Arizona Department of Environmental Quality

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Air Quality Report
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Acknowledgments

Numerous agencies, companies, individuals and organizations have collected the ambient air quality monitoring data presented in this report. The Arizona Department of Environmental Quality (ADEQ) publishes data from these various sources to provide as complete of a picture as possible of air quality conditions throughout Arizona and gratefully acknowledges the efforts of all involved. Generally, ambient data presented in this report are collected, processed and reported following U.S. Environmental Protection Agency (EPA) policies and procedures. Air quality data that ADEQ staff and contract operators collect have also received internal and external quality control and assurance checks. Data provided by other sources have been checked by the responsible organization but not by ADEQ.

Private individuals and companies under contract to ADEQ provided invaluable field sampler operation and data processing services in support of monitoring activities during 2004. Their efforts are appreciated as they maneuvered on rooftops and metal towers to operate monitoring equipment in uncomfortable weather conditions, or review instrument performance and ambient monitoring data for technical accuracy. Field staff from other public agencies also operated numerous ambient monitoring sites in Arizona, providing spatial resolution and temporal coverage of air quality conditions statewide. ADEQ recognizes the efforts of these other monitoring and reporting agencies, and appreciates the opportunity to publish their data. Several industrial facilities collected and reported ambient air quality data to ADEQ, usually to satisfy permit requirements; their efforts are also acknowledged. Finally, ADEQ staff work daily installing, calibrating, maintaining, conducting quality control checks, collecting, processing, performing quality assurance tests and reporting data from a wide variety of ambient air monitoring instruments. ADEQ management wishes to thank these staff members for their dedication to maintaining and improving the quality of our program.

This report was prepared by ADEQ's Air Quality Assessment Section, which can be contacted at 1110 W. Washington St., Phoenix, AZ 85007, (602) 771-2274 or, toll free in Arizona at (800) 234-5677, then enter 771-2274. Our Web site is located at http://www.azdeq.gov/.

Introduction

This report presents the results of air quality monitoring conducted throughout Arizona in the 2004 calendar year. Data from more than 100 monitoring sites are included in this report. Many of the sites have multiple instruments measuring a variety of gaseous, particulate and visibility parameters. The majority of the air quality measurements are for criteria pollutants (ozone, particulate matter, sulfur dioxide, carbon monoxide, nitrogen dioxide and lead) for which EPA has established National Ambient Air Quality Standards (NAAQS). Visibility-related measurements are an increasing part of air monitoring activities in Arizona. In addition to the ADEQ monitoring network, air quality agencies in Maricopa, Pima and Pinal counties also operated networks, as did several industrial facilities. Their data are summarized in this report.

The report on ambient air quality monitoring networks, which begins on Page 3, discusses the purpose, measurement methods and the specific scale of geographic resolution of each network of various air monitoring networks in Arizona.

Beginning on Page 14, the monitoring data report summarizes the monitoring data and shows the compliance status for criteria pollutants and consists of three sections: measurement of traditional criteria pollutants, compliance status of the criteria pollutants and visibility characterization. The text describes how the measurements are made and how they relate to compliance with the NAAQS.

The report on special projects, which begins on Page 65, summarizes activities from special monitoring projects undertaken in the last few years which have continued into 2004. Some of the projects presented in this report are the expanding Class I visibility monitoring network for larger national parks and wilderness areas, a new and expanding effort to characterize ozone precursors, and an intensive ambient monitoring and risk assessment project beginning in the Yuma area.

Air quality trends are reported beginning on Page 72. Air quality trends at most of the long-term monitors reveal improved air quality. Concentrations of carbon monoxide, lead and sulfur dioxide have improved dramatically since measurements began in the 1970s, and all monitors for these pollutants have shown compliance with health standards in recent years. Particulate matter (PM_{10}) concentrations have also improved in rural and industrial areas where controls have been implemented, while less dramatic improvements have occurred in the neighborhoods of Phoenix and Tucson. Ozone concentrations have been fairly steady in Tucson and Yuma but have decreased since 1997 in Phoenix. Phoenix is the only area where violations of the ozone 1-hour standard have been recorded, although concentrations have fallen significantly in recent years, and no exceedances have been recorded since 1996. Shorter periods of record for visibility in the urban and national parks and wilderness areas make trend assessments less definitive, but trend assessments are shown for the two urban areas.

Ambient Air Quality Monitoring Networks

Figure 1 – Greer visibility monitoring site, located at 8,255 feet elevation in the Mt. Baldy Wilderness Area.

The federal Clean Air Act of 1970 required EPA to assist states and localities in establishing ambient air quality monitoring networks to characterize human health exposure and public welfare effects of criteria pollutants. The 1977 federal Clean Air Act amendments required each state to implement a visibility monitoring network to cover specified national parks and wilderness areas. The Phoenix and Tucson metropolitan areas also have year-round visibility monitoring networks to assess urban hazes. All of these networks are composed of individual monitoring sites; they are operated to collect ambient air quality data to ensure that Arizona citizens are able to know local air quality conditions and help ADEQ and local air quality control agencies identify the causes of polluted air.

Criteria Pollutant Monitoring Networks

Ambient monitoring networks for air quality are established to sample pollution in a variety of representative settings, to assess the health and welfare effects, and to assist in determining air pollution sources. These networks cover both urban and rural areas of the state. Sampling networks are designed to satisfy monitoring objectives and measurement scales defined in Tables 1 and 2. Networks operated to monitor the nature and causes of visibility impairment use some of the same sampling methods and are described in more detail later in this section.

The criteria pollutants are presently defined as carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), ozone (O_3), suspended particulate matter (PM), and total particulate lead (Pb). These pollutants are monitored with federal reference or equivalent methods that EPA has certified. EPA defined particulate matter monitoring in 1987 to measure particles less than or equal to 10 microns in aerodynamic diameter (PM_{10}), and again in 1997 to measure both PM_{10} and, separately, particles less than or equal to 2.5 microns in aerodynamic diameter ($PM_{2.5}$).

For each criteria pollutant, EPA specifies monitoring objectives that define the parameters by which health exposure and public welfare are assessed and the measurement scale classifications that describe the influence of atmospheric movement at a given location.

The types and scales of monitoring sites described above are combined into networks, which a number of government agencies and regulated companies operate. These networks are composed of one or more monitoring sites whose data are compared to the NAAQS and statistically analyzed in various ways. The agency or company operating a monitoring network also tracks data recovery, quality control and quality assurance parameters for the instruments operated at their various sites. The agency or company also often measures meteorological variables at the monitoring site.

Table 1. Monitoring Objectives for Air Quality Monitoring Sites

Number	Definition
1	Determine highest concentrations expected to occur in the area covered by the network
2	Determine representative concentrations in areas of high population density
3	Determine the impact on ambient pollution levels of significant sources or source categories
4	Determine general background concentration levels
5	Determine the extent of regional pollutant transport among populated areas and in support of secondary standards
6	Determine the welfare-related effects in more rural and remote areas (such as visibility impairment and vegetation effects)

Table 2. Measurement Scales for Air Quality Monitoring Sites

Measurement Scale *represents concentrations in air volumes within areas defined below*	Criteria Pollutant					
	Carbon Monoxide (CO)	Nitrogen Dioxide (NO_2)	Ozone (O_3)	Sulfur Dioxide (SO_2)	Particulate Matter (PM_{10}, $PM_{2.5}$)	Lead (Pb)
Micro (0 to 100 m)	X				X	X
Middle (~100 to 500 m)	X	X	X	X	X	X
Neighborhood (~0.5 to 4 km)	X	X	X	X	X	X
Urban (~4 to 50 km)		X	X	X	X	X
Regional (~10 to 100s of km)			X	X	X	X

Some of the agencies do special continuous monitoring for the optical characteristics of the atmosphere and manual sampling of ozone-forming compounds and other hazardous air pollutants. Maricopa, Pima and Pinal counties operate networks primarily to monitor urban air pollution. In contrast, the industrial networks are operated to determine the effects of their emissions on local air quality. The National Park Service's network tracks conditions in and around national parks and monuments. The state network monitors a wide variety of pollutant and atmospheric characteristics, including urban, industrial, rural and background surveillance.

The monitoring networks and their characteristics are shown in Table 3. A list of individual sites and monitoring parameters, based on the best available information at the time of publication, is presented in Appendix 1.

Table 3. Monitoring Networks Operating in Arizona

Network Operator	Geographic Area Monitored	Monitoring Objective*	Measurement Scale(s)**	Pollutant(s) Monitored
Arizona Dept. of Environmental Quality	Statewide	1, 2, 3, 4, 5, 6	Micro, Middle, Neighborhood, Urban, Regional	SO_2, O_3, NO_2, CO, PM_{10}, $PM_{2.5}$
Arizona Portland Cement Company	Rillito	1, 3	Neighborhood	PM_{10}
ASARCO, Inc.	Hayden	1, 2, 3	Middle, Neighborhood	SO_2
Maricopa County Environmental Services Dept.	Phoenix urban area, Maricopa County	1, 2, 3, 4, 5, 6	Micro, Middle, Neighborhood, Urban, Regional	SO_2, O_3, NO_2, CO, PM_{10}
National Park Service	National parks and monuments	3, 4, 5, 6	Urban, Regional	SO_2, O_3, NO_2, PM_{10}, $PM_{2.5}$
Phelps Dodge Miami Inc. (PDMI)	Miami	1, 2, 3	Neighborhood	SO_2, PM_{10}, $PM_{2.5}$
Phoenix Cement Company	Clarkdale	1, 3	Neighborhood	PM_{10}
Pima County Dept. of Environmental Quality	Tucson urban area, Pima County	1, 2, 3, 4, 5, 6	Micro, Middle, Neighborhood, Urban, Regional	SO_2, O_3, NO_2, CO, PM_{10}, $PM_{2.5}$

Table 3. Monitoring Networks Operating in Arizona				
Network Operator	Geographic Area Monitored	Monitoring Objective*	Measurement Scale(s)**	Pollutant(s) Monitored
Pinal County Air Quality Control District	Pinal County, Phoenix urban area	1, 2, 3, 4, 5	Middle, Neighborhood, Urban, Regional	O_3, CO, PM_{10}, $PM_{2.5}$
Praxair, Inc.	Kingman	1, 3	Middle	PM_{10}
Salt River Project	Page	1, 3	Urban, Regional	NO_2, O_3, SO_2, PM_{10}, $PM_{2.5}$
Tucson Electric Power Company	Tucson and Springerville	1, 2, 3	Middle, Regional	SO_2, NO_2, PM_{10}, $PM_{2.5}$

**See Table 1 for a list of monitoring objectives*

***See Table 2 for a definition of measurement scales*

Visibility Monitoring Networks in National Parks and Wilderness Areas

The intent of the Class I visibility monitoring program is to characterize long-term trends as completely as possible using ambient visibility measurements within constraints of an area's size, terrain or logistics for each of the 12 federally protected Class I areas in Arizona (see Figure 2 and Appendix 4). The objectives of the visibility monitoring network are to track short-term and long-term trends in Arizona Class I areas, to assist in identifying any visibility impairment caused by existing major industrial sources, and to provide monitoring data if necessary for new or major modifications of major industrial sources.

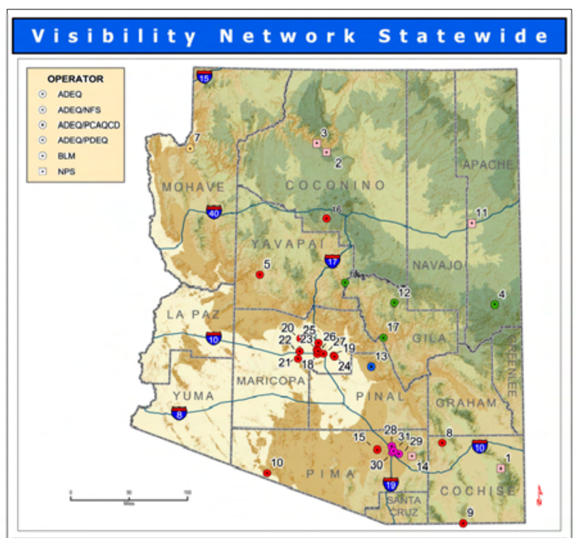


Figure 2 - Visibility Monitoring Sites Statewide

Arizona continues to participate in the Interagency Monitoring of Protected Visual Environments (IMPROVE) Program as part of the overall national visibility monitoring effort. IMPROVE is a cooperative measurement effort between EPA, federal land management agencies and state air agencies. The objectives of IMPROVE are:

- To establish current visibility and aerosol conditions in mandatory Class I areas;
- To identify chemical species and emission sources responsible for existing man-made visibility impairment;
- To document long-term trends for assessing progress towards the national visibility goal and
- With the enactment of the regional haze rule, to provide regional haze monitoring representing all visibility-protected federal Class I areas.

Class I areas were designated based on an evaluation required by Congress in the 1977 federal Clean Air Act amendments. The evaluation, which the U.S. Forest Service and National Park Service performed, reviewed the wilderness areas of parks and national forests which were designated as wilderness before 1977, were more than 6,000 acres in size and have visual air quality as an important resource for visitors. Of the 156 Class I areas designated across the nation, 12 are located in Arizona.

The Arizona Class I visibility network consists of a combination of visibility monitoring sites established by ADEQ and those established by the IMPROVE committee. Monitoring was conducted:
Grand Canyon National Park – Hance Camp

- Grand Canyon National Park – Indian Gardens
- Petrified Forest National Park
- Mt. Baldy Wilderness – Greer Water Treatment Plant
- Sycamore Canyon Wilderness – Camp Raymond
- Mazatzal/Pine Mountain Wildernesses – Ike's Backbone
- Sierra Ancha Wilderness – Pleasant Valley Ranger Station
- Superstition Wilderness – Tonto National Monument
- Superstition Wilderness – Queen Valley
- Saguaro National Park – West Unit
- Saguaro National Park – East Unit
- Chiricahua National Monument – Entrance Station
- Galiuro Wilderness – Muleshoe Ranch
- Hillside
- Organ Pipe National Monument
- Meadview

Each IMPROVE site includes $PM_{2.5}$ sampling with subsequent analysis for the fine particle mass and major aerosol species, as well as PM_{10} sampling and mass analysis. Many of the sites also include optical monitoring with nephelometers or transmissometer and color photography to document scenic appearance.

More information about the IMPROVE procedures, sites and data can be found on the IMPROVE website at http://vista.cira.colostate.edu/improve/.

Urban Haze Networks

ADEQ monitors the Phoenix and Tucson metropolitan areas with a network of instruments to characterize and quantify the extent of urban haze. There are no established federal or state standards for acceptable levels of urban haze. ADEQ began studying the nature and causes of urban hazes by conducting a study in the winter of 1989-90 in Phoenix and the winter of 1992-93 in Tucson. These studies recommended long-term, year-round monitoring of visibility. In 1993, ADEQ began deploying visibility monitoring equipment in Phoenix and Tucson. These visibility monitoring data are needed to provide policymakers and the public with information, track short- and long-term trends, assess source contributions to urban haze and better evaluate the effectiveness of air pollution control strategies.

The current Phoenix urban haze network includes two transmissometers (located in Phoenix and Mesa) for measuring light extinction along a fixed path length of about 3 to 5 kilometers, four nephelometers for measuring light scattering, 5 digital camera systems to record visual characteristics of the urban area, and particulate filters for quantifying and characterizing particulate matter. The current Tucson urban haze network includes one transmissometer for measuring light extinction along a fixed path length of about 3-5 kilometers, 3 nephelometers for measuring light scattering, and a digital camera system operated by Pima County to record visual characteristics of the urban area. Operation of Phoenix and Tucson area urban haze particulate monitors was discontinued at the close of 2004. Data from active PM_{10} and $PM_{2.5}$ samplers will be used to characterize chemical composition and seasonal variation on an as needed basis.

The website for Phoenix area visibility is http://www.phoenixvis.net/ . The website for the Tucson camera system is http://www.airinfonow.org/.

Photochemical Assessment Monitoring Station Monitoring

Section 182(c)(1) of the 1990 Clean Air Act Amendments required the administrator to promulgate rules for the enhanced monitoring of ozone, oxides of nitrogen (NOx) and volatile organic compounds (VOCs) to obtain more comprehensive and representative data on ozone air pollution. Immediately following the promulgation of those rules, the affected states were to begin actions necessary to adopt and implement a program to improve ambient monitoring activities and the monitoring of emissions of NOx and VOCs. Each state implementation plan (SIP) for the affected areas must contain commitments to implement the appropriate ambient monitoring network for such air pollutants. The subsequent revisions to 40 CFR 58 (1993) required states to establish photochemical monitoring stations (PAMS) as part of their SIP monitoring networks in ozone nonattainment areas classified as serious, severe or extreme. The principal reasons for requiring the collection of additional ambient air pollutant and meteorological data are the nationwide lack of attainment of the ozone NAAQS and the need for a more comprehensive air quality database for ozone and its precursors.

The chief objective of the enhanced ozone monitoring requirements is to provide air quality data that will assist air pollution control agencies in evaluating, tracking the progress of and, if necessary, refining control strategies for attaining the ozone NAAQS. Ambient concentrations of ozone and ozone precursors are used to make attainment and nonattainment decisions, aid in tracking VOC and NOx emission reductions, better characterize the nature and extent of the ozone problem, and examine air quality trends. In addition, data from the PAMS network provide an improved database for evaluating photochemical model performance, especially for future control strategy mid-course corrections as part of the continuing air quality management process. The data are particularly useful to states in ensuring the implementation of the most cost-effective regulatory controls.

The PAMS network array for an area should be fashioned to supply measurements that will assist states in understanding and solving ozone nonattainment problems. EPA has defined number of important monitoring objectives with the following five site types. Type 1 Site: Upwind and Background Characterization, Type 2 and 2a Sites: Maximum Ozone Precursor Emissions Impact, Type 3 Site: Maximum Ozone Concentration, Type 4 Site: Extreme Downwind Monitoring.

PAMS data include measurements of O_3, NOx, a target list of VOCs including several carbonyls, and surface and upper air meteorology. Most PAMS sites measure 56 target hydrocarbons on either an hourly or three-hour basis during the ozone season. The Type 2 sites also collect data on three carbonyl compounds (formaldehyde, acetaldehyde and acetone) during the ozone monitoring period. Included in the monitored VOC species are 10 compounds classified as hazardous air pollutants. All stations must measure O_3, NOx and surface meteorological parameters on an hourly basis. ADEQ has installed four PAMS monitoring sites to date, the ADEQ Supersite (located near 17th Avenue and Campbell) in Central Phoenix (a Type 2 site); the wind profiler (upper air meteorology) site; the Queen Valley site (Type 3); and the South Phoenix site (Type 2a). A time line describing proposed installation dates of additional sites is provided in Table 4.

Table 4: PAMS Installation Time Line		
Type of Ozone		
PAMS	Season	Proposed Installation
Type 2	1999	Supersite – 17th Avenue and Campbell, Phoenix
Type 2a	2001	South Phoenix – Central and Broadway
Type 3	2001	Queen Valley

Annual Ambient Air Monitoring Network Review

In 1999, ADEQ expanded the scope of the annual ambient air monitoring network reviews beyond the state and local air monitoring stations (SLAMS) to include all state networks. 40 CFR §58.20(d) requires states to complete and submit to EPA an annual network review.

States are required to commit to and explain the air quality surveillance systems in their state implementation plans. The air quality surveillance systems consist of various sites designated as SLAMS, national air monitoring stations (NAMS) and PAMS. To provide a complete review of the air monitoring network, ADEQ chose to include additional stations classified as special purpose monitoring stations (SPM), which includes urban haze monitoring sites, IMPROVE sites, ADEQ visibility stations located in or near mandatory Class I areas, and source-oriented monitoring sites operated independently by the permittee.

The annual network review determines conformance with the requirements of 40 CFR Part 58, Appendix D (*Network Design Criteria*) and Appendix E (*Probe and Path Siting Criteria*) for sites classified as SLAMS, NAMS, PAMS and SPM. Class I monitoring sites are subject to specific siting and operational guidance developed by the IMPROVE Steering Committee. Results of the annual network review are used to determine how well the network is achieving its required air monitoring objectives, how well it meets data users' needs and how it should be modified (through termination of existing stations, relocation of stations, establishment of new stations, monitoring of additional parameters and/or changes to the sampling schedule) to continue to meet its objectives and data needs. The main purpose of the review is to improve the network so that it provides adequate, representative and useful air quality data.

In the upcoming year, ADEQ anticipates developing or refining existing network plans for the NAAQS and urban haze ambient monitoring programs that will define specific program goals and objectives. The initial monitoring plans will use recommendations made in the annual network review and will go through a review every two to three years considering factors such as data results and completeness, site representativeness, and data representativeness. The monitoring plan review will also tabulate network review results accumulated over the prior three-year period and will recommend changes to the monitoring plans and instrument or operating requirements.

Monitoring Methods

The gaseous criteria pollutants (SO_2, O_3, NO_2 and CO), as well as PM_{10} (TEOMs) and optical characteristics of the atmosphere (total light extinction, light absorption by gases, light scattering by particles and light absorption by particles), are monitored with continuous analyzers taking approximately one pollutant sample per second. These values are averaged on an hourly basis and recorded to the correct number of significant digits, based on the form of the air quality standards and the detection limits of the instrument. In most cases, the hourly data are summarized into the appropriate multi-hour averages. The agency or company network operators conduct regular checks of the stability, reproducibility, precision and accuracy of these instruments. Precision and accuracy of ambient data are assessed across an entire network using statistical tests that EPA requires.

Particulate matter, PM_{10} and $PM_{2.5,}$ is usually sampled for 24 hours, from midnight to midnight, most often on every sixth day. Using a timer, ambient air is drawn through an inlet of a specified design at a known flow rate onto a filter that collects all PM less than a diameter specified by the inlet design. The filters are weighed before and after the sample period to determine the difference in mass and then divided by the product of the flow rate with the elapsed time to arrive at a mass per unit volume concentration. Some filters are subjected to chemical analysis to determine the amount of various analytes and integrated with the flow rate and timer information to calculate their concentrations. These data are summarized into the appropriate quarterly or annual averages. These samplers are also certified as federal reference or equivalent methods. The agency or company network operators perform regular checks of the stability, reproducibility, precision and accuracy of the samplers and laboratory procedures. Again, precision and accuracy of ambient data are assessed across an entire network using statistical tests that EPA requires.

Visibility monitoring methods are generally divided into the three groups of optical, scene and aerosol (PM). Monitoring of visibility requires qualitative and quantitative information about the causes of haze (e.g., what is in the air, the formation, transport and deposition of pollutants) and the nature of haze (the optical effects of those pollutants to the observer). Scene conditions of visual air quality associated with hazes are recorded with a camera. In the past, ADEQ has used a super-VHS video format and 35 mm slides. The video camera was programmed to advance at the rate of one frame every four minutes during daylight hours. When scene information is obtained from 35 mm slides, a picture is taken at the same times each day to establish baseline conditions and track variations in haze. ADEQ is currently replacing 35 mm slides with digital and Web cameras for continued documentation of scene conditions.

Quantitative measurement of light extinction (B_{ext}) has four components:

- Light scattering by gases (Bsg)
- Light absorption by gases (Bag)
- Light scattering by particles (Bsp)
- Light absorption by particles (Bap)

Mathematically, the relationship is expressed as $B_{ext} = B_{sg} + B_{ag} + B_{sp} + B_{ap}$, where the units are inverse megameters (Mm^{-1}), or the amount of light removed per million meters of distance a viewer looks through.

Total optical light extinction (B_{ext}) is measured directly with a device called a transmissometer. The transmissometer generates visible light in the same wavelength (550 nanometers) as the human eye detects and then transmits that light beam over a sight path of several kilometers to a photocell detector. The transmissometer's design and operation allow its data to be directly correlated with human perception of visibility through the atmosphere. Transmissometer data are also used to check the general accuracy of the sum of the components of light extinction as measured by other continuous monitors. Transmissometers have been operated in Phoenix and Tucson since 1993.

Light scattering by gases (B_{sg}) is a function of air density and is unrelated to air pollution sources. This parameter is derived and does not require measurement. In contrast, the other three components of light extinction are human-caused and require measurement with continuous monitors.

Light absorption by gases (B_{ag}) is determined by continuously measuring nitrogen dioxide (NO_2) since it is the only gas normally present in urban or Class I areas that absorbs significant quantities of visible light. Several EPA reference or equivalent method NO_2 monitors are deployed to verify maintenance of the NAAQS throughout Arizona, including monitoring at Tucson, Phoenix, Queen Valley and Tonto National Monument, while the National Park Service network tracks NO_2 at several national parks in Arizona.

Light scattering by particles (B_{sp}) is determined by continuously, directly measuring particle scattering variation in a calibrated ambient sampling chamber called a nephelometer. The nephelometer samples air at ambient temperature and relative humidity conditions. Routine monitoring with this instrument began in both the Class I area and urban haze networks during 1996. Light absorption by particles (B_{ap}) is determined by continuously measuring the quantity of light transmitted through a filter tape or intermittently through a filter from a PM sampler. Data from these analyses are reported in micrograms per cubic meter ($\mu g/m^3$) of elemental carbon and are converted to the B_{ap} units of Mm^{-1} using a laboratory-derived light absorption coefficient. Routine data collection using a continuous instrument, the aethalometer, began in December 1996 in Phoenix and February 1998 in Tucson. B_{ap} is also measured intermittently using the PM sample filters collected in both the Class I area and urban haze networks.

In monitoring visibility, it is also essential to collect and analyze particulate samples to define and to understand the chemistry of aerosols present before, during and after haze events. The chemical speciation data can be used to determine the contributions of each source category to the observed optical haze data. From these filter data, the chemical components are used to calculate light extinction for the filter sample period and compared with continuous measurements as a check. Finally, the samplers used in the urban haze networks also monitor compliance with PM_{10} and $PM_{2.5}$ national air quality standards and provide information on the categories of pollution sources contributing to observed PM_{10} and $PM_{2.5}$ concentrations. Sampling frequency for PM in the urban networks is generally every sixth day in the ADEQ network and every third day in the IMPROVE Class I area network. Every day sampling at all monitoring sites would be cost-prohibitive and personnel-intensive using current particulate sampling technologies.

To more fully understand the causes of hazes often associated with certain atmospheric conditions, it is necessary to monitor certain meteorological parameters. For these reasons, each network includes meteorological data such as temperature, relative humidity, wind speed and direction. Routine measurements of upper air temperature and water vapor are not made in the Phoenix area but information from the twice-daily rawinsonde launches by the National Weather Service at Tucson, Flagstaff, Las Vegas, Nevada and El Paso, Texas are used to characterize the air masses over Arizona.

Monitoring Data

Introduction

Air quality measurements in Arizona can be divided into the three categories of criteria pollutants, visibility and photochemical monitoring. Each category is discussed below. EPA has set National Ambient Air Quality Standards (NAAQS) for the criteria air pollutants, which are CO, ozone, nitrogen dioxide, sulfur dioxide, lead and particulate matter 10 microns in size and smaller (PM_{10}) and particulate matter 2.5 microns in size and smaller (PM_{25}). These pollutants are monitored in Arizona by industry, county air pollution districts, the National Park Service, Indian tribes and ADEQ. The 2004 data measurements by criteria pollutant begin below. The data tables in this section are organized by county; site operator information can be found in the site index tables in Appendix 1. Data recovery information (valid samples as a percent of total scheduled samples) is included in the tables. The number of valid samples is important for determining the representativeness of the average data calculations. Information about the compliance requirements and status for the criteria pollutants begins on Page 36. Visibility monitoring information is presented beginning on Page 58.

Figure 3 – ADEQ's Phoenix James L. Guyton Supersite monitoring station.

Criteria Pollutants – 2004 Data

Carbon Monoxide

Carbon monoxide (CO) – a colorless, odorless, tasteless gas that is produced in the incomplete combustion of fuels – has a variety of adverse health effects that arise from its ability to chemically bind with blood hemoglobin. CO successfully competes with oxygen for binding with hemoglobin and thereby impairs oxygen transport. This impaired transport leads to several central nervous system effects, such as the impairment of time interval discrimination, changes in relative brightness thresholds, increased reaction time, and headache, fatigue and dizziness. CO exposures also contribute to or exacerbate arteriosclerotic heart disease.

In Arizona's metropolitan areas, about 51 percent of CO emissions come from on-road motor vehicles; 45 percent from off-road vehicles or equipment such as construction, lawn and garden equipment; and the remainder from point and area sources. This pollutant has low background levels, with highest concentrations next to busy streets, and has elevated neighborhood concentrations in locations that reflect emissions transported from upwind areas. Its concentrations peak from November to January because its emissions are highest in cold weather – automotive emissions of CO vary inversely with temperature – and because the surface layer of the atmosphere is at its most stable in wintertime. Hourly concentrations tend to be at their maximum during the morning rush hour and between 6 PM and midnight.

Carbon Monoxide Network 2004

Controls have reduced CO emissions, and the standards have been achieved in the metropolitan Phoenix area since 1996, in stark contrast to the first half of the 1980s, when more than 100 exceedances were recorded each year. Similar improvements have occurred in Tucson, where the last eight-hour exceedances were recorded in 1988 at two sites. Equipping vehicles with catalytic converters and electronic ignition systems were the most effective controls, but significant reductions can also be attributed to the vehicle inspection program (beginning in 1976) and oxygenated fuels (beginning in 1989).

CO is monitored continuously with non-dispersive infrared instruments that are deployed in urban neighborhoods and near busy roadways or intersections. In 2004, 15 monitors were operated in greater Phoenix; 6 monitors were operated in metropolitan Tucson. Monitors in Apache Junction and Casa Grande were closed during 2002. Table 5 presents the 2004 CO data.

Table 5: 2004 Carbon Monoxide Data (in ppm) *(NAAQS 1-hour 35 ppm, Eight-hour 9 ppm)*					
Site or City	**One-Hour Average Value**		**Eight-hour Average Value**		**Valid Data Recovery * (%)**
	Max Value	**2nd High**	**Max Value**	**2nd High**	
Maricopa County					
Buckeye [S] (Opened 09/01/2004)	0.9	0.9	0.5	0.4	88
Central Phoenix	5.0	4.4	3.4	3.3	98
Dysart [S]	2.1	1.8	1.1	1.1	98
Glendale [S]	6.1	3.2	2.4	2.1	99
Greenwood	7.6	7.3	4.9	4.3	99
JLG Supersite	4.9	4.9	4.2	4.0	99
Maryvale [S] (Closed 03/31/2004)	5.7	5.0	3.5	2.9	99
Mesa [S]	3.0	2.6	1.7	1.7	98
North Phoenix [S]	4.1	3.7	2.2	2.0	96
South Phoenix [S]	6.7	5.9	3.5	3.3	99
South Scottsdale [S]	3.4	3.1	2.4	2.4	95
Tempe [S]	3.1	2.6	1.9	1.7	96
West Chandler [S]	2.9	2.7	2.1	2.1	98
West Indian School	6.9	6.7	4.7	4.6	96
West Phoenix	7.7	7.5	5.2	5.1	96
Pima County					
22nd St. & Alvernon	4.0	4.0	2.1	2.0	99
22nd St. & Craycroft	3.6	3.4	1.6	1.6	99
Cherry & Glenn [S]	4.0	3.9	2.7	2.2	99
Children's Park	2.2	2.2	1.4	1.4	99
Golf Links & Kolb [S]	3.6	3.5	2.1	2.1	99
Tucson Downtown	5.5	4.7	3.7	2.5	99

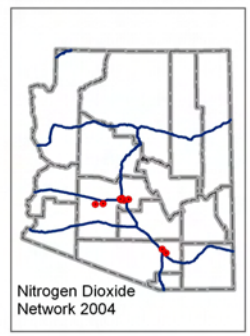
* Valid Data Recovery is the percentage of valid samples collected of the total number of scheduled sampling hours. There were 8,784 sampling hours in 2004. Valid data recovery should be less than 100% due to quality assurance testing of the monitors requiring them to be off-line for several hours at a time.

[S] Seasonal monitor. Maricopa County monitors operate during January 1 to April 1 and September 1 to December 31; 5112 hours in 2004. Pima County monitors operate during January 1 to May 1 and October 1 to December 31; 5112 hours in 2004.

Nitrogen Dioxide

Nitrogen dioxide (NO_2) is a reddish-brown gas that is formed by the oxidation of nitric oxide (NO), which is a byproduct of combustion of all fuels. At the lowest NO_2 exposure levels at which adverse health effects have been detected, respiratory damage has been observed: destruction of cilia, alveolar tissue disruption and obstruction of the respiratory bronchioles. Animal studies suggest that NO_2 may be a causal or aggravating agent in respiratory infections. However, community exposure studies to lower ambient levels of NO_2 have demonstrated no significant links with respiratory symptoms or disease.

This pollutant is of greater concern in its reduction of visibility (it causes 5 percent of the visibility reduction in Phoenix) and in its contributory role in the photochemical formation of ozone.



Combustion emissions of nitrogen oxides are 95 percent nitric oxide and 5 percent NO_2. Because nitric oxide is rapidly oxidized to nitrogen dioxide, nitric oxide emissions serve as a surrogate for NO_2. In a recent Phoenix emissions inventory, the transportation sector dominated nitric oxide emissions: 58 percent of the emissions came from cars and trucks, 27 percent came from off-road vehicles such as trains and diesel-powered construction vehicles, and 15 percent from other sources, including power plants, biogenic emissions from soil and stationary combustion sources. Nitric oxide and NO_2 concentrations are highest near major roadways. Nitric oxide concentrations decrease rapidly with distance from the roadway, whereas NO_2 concentrations are more evenly distributed because of their formation through oxidation and their subsequent transport. Concentrations of NO_2 are highest in the late afternoon and early evening of winter, when rush hour emissions of nitric oxide are converted to NO_2 under relatively stable atmospheric conditions. Because nitric oxide reacts rapidly with ozone, nocturnal ozone concentrations in cities are often reduced to near-zero levels. This nitric oxide scavenging of ozone does not occur in remote areas. Nocturnal ozone concentrations at background sites are high compared with the urban concentrations.

Nitrogen oxides emissions from motor vehicles have been reduced through retardation of spark timing, lowering the compression ratio, exhaust gas recirculation systems and three-way catalysts. The vehicle inspection program, with its NOx test for light-duty gasoline vehicles 1981 and newer (in Phoenix only) has also helped. Reformulated gasolines also decrease nitrogen oxides emissions: Federal Phase II gasoline, by 1.5 percent for vehicular and 0.5 percent for off-road equipment; California Phase 2 gasoline, by 6.4 percent for vehicular and 7.7 percent for off road equipment.

NO_2 is monitored continuously with chemiluminescence instruments, which also determine nitric oxide (NO) concentrations and NOx (the sum of NO_2 and NO) concentrations. These instruments are located in urban neighborhoods where either the emissions are dense or where ozone concentrations tend to be at their maximum. In addition, these monitors are located near major coal-fired electrical power plants. Eleven monitors were operated in Arizona in 2004 at eight urban locations and near three power plants. Table 6 presents the NO_2 data available in 2004.

Table 6: 2004 Nitrogen Dioxide (in ppm)
(NAAQS Annual Mean 0.053 ppm)

Site or City	Annual Average	Maximum Value One-Hour Average	Valid Data * Recovery (%)
Apache County			
Springerville – Coyote Hills	0.0013	0.026	94
Maricopa County			
Buckeye (Opened 08/01/04)	N/A	0.045	88
Central Phoenix	0.0247	0.077	95
Greenwood	0.0314	0.104	97
JLG Supersite [S]	N/A	0.075	99
Palo Verde [S]	N/A	0.039	99
South Scottsdale	0.0194	0.076	92
West Phoenix	0.0238	0.090	97
Pima County			
22nd St. & Craycroft	0.0153	0.059	99
Children's Park	0.0159	0.063	99

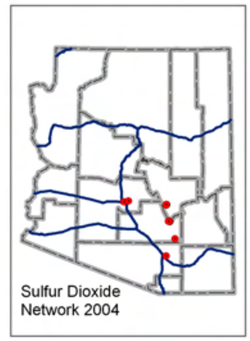
* Valid Data Recovery is the percentage of valid samples collected of the total number of scheduled sampling hours. There were 8,784 sampling hours in 2004. Valid data recovery should be less than 100% due to quality assurance testing of the monitors requiring them to be off-line for several hours at a time.

[S] Seasonal Monitors:
Palo Verde operates during summer ozone season, April 1 to October 31; 5136 hours
Phoenix JLG Supersite operates during winter CO season, January 1 to March 31 and November 1 to December 31; 3648 hours in 2004.

N/A – Data not available

Sulfur Dioxide

Exposure to sulfur dioxide (SO_2), a colorless gas with a pungent, irritating odor at elevated concentrations, alters the mechanical function of the upper airway, including increasing the nasal flow resistance and decreasing the nasal mucus flow rate. Short-term exposures result in an exaggerated air flow resistance in about 10 percent of the subjects tested and produce acute bronchioconstriction in strenuously exercising asthmatics.



In Arizona, the principal source of SO_2 emissions has been the smelting of sulfide copper ore. Most fuels contain trace quantities of sulfur, and their combustion releases both gaseous SO_2 and particulate sulfate (SO_4^{--}). A recent emissions inventory for Phoenix shows 32 percent of SO_2 emissions come from point sources, 26 percent from area sources, 23 percent from off-road vehicles and equipment, and 19 percent from on-road motor vehicles. SO_2 is removed from the atmosphere through dry deposition on plants and its conversion to sulfuric acid and eventually to sulfate. SO_2 has extremely low background levels, with elevated concentrations found downwind of large point sources. Concentrations in urban areas are low and are homogeneously distributed, with annual averages varying from 3 to 11μg/m^3.

Major controls were installed in Arizona's copper smelters in the 1980s, which reduced SO_2 emissions substantially. Vehicular emissions of SO_2 and sulfate have been reduced through lowering the sulfur content in diesel fuel and gasoline.

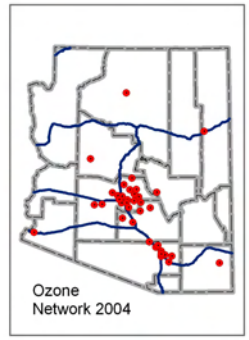
SO_2 is monitored continuously with pulsed fluorescence instruments, most of which are clustered around copper smelters or coal-fired electric power plants. In 2004, ten reporting monitors were sited near copper smelters, two near power plants and three in urban areas. Table 7 presents the SO_2 data collected in Arizona in 2004 from the monitors near copper smelters and in urban areas.

Table 7: 2004 Sulfur Dioxide (in $\mu g/m^3$) ***(Primary NAAQS Annual Average 80 $\mu g/m^3$[0.030 ppm]), 24-hour Average 365 $\mu g/m^3$[0.14 ppm] Secondary NAAQS 3-hour 1300 $\mu g/m^3$ [0.5 ppm])***						
Site or City	**Annual Average**	**Maximum Value**				**Valid Data Recovery* (%)**
		3-Hour Average		**24-Hour Average**		
		Max Value	**2nd High**	**Max Value**	**2nd High**	
Apache County						
TEP – Springerville – Coyote Hills	3	10	8	18	13	91
Gila County						
ASARCO – Globe Highway	43	931	928	231	229	99
ASARCO – Hayden – Garfield AVE	40	793	752	332	318	99
ASARCO – Montgomery Ranch	47	1076	911	264	231	98
Hayden – Old Jail, ADEQ	26	508	506	118	105	99
Hayden – Old Jail, ASARCO	22	550	524	113	102	99
Miami – Ridgeline	10	293	220	79	50	97
PDMI – Miami – Jones Ranch	13	326	289	99	81	99
PDMI – Miami – Town Site	11	319	307	80	49	99
Maricopa County						
Central Phoenix	7	31	29	24	21	89
South Scottsdale	4	18	18	16	13	94
Pima County						
22nd St. & Craycroft	4	31	26	16	10	99
Pinal County						
ASARCO - Hayden Junction	13	326	304	53	49	98
San Manuel	4	26	26	10	8	99

* Valid Data Recovery is the percentage of valid samples collected of the total number of scheduled sampling hours. There were 8,784 sampling hours in 2004. Valid data recovery should be less than 100% due to quality assurance testing of the monitors requiring them to be off-line for several hours at a time.

Ozone

Ozone (O_3) – a colorless, slightly odorous gas – is both a natural component of the atmosphere, through its photochemical formation from natural sources of CO, hydrocarbons and nitrogen oxides, and an important air contaminant in urban atmospheres. In the stratosphere, O_3 blocks harmful ultraviolet radiation. In the urban atmosphere, its formation from anthropogenic emissions of hydrocarbons and nitrogen oxides leads to concentrations harmful to people, animals, plants and materials. O_3 causes significant physiological and pathological changes in both animals and humans at concentrations present in many urban environments. Short-term (one to two hours) exposures to concentrations in the range of 0.1 to 0.4 parts per million induce changes in lung function, including increased respiratory rates, increased pulmonary resistance, decreased tidal volumes and changes in lung mechanics. Symptomatic responses in exercising adults include throat dryness, chest tightness, substernal pain, cough, wheeze, pain on deep inspiration, shortness of breath and headache. These symptoms also have been observed at lower concentrations for longer exposures. Evidence suggests that O_3 exposure makes the respiratory airways more susceptible to other bronchioconstrictive challenges. Animal studies suggest that ozone exposure interferes with or inhibits the immune system. O_3 at ambient concentrations injures the stomates, which are the cells that regulate plant respiration, resulting in flecks on the upper leaf surfaces of dichotomous plants and the death of the tips of coniferous needles. O_3 is considered by plant scientists to be the most important of all of the phytotoxic air pollutants, causing over 90 percent of all plant injury from air pollution on a global basis.



O_3 is formed photochemically by the reaction of volatile organic compounds and nitrogen oxides. Volatile organic compound (VOC) emissions in greater Phoenix come from cars and trucks (31 percent), off-road vehicles and equipment such as lawn mowers (27 percent), small stationary sources (20 percent), biogenic emissions from grass, shrubs and trees (17 percent) and point sources (5 percent). NOx comes from cars and trucks (58 percent), off-road vehicles such as construction equipment and trains (27 percent), electric power plants (7 percent), small stationary sources (4 percent) and biogenic emissions from soil (4 percent). O_3 has relatively high background levels, with the daily maximum in remote areas being about one-half to three-quarters of the daily maximum in the urban areas. In an urban area, the highest O_3 concentrations tend to occur on the downwind edge, although high concentrations do occur less frequently in the central city. High O_3 concentrations are a summer phenomenon caused when sunlight and evaporative hydrocarbon emissions peak. Urban O_3 concentrations are low to near zero at night, rise rapidly through the morning and peak in the afternoon.

Controls to reduce the precursors of ozone – VOC and NOx – have been successfully implemented for years. NOx and VOC from vehicular exhaust have been reduced through engine modifications and three-way catalytic converters. Evaporative hydrocarbons from vehicles have been reduced through better engineered fuel tanks and auxiliary plumbing combined with carbon absorption canisters. Additional reductions of vehicular VOC have come through ADEQ's vehicle inspection program, which tests all gasoline vehicles for hydrocarbons (Phoenix and Tucson), through vapor-capturing equipment for gasoline tankers, vapor recovery systems at retail gas stations (Phoenix area only) and cleaner burning gasoline (Phoenix area only). Stationary source hydrocarbons have been reduced through a variety of better control equipment required by stricter regulations. Despite these efforts, the continued population growth in Arizona combined with the high natural background O_3, may make achieving the eight-hour standard difficult.

Ultraviolet absorption instruments monitor O_3 continuously in urban neighborhoods for population exposure, in areas downwind of urban areas for maximum concentration monitoring and in remote areas for background information. In 2004, 35 reporting O_3 monitors were in operation; four for background, 21 for urban neighborhoods and 10 for maximum concentrations downwind of urban areas. Tables 8 and 9 present the 2004 Arizona O_3.

Table 8: 2004 Ozone Data (in ppm), One-Hour Averages (NAAQS 1-hour 0.12 ppm)

Site or City	**Max Value**	**2nd High**	**3rd High**	**4th High**	**Valid Data Recovery* (%)**
Cochise County					
Chiricahua NM Entrance Station	.080	.078	.075	.075	99
Coconino County					
Grand Canyon NP Hance	.082	.080	.077	.076	99
Gila County					
Tonto NM S	.097	.092	.088	.085	97
Maricopa County					
Blue Point	.110	.098	.098	.092	96
Buckeye S (Opened 08/01/04)	.088	.080	.071	.070	40 #
Cave Creek S	.092	.091	.089	.087	99
Central Phoenix	.100	.093	.088	.088	97
Dysart S	.081	.079	.078	.078	98

Table 8: 2004 Ozone Data (in ppm), One-Hour Averages (NAAQS 1-hour 0.12 ppm)					
Site or City	**Max Value**	**2nd High**	**3rd High**	**4th High**	**Valid Data Recovery* (%)**
Falcon Field S	.093	.087	.087	.086	98
Fountain Hills	.098	.095	.095	.089	98
Glendale S	.100	.091	.089	.089	99
Humboldt Mt. S	.089	.088	.087	.086	98
JLG Supersite	.099	.088	.086	.085	99
North Phoenix	.110	.099	.096	.094	97
Palo Verde S	.080	.079	.078	.078	99
Pinnacle Peak	.084	.082	.080	.079	95
Rio Verde S	.107	.092	.092	.091	84
South Phoenix	.089	.088	.086	.085	98
South Scottsdale	.091	.087	.086	.084	95
Tempe S	.095	.088	.086	.084	97
West Chandler S	.080	.078	.078	.078	99
West Phoenix	.097	.089	.089	.088	98
Navajo County					
Petrified Forest NP	.088	.083	.077	.077	88
Pima County					
22nd & Craycroft	.079	.078	.077	.076	99
Children's Park	.082	.077	.077	.077	99
Coachline	.074	.073	.072	.071	97
Green Valley	.075	.074	.071	.070	99
Rose Elementary	.073	.072	.071	.070	99
Saguaro National Park East	.085	.084	.082	.082	99
Tangerine	.076	.075	.073	.073	100
Tucson Downtown	.076	.076	.073	.070	99
Tucson Fairgrounds	.078	.078	.076	.074	99
Pinal County					
Apache Junction Maintenance Yard	.084	.079	.079	.079	98
Casa Grande Airport	.077	.077	.076	.075	98
Combs S	.080	.069	.068	.067	95
Maricopa S	.078	.072	.072	.071	100
Pinal Air Park S	.074	.073	.072	.072	99
Queen Valley S	.093	.092	.092	.087	99

Table 8: 2004 Ozone Data (in ppm), One-Hour Averages (NAAQS 1-hour 0.12 ppm)					
Site or City	**Max Value**	**2nd High**	**3rd High**	**4th High**	**Valid Data Recovery* (%)**
Yavapai County					
Hillside [S]	.090	.085	.081	.080	95
Yuma County					
Yuma Game & Fish [S]	.083	.082	.082	.081	99

* Valid Data Recovery is the percentage of valid samples collected of the total number of scheduled sampling hours. There were 8,784 sample hours in 2004. Valid data recovery should be less than 100% due to quality assurance testing of the monitors requiring them to be off-line for several hours at a time.

[S] Seasonal monitor, operational during April 1 to November 1; 5,136 sample hours.

[#] Less than 75% data recovery; does not satisfy EPA summary criteria.

Table 9: 2004 Ozone Data (in ppm), Eight-hour Averages (NAAQS Eight-hour 0.08 ppm)						
Site or City	**Max Value**	**2nd High**	**3rd High**	**4th High**	**Daily Exceed.**	**Valid Sample Days ***
Cochise County						
Chiricahua NM Entrance Station	.073	.072	.072	.070	0	360
Coconino County						
Grand Canyon NP Hance	.077	.076	.074	.072	0	359
Gila County						
Tonto NM [S]	.080	.078	.077	.077	0	206
Maricopa County						
Blue Point	.081	.077	.076	.075	0	352
Buckeye [S] (Opened 08/01/04)	.068	.067	.064	.058	0	88 #
Cave Creek[S]	.079	.077	.076	.076	0	214
Central Phoenix	.078	.077	.075	.074	0	358
Dysart [S]	.074	.073	.070	.065	0	210
Falcon Field [S]	.077	.077	.072	.070	0	211

Table 9: 2004 Ozone Data (in ppm), Eight-hour Averages (NAAQS Eight-hour 0.08 ppm)						
Site or City	**Max Value**	**2nd High**	**3rd High**	**4th High**	**Daily Exceed.**	**Valid Sample Days ***
Fountain Hills	.077	.077	.076	.075	0	363
Glendale S	.082	.080	.079	.076	0	214
Humboldt Mt. S	.081	.080	.080	.078	0	212
JLG Supersite	.077	.076	.073	.072	0	362
North Phoenix	.087	.084	.082	.080	1	356
Palo Verde S	.075	.074	.073	.072	0	213
Pinnacle Peak	.071	.070	.069	.068	0	344
Rio Verde S	.083	.077	.077	.074	0	179
South Phoenix	.079	.073	.073	.072	0	362
South Scottsdale	.081	.079	.077	.073	0	346
Tempe S	.078	.072	.072	.072	0	206
West Chandler S	.073	.072	.072	.070	0	213
West Phoenix	.080	.077	.074	.072	0	364
Navajo County						
Petrified Forest NP	.084	.072	.071	.071	0	317
Pima County						
22nd St. & Craycroft	.073	.072	.071	.069	0	366
Children's Park	.071	.071	.069	.068	0	366
Coachline	.069	.068	.068	.068	0	356
Green Valley	.071	.070	.067	.066	0	365
Rose Elementary	.067	.065	.064	.064	0	366
Saguaro NP East	.075	.074	.073	.073	0	361
Tangerine	.072	.069	.069	.068	0	366
Tucson Downtown	.070	.070	.064	.063	0	365
Tucson Fairgrounds	.071	.071	.066	.064	0	362
Pinal County						
Apache Junction Maintenance Yard	.070	.070	.070	.069	0	358
Casa Grande Airport	.072	.070	.070	.070	0	360
Combs S	.064	.062	.060	.059	0	202
Maricopa S	.072	.067	.065	.064	0	214
Pinal Air Park S	.069	.069	.068	.067	0	213
Queen Valley S	.077	.076	.074	.073	0	214

Table 9: 2004 Ozone Data (in ppm), Eight-hour Averages (NAAQS Eight-hour 0.08 ppm)						
Site or City	Max Value	2nd High	3rd High	4th High	Daily Exceed.	Valid Sample Days *
Yavapai County						
Hillside [S]	.082	.080	.078	.077	0	203
Yuma County						
Yuma Game & Fish [S]	.075	.073	.073	.073	0	214

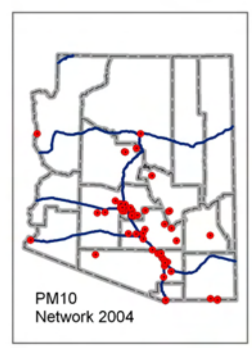
* Valid Sample Days is the number of days with valid data recovery of the total number of scheduled sampling days. Scheduled sample days for non-seasonal monitors in 2004 was 366. A Valid Sample Day has 18 or more hours of valid data recovery.

[S] Seasonal monitor, operational during April 1 to November 1; 214 sample days in the season.

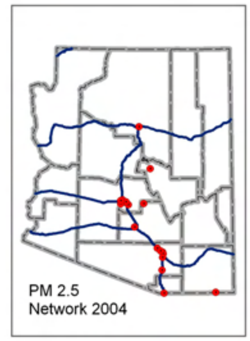
[#] Less than 75% data recovery; does not satisfy EPA summary criteria.

Particulate Matter Smaller Than 10 Microns (PM_{10}) and Smaller Than 2.5 Microns ($PM_{2.5}$)

Particulate matter is a collective term describing very small solid or liquid particles that vary considerably in size, geometry, chemical composition and physical properties. Produced by both natural processes (pollen and wind erosion) and human activity (soot, fly ash, and dust from paved and unpaved roads), particulates contribute to visibility reduction, pose a threat to public health and cause economic damage through soil disturbance. Some fine particulates ($PM_{2.5}$) are formed by the condensation of vapors or by their subsequent growth through coagulation or agglomeration. Others are emitted directly from the sources, either by combustion or from mechanical grinding of soils. Coarse particulates (2.5 to 10 microns) are formed through mechanical processes such as the grinding of matter and the atomization of liquids. Fine particulates can also be classified as primary – produced within and emitted from a source with little subsequent change – or secondary – formed in the atmosphere from gaseous emissions. Secondary particulate nitrates and sulfates, for example, form in the atmosphere from the oxidation of gaseous SO_2 and NO_2. In contrast, most atmospheric carbon is primary, having been emitted directly from combustion sources, although some of the organic carbon in the aerosol is secondary, having been formed by the complex photochemistry of gaseous volatile organic compounds.



The size, shape and chemical composition of particulates determine their health effects. Particles larger than 10 microns are deposited in the upper respiratory tract. Particles from 2.5 to 10 microns are inhalable and are deposited in the upper parts of the respiratory system. Particles smaller than 2.5 microns are respirable and enter the pulmonary tissues to be deposited there. Particles in the size range of 0.1 to 2.5 microns are most efficiently deposited in the alveoli, where their effective toxicity is greater than larger particles because of the higher relative content of toxic heavy metals, sulfates and nitrates. Epidemiological studies have shown causal relationships between particulates and excess mortality, aggravation of bronchitis, and, in children, small, reversible changes in pulmonary function. Acidic aerosols have been linked to the inability of the upper respiratory tract and pulmonary system to remove harmful particles.



The Arizona Comparative Environmental Risk Project – a multi-disciplinary investigation into human exposure to all environmental risks completed in 1995 – ranked outdoor air quality in general and particulate matter in particular as the highest environmental risk in the state. In this study, annual premature deaths from exposure to PM_{10} concentrations in Arizona were estimated at 963, which included 667 in Maricopa County and 88 in Tucson. Increased percentages of hospital admissions for respiratory disease (1 to 4 percent, depending on the city), of asthma episodes (5 to 14 percent), of lower respiratory symptoms (5 to 15 percent) and of coughs (2 to 6 percent) were attributed to the prevailing annual PM_{10} concentrations in 1991. Chronically high particulate concentrations in the ambient air continue to pose a serious health threat to many Arizonans.

Coarse particulate emissions are mostly geological and are dominated by dusts from three activities: re-entraining dust from paved roads, driving on unpaved roads and earthmoving associated with construction. Soil dust from these sources and others contribute more than 70 percent of the coarse particulates in Phoenix. On days with winds in excess of 15 miles per hour, wind erosion of soil contributes to this loading. With a more diverse chemical composition, fine particulate ($PM_{2.5}$) emissions are more evenly distributed among a larger number of sources. At the Phoenix JLG Supersite, receptor modeling indicates gasoline and diesel engine exhaust account for more than two-thirds of the $PM_{2.5}$ emissions. Soil dust contributes another 10.5 percent.

In other urban and rural areas, this mixture of sources will vary. Agricultural and mining areas, for example, will be more heavily influenced by emissions from these activities.

$PM_{2.5}$ concentrations tend to be at their highest in the central portions of urban areas, diminishing to background levels at the urban fringe. In contrast, PM_{10} concentrations are not smoothly spatially distributed because each monitoring site is strongly influenced by the degree of localized emissions of coarse particulates. Background concentrations of PM_{10} are about 40 percent of the urban maxima (20 $\mu g/m^3$ for an annual average background versus about 50 $\mu g/m^3$ for the urban maximum). Background concentrations of $PM_{2.5}$ are about 5 $\mu g/m^3$, in contrast to the urban maxima of 12 to 15 $\mu g/m^3$. Concentrations of both size ranges of particulates tend to be higher in the late fall and winter, when atmospheric dispersion is at a seasonal low. PM_{10} maximum concentrations can occur in any season, provided nearby sources of coarse particulates are present or when strong and gusty winds suspend soil disturbed by human activities. Hourly concentrations of particulates tend to peak during those hours of the worst dispersion, which is from sunset to mid-morning.

Controls to reduce particulates have been in place for decades, beginning with an ordinance that required watering to reduce dust from construction in Pima County in the 1960s. Maricopa County's umbrella dust abatement rule, Rule 310, has been revised many times through the years and now regulates construction dust, track-out dust from construction sites, and dust from unpaved parking and vacant lots. Efforts to reduce dust resuspended from paved roads have concentrated on eliminating track-out from construction sites, curbing and stabilizing road shoulders, and investigating more efficient street sweepers. Secondary fine particulates have been reduced by vehicular emission controls, which have reduced their precursor gases. Reducing gaseous hydrocarbon emissions, for example, has led to reductions in ambient concentrations of secondary organic carbon. In Maricopa County, the Governor's Agricultural Best Management Practices Committee developed a rule containing best management practices for agricultural activities to reduce particulate emissions from tilling and harvesting activities of cropland and non-cropland. In a recent PM_{10} SIP, the Maricopa Association of Governments committed to implement 77 new measures, including enhanced enforcement of the county dust rules, implementation of agricultural best management practices, diesel engine replacement and retirement programs and requirements for cleaner burning fireplaces.

Particulates are monitored by pulling ambient air through a filter, generally for 24 hours every sixth day, weighing the filter before and after, and measuring the volume of air sampled. The monitoring instruments are fitted with different aerodynamic devices to segregate particle size fractions. Particulates can also be monitored continuously with a tapered element oscillating microbalance (TEOM) instrument or a beta attenuation mass monitor (BAM) which utilizes a beam sensing through a paper tape.

The 2004 PM_{10} data reported in Table 10 represent 64 monitors throughout Arizona and two in Mexico, located in Agua Prieta and Nogales, Sonora. TEOM data are included for those sites in the Phoenix metropolitan area that were required to change to everyday monitoring from every sixth day. BAM data are included for sites in Pima County. Data from collocated monitors are included if available. The data are reported in standard conditions adjusted to 25ºC and 1 atmosphere pressure) as required by EPA.

EPA began a nationwide program to measure $PM_{2.5}$ using federal reference method monitors in anticipation of a new federal standard for fine particulates in 1999. Eleven federal reference method samplers were located in Arizona. The fine particulate portion of the PM_{10} measurement made by dichot monitors has been measured for many years in Arizona and has served as an approximation for the $PM_{2.5}$ measurement; however it is not exactly equivalent to that measurement. Table 11 lists only the federal reference method measurements for 2004. The data are reported in ambient conditions (local temperature and pressure) as required by EPA. Particulate data from the IMPROVE network are not included.

Table 10: 2004 PM_{10} Data (in µg/m^3)
(NAAQS Annual Average 50µg/m^{3,} 24-hour Average 150 µg/m^3)
Bold denotes an exceedance, defined as any daily value greater then 150 µg/m^3 after rounding to the nearest 10 µg/m^3 and any annual average value greater than 50 µg/m^3 when rounded to the nearest 1 µg/m^3.

Site or City	Method	Annual Average	24-Hour Average		Valid Data Recovery* (%)
			Max Value	2nd High	
Apache County					
TEP – Springerville – Coalyard	TEOM	13.4	128.7	75.0	99
TEP – Springerville – Coyote Hills	TEOM	10.2	68.6	34.8	99
Cochise County					
Douglas Red Cross	Dichot/ Partisol	26.3	56	52	97
Paul Spur Chemical Lime Plant (1)	Partisol	14.7	44	37	98
Paul Spur Chemical Lime Plant (2)	Partisol	17.3	41	41	100
Coconino County					
Flagstaff Middle School	Dichot/ Partisol	16.0	42	42	92
Sedona Post Office	Partisol	11.1	32	20	98

Table 10: 2004 PM_{10} Data (in µg/m³)
(NAAQS Annual Average 50µg/m³, 24-hour Average 150 µg/m³)
Bold denotes an exceedance, defined as any daily value greater then 150 µg/m³ after rounding to the nearest 10 µg/m³ and any annual average value greater than 50 µg/m³ when rounded to the nearest 1 µg/m³.

Site or City	Method	Annual Average	24-Hour Average		Valid Data Recovery* (%)
			Max Value	2nd High	
Gila County					
Hayden – Old Jail, ADEQ (1)	Dichot/ Partisol	27.5	55	47	95
Hayden – Old Jail, ADEQ (2) # (Closed 6/30/2004)	Dichot	25.6	53	38	93
PDMI – Miami – Golf Course	Dichot	16.9	40	32	93
Miami – Ridgeline, PDMI	Dichot	10.2	26	24	100
Payson Well Site	Partisol	18.9	52	49	93
Graham County					
Safford	Dichot	17.0	99	34	100
Maricopa County					
Bethune Elementary School (1)	Dichot	42.4	122	108	97
Bethune Elementary School (2) # (Opened 10/19/2004)	Dichot	41.8	103	63	100
Buckeye # (Opened 8/01/2004) [3]	Hi-Vol/ TEOM	39.9	82	81	91
Central Phoenix	TEOM	36.6	94	88	93
Central Phoenix	Hi-Vol	32.3	81	55	98
Chandler	Hi-Vol	39.6	150	80	100
Durango Complex [3]	Hi-Vol/ TEOM	**51.6**	139	122	99
Dysart	Hi-Vol	27.3	94	80	100
Glendale	Hi-Vol	25.7	69	47	97
Greenwood	Hi-Vol	44.3	100	82	100
Higley [3]	Hi-Vol/ TEOM	47.9	**159**	150	98

Table 10: 2004 PM_{10} Data (in $\mu g/m^3$) ***(NAAQS Annual Average 50$\mu g/m^3$, 24-hour Average 150 $\mu g/m^3$)*** **Bold** denotes an exceedance, defined as any daily value greater then 150 $\mu g/m^3$ after rounding to the nearest 10 $\mu g/m^3$ and any annual average value greater than 50 $\mu g/m^3$ when rounded to the nearest 1 $\mu g/m^3$.					
Site or City	**Method**	**Annual Average**	**24-Hour Average**		**Valid Data Recovery* (%)**
			Max Value	**2nd High**	
Maryvale # (Closed 04/01/2004)	Hi-Vol	29.1	46	42	100
Mesa	Hi-Vol	23.2	49	40	100
North Phoenix	Hi-Vol	24.8	46	43	97
Palo Verde	Dichot	14.5	42	34	89
South Phoenix	Hi-Vol	45.6	132	126	95
South Scottsdale	Hi-Vol	26.1	77	41	100
West Chandler	Hi-Vol	29.9	70	55	100
West Phoenix	Hi-Vol	36.9	100	72	100
West Forty Third [3]	Hi-Vol/ TEOM	**61.1**	145	133	96
Mohave County					
Bullhead City	Partisol	18.2	48	39	100
Navajo County					
Show Low	Partisol	14.9	41	39	98
Pima County					
Ajo	Partisol	19.3	43	42	90
Broadway & Swan	Hi-Vol	20.7	35	34	100
Corona De Tucson	Hi-Vol	12.4	37	24	98
Green Valley [2]	BAM	13.6	127	96	97
Orange Grove [1]	Hi-Vol	26.8	119	100	98
Prince Road	Hi-Vol	28.4	67	50	100
Rillito, ADEQ	Dichot	32.2	93	92	100
Rillito, APCC	Hi-Vol	26.9	130	58	98

Table 10: 2004 PM_{10} Data (in $\mu g/m^3$) **(NAAQS Annual Average $50 \mu g/m^3$, 24-hour Average 150 $\mu g/m^3$)** **Bold** denotes an exceedance, defined as any daily value greater then 150 $\mu g/m^3$ after rounding to the nearest 10 $\mu g/m^3$ and any annual average value greater than 50 $\mu g/m^3$ when rounded to the nearest 1 $\mu g/m^3$.					
Site or City	**Method**	**Annual Average**	**24-Hour Average**		**Valid Data Recovery* (%)**
			Max Value	**2nd High**	
Santa Clara	Hi-Vol	20.4	41	41	98
South Tucson	Hi-Vol	29.2	149	117	96
Tangerine	Hi-Vol	14.7	34	26	98
Pinal County					
Apache Junction Fire Station	Hi-Vol	18.4	35	35	98
Casa Grande Downtown	Hi-Vol	24.4	52	47	95
Coolidge Maintenance Yard	Hi-Vol	24.5	57	54	97
Eloy City Complex	Hi-Vol	27.8	46	46	100
Mammoth County Complex	Hi-Vol	11.8	30	21	98
Pinal Air Park	Hi-Vol	20.2	39	35	100
Pinal County Housing Complex (1)	Hi-Vol	47.1	**155**	116	98
Pinal County Housing Complex (2)	Hi-Vol	35.0	113	109	95
Riverside Maintenance Yard	Hi-Vol	15.2	34	32	100
Stanfield	Hi-Vol	33.9	80	76	98
Santa Cruz County					
Nogales Post Office	Partisol	42.6	140	109	98
Yavapai County					
Clarkdale – NW (#2) #	Dichot	14.7	36	31	79
Clarkdale – SE (#1)	Dichot	19.8	41	40	95
Prescott Valley	Partisol	12.9	31	27	98
Yuma County					
Yuma Courthouse (1) #	Partisol	35.5	114	102	90

Table 10: 2004 PM_{10} Data (in µg/m^3) **(NAAQS Annual Average 50µg/m^3, 24-hour Average 150 µg/m^3)** **Bold** denotes an exceedance, defined as any daily value greater then 150 µg/m^3 after rounding to the nearest 10 µg/m^3 and any annual average value greater than 50 µg/m^3 when rounded to the nearest 1 µg/m^3.					
Site or City	**Method**	**Annual Average**	**24-Hour Average**		**Valid Data Recovery* (%)**
			Max Value	**2nd High**	
Yuma Courthouse (2) # (Opened 07/2/2004)	Partisol	37.5	90	58	87
Mexico					
Agua Prieta Fire Station	Dichot	**60.5**	128	119	92
Sonora Nogales Fire Station	Dichot	50.2	114	114	95

Bold denotes an exceedance, defined as any daily value greater then 155 µg/m^3 and any annual average value greater than 50 µg/m^3 when rounded to the nearest 1 µg/m^3.

[1] Samples collected every day - 366 sample days in 2004.
[2] Samples collected every hour - 8784 sample hours in 2004.
[3] Samples changed from every 6th day with a Hi-Vol sampler to every hour with a TEOM.

(1) Indicates the Primary monitor (used for NAAQS compliance) in a collocated pair of monitors.
(2) Indicates the Secondary monitor (used for precision and accuracy) in a collocated pair of monitors.

*Valid data recovery is the percentage of valid samples collected of the total number of scheduled samples. There were 61 monitoring days scheduled in 2004 for monitors on the every 6th day schedule. Rillito - APCC was the only site following the every 3rd day schedule (122 observations in 2004).

#Indicates the data do not satisfy EPA's summary criteria, usually meaning less than 75 percent valid data recovery available in one or more calendar quarters.

Exceedances due to Natural Events and excluded from annual statistics:

August 13	209 µg/m^3	Durango Complex
August 13	493 µg/m^3	Higley
August 13	251 µg/m^3	West Forty-Third
September 18	288.7 µg/m^3	Buckeye

Table 11: 2004 PM2.5 Data (in µg/m³) *(NAAQS Annual Average 15µg/m³, 24-hour Average 65 µg/m³)*					
City or Site	**Method**	**Annual Average**	**24-Hour Avg**		**Valid Data Recovery* (%)**
			Max	**2nd High**	
Cochise County					
Douglas Red Cross [2]	FRM	7.11	22.7	22.5	95
Coconino County					
Flagstaff Middle School [2]	FRM	6.77	22.2	20.7	92
Gila County					
Payson Well Site [2]	FRM	9.54	27.6	19.3	92
Maricopa County					
Bethune Elementary School [2] # (Closed 7/01/2004)	Speciation ^^	10.97	25.8	17.3	100
JLG Supersite [3]	FRM	9.73	38.0	28.1	97
JLG Supersite [3]	Speciation ^^	9.55	29.8	26.8	96
Tempe Community Center [3] # (Closed 7/26/2004)	FRM	7.30	17.1	14.8	91
Vehicle Emissions Laboratory # (Opened 7/02/2004)	Speciation ^^	8.55	19.9	13.2	49
West Forty Third [2] # (Closed 3/16/2004)	Speciation ^^	14.80	21.7	20.1	75
West Phoenix [3] (1)	FRM	11.60	35.1	32.6	98
West Phoenix [3] (2)	FRM	11.01	33.2	31.5	99
West Phoenix [2] # (Opened 3/22/2004)	Speciation ^^	9.72	25.0	18.3	90
Pima County					
Children's Park [3]	FRM	5.57	12.2	11.5	98
Children's Park [2]	Speciation ^^	6.61	13.3	11.9	98
Coachline [4]	BAM ++	6.36	21.1	17.6	98
Geronimo [4]	BAM ++	7.03	25.8	23.2	99
Green Valley [4]	BAM ++	3.50	11.2	9.9	94

Table 11: 2004 PM2.5 Data (in $\mu g/m^3$) (NAAQS Annual Average 15$\mu g/m^3$, 24-hour Average 65 $\mu g/m^3$)					
City or Site	Method	Annual Average	24-Hour Avg Max	24-Hour Avg 2nd High	Valid Data Recovery* (%)
Orange Grove [1]	FRM	5.79	16.5	15.6	95
Rose Elementary [4]	BAM ++	6.32	21.0	20.2	97
Pinal County					
Apache Junction Fire Station [3] #	FRM	5.51	17.0	12.9	90
Casa Grande Downtown [2]	FRM	7.13	16.6	13.7	100
Santa Cruz County					
Nogales Post Office [2] (1)	FRM	10.83	28.0	25.1	97
Nogales Post Office [2] (2)	FRM	10.40	25.9	25.8	95

*Valid data recovery is the percentage of valid samples collected of the total number of scheduled samples.
++ Non Reference method.
^^ Speciation monitor; not to be used for compliance with the NAAQS.

[1] Samples collected every day – 366 sample days in 2004.
[2] Samples collected every sixth day – 61 sample days in 2004.
[3] Samples collected every third day – 122 sample days in 2004.
[4] Samples collected every hour – 8784 sample hours in 2004.

(1) Indicates the Primary monitor (used for NAAQS compliance) in a collocated pair of monitors.
(2) Indicates the Secondary monitor (used for precision and accuracy) in a collocated pair of monitors.

#Indicates the data do not satisfy EPA's summary criteria, usually meaning less than 75 percent valid data recovery available in one or more calendar quarters.

Criteria Pollutants – Compliance

Carbon Monoxide

There are two NAAQS for CO: an eight-hour standard (most critical for compliance) and a one-hour standard. The eight-hour standard is 9 ppm and the one-hour standard is 35 ppm. According to the Code of Federal Regulations, compliance for both standards is determined by having no more than one exceedance per calendar year. EPA determines attainment of the standard at all sites in the non-attainment (or monitoring) area by evaluating two calendar years of data from each site. The highest of the second-highest values in a two-year period must not exceed the standard of 9 ppm (greater than or equal to 9.5 ppm to adjust for rounding) for the eight-hour standard or 35 ppm (greater than or equal to 35.5 ppm) for the one-hour standard.

No exceedances of the one-hour or eight-hour standards were recorded in 2003 or 2004. The data are presented in Table 12 and Table 13.

Table 12. 2003-2004 One-hour Carbon Monoxide Compliance (in ppm)

NAAQS for one-hour carbon monoxide: The highest of the second-highest values in a two-year period must not exceed 35 ppm. NOTE: Pinal County monitors closed in 2002.

2003-2004 One-Hour Carbon Monoxide NAAQS Compliance Values by County		
County	Exceedances	Violations
Maricopa	0	0
Pima	0	0
Summary: 20 of 20 monitors in compliance		

Table 12: 2003-2004 One-Hour Carbon Monoxide Compliance (in ppm)					
City or Site	2003		2004		Compliance Value
	Max Value	2nd High	Max Value	2nd High	
Maricopa County					
Buckeye S (Opened 09/01/2004)	N/A	N/A	0.9	0.9	N/A
Central Phoenix	5.9	5.4	5.0	4.4	5.4
Dysart S	N/A	N/A	2.1	1.8	N/A
Glendale S	5.7	3.5	6.1	3.2	3.5
Greenwood	6.8	6.8	7.6	7.3	7.3

Table 12: 2003-2004 One-Hour Carbon Monoxide Compliance (in ppm)					
City or Site	2003		2004		Compliance Value
	Max Value	2nd High	Max Value	2nd High	
JLG Supersite	6.7	6.0	4.9	4.9	6.0
Maryvale [S] (Closed 03/31/2004)	5.8	5.7	5.7	5.0	5.7
Mesa [S]	3.5	3.4	3.0	2.6	3.4
North Phoenix [S]	4.0	4.0	4.1	3.7	4.0
South Phoenix [S]	5.8	5.5	6.7	5.9	5.9
South Scottsdale [S]	4.1	4.0	3.4	3.1	4.0
Tempe [S]	3.8	3.7	3.1	2.6	3.7
West Chandler [S]	3.9	3.3	2.9	2.7	3.3
West Indian School	6.8	6.8	6.9	6.7	6.8
West Phoenix	7.5	7.3	7.7	7.5	7.5
Pima County					
22nd St. & Alvernon	6.0	5.8	4.0	4.0	5.8
22nd St. & Craycroft	4.4	4.3	3.6	3.4	4.3
Cherry & Glenn [S]	4.2	3.9	4.0	3.9	3.9
Children's Park	2.4	2.3	2.2	2.2	2.3
Golf Links & Kolb [S]	3.9	3.8	3.6	3.5	3.8
Tucson Downtown	10.0	9.6	5.5	4.7	9.6

[S] Seasonal monitor. Maricopa County monitors operate during January 1 to April 1 and September 1 to December 31; 5112 hours in 2004. Pima County monitors operate during January 1 to May 1 and October 1 to December 31; 5112 hours in 2004.

N/A – Information not available.

Table 13. 2003-2004 Eight-hour Carbon Monoxide Compliance (in ppm)

NAAQS for eight-hour carbon monoxide:

The highest of the second-highest values in a two-year period must not exceed 9 ppm. NOTE: Pinal County monitors closed in 2002.

2003-2004 Eight-hour Carbon Monoxide NAAQS Compliance Values by County		
County	Exceedances	Violations
Maricopa	0	0
Pima	0	0
Summary: 20 of 20 monitors in compliance		

Table 13: 2003-2004 Eight-hour Carbon Monoxide Compliance (in ppm)					
	2003		2004		
City or Site	Max Value	2nd High	Max Value	2nd High	Compliance Value
Maricopa County					
Buckeye [S] (Opened 09/01/2004)	N/A	N/A	0.5	0.4	N/A
Central Phoenix	4.6	3.8	3.4	3.3	3.8
Dysart [S]	N/A	N/A	1.1	1.1	N/A
Glendale [S]	2.4	2.3	2.4	2.1	2.3
Greenwood	5.4	5.1	4.9	4.3	
JLG Supersite	4.8	4.2	4.2	4.0	4.2
Maryvale [S] (Closed 03/31/2004)	4.2	4.1	3.5	2.9	4.1
Mesa [S]	2.5	2.2	1.7	1.7	2.2
North Phoenix [S]	2.3	2.1	2.2	2.0	2.1
South Phoenix [S]	3.6	3.3	3.5	3.3	3.3
South Scottsdale [S]	2.3	2.2	2.4	2.4	2.4
Tempe [S]	2.9	2.4	1.9	1.7	2.4
West Chandler [S]	2.6	2.6	2.1	2.1	2.6
West Indian School	5.4	5.3	4.7	4.6	5.3
West Phoenix	6.2	5.5	5.2	5.1	5.5
Pima County					
22nd St. & Alvernon	2.7	2.6	2.1	2.0	2.6

Table 13: 2003-2004 Eight-hour Carbon Monoxide Compliance (in ppm)					
City or Site	2003		2004		Compliance Value
	Max Value	2nd High	Max Value	2nd High	
22nd St. & Craycroft	2.1	1.9	1.6	1.6	1.9
Cherry & Glenn [S]	2.9	2.7	2.7	2.2	2.7
Children's Park	1.5	1.4	1.4	1.4	1.4
Golf Links & Kolb [S]	2.2	2.2	2.1	2.1	2.2
Tucson Downtown	3.1	2.7	3.7	2.5	2.7

[S] Seasonal monitor. Maricopa County monitors operate during January 1 to April 1 and September 1 to December 31; 5112 hours in 2004. Pima County monitors operate during January 1 to May 1 and October 1 to December 31; 5112 hours in 2004.

N/A – Information not available.

Nitrogen Dioxide

The NAAQS for NO_2 is 0.053 parts per million (ppm) for an annual average. The standard is attained when the annual arithmetic mean concentration in a calendar year is less than or equal to 0.053 ppm. To demonstrate attainment, the annual mean must be based upon hourly data that are at least 75 percent complete. NO_2 annual averages near Arizona power plants range from 2 percent to 17 percent of the standard; in the urban areas, from 30 percent to 70 percent. All Arizona sites were in compliance with the NAAQS. Refer to Table 6 for the 2004 averages.

Table 18: 2004 Nitrogen Dioxide Average NAAQS Compliance Values		
County	Exceedances	Violations
Apache	0	0
Maricopa	0	0
Pima	0	0
Summary: 14 of 14 monitors in compliance		

Sulfur Dioxide

There are three NAAQS for SO_2, two primary (annual average and 24-hour block average) and one secondary (three-hour block average). The annual average standard is 0.030 ppm (80 $\mu g/m^3$) and cannot be exceeded in a calendar year. The 24-hour block average standard is 0.14 ppm (365 $\mu g/m^3$), not to be exceeded more than once per calendar year. A 24-hour block average is considered valid if at least 75 percent of the hourly averages for the 24-hour period are available. The 24-hour averages are determined from successive non-overlapping

24-hour blocks which begin at midnight each day. To demonstrate attainment, the second highest 24-hour block average must be based on hourly data that are at least 75 percent complete in each calendar quarter. A 24-hour block average is considered valid if 18 or more valid hourly averages are available. The sum of the valid averages is divided by the number of valid hours to determine the 24-hour average.

The secondary three-hour standard is 0.5 ppm (1300 $\mu g/m^3$), not to be exceeded more than once per calendar year. The three-hour averages are determined from successive non-overlapping three-hour blocks starting at midnight each calendar day. To demonstrate attainment, the second highest three-hour average must be based upon hourly data that are at least 75 percent complete in each calendar quarter. All three hours of the block must be available to calculate a valid average. However, if only one or two hourly averages are available and the three-hour average would exceed the level of the standard when zeroes are substituted for the missing hours, the block would be considered valid.

In Arizona in 2004, the maximum concentration sites – all near copper smelters – comply with these standards; the concentrations ranging from 23 to 83 percent of the three-hour, 22 to 91 percent of the 24-hour and 59 percent of the annual average standards. Sites near power plants are close to background levels, with annual averages from less than 1 to 8 $\mu g/m^3$. See Table 7 for the 2004 averages.

Table 15: 2004 Sulfur Dioxide Average NAAQS Compliance Values

County	Annual		Three Hour		24-Hour	
	Exceedances	Violations	Exceedances	Violations	Exceedances	Violations
Gila	0	0	0	0	0	0
Maricopa	0	0	0	0	0	0
Pima	0	0	0	0	0	0
Pinal	0	0	0	0	0	0
Summary: 14 out of 14 monitors in compliance						

Ozone -- One-hour

The NAAQS one-hour standard for ozone is 0.12 ppm. Compliance with this standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm (0.124 ppm for rounding) is equal to or less than one. An exceedance day is defined as any day having one or more hourly averages equal to or greater than 0.125 ppm. Hourly averages for at least 75 percent of the hours sampled (18-24 hours per day) must be present. The most recent three calendar years of daily averages are used to determine if the annual standard is met. No exceedances of the one hour standard occurred in Arizona in 2004. Therefore, no compliance table for one-hour data is included here.

As there have been no violations of the one-hour O_3 standard since 1996, on May 15, 2001, EPA found that Maricopa County had reached attainment for the one-hour O_3 standard. A maintenance plan and redesignation request developed by Maricopa Association of Governments (MAG), demonstrating how the area will maintain compliance with the one-hour standard, was submitted to EPA on April 21, 2004.

Ozone -- Eight-hour

On April 15, 2004, the Phoenix area was designated nonattainment for the new, more stringent, eight-hour ozone standard. The one-hour standard will be revoked one year following the effective date of the eight-hour designation or June 15, 2005. However, certain of the control measures developed and implemented for the one-hour standard are required to remain in place to ensure continued progress toward attainment of the new eight-hour standard.

EPA developed the eight-hour O_3 standard in response to human exposure studies that showed adverse health effects occur at lower ozone concentrations extending over several hours. After its proposal in 1997 and after a protracted legal battle, the eight-hour standard was officially promulgated in 2003 and nonattainment area boundaries established. The eight-hour ozone standard is 0.08 ppm (0.084 for rounding) for a daily maximum eight-hour average. This standard is met when the three-year average of the annual fourth-highest daily maximum eight-hour average O_3 concentration is less than or equal to 0.08 ppm. The data in Table 16 are for those sites in operation in 2002 – 2004.

Table 16: 2002 to 2004 Eight-Hour Ozone Compliance (in ppm)

NAAQS: The three-year average of the annual fourth-highest daily maximum eight-hour average ozone concentration is less than or equal to 0.08 ppm.

2002 to 2004 Eight-Hour Ozone NAAQS Compliance Values, By County				
County	Eight-Hour Exceedances *			Sites in Violation
	2002	2003	2004	
Cochise	0	0	0	0
Coconino	0	0	0	0
Gila	0	3	0	0
Maricopa	55	32	1	1
Navajo	0	0	0	0
Pima	3	1	0	0
Pinal	1	5	0	0
Yavapai	4	0	0	0
Yuma	N/A	1	0	0
Summary: 39 of 40 monitors in compliance for 2002 to 2004				

Table 16: 2002 to 2004 Eight-Hour Ozone Compliance (in ppm)

Bold denotes exceedances and sites in violation.

City or Site	Fourth-Highest Value			Three-Year Average
	2002	2003	2004	
Cochise County				
Chiricahua NM Entrance Station	0.074	0.073	0.070	0.072
Coconino County				
Grand Canyon NP – Hance	0.079	0.073	0.072	0.074
Gila County				
Tonto NM [S]	0.087	0.084	0.077	0.082
Maricopa County				
Blue Point	**0.086**	**0.086**	0.075	0.082
Buckeye [S] (Opened 08/01/04)	N/A	N/A	0.058 #	N/A
Cave Creek [S]	**0.086**	0.083	0.076	0.081
Central Phoenix	0.076	0.079	0.074	0.076
Dysart [S]	N/A	0.073	0.065	N/A

Table 16: 2002 to 2004 Eight-Hour Ozone Compliance (in ppm) **Bold** denotes exceedances and sites in violation.				
City or Site	**Fourth-Highest Value**			**Three-Year Average**
	2002	**2003**	**2004**	
Falcon Field S	0.084	0.079	0.070	0.077
Fountain Hills	**0.086**	0.083	0.075	0.081
Glendale S	0.083	**0.085**	0.076	0.081
Humboldt Mt. S	**0.090**	**0.087**	0.078	**0.085**
JLG Supersite	0.076	0.075	0.072	0.074
North Phoenix	**0.085**	**0.086**	0.080	0.083
Palo Verde S	0.078	0.075	0.072	0.075
Pinnacle Peak	0.084	0.083	0.068	0.078
Rio Verde S	**0.085**	0.083	0.074	0.080
South Phoenix	0.081	0.076	0.072	0.076
South Scottsdale	0.079	0.079	0.073	0.077
Tempe S	0.080	0.080	0.072	0.077
West Chandler S	0.083	0.078	0.070	0.077
West Phoenix	0.084	0.077	0.072	0.077
Navajo County				
Petrified Forest NP	0.055 #	0.074	0.071	N/A
Pima County				
22nd St. & Craycroft	0.075	0.073	0.069	0.072
Children's Park	0.073	0.076	0.068	0.072
Coachline	N/A	0.061 #	0.068	N/A
Green Valley	N/A	0.068 #	0.066	N/A
Rose Elementary	N/A	0.065 #	0.064	N/A
Saguaro NP East	0.077	0.078	0.073	0.076
Tangerine	0.075	0.074	0.068	0.072
Tucson Downtown	0.072	0.068	0.063	0.067

Table 16: 2002 to 2004 Eight-Hour Ozone Compliance (in ppm) **Bold** denotes exceedances and sites in violation.				
City or Site	**Fourth-Highest Value**			**Three-Year Average**
	2002	**2003**	**2004**	
Tucson Fairgrounds	0.072	0.070	0.064	0.068
Pinal County				
Apache Junction - Maintenance Yard	0.079	0.072	0.069	0.073
Casa Grande - Airport	0.077	0.073	0.070	0.073
Combs [S]	0.068	0.072	0.059	0.066
Maricopa [S]	0.068	0.075	0.064	0.069
Pinal Air Park [S]	0.070	0.074	0.067	0.070
Queen Valley	0.083	0.087	0.073	0.081
Yavapai County				
Hillside [S]	0.089	0.067	0.077	0.077
Yuma County				
Yuma Game & Fish	N/A	0.078	0.073	N/A

[S]Seasonal monitor, operational during April 1 to Nov. 1.

[#]Indicates the data do not satisfy EPA's summary criteria, usually meaning less than 75 percent valid data recovery available.

N/A - Data not available

Notes:

Yuma – No data collected in 2002 while monitor was relocated to new site.

Data follow EPA truncation and averaging rules. Data published in previous annual reports may be slightly different.

Particulate Matter – PM_{10}

With the delay in adopting the proposed PM_{10} and $PM_{2.5}$ standards, 2004 compliance will be assessed using the rules in place prior to the 1997 proposal. Therefore, the NAAQS for particulate matter 10 microns and less in diameter (PM_{10}) are 50 $\mu g/m^3$ for the annual arithmetic mean concentration and 150 $\mu g/m^3$ for the 24-hour average concentration.

The annual standard is attained when the expected annual arithmetic mean concentration is less than or equal to 50μ g/m^3. Annual arithmetic means are determined by calculating quarterly (three month) averages of the samples collected during that quarter; a minimum of 75 percent of the samples must be valid to produce the annual mean. The expected annual arithmetic mean is determined by averaging the annual arithmetic mean concentrations for the past three calendar years. This mean is rounded to the nearest 1 $\mu g/m^3$ for comparison to the standard.

Compliance with the 24-hour PM_{10} standard is attained when the expected exceedance rate is one or less per year measured over three years. A sample value is rounded to the nearest 10 $\mu g/m^3$ for comparison with the standard to determine if it is an exceedance (i.e., a sample value of 154 $\mu g/m^3$ is not an exceedance; a sample value of 155 $\mu g/m^3$ is an exceedance). Since the majority of monitoring sites do not collect daily samples, the expected exceedance rate must be calculated by quarter following EPA guidelines. The same requirements of 75 percent completeness and three consecutive years of data apply.

Tables 17 and 18 present the 2002 to 2004 expected annual arithmetic means and the expected exceedance rate PM_{10} data.

Table 17: 2002 to 2004 Annual Average PM_{10} Compliance (in $\mu g/m^3$, Standard Conditions)

NAAQS: The expected annual arithmetic mean (average of three most recent annual means) is less than or equal to 50 $\mu g/m^3$.

The expected annual arithmetic mean is rounded to nearest 1 $\mu g/m^3$ for comparison to the standard.

2002 to 2004 PM_{10} Annual Average NAAQS Compliance Values, By County				
County	Sites above Standard			Sites in Violation
	2002	2003	2004	
Apache	0	0	0	0
Cochise	0	0	0	0
Coconino	0	0	0	0
Gila	0	0	0	0
Graham	0	0	0	0
Maricopa	7	5	2	4
Mohave	0	0	0	0
Navajo	0	0	0	0
Pima	0	0	0	0
Pinal	2	1	1	0
Santa Cruz	0	0	0	0
Yavapai	0	0	0	0
Yuma	0	0	0	0
Summary: 55 of 59 monitors in compliance				

Table 17: 2002 to 2004 Annual Average PM_{10} Compliance (in $\mu g/m^3$)				
City or Site	**2002**	**2003**	**2004**	**Expected Annual Mean**
Apache County				
TEP – Springerville – Coalyard	13.7	16.2	13.4	14
TEP – Springerville – Coyote Hills	10.9	11.9	10.2	11
Cochise County				
Douglas – Red Cross	32.1	30.3	26.3	30
Paul Spur	16.3	19.3	14.7	17
Coconino County				
Flagstaff – Middle School	16.6 #	19.8 #	16.0	17
Sedona	15.2 #	26.5 #	11.1	18
Gila County				

Table 17: 2002 to 2004 Annual Average PM_{10} Compliance (in $\mu g/m^3$)				
City or Site	**2002**	**2003**	**2004**	**Expected Annual Mean**
Hayden – Old Jail	34.2 #	36.0	27.5	33
Miami – Golf Course	23.0	21.0	16.9	20
Miami – Ridgeline	13.0	15.0	10.2	13
Payson	25.5 #	24.3	18.9	22.9
Graham County				
Safford	26.1	23.4	17.0	22
Maricopa County				
Bethune Elementary School (Opened 1/3/2003)	N/A	47.2	42.4	N/A
Buckeye (Opened 10/19/2004)	N/A	N/A	39.9 #	N/A
Central Phoenix – every 6th day monitor	43.1	39.8	32.3	38
Central Phoenix – continuous monitor	42.0	43.0	36.6	41
Chandler	**56.0**	49.8	39.6	48
Durango Complex	**69.9**	**62.3**	**51.6**	**61**
Dysart (Opened 7/16/2003)	N/A	36.3 #	27.3	N/A
Glendale	39.7	35.6	25.7	34
Greenwood	**54.6**	**51.0**	44.3	50
Higley	**62.5**	**61.6**	47.9	**57**
JLG Supersite (Closed 12/31/2003 – part of urban haze program)	33.4 #	36.6 #	N/A	N/A
Maryvale (Closed 04/01/2004)	45.1	42.0 #	N/A	N/A
Mesa	36.2	33.6	23.2	31
North Phoenix	36.9	33.9	24.8	32
Palo Verde	28.8	26.4	14.5	23

Table 17: 2002 to 2004 Annual Average PM_{10} Compliance (in $\mu g/m^3$)				
City or Site	**2002**	**2003**	**2004**	**Expected Annual Mean**
Salt River (Closed 12/31/2002)	**80.5**	N/A	N/A	N/A
South Phoenix	**59.5**	**52.0**	45.6	52
South Scottsdale	36.7	36.1	26.1	**33**
West Chandler	38.5	42.4	29.9	37
West Forty Third	**68.3 #**	**62.3**	**61.1**	**64**
West Phoenix	**53.4**	46.4	36.9	46
Mohave County				
Bullhead City – ADEQ	19.2 #	20.1	18.2	19
Navajo County				
Show Low	15.8 #	18.2	14.9	16
Pima County				
Ajo	18.7	22.7	19.3	20
Broadway & Swan	26.2	26.6	20.7	25
Corona de Tucson	15.3	16.8	12.4	15
Green Valley	19.4	18.7	13.6	17
Orange Grove	32.8	29.8	26.8	30
Prince Road	34.0	31.4	28.4	31
Rillito, ADEQ	37.1	39.5	32.2	36
Rillito, APCC	31.2	33.6	26.9	31
Santa Clara	27.6	26.7	20.4	25
South Tucson	38.5	34.1	29.2	34
Tangerine	18.8	19.3	14.7	18
Pinal County				
Apache Junction Maintenance Yard (Closed 12/31/2003)	21.3 #	20.3	N/A	N/A
Apache Junction Fire Station (Opened 7/1/2003)	N/A	26.7 #	18.4	N/A

Table 17: 2002 to 2004 Annual Average PM_{10} Compliance (in $\mu g/m^3$)				
City or Site	**2002**	**2003**	**2004**	**Expected Annual Mean**
Casa Grande Downtown	30.4 #	31.5	24.4	29
Coolidge Maintenance Yard	32.8 #	35.3	24.5	31
Eloy	46.5 #	41.5	27.8	39
Mammoth	18.8 #	16.4	11.8	16
Pinal Air Park	30.2 #	28.6	20.2	26
Pinal County Housing Complex (Opened 8/1/2002)	**56.6 #**	**61.0**	47.1	**55**
Riverside Maintenance Yard (Opened 3/2003)	**N/A**	23.9	15.2	N/A
Stanfield	**59.7 #**	46.1 #	33.9	47
Santa Cruz County				
Nogales Post Office	**51.3**	37.5	42.6	43.8
Yavapai County				
Clarkdale – NW (#2)	19.0	19.4	14.7	18
Clarkdale – SE (#1)	28.0	23.8	19.8	24
Prescott Valley (Opened 3/12/2003)	N/A	13.9 #	12.9	N/A
Yuma County				
Yuma – Juvenile Center/Courthouse	47.9 #	38.1	35.5 #	41
Mexico				
Agua Prieta – Fire Station	**68.4**	**60.3**	**60.5**	**63**
Nogales – Fire Station	**68.8**	**65.0 #**	50.2	**61**

Bold denotes value above the standard.
N/A – Not available
# Indicates the data do not satisfy EPA's summary criteria, usually meaning less than 75 percent valid data recovery available in one or more calendar quarters.
Notes:
For collocated sites, data from the Primary monitor (POC 1) are used for the Annual Average calculations. However, if valid data recovery is between 50% and 75%, data from the Secondary (POC2) monitor can be used. If no Secondary data are available, data substitution can be made following the EPA document, 'Guideline on Exceptions to Data Requirements for Determining Attainment of Particulate Matter Standards.'

Table 18: 2002 to 2004 Maximum 24-Hour Average PM_{10} Compliance (in $\mu g/m^3$, Standard Conditions)

NAAQS: Expected occurrence of exceedances (samples equal to or greater than 150 µg/m3) is one or less over three consecutive years.

Sample values are rounded to the nearest 10 $\mu g/m^3$ to determine exceedance; values less than or equal to 154 $\mu g/m^3$ are not exceedances; values greater than or equal to 155 $\mu g/m^3$ are exceedances.

2002 to 2004 PM_{10} Maximum 24-Hour Compliance Values, By County

	Sites with Exceedances 2002	Sites with Exceedances 2003	Sites with Exceedances 2004	Sites in Violation
Apache	0	0	0	0
Cochise	0	1	0	1
Coconino	0	0	0	0
Gila	0	0	0	0
Graham	0	0	0	0
Maricopa	3	14	1	12
Mohave	0	0	0	0
Navajo	0	0	0	0
Pima	3	1	1	1
Pinal	2	2	2	2
Santa Cruz	1	1	0	1
Yavapai	0	0	0	0
Yuma	0	0	0	0
Summary: 42 of 59 monitors in compliance				

Table 18: 2002 to 2004 Maximum 24-Hour Average PM_{10} Compliance (in $\mu g/m^3$)

City or Site	2002 Max 24-Hr Avg	2002 Exp. Exc.	2003 Max 24-Hr Avg	2003 Exp. Exc.	2004 Max 24-Hr Avg	2004 Exp. Exc.	3-Year Avg Expected Rate of Exceedance
Apache County							
TEP – Springerville – Coalyard	97.1	0	185.0	1	128.7	0	<1
TEP – Springerville – Coyote Hills	86.6	0	76.8	0	68.6	0	<1
Cochise County							
Douglas Red Cross	127	0	79	0	56	0	<1
Paul Spur Chemical Lime Plant	63	0	**207**	**6.4**	44	0	**2.1**
Coconino County							
Flagstaff Middle School	49 #	0	60 #	0	42	0	<1

Table 18: 2002 to 2004 Maximum 24-Hour Average PM_{10} Compliance (in $\mu g/m^3$)							
City or Site	2002		2003		2004		3-Year Avg Expected Rate of Exceedance
	Max 24-Hr Avg	Exp. Exc.	Max 24-Hr Avg	Exp. Exc.	Max 24-Hr Avg	Exp. Exc.	
Sedona Post Office	55 #	0	69 #	0	32	0	<1
Gila County							
Hayden – Old Jail	122 #	0	91	0	55	0	<1
PDMI - Miami – Golf Course	55	0	53	0	40	0	<1
PDMI - Miami – Ridgeline	52	0	59	0	26	0	<1
Payson Well Site	46 #	0	99	0	52	0	<1
Graham County							
Safford	87	0	76	0	99	0	<1
Maricopa County							
Bethune Elementary School (Opened 1/3/2003)	N/A	N/A	145	0	122	0	N/A
Buckeye [E] (Opened 10/19/2004)	N/A	N/A	N/A	N/A	82 #	0	N/A
Central Phoenix – every 6th day monitor	81	0	114	0	81	0	<1
Central Phoenix – continuous monitor [E]	96	0	**183**	**3.1**	94	0	1.0
Chandler	128	0	**240**	**6.0**	150	0	**2.0**
Durango Complex [E]	**232**	**12.0**	**195**	**6.0**	139	0	**6.0**
Dysart (Opened 7/16/2003)	N/A	N/A	133 #	0	94	0	N/A
Glendale	88	0	151	0	69	0	<1
Greenwood	116	0	**166**	**6.0**	100	0	**2.0**
Higley [E]	138	0	**225**	**6.0**	**159**	**1**	**2.3**

Table 18: 2002 to 2004 Maximum 24-Hour Average PM_{10} Compliance (in $\mu g/m^3$)							
City or Site	**2002**		**2003**		**2004**		**3-Year Avg Expected Rate of Exceedance**
	Max 24-Hr Avg	**Exp. Exc.**	**Max 24-Hr Avg**	**Exp. Exc.**	**Max 24-Hr Avg**	**Exp. Exc.**	
JLG Supersite (Closed 12/31/2003 – part of urban haze program)	72 #	0	**169 #**	**6.0**	N/A	**N/A**	N/A
Maryvale (Closed 4/1/2004)	142	0	151	0	46 #	0	<1
Mesa	102	0	**176**	**6.0**	49	0	**2.0**
North Phoenix	80	0	**155**	**6.0**	46	0	**2.0**
Palo Verde	100	0	**158**	**6.4**	42	0	**2.1**
Salt River (Closed 12/31/2002)	**249**	**12.4**	**N/A**	**N/A**	N/A	N/A	**N/A**
South Phoenix	137	0	**164**	**6.0**	132	0	**2.0**
South Scottsdale	64	0	**172**	**6.0**	77	0	**2.0**
West Chandler [E]	80	0	**206**	**13.7**	70	0	**4.6**
West Forty Third [E]	**172 #**	**6.0**	**157**	**6.0**	145	0	**4.0**
West Phoenix	122	0	**158**	**6.4**	100	0	**2.1**
Mohave County							
Bullhead City – ADEQ	56 #	0	121	0	48	0	<1
Navajo County							
Show Low	53 #	0	58	0	41	0	<1
Pima County							
Ajo – ADOT	50	0	139	0	43	0	<1
Broadway & Swan	62	0	122	0	35	0	<1
Corona De Tucson	40	0	104	0	37	0	<1
Green Valley	97	0	127	0	127	0	<1

Table 18: 2002 to 2004 Maximum 24-Hour Average PM_{10} Compliance (in $\mu g/m^3$)							
City or Site	2002		2003		2004		3-Year Avg Expected Rate of Exceedance
	Max 24-Hr Avg	Exp. Exc.	Max 24-Hr Avg	Exp. Exc.	Max 24-Hr Avg	Exp. Exc.	
Orange Grove [E]	**171**	**1.0**	152	0	119	0	<1
Prince Road	83	0	126	0	67	0	<1
Rillito , ADEQ	70	0	118	0	93	0	<1
Rillito , APCC (1-in-3 day schedule)	**199**	**3.1**	**256**	**3.1**	130	0	**2.1**
Santa Clara	86	0	146	0	41	0	<1
South Tucson	**200**	**2.0**	150	0	149	0	<1
Tangerine	63	0	125	0	34	0	<1
Pinal County							
Apache Junction Maintenance Yard (Closed 12/31/2003)	62 #	0	95	0	N/A	N/A	N/A
Apache Junction Fire Station (Opened 7/1/2003)	N/A	N/A	103	0	35	0	N/A
Casa Grande Downtown	69 #	0	99	0	52	0	<1
Coolidge Maintenance Yard	106 #	0	106	0	57	0	<1
Eloy City Complex	146 #	0	154	0	46	0	<1
Mammoth County Complex	53 #	0	89	0	30	0	<1
Pinal Air Park	62 #	0	108	0	39	0	<1
Pinal County Housing Complex (Opened 8/1/2002)	**166 #**	**11.5**	**289**	**12.0**	**155**	**6**	**9.8**
Riverside Maintenance Yard (Opened 3/2003)	N/A	N/A	101	0	34	0	N/A

Table 18: 2002 to 2004 Maximum 24-Hour Average PM_{10} Compliance (in $\mu g/m^3$)							
City or Site	**2002**		**2003**		**2004**		**3-Year Avg Expected Rate of Exceedance**
	Max 24-Hr Avg	**Exp. Exc.**	**Max 24-Hr Avg**	**Exp. Exc.**	**Max 24-Hr Avg**	**Exp. Exc.**	
Stanfield	**352 #**	**12.9**	**171 #**	**6.4**	80	0	**6.4**
Santa Cruz County							
Nogales Post Office	**188**	**6.0**	**184**	**12.3**	140	0	**6.1**
Yavapai County							
Clarkdale – NW (#2)	127	0	68	0	36	0	0
Clarkdale – SE (#1)	86	0	59	0	41	0	0
Prescott Valley (Opened 3/12/2003)	N/A	N/A	68 #	0	31	0	N/A
Yuma County							
Yuma – Juvenile Center/Courthouse	125 #	0	127	0	114 #	0	0

Bold denotes value above the standard.

N/A – Not available

# Indicates the data do not satisfy EPA's summary criteria, usually meaning less than 75 percent valid data recovery available in one or more calendar quarters.

E Indicates every day monitoring. Phoenix area sites which began every day monitoring in 2004 include: Buckeye, Durango Complex, Higley, and West Forty Third.

Particulate Matter – $PM_{2.5}$

The NAAQS for particulate matter 2.5 microns and smaller in diameter ($PM_{2.5}$) are 15.0 micrograms per cubic meter ($\mu g/m^3$) for the annual arithmetic mean concentration and 65 $\mu g/m^3$ for the 24-hour average concentrations. Appendix N to Part 50 of the 40 CFR will be used to assess the compliance of the monitors operating in Arizona during 2004.

The annual $PM_{2.5}$ standard is met when the three-year average of annual means is less than or equal to 15.0 $\mu g/m^3$. This three-year average is determined by calculating the quarterly averages for each year (with 75 percent data recovery in each quarter) to determine the calendar year average and then averaging the three years together.

The 24-hour standard is met when the three-year average of the 98th percentile values is less than or equal to 65 µg/m^3. There must also be 75 percent data completeness for each year.

Please note that the data in the Table 19 are from federal reference monitors. In prior years, the dichot fine measurement was used as an approximate equivalent for $PM_{2.5}$, but the federal reference monitors provide a more accurate measurement of this pollutant. Data are collected and reported in local conditions.

In February of 2004, Arizona requested that all parts of the State (except for Indian Country) be designated attainment/unclassifiable for the $PM_{2.5}$ NAAQS.

Table 19: 2002 to 2004 Annual Average $PM_{2.5}$ Compliance (in µg/m^3, local conditions)

NAAQS: The three-year average of annual means is less than or equal to 15 µg/m^3

2002 to 2004 $PM_{2.5}$ Annual Average NAAQS Compliance Values, By County				
	Sites with Exceedances			Sites in Violation
	2002	2003	2004	
Cochise	0	0	0	0
Coconino	0	0	0	0
Gila	0	0	0	0
Maricopa	0	0	0	0
Pima	0	0	0	0
Santa Cruz	0	0	0	0
Summary: 11 of 11 federal reference monitors in compliance				

Table 19: 2002 to 2004 Annual Average $PM_{2.5}$ Compliance (in µg/m^3)				
City or Site Federal Reference Monitors	**2002**	**2003**	**2004**	**Three-Year Average**
Cochise County				
Douglas Red Cross	7.35 #	6.47 #	7.11	7.0
Coconino County				
Flagstaff Middle School	7.18 #	5.69 #	6.77	6.5
Gila County				
Payson Well Site	10.04 #	9.01 #	9.54	9.5
Maricopa County				

Table 19: 2002 to 2004 Annual Average $PM_{2.5}$ Compliance (in $\mu g/m^3$)				
City or Site Federal Reference Monitors	**2002**	**2003**	**2004**	**Three-Year Average**
JLG Supersite	11.63 #	11.27	9.73	10.9
Tempe Community Center (Closed 7/26/2004)	10.36	9.63	7.30 #	9.1
West Phoenix	12.57 #	10.68	11.60	11.6
Pima County				
Children's Park	6.62	6.54	5.57	6.2
Orange Grove	6.36	6.45	5.79	6.2
Pinal County				
Apache Junction Fire Station	6.39	6.30 #	5.51 #	6.1
Casa Grande Downtown	8.46	8.42	7.13	8.0
Santa Cruz County				
Nogales Post Office	12.18	11.30	10.83	11.4

# Indicates the data do not satisfy EPA's summary criteria, usually meaning less than 75 percent valid data recovery available in one or more calendar quarters.

Table 20: 2002 to 2004 24-Hour Average $PM_{2.5}$ Compliance (in $\mu g/m^3$, local conditions)

NAAQS: The three-year average of the 98th percentile values is less than or equal to 65 µg/m3.

Note: The three-year average is rounded to the nearest 1 $\mu g/m^3$ for comparison to the standard.

2002 to 2004 $PM_{2.5}$ 24-Hour Average NAAQS Compliance Values, By County				
	Sites with Exceedances			Sites in Violation
	2002	2003	2004	
Cochise	0	0	0	0
Coconino	0	0	0	0
Gila	0	0	0	0
Maricopa	0	0	0	0
Pima	0	0	0	0
Santa Cruz	0	0	0	0
Summary: 11 of 11 federal reference monitors in compliance				

Table 20. 2002 to 2004 24-Hour Average $PM_{2.5}$ Compliance (in µg/m³)				
City or Site Federal Reference Monitors	**98th Percentile Samples ****			**Three-Year Average**
	2002	**2003**	**2004**	
Cochise County				
Douglas Red Cross	13.9 #	11.7#	22.5	16
Coconino County				
Flagstaff Middle School	12.0 #	16.9 #	20.7	17
Gila County				
Payson	21.2 #	24.9 #	19.3	22
Maricopa County				
JLG Supersite	31.9	24.2	27.6	28
Tempe Community Center	21.6	25.0	14.8 #	20
West Phoenix	36.2 #	25.9	29.9	31
Pima County				
Children's Park	20.2	13.2	10.3	15
Orange Grove	21.5	15.9	13.3	17
Pinal County				
Apache Junction Fire Station	13.1	21.1	10.3	15
Casa Grande Downtown	20.8	26.7	13.7	20
Santa Cruz County				
Nogales – Post Office	25.4	35.0	25.1	29

** The 98th percentile value will be the second highest value for sites on an every 6th day sample schedule. The 98th percentile value will be the 3rd highest value for sites on an every 3rd day sample schedule.

#Indicates the data do not satisfy EPA's summary criteria, usually meaning less than 75 percent valid data recovery available in one or more calendar quarters.

Visibility Data

Visibility monitoring is of three types: aerosol, optical and scene. Aerosol measurements include the physical properties of the ambient atmospheric particles (chemical composition, size, shape, concentration, temporal and spatial distribution and other physical properties) through which a scene is viewed. The chemical species that comprise a particulate sample have different extinction efficiencies. Extinction efficiency is the extent to which an individual or a specific particle will either scatter or absorb light, thus blocking the light's path to one's eye. The overall impact of particles can be estimated by summing the effect of all the component species. This method is the primary approach used in the draft national regional haze rule for estimating present visibility and charting trends for future plan reviews. Optical methods measure either light scattering or light extinction continuously. Scene measurements are photograph-based with subsequent analysis.

ADEQ operates several types of monitors designed to characterize different optical phenomena. Visibility data from these monitors can be expressed by several different measurement units: deciview, inverse megameters, and visual range. Inverse megameters is a representation of the ratio between how much light is not received by a sensor compared to the amount of light that leaves a source. Higher numbers mean worse visibility.

Class I Areas

In anticipation of the federal regional haze rule, ADEQ, in 1997, undertook development of a visibility monitoring program directed at Class I areas in partnership with Arizona's federal land managers. The aim is to collect data at all of Arizona's Class I areas. Based on the regional haze rule, five years of data will be needed to determine baseline and projected visibility conditions. Since the IMPROVE program consists only of aerosol sampling, ADEQ will jointly operate sites by installing nephelometers that measure light scattering. Since IMPROVE aerosol samplers operate every three days and represent 24-hour averages, taking continuous measurements provides insight into variation in visibility impairment with time, along with advancing the understanding of the relationship between particles and light scattering.

Table 21 summarizes the nephelometer data from locations in or near Arizona Class I areas from 1998 to 2004. The data are summarized into three categories for all hours (24 hours a day): the average visibility of the dirtiest 20 percent of the sampled hours, the mean visibility of all hours and the average visibility of the cleanest 20 percent of the sampled hours.

Table 21: Visibility in Class I Areas (Nephelometer Data in Mm^{-1})

Site and Wilderness Area	Year	Mm^{-1} (24 hour Averages)		
		Mean of the 20% Dirtiest Sampled Hours	Mean of all Sampled Hours	Mean of the Cleanest 20% Sampled Hours
Greer Water Treatment Plant *Mt. Baldy Wilderness*	2002	26	10	2
	2003	26	10	1.3
	2004	17	8	1
Humboldt Mountain *Mazatzal Wilderness and Pine Mountain Wilderness (Site closed in 2004)*	1998	24	9	0
	1999	25	12	3
	2000	28	13	3
	2001	21	9	1
	2002	24	8	0
	2003	36	16	3
Ike's Backbone *Mazatzal/Pine Mountain Wildernesses*	2002	24	10	2
	2003	30	12	2
	2004	24	11	3
Mount Ord *Mazatzal Wilderness (site closed in 2000)*	1998	28	12	2
	1999	22	11	3
McFadden Peak *Sierra Ancha Wilderness (site closed in 2000)*	1998	24	10	1
	1999	18	7	0
Muleshoe Ranch *Chiracahua National Monument Wilderness, Galiuro Wilderness, Chiricahua Forest Service Wilderness*	1998	24	11	4
	1999	20	11	3
	2000	22	11	3
	2001	24	12	4
	2002	25	12	4
	2003	25	11	3

Table 21: Visibility in Class I Areas (Nephelometer Data in Mm^{-1})				
		Mm^{-1} (24 hour Averages)		
Site and Wilderness Area	**Year**	**Mean of the 20% Dirtiest Sampled Hours**	**Mean of all Sampled Hours**	**Mean of the Cleanest 20% Sampled Hours**
	2004	20	8	1
Rucker Canyon *Chiricahua Wilderness (site closed in 2001)*	1998	30	12	3
	1999	20	10	4
	2000	18	8	1
Pleasant Valley Ranger Station *Sierra Ancha Wilderness*	2001	28	14	5
	2002	27	13	3
	2003	33	15	4
	2004	20	10	3
Camp Raymond *Sycamore Canyon Wilderness*	1998	N/A	N/A	N/A
	1999	28	13	4
	2000	28	13	3
	2001	28	13	3
	2002	30	13	3
	2003	32	14	3
	2004	25	12	3
Tucson Mountain *Saguaro National Park (Includes both the West facilities support building and the National Park Service well site)*	1998	30	12	2
	1999	24	13	6
	2000	23	12	5
	2001	22	11	3
	2002	31	16	6
	2003	35	17	6
	2004	32	16	5

Table 21: Visibility in Class I Areas (Nephelometer Data in Mm^{-1})				
		Mm^{-1} (24 hour Averages)		
Site and Wilderness Area	Year	Mean of the 20% Dirtiest Sampled Hours	Mean of all Sampled Hours	Mean of the Cleanest 20% Sampled Hours
Chiricahua National Monument	2004	18	9	3
Organ Pipe National Monument	2004	21	10	3
Petrified Forest National Park	2004	20	9	3

N/A – Not available

Urban Haze

In addition to the 24-hour PM_{10} samples collected for regulatory purposes, ADEQ has also collected six-hour samples of PM_{10} and $PM_{2.5}$. The six-hour samples were for the morning hours (5 a.m. to 11 a.m.) and were collected in the Phoenix and Tucson metropolitan areas. This program ended in July 2001 for all six-hour sampling sites. The program ended for all other urban haze monitors in 2004.

Along with the particulate matter sampling, ADEQ also operated transmissometers and nephelometers in Phoenix and Tucson. Data from these instruments through 2004 are presented in Table 22. The data are separated into categories for all hours and for 6-hours. Each category is further summarized into the average visibility for the dirtiest 20 percent of the sampled hours, the mean visibility of all hours and the cleanest 20 percent of the sampled hours.

Table 22. Phoenix and Tucson Urban Haze Data 1998 to 2004 (in Mm^{-1})							
Site	**Year**	**24 Hour Samples**			**5 a.m. to 11 a.m.**		
		Dirtiest 20%	**Mean**	**Cleanest 20%**	**Dirtiest 20%**	**Mean**	**Cleanest 20%**
Mesa Transmissometer	2004	106	60	24	110	65	29
Phoenix Transmissometer	1998	133	78	45	136	84	50
	1999	127	72	38	128	77	42
	2000	131	74	38	134	80	42
	2001	118	69	36	118	73	42
	2002	124	75	42	125	79	46
	2003	131	72	36	135	78	42
	2004	121	69	35	126	75	42
Phoenix Nephelometer (Supersite)	1998	91	35	10	77	34	13
	1999	87	36	11	74	36	14
	2000	93	39	12	80	39	15
	2001	73	32	12	66	33	15
	2002	72	33	12	62	33	14
	2003	79	34	11	73	35	14
	2004	72	30	9	61	30	11
Phoenix Nephelometer (Dysart)	2004	46	22	7	52	27	9

Table 22. Phoenix and Tucson Urban Haze Data 1998 to 2004 (in Mm^{-1})							
Site	Year	24 Hour Samples			5 a.m. to 11 a.m.		
		Dirtiest 20%	Mean	Cleanest 20%	Dirtiest 20%	Mean	Cleanest 20%
Phoenix Nephelometer (Estrella Mountain)	2004	54	24	7	68	32	10
Phoenix Nephelometer (Vehicle Emissions)	2004	69	29	9	64	31	12
Tucson Transmissometer	1998	102	57	28	119	69	34
	1999	90	57	35	107	65	38
	2000	98	56	27	114	66	31
	2001	96	55	26	109	66	33
	2002	87	49	24	109	61	29
	2003	88	52	26	107	62	30
	2004	97	58	27	113	67	32
Tucson Nephelometer (U of A Central)	1998	45	21	4	47	23	7
	1999	43	23	10	41	24	11
	2000	40	20	8	40	22	9
	2001	42	23	10	44	25	13
	2002	38	20	7	42	22	9
	2003	43	23	9	45	25	11
	2004	38	20	8	42	22	10

Table 22. Phoenix and Tucson Urban Haze Data 1998 to 2004 (in Mm^{-1})							
Site	**Year**	**24 Hour Samples**			**5 a.m. to 11 a.m.**		
		Dirtiest 20%	**Mean**	**Cleanest 20%**	**Dirtiest 20%**	**Mean**	**Cleanest 20%**
Tucson Nephelometer (Craycroft)	2001	38	19	8	N/A	N/A	N/A
	2002	37	18	7	N/A	N/A	N/A
	2003	52	25	7	N/A	N/A	N/A
	2004	42	21	8	43	22	9
Tucson Nephelometer (Children's Park)	2004	41	20	8	43	23	10

N/A – Not available

Special Projects

Introduction


Figure 4 - Yuma West Monitoring Station, Western Arizona/Sonora Border Air Quality Study

In addition to ADEQ's statewide regulatory ambient air monitoring program, the Air Quality Division undertook several special projects during 2004 and the first half of 2005. All of these studies go beyond data collection and seek to provide a better understanding of air pollutant science in Arizona and the Southwest. Data are employed in advanced computer models that help to explain and predict the relationship between emissions and air pollutant concentrations under a variety of conditions. Control strategies are modeled to predict the most effective methods to attain and maintain the National Ambient Air Quality Standards in Arizona. Issues related to the international border, identification of potential air pollution hotspots, improved visibility and reduction of regional haze, and appropriate responses to smoke and other air pollution hazards to protect public health fall under special projects. The knowledge gained from these studies can then be used by decision-makers to choose the most effective control strategies that will continue to improve the State's air quality.

Salt River PM_{10} Study

In 1997, the EPA approved an attainment demonstration as part of the metropolitan Phoenix serious area PM_{10} State Implementation Plan (SIP) that showed the 24-hour PM_{10} standard would not be violated at the Salt River site after 1998. Subsequent data from the Salt River monitoring site showed violations of the 24-hour standard in 1999, 2000, and 2001. In a Federal Register notice published July 2, 2002, EPA found that the SIP was substantially inadequate to provide for attainment of the 24-hour PM_{10} standard, and EPA required the State to add control measures for the Serious PM_{10} nonattainment area.

The Salt River Area covers approximately 32 square miles (1% of the Phoenix metropolitan area) located along the Salt River in southwest Phoenix. To demonstrate attainment, the State developed a relationship between the emissions and ambient air concentrations through the construction of an emissions inventory and the use of this inventory in an air quality model. Second, the State developed and evaluated potential control strategies called Best Available Control Measures (BACM) and Most Stringent Measures (MSM) for all significant sources of PM_{10} contributing to the Salt River Area monitor exceedances. These sources include sand and gravel mining, materials processing, brick manufacturers, earthmoving and motor vehicle traffic on unpaved roads and vacant lands, and trespass on vacant lands that disturbs soils. ADEQ and the Maricopa County Environmental Services Department developed a base case emissions inventory and source category emissions estimates, characterized the air quality and meteorology of the area, statistically analyzed the data, and employed modeling to simulate ambient conditions and to show the air quality benefits of the strategies adopted to achieve the NAAQS. Revised SIPs were submitted to EPA in February, June, and October of 2004. Selected control measures targeted three categories of pollution sources: primary and secondary paved roads; unpaved roads and unpaved shoulders; and windblown dust from disturbed land (including areas in the river bottom) and vacant lots.

Enhancements to Maricopa County Rule 310 concerning earthmoving operations were adopted by the Maricopa County Board of Supervisors on April 7, 2004. These enhancements include opacity restrictions; requirements to use water, gravel or dust suppressants and wind barriers to control windblown dust emissions from disturbed areas; and restricting vehicle access. Maricopa County is also improving enforcement by increasing the number of its inspectors for construction sites and vacant lands.

The City of Phoenix cleared trash from the banks of the Salt River, stabilized the banks with several inches of mulch, restricted access with concrete barriers, and increased enforcement against trespassing.

Municipalities and the Arizona Department of Transportation continue to pave, curb and gutter unpaved parking lots, roads and shoulders. Congestion Mitigation and Air Quality funds have been earmarked to purchase an additional 32 PM_{10} efficient street-sweepers. Municipalities have adopted Resolutions committing to more frequent street-sweeping on “high dust” roadways identified through protocols.

Yuma PM_{10} Nonattainment Area Redesignation Project

Yuma was designated nonattainment for PM_{10} (particulate matter 10 microns or smaller) in 1990. ADEQ developed a State Implementation Plan (SIP) for Yuma in 1991 that demonstrated the area could meet the federal NAAQS by December 1994. After several consecutive years of clean monitoring data, a stakeholder process to prepare an attainment demonstration and maintenance plan was convened in July 2001. ADEQ met with local stakeholders to review the control measures already in place and hired a contractor to assist in developing an emissions inventory for the 1999 base year and future years emissions estimates. After air quality modeling for 1999 was completed successfully, ADEQ staff learned that incomplete monitoring data for 2001 would necessitate using the 2002-2004 monitoring data for the attainment demonstration, with a SIP submittal in early 2005.

On August 18, 2002, however, an unusually large and intense thunderstorm with blowing dust over east-central Sonora moved northwesterly through Yuma. For this day there were three hours with wind speeds above the dust re-suspension threshold of 15 mph. The Yuma PM_{10} monitor registered 170 ug/m3, exceeding the National Ambient Air Quality Standard of 150 ug/m3. Data from nearby meteorological sites were tested to determine whether the exceedance date in question is considered meteorologically exceptional. These tests are described in an ADEQ document, "Technical Criteria Document for Determination of Natural Exceptional Events for Particulate Matter Equal to or Less than Ten Microns in Aerodynamic Diameter (PM_{10})", May 31, 2000. The August 18, 2002, date passed the criteria for a natural exceptional event, and qualifies for treatment through a Natural Events Action Plan (NEAP).

ADEQ submitted a NEAP to EPA on February 19, 2004. ADEQ continues to work with the stakeholder group to submit the attainment demonstration and SIP to EPA by late 2005. All Best Available Control Measures must be adopted and implemented by August 18, 2005 and implemented by a certain date. Best Available Control Measures (BACM) for all significant sources of PM_{10} contributing to the PM_{10} concentrations in Yuma County include enforcement to prevent traffic and trespass on unpaved Irrigation District canal roads, and measures applicable to windblown dust from agricultural practices, disturbed land, uncovered trucks hauling particulate matter, and vacant lots. A public outreach campaign is also under development involving bilingual brochures, a public service announcement, and videos to explain dust control plans for construction site contractors and agricultural practices.

Additional analyses have been prepared by the Air Quality Division to quantify the emission reductions from the implementation of Agricultural Best Management Practices, which began in Yuma August 1, 2005. This work has been accomplished with the help of Yuma farmers, conservation agents, and Arizona Department of Agriculture personnel.

Western Arizona/Sonora Border Air Quality Study

The purpose of this study is to determine the sources and movement of air pollutants as well as assess their health impacts on residents of far southwestern Arizona and adjacent regions of Mexico. To accomplish this, ADEQ, in partnership with local, state, federal, and tribal governments, have identified six phases to the study: identifying study requirements and collecting meteorological data; siting study for pollutant monitor locations; monitor deployment; data collection; air quality modeling and health risk assessment. The Air Quality Division will carry out a thorough public outreach program during the study. The first phase is well underway. A total of eight meteorological stations have been installed to acquire data on wind, temperature, relative humidity, solar radiation, atmospheric pressure, and lapse rate. Three stations are in Mexico and five in Arizona. The information acquired during this phase will be used with emissions inventory data and exposure potential to determine where air quality monitors should be sited in the next phase of the study.

Monitor deployment and data collection are scheduled to begin in autumn 2005 at two "supersites" –sites with a full complement of gaseous and particulate monitors – one in San Luis, Rio Colorado, Sonora, and one in the northeastern part of Yuma.

Figure 6 – Map of Western Arizona/Sonora Border Air Quality Study monitoring locations.

In September – October 2004 ADEQ staff conducted an intensive air monitoring study of PM10 at three sites near unpaved roads in San Luis, Rio Colorado. This study was performed, in part, to provide information to Mexican officials that would help them obtain funds to pave the dirt roads. Results of this month-long study with continuous monitors were maximum four-hour and 24-hour PM10 concentrations of 1078 and 190 ug/m3, respectively, with 45% of the averages exceeding the respective guidelines (150 ug/m3 for each averaging period).

Impacts of Cement Plants on the Sycamore Canyon Wilderness

One of 12 Class I Wilderness Areas in Arizona – all designated by the Clean Air Act for special protection of their pristine air quality – Sycamore Canyon begins high on the Mogollon Rim 20 miles southwest of Flagstaff and develops into a picturesque, steep-walled canyon that meets the Verde River upstream of Clarkdale. Six miles south of the canyon's mouth is the Phoenix Cement Plant, one of the state's two large Portland cement plants . About 20 miles west of the canyon is the site of a proposed cement plant. As part of the permit application for the proposed plant, visibility and deposition modeling were performed to assess the impacts of its emissions on Sycamore Canyon. To give the Federal Land Managers a more complete picture, ADEQ staff and a contractor began air quality modeling of the combined (and separate) effects of the two plants on the canyon. This work, which will continue into autumn 2005, is intended to provide the regulatory agencies with a comprehensive assessment of the present visibility degradation in the canyon from Phoenix Cement, as well as the combined degradation from the two plants.

Joint Air Toxics Assessment Project (JATAP)

The second phase of the Joint Air Toxics Assessment Project (JATAP) began in January 2005 and will take place until the end of the year. Funding is provided through EPA Region 9 and EPA's Office of Air Quality, Planning and standards (OAQPS). Carried out through the Institute for Tribal Environmental Professionals (ITEP) in Flagstaff, the JATAP coalition consists of staff from the following agencies and tribes:

EPA - Region 9
EPA - Office of Air Quality Planning and Standards
Salt River Pima - Maricopa Indian Community
Ft. McDowell Indian Community
Gila River Indian Community
Maricopa County Environmental Services Department (MCESD)
Arizona Department of Environmental Quality (ADEQ)
Maricopa Association of Governments (MAG)
Pinal County Air Quality Control District (PCAQCD).

Following a pilot-scale monitoring study to determine which Hazardous Air Pollutants (HAPs) are of most concern in South Phoenix and the Gila River Indian Community in 2003 -2004, this larger air toxics monitoring effort has nine sites: one each in the Gila River, Salt River, and Fort McDowell Indian Communities and five in central and west-central Phoenix . These air toxics concentrations will provide enough information for a preliminary risk assessment and, if funding can be obtained, for a full-scale risk assessment based on an emissions inventory, air quality modeling, and risk assessment modeling. This full-scale assessment is planned for 2006 – 2009.

Dioxins and Furans in Rillito

Concerns of Rillito citizens about emissions of dioxins and furans from the Arizona Portland Cement Plant (APCC) and stack testing at APCC led to an ambient air monitoring program conducted in 2004 -2005. ADEQ staff operated the air monitors and the Kansas City laboratory of the U.S. EPA performed the chemical analyses. Ambient concentrations of dioxins and furans proved to be within health-based guidelines. These concentrations were somewhat higher than those measured at background sites in Arizona but considerably lower than at urban sites throughout the country. The distribution of the 17 toxic dioxins and furans in the ambient air of Rillito closely resembled the mobile source profile but was quite different from the APCC profile. The dioxin and furan concentrations measured during the one-year study suggested that mobile source emissions had a much greater impact at Rillito than the cement plant emissions.

Regional Haze

Regional haze is caused by the emissions of air pollutants from a wide variety of sources located over a large geographic area. The haze obscures scenic vistas, which degrades our parks and wilderness areas and interferes with people's enjoyment and recreation in those areas. In 1977, the federal Clean Air Act set a goal to remedy any existing visibility impairment, and prevent any future impairment, from manmade pollution at 158 national parks and wilderness areas known as mandatory Federal Class I areas. The Regional Haze State Implementation Plan (SIP) submitted to EPA in December 2003, focused on four of the 12 national parks and wilderness areas in Arizona: Grand Canyon National Park, Petrified Forest National Park, Sycamore Canyon Wilderness, and Mount Baldy Wilderness. The remaining eight Class I areas will be addressed in a SIP to be submitted to EPA by the December 17, 2007, deadline.

The 2003 Regional Haze SIP relied on a demonstration of how the state is implementing the recommendations of the Grand Canyon Visibility Transport Commission to satisfy reasonable progress toward the national visibility goal. All SIPs from this point on will need to assess the current conditions at a Class I area and then determine what strategies would be necessary should the area be found to have impaired visibility. Areas with good visibility will need to determine strategies to assure those areas maintain good air quality. Western states developing SIPs under sections 309(g) and 308 of the Federal Regional Haze Rule will have assistance with the assessment and strategies portion of the SIP from the Western Regional Air Partnership (WRAP at www.wrapair.org).

The Air Quality Division (AQD) will have an expanded role regarding regional haze. Extensive fire regulations and policy were developed for the 2003 Regional Haze SIP and the Enhanced Smoke Management Plan will continue to be an important part of regional haze. AQD will perform emissions tracking and modeling necessary to determine specific conditions at Arizona Class I areas beyond what WRAP will provide. Arizona will also implement SO_2 Milestones and Backstop Trading Program, which is a voluntary program for stationary sources emitting 100 tons or more per year of sulfur dioxide that will be integrated into existing permits, and emissions will be tracked annually. The annual emissions for the stationary sources will be reported to WRAP, and every five years, beginning with 2004, emissions will be compiled into a regional Milestone Report. Should a milestone, representing markers on a decreasing regional emissions cap, be exceeded, the backstop trading program would be activated. The possibility of developing a trading program for NOx will also be researched by WRAP and ADEQ. Additional information on regional haze can be found at http://www.wrapair.org/309/index.html.

Hazardous Air Response Team

Part of the ADEQ multimedia response team, the Hazardous Air Response Team (HART) is called to emergencies by the Emergency Response Unit (ERU) for those incidents that threaten air quality. HART's objectives are to monitor air quality for public exposure of air pollutants and to provide meteorological support regarding dispersion. This information is provided to the Arizona Department of Health Services or the County Health Department so that appropriate actions can be taken to protect the public. The Team has a fully equipped van with a variety of grab-sampling and continuous sampling air monitoring equipment. It is staffed by five volunteer members of the Air Quality Division.

Since it started in 1992, the Team has responded to 109 incidents. During the calendar year of 2004, HART responded to seven incidents: the transformer substation fire in Surprise, a garbage dump fire, a hay fire, and three wildfires (Three Forks Fire outside Three Forks, Willow Fire outside Payson, and Nuttall Fire outside Safford), and monitoring of an open burn of propellants at an industrial manufacturing facility in North Phoenix. Through August 2005, HART responded to four incidents which were all wildfires: the Bart Fire near Carefree, the Cave Creek Complex Fire that started north of Carefree, the Florida Fire southeast of Tucson, and the Edge Fire near Lake Roosevelt.

Trends

Introduction

Whether air quality meets the standards is a central question – explored at length in the second chapter of this report, but one posed more often is whether it is improving or deteriorating. In Arizona, because of the phasing out of leaded gasoline in the mid-1970s and the installation of effective controls on copper smelters in the 1980s, the concentrations of both lead and SO_2 decreased rapidly. Although improvements have also been made in the concentrations of CO, O_3 and particulates, the last two still exceed air quality standards at some sites: the eight-hour O_3 standard at one site in greater Phoenix, and the 24-hour and annual PM_{10} standards at some urban and rural sites. Visibility – the aspect of the atmosphere most obvious to the population – has been measured continuously in urban and pristine parts of state long enough to establish trends. The following discussions examine the trends in these three common air pollutants and visibility in Arizona.

Average Best & Average Worst Visibility Impairment in the Phoenix Area

Carbon Monoxide

Since the mid to late 1970s, CO concentrations have declined dramatically. In Tucson, the maximum annual eight-hour concentration at 22nd Street and Alvernon declined from 12.0 in 1978 to 2.1 parts per million (ppm) in 2004 – a decrease of 83% (Figure 8).

In Phoenix at 18th Street and Roosevelt (Central Phoenix), the decline was from 23.0 to 3.4 ppm – a decrease of 81% (Figure 9). The number of exceedances of the eight-hour standard in Phoenix decreased from 75 to 0 at Central Phoenix. The entire Phoenix network of CO monitors recorded over 100 exceedances each year from 1981 through 1986, with an average of 134 per year. The last recorded exceedance was in 1999. Most of this improvement can be attributed to Federal new-vehicle emission standards, augmented by emission reductions from the vehicle inspection and maintenance program, which began in 1976, and the use of oxygenated fuels in the winter, beginning in 1989.

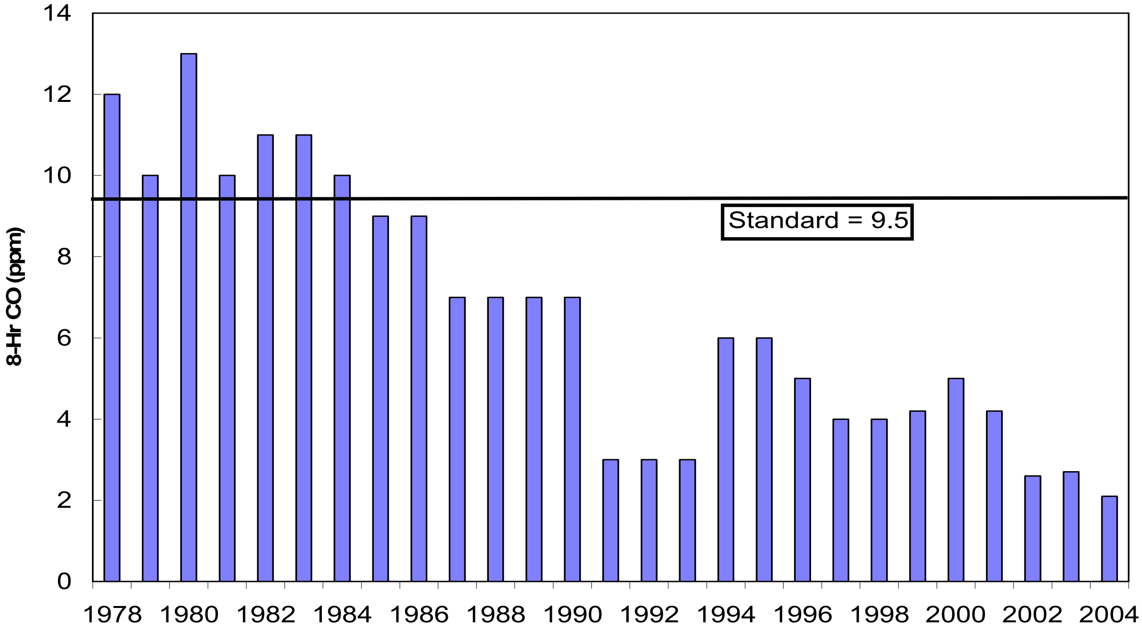


Figure 8: Eight-hour carbon monoxide maxima at 22nd Street and Alvernon Way in Tucson

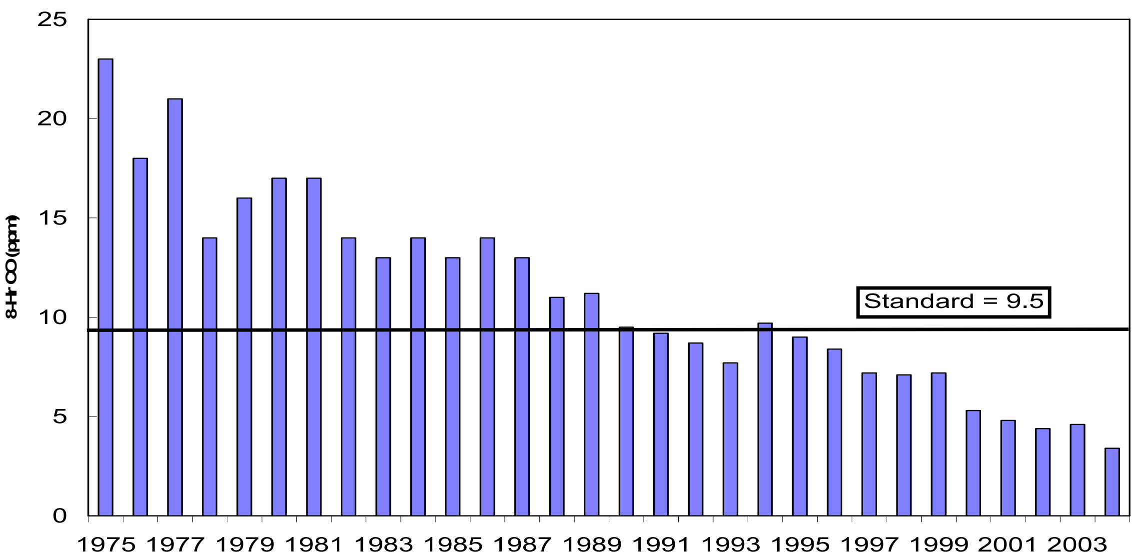


Figure 9: Eight-hour carbon monoxide maxima at 18th Street and Roosevelt in Central Phoenix

Ozone

One-Hour Ozone Concentrations

Maximum one-hour O_3 concentrations have remained steady in Yuma, but have declined in Phoenix and Tucson since 1980 (Figure 10). These decreases have been 34% and 24%, for Phoenix and Tucson, respectively. Yuma and Tucson have met the one -hour standard consistently since monitoring began. In the Phoenix airshed, the standard was exceeded regularly through the mid 1990s, with a gradual decrease to 1996, after which the concentrations have remained steady and just below the standard. The Phoenix decrease in O_3 concentrations has been nowhere near as pronounced as its declining CO trend, but the net result has been similar: no exceedances of the O_3 standard have been recorded after 1996. The one-hour standard was officially declared attained on May 16, 2001. Because of the relatively high background level of O_3 and its photochemical formation from hydrocarbons and nitrogen oxides, changes in emissions would not be expected to produce proportional changes in concentration.

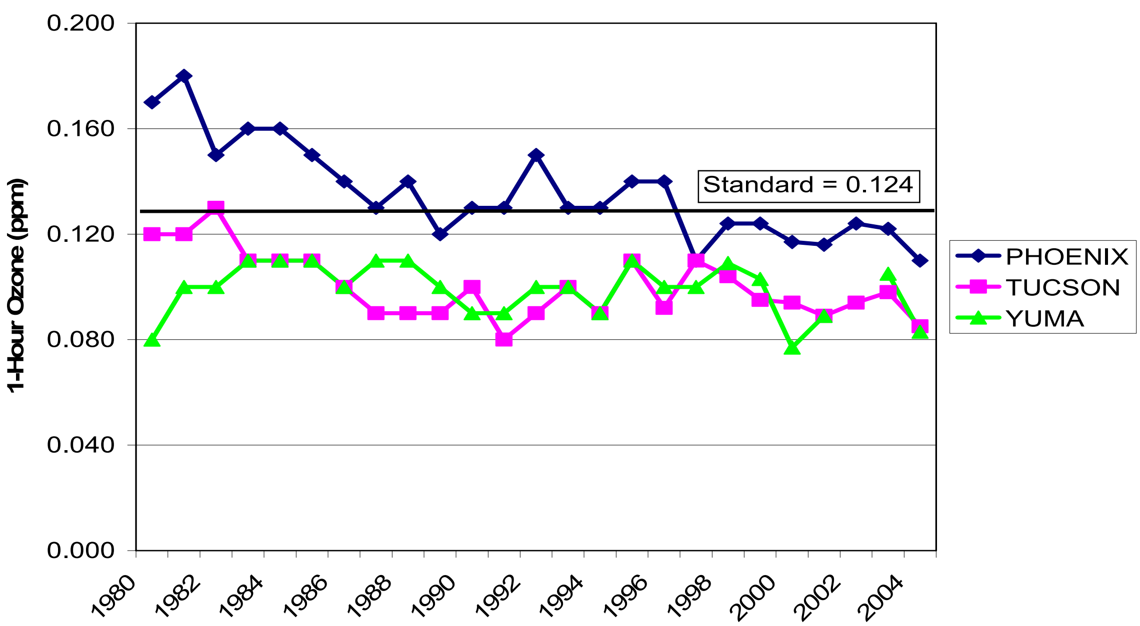


Figure 10: Maximum one-hour ozone concentrations in three cities

Eight-Hour Ozone Concentrations

The eight-hour O_3 standard, proposed by EPA in 1997 and officially promulgated in 2003, is expressed as the three-year average of the annual fourth-highest concentration, not to exceed 0.08 parts per million. Because of instrument precision and rounding, this standard translates into a numerical value of 0.085 ppm: any value 0.085 ppm and above is an exceedance. The eight-hour standard has been exceeded in many areas across the United States where the one-hour standard is met; Phoenix falls into this category but Tucson and

Yuma do not. Long-term trends of the fourth-highest ozone concentrations in Tucson fluctuate between 0.06 and 0.08 ppm, but, overall, are steady (Figure 11).

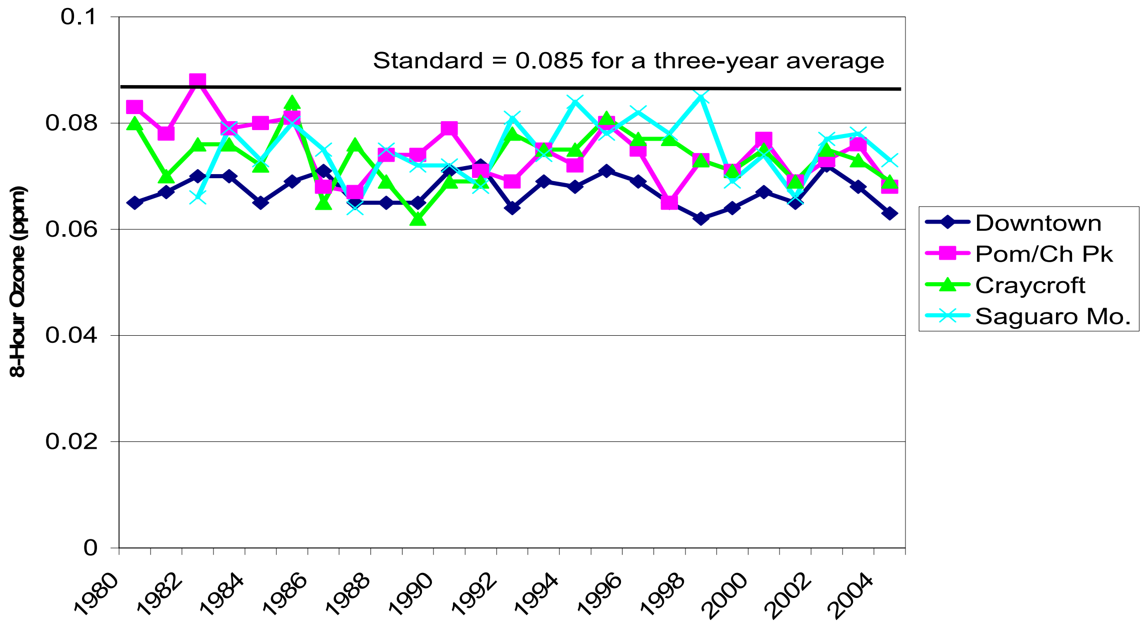


Figure 11: Annual fourth-highest eight-hour ozone concentrations in Tucson

A similar pattern in eight-hour ozone trends also characterizes Yuma, where, although the values are slightly higher than Tucson's, the constant trend line is apparent (Figure 12).

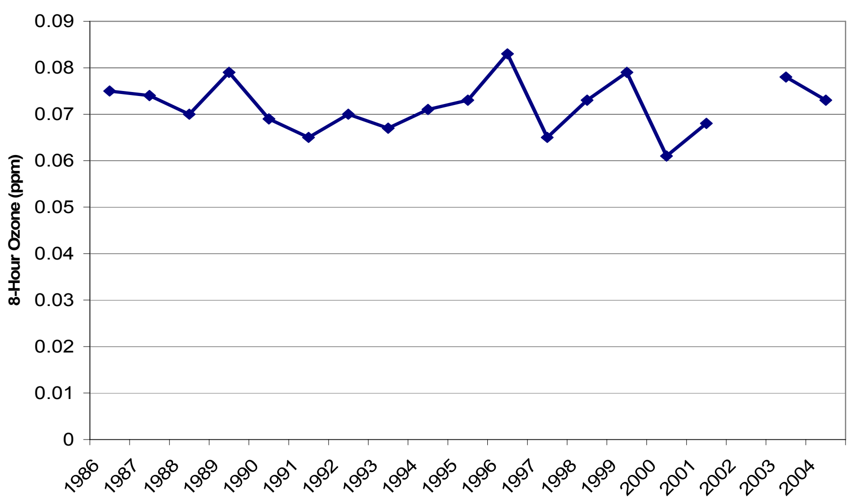


Figure 12: Annual fourth-highest eight-hour ozone concentrations in Yuma

In contrast to the within-standard concentrations in Tucson and Yuma, 24 of the 28 sites in greater Phoenix have recorded annual fourth-highest O_3 values in excess of 0.084 ppm in 1995 to 2004. In metropolitan Phoenix, these elevated eight-hour O_3 concentrations occurred at fewer monitoring sites and at lower values in 2004 than in 1995, with most of the improvement taking place since the 2000 – 2002 period. For instance, of the 20 sites operational both in 1995 or 1996 and 2004, 14 recorded fourth-highest values greater than 0.084 ppm in 1995, but none in 2004. The values have decreased through time as well, with typical fourth-highest concentrations decreasing from 1995-96 to 2004: Blue Point Bridge, 0.083 to 0.075; Phoenix Supersite, 0.087 to 0.072; and North Phoenix, 0.095 to 0.080 ppm. Elevated concentrations of O_3 averaged for eight hours, then, when looking at the annual fourth-highest values, have exceeded the 0.084 ppm guideline in metropolitan Phoenix, although the extent and severity of these high concentrations were much greater ten years ago. Ozone concentrations in 2004 were unusually low compared with previous years, with the highest four-highest concentration of 0.080 ppm at North Phoenix.

Looking at the specific statistical form of the standard – the three-year average of the annual fourth-highest eight-hour ozone concentration – metropolitan Phoenix continues to exceed the standard, but, as with the annual fourth-highest values, the extent and severity are decreasing with time. Consider the three-year periods ending with 1997 through 2004: the first being 1995 to 1997 and the last 2002 to 2004. In the first two three-year periods (Table 23), 12 and 13 monitoring sites, respectively, had average fourth-highest values equal to or exceeding 0.085 ppm. In the last two periods, the numbers of such sites had decreased to three and one, respectively. The magnitude of these three-year averages has decreased substantially, as well. The highest average for the period ending in 1997 was 0.0963 ppm; the highest average in 2004 was 12 percent lower, at the standard of 0.085 ppm. These trends are consistent with the decreasing one-hour maximum ozone trends; however, most of the decrease in eight-hour ozone concentrations occurred since 2000, a few years later than the decrease in the one-hour concentrations. The unusually low concentrations in 2004, however, suggest that the eight-hour standard may be achieved in two to three years.

Table 23. Three-Year Averages of the Annual Fourth-Highest Eight-Hour Ozone Concentrations in Phoenix and Environs *(Units are in parts per million (ppm). Bold values in yellow cells equal or exceed the operational standard of 0.085 ppm)*								
Site	1995-1997	1996-1998	1997-1999	1998-2000	1999-2001	2000-2002	2001-2003	2002-2004
Emergency Mgmt	**0.0963**	**0.0873**	0.0847	0.0823	0.0763	Closed	Closed	Closed
North Phoenix	**0.0937**	**0.0923**	**0.0880**	**0.0863**	**0.0853**	**0.0857**	**0.0856**	0.0837
Salt River Pima	**0.0930**	**0.0907**	0.0843	Closed	Closed	Closed	Closed	Closed
Phoenix	**0.0927**	**0.0853**	0.0737	0.0727	0.0723	0.0770	0.0766	0.0743
Blue Point	**0.0903**	**0.0893**	**0.0860**	**0.0887**	**0.0853**	0.0843	0.0840	0.0823
Apache Junction	**0.0900**	**0.0860**	0.0817	0.0813	0.0797	0.0797	0.0763	0.0737
Mesa	**0.0897**	**0.0853**	0.0810	0.0793	0.0773	0.0737	Closed	Closed
Pinnacle Peak	**0.0890**	**0.0867**	0.0810	0.0817	0.0820	**0.0850**	0.0840	0.0783
Fountain Hills	**0.0890**	**0.0850**	0.0823	0.0817	0.0810	0.0847	0.0840	0.0813
Falcon Field	**0.0890**	**0.0850**	0.0823	0.0817	0.0810	0.0800	0.0813	0.0777
Mount Ord	**0.0880**	**0.0907**	**0.0873**	**0.0887**	0.0847	Closed	Closed	Closed
South Scottsdale	0.0843	0.0807	0.0753	0.0760	0.0760	0.0787	0.0783	0.0763
West Phoenix	0.0843	0.0847	**0.0853**	**0.0860**	0.0823	0.0800	0.0786	0.0777
Maryvale	0.0840	0.0837	0.0813	0.0830	0.0783	0.0790	0.0800	0.0835
Humboldt Mt.	0.0837	**0.0880**	**0.0860**	**0.0863**	0.0847	**0.0850**	**0.0873**	**0.0850**
Tonto Monument						**0.0870**	**0.0855**	0.0827
Queen Valley					0.0790	0.0810	0.0830	0.0810
Cave Creek					0.0830	0.0845	0.0840	0.0817
Hillside	0.0805	**0.0855**	0.0810	0.0833	0.0810	0.0827	0.0773	0.0777
Rio Verde	**0.0850**	0.0840	0.0833	0.0837	**0.0850**	0.0847	0.0837	0.0840
West Chandler	0.0770	0.0820	0.0733	0.0733	0.0747	0.0793	0.0797	0.0770
Maximum	**0.0963**	**0.0923**	**0.0880**	**0.0887**	**0.0853**	**0.0857**	**0.0873**	**0.0850**
n $\geq$ 0.085 ppm	12	13	5	5	3	4	3	1

Illustrated in Figure 12 are the three-year averages from nine monitoring sites in Table 23 that have a long-term period of operation and have recorded one or more averages above the standard. Although there is considerable site-to-site variability, the overall impression is a distinctly downward trend, perhaps best exemplified by Apache Junction. Humboldt Mountain goes against this tend. The anomalously low 2004 ozone concentrations result in seven of nine sites having lower averages in 2002 – 2004 than in the previous period.

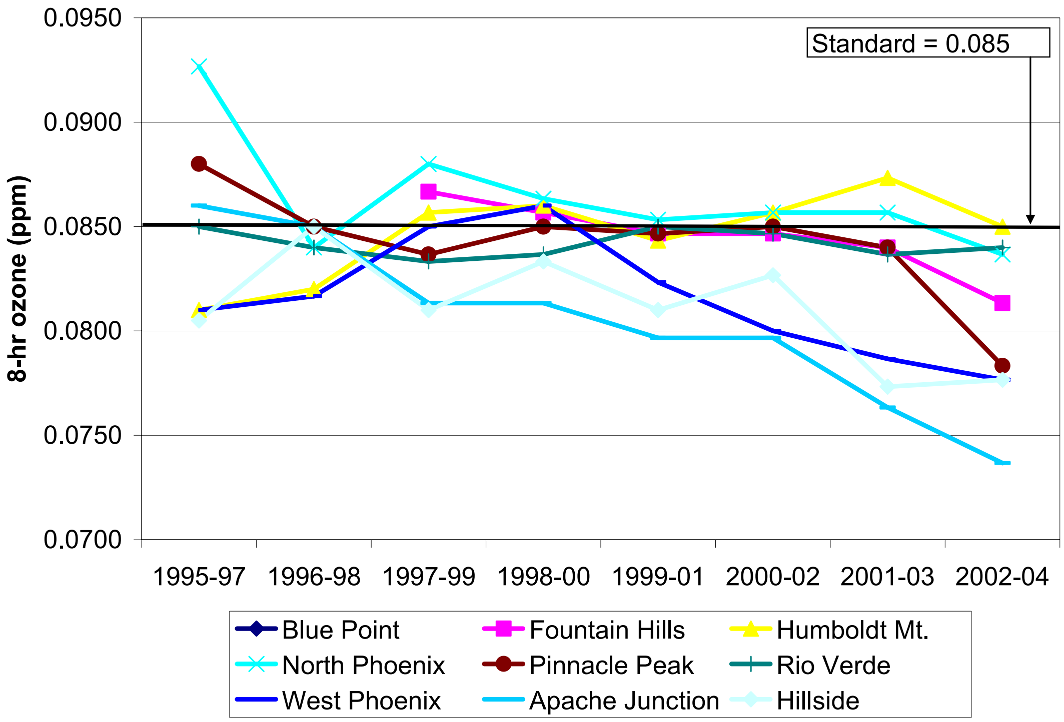


Figure 12: Phoenix area eight-hour ozone trends: three-year averages of the annual fourth-highest concentrations

Considering these sites together (Figure 14), the pattern of the maximum value fluctuates at or just above the standard for all of the periods except the first, with a range from 0.085 to 0.088 ppm. The average of these sites, after a steady trend for the first half of the record, moves decidedly down in the latter half. These sites seem capable of producing maximum values at or slightly above the standard throughout the period of record; but their average is displaying a robust decline since 2000 - 2002.

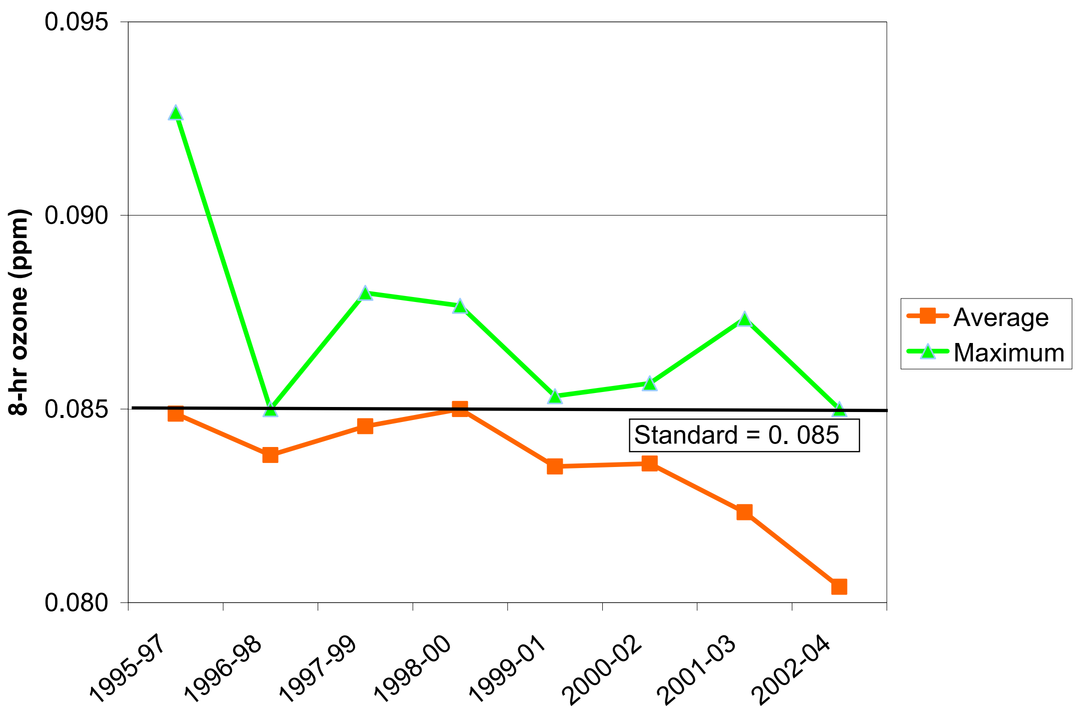


Figure 14: Phoenix area eight-hour ozone trends: three-year averages of the annual fourth-highest concentrations, expressed as the average and maximum of nine long-term sites

If the trend in the latter half of the period continues, attainment of the eight-hour ozone standard may not be far away.

Particulates

PM_{10}

PM_{10} concentrations have decreased considerably throughout the state in both urban and rural settings. Nonetheless, this pollutant, more than any other, continues to exceed its standards. For example, annual PM_{10} concentrations in South Phoenix averaged 68.7 μg/m^3 from 1985 through 1987, but only 52.7 μg/m^3 in 2002-2004, a decrease of 23 percent but still over the standard. Similar percentage decreases occurred since the 1980s at Central Phoenix and West Phoenix (Figures 13a & b). These figures, which show the three-year moving averages, have two points in common: first, one or more sites show dramatic improvement in the earliest part of the record; and, second, all sites show improvement in the latter part. In Figure 13a the exceptional site is Chandler, which begins and ends at the same concentration but which peaks midway through the period of record. Figure 13b shows that South Phoenix increased steadily from the period ending in 1997 through the one ending in 2002, while West Phoenix had only a modest increase during this interval.

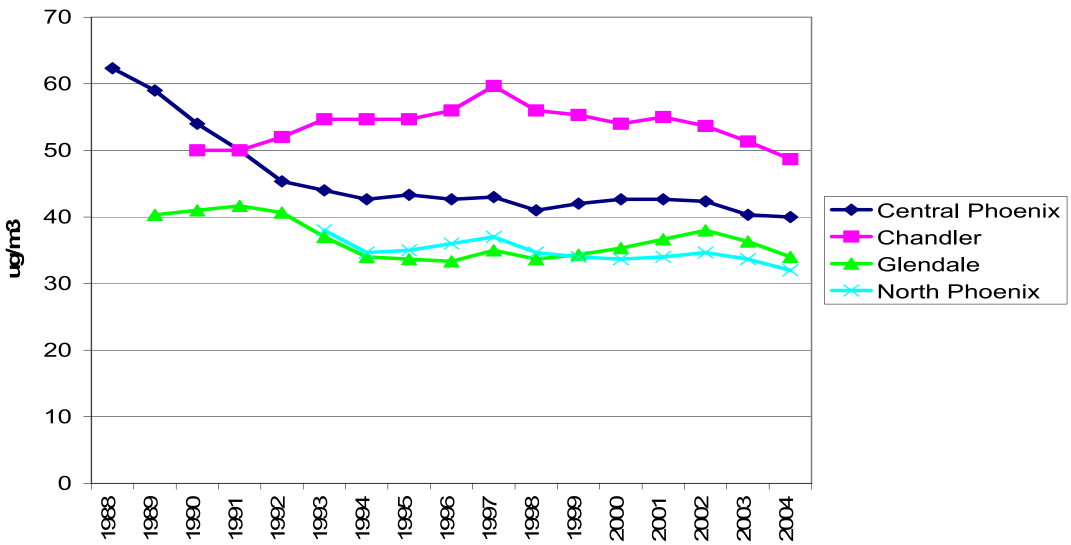


Figure 13a: Three-Year Moving Averages of Annual Average PM_{10} at four metropolitan Phoenix sites with moderate PM_{10} levels (each data point is the average of the three years ending in that year (e.g.. "2004" is the average of 2002, 2003, and 2004).

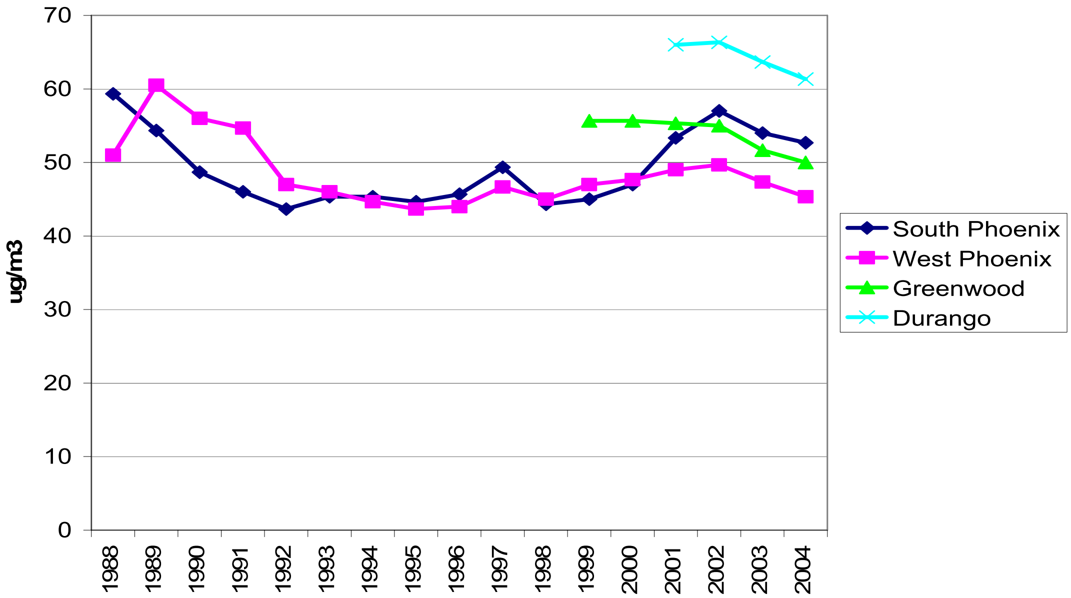


Figure 13b: Three-Year Moving Averages of PM_{10} at four metropolitan Phoenix sites with higher PM_{10} concentrations

Despite these improvements, unlike the case for CO and O_3, PM_{10} standards continue to be violated. Annual concentrations for the last 10 years, presented in Table 24, demonstrate that some sites in metropolitan Phoenix have been above the standard for one or more years: Chandler, South Phoenix, West Phoenix and Greenwood. Of these four sites, in 116 monitor years, 27 (23%) have exceeded the annual standard. Each of these sites presents a different mix of localized emission sources. Chandler's emissions have gone from agricultural to earthmoving for residential and road construction. South Phoenix and Durango, near the industrial Salt River area, are influenced by emissions from the industrial sources there. Without any nearby industrial or earthmoving activity, West Phoenix PM_{10} concentrations would appear to be the result of the transport of metropolitan wide emissions into this part of town. Two miles southeast of West Phoenix, Greenwood combines the high regional concentrations with its close proximity to a major arterial street and freeway.

Table 24: Annual PM_{10} Concentrations in Metropolitan Phoenix (in $\mu g/m^3$)

	Central Phoenix	Chandler	Glendale	North Phoenix	South Phoenix	West Phoenix	Mesa	South Scottsdale	Greenwood	Durango
1992	42	**56**	34	35	48	47	29	34		
1993	43	**58**	35	34	44	44	35	34		
1994	43	50	33	35	44	43	36	38		
1995	44	**56**	33	36	46	44	35	36		
1996	41	**62**	34	37	47	45	33	35		
1997	44	**61**	38	38	**55**	**51**	43	41	**61**	
1998	38*	45	29	29	31*	39	29	34	50	
1999	44	**60**	36	35	49	**51**	35	40	**56**	**69**
2000	46	**57**	41	37	**61**	**53**	37	40	**61**	**70**
2001	38	48	33	30	50	43	30	33	49	**59**
2002	43	**56**	40	37	**60**	**53**	36	37	**55**	**70**
2003	40	50	36	34	**52**	46	34	36	**51**	**62**
2004	37	40	26	25	46	37	23	26	44	**52**

Bold values in yellow cells exceed the annual standard of 50 ug/m3.

*Does not satisfy EPA summary criteria of 75% data recovery.

The highest PM_{10} concentrations in metropolitan Phoenix are in southwest Phoenix, along the Salt River from about 7th Street to 59th Avenue. Although most of the area is industrial, there are many residential areas. The PM_{10} record in this area since 1994 is shown in Figure 14. The West 43rd Avenue site is the replacