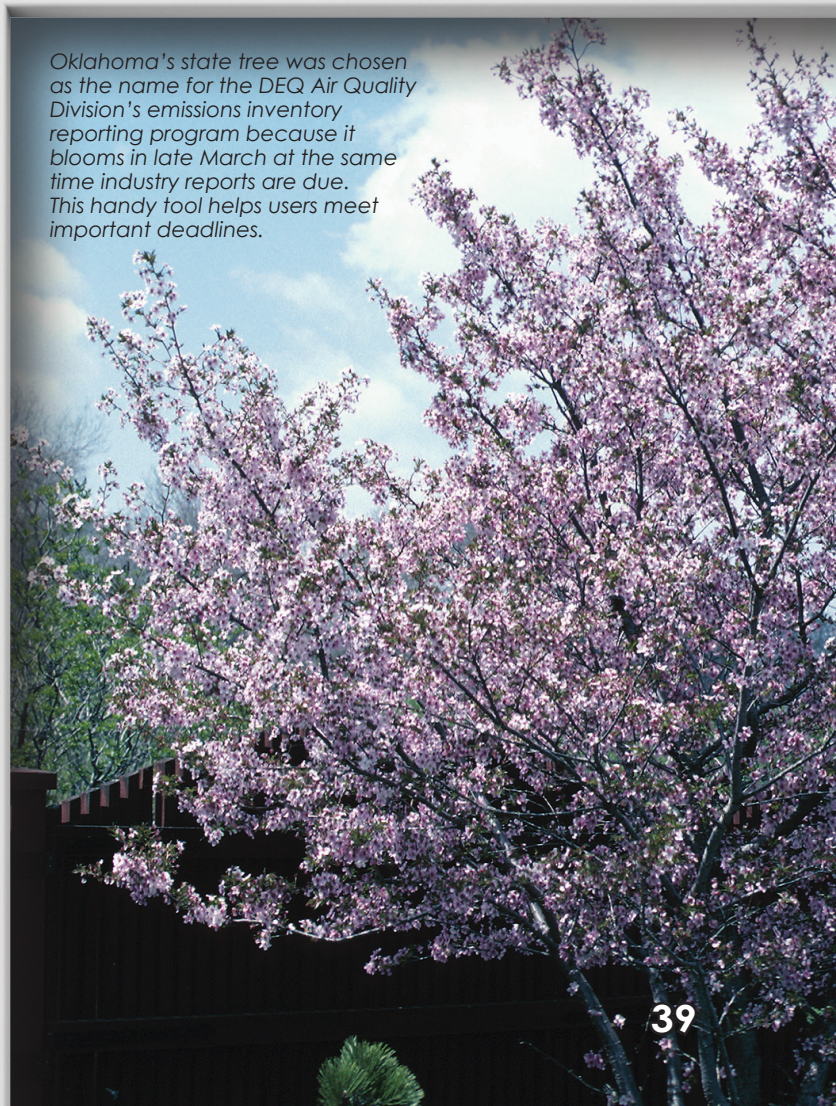
The future of emissions reporting is the continuous improvement of Redbud, DEQ's web-based emissions inventory reporting program. The Redbud system, named after the state tree of Oklahoma, has a customer-friendly interface that allows regulated facilities to quickly and easily report annual emissions inventories required as part of an operating permit. Company personnel at facilities regulated by DEQ can enter facility data on a secure website from any location. Redbud does not require specialty software. Electronic signatures and online access allow users to save paper, time and money. Where applicable, data from the previous year's submission is already loaded and saved in the system. Fields that normally change from year to year, like process rates and emission amounts, are highlighted in orange to make updates simple. A Redbud help document and the Emissions Inventory General Instructions are linked from inside the system, making guidance a quick click away. Also, Redbud users can easily e-mail DEQ staff with questions or assistance requests.

Redbud was developed in-house and is specific to Oklahoma's reporting needs and requirements, which means the program has good technical support and a quick turnaround for resolving user problems. Redbud has room to grow as any changes in Oklahoma's reporting requirements can be simply and cost-effectively added to the system. The system has consistently received good feedback from users, especially when compared to other states' reporting programs. Since Redbud was introduced, submission formats have evolved from a majority of hard copy emissions inventories to 97 percent electronic submittal. Now, rather than assigning resources to manually enter data into a program, DEQ staff has additional time to focus on the data itself. The emissions inventory section can review the quality of submissions to ensure the most accurate inventories possible for Oklahoma. The data from Redbud is used in a variety of ways including: air quality modeling, rules planning, control strategies for non-attainment areas, public information requests, submission to EPA's National Emissions Inventory, determining annual operating fees for industry, and verification that a regulated facility is in compliance.

Redbud is constantly in development as improvements are added each year and feedback from users is incorporated. New features for 2011 included forms to easily change company contacts and delete incorrect data records. Redbud now lets users add an extra contact to receive notification of final inventory submission. Improvements have also been made to the form generated during submission, known as a Turn Around Document.

More detailed and more extensive validation of data has been implemented into Redbud so problems and errors can be caught at the time of data entry, saving companies from having to fix mistakes later. Redbud not only requires values for all data fields, but the program has an increasing capability to check related values in other fields to ensure consistency. In addition, better validation frees up even more time for detailed quality control audits by DEQ.

The future of emissions inventory includes regularly incorporating more feedback from users and ideas of staff members into Redbud. Currently, two projects to improve the system are under evaluation and development. The first project would offer short video tutorials on the Redbud system. The videos would be similar to presentations given at industry outreach workshops held each year and would include lessons on data entry for each Redbud page and demonstrations of all of the program's key features. The second project would focus on allowing large companies with numerous or complex facilities to submit plant spreadsheets with emissions calculations directly through Redbud. The emissions inventory section expects to start evaluating and piloting these new approaches as resources permit.



Oklahoma's state tree was chosen as the name for the DEQ Air Quality Division's emissions inventory reporting program because it blooms in late March at the same time industry reports are due. This handy tool helps users meet important deadlines.

Camera is More Than **Meets the Eye**

Infrared imaging cameras have been successfully used by law enforcement agencies and the military for many years, but the technology is now changing how AQD "views" pollution control. The military first developed this technology to determine the origin of rockets and missiles based on the characteristic release of thermal energy from exhaust plumes. A relatively new use of infrared technology makes it possible for DEQ inspectors to see gas leaks that are not visible to the naked eye. The infrared gas-imaging (IR) camera is the latest tool deployed to assist AQD in performing routine compliance evaluations and complaint investigations. So far, the camera has proven extremely effective in discovering emissions from unpermitted and underreported sources, which has allowed the agency to work with industry to develop corrective strategies.

Leaks detected by the IR camera are not necessarily violations of DEQ regulations or unpermitted releases of emissions. Many of the gas plumes observed during onsite evaluations are from routine and permitted releases of volatile organic compounds (VOCs), such as the venting of a pressure relief valve on a storage tank. The camera does not identify the specific gases produced or the amount of emissions. For example, methane, which is not a VOC, is easily seen by the IR camera and can give the appearance that a substantial amount of pollution is being emitted. Additional equipment is needed to identify the amount of gas released. The camera is a helpful tool, but the inspector is still responsible for assuring that the facility has the proper permit and that observed releases are in compliance.

The camera can alert inspectors to permit violations and careless operators. With a quick scan, inspectors have found VOC emissions originating from simple mistakes such as leaving storage tank hatches open, not lighting flares, leaking open-ended lines, and leaking tanks previously thought to store only water. This new technology assists the Air Quality Compliance and Enforcement Group in making onsite evaluations more efficiently, allowing inspectors to focus on problem areas and find sources of emissions not previously identified.

Photos taken side by side illustrate the power of the infrared imaging camera. The photo on the left shows the naked eye version of a natural gas storage tank. The same tank is shown along with leaking emissions in the photo on the right.

Permits Predict Future of **Air Quality**

Air quality permits explain not only what is happening in the air today, but they can direct the future of air quality in Oklahoma. Over the past four years, air permit issuance has increased by 67 percent, spurring DEQ to work with companies to mitigate the environmental impact and set allowable levels of pollution for industry practices.

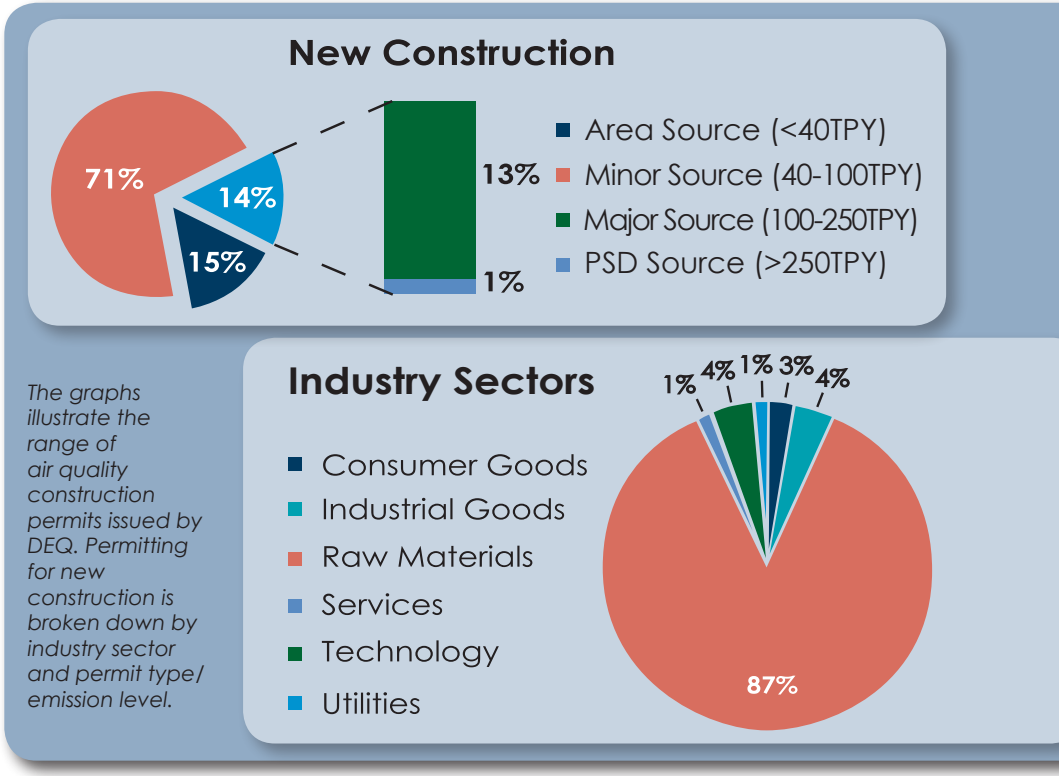
Permits are evaluated and issued to a variety of industries in anticipation of new facilities being constructed and modifications being made to existing plants. Of the 157 permits for new construction in 2010, 86 percent were issued to minor or area sources as required technology has reduced the amount of expected emissions. The remaining 14 percent of new construction permits issued were to larger sources, triggering requirements to install more advanced equipment and to perform additional assessments. Permit issuance shows a trend toward fewer large emission sources and more small ones.

Permits can also be examined to determine industry trends, leading to information on pollutant type. For 2010, 87 percent of the new construction permits were related to the raw material sector, with 89 percent of those comprised solely of oil and natural gas-related activities.

While the quantity of pollution emitted by each facility varies, the overwhelming number of separate oil and gas-related projects over the past year drives growth in pollutant emissions. The oil and natural gas activities signal a growth in statewide pollution emission inventories for volatile organic compounds (VOCs) and combustion-related emissions, such as carbon monoxide (CO) and oxides of nitrogen (NOx).

New construction in the remaining 13 percent of other industrial sectors was comprised primarily of area and minor source construction projects, which will only modestly contribute to future pollution growth.

The growth in VOCs, CO and NOx emissions from the new permits is somewhat mitigated by the agency's adoption of federal New Source Performance Standards (NSPS) and Maximum Achievable Control Technology (MACT) standards. For the oil and gas industry, these standards require new and modified facilities to optimize combustion efficiency, minimize emissions through enhanced work practice standards and add combustion controls. In the future, federal standards adopted by the agency will, upon implementation, begin to reduce emissions from older sources within this sector, thereby reducing the overall contribution of NOx emissions in Oklahoma.



The graphs illustrate the range of air quality construction permits issued by DEQ. Permitting for new construction is broken down by industry sector and permit type/ emission level.

Mesonet Data Improves Air Quality Modeling

Determining the impact of air pollution can be complicated, but with the use of new inputs to computer models, DEQ has increased accuracy, allowing staff to make better decisions concerning the safety of Oklahomans.

To enhance the accuracy of air quality modeling, statewide meteorological data was obtained from the Oklahoma Mesonet, a network of environmental monitoring stations. The additional data was used in AERMOD, the predominant EPA computer model for dispersion of air pollution.

Previously, DEQ used only a few antiquated datasets, spanning from 1986-1991, from Integrated Surface Hourly (ISH) weather sites. The improvements in modeling data began in 2008 and continued this year with the establishment of a 10-year dataset of 5-minute Mesonet data for each location. With 120 Mesonet sites available, at least one per county, facilities are now assured that the data for emission modeling is both local and current. Oklahoma has one of the most extensive and modern networks available and is a pioneer in the use of local meteorological data for emission modeling.

In 2010, with 120 Mesonet sites across Oklahoma, there were still only 52 ISH sites. In addition to having a denser network of sites, the Mesonet records meteorological conditions in five-minute increments. Typical ISH sites only record meteorological conditions once an hour. By using the Mesonet data, DEQ collects 12 times as much data to input to the model.

Using Mesonet data in air quality modeling provides applicants with surface-based meteorological conditions that best reflect local climate, thus improving the modeling. These enhancements in modeling inputs and continually updated datasets will assist DEQ in National Ambient Air Quality Standards planning and revising the State Implementation Plan.

The Oklahoma Mesonet has more than 100 sites, like the one pictured here located at the National Weather Center in Norman, Oklahoma. DEQ is using monitored data from the Mesonet sites to build better tools to protect Oklahoma's citizens.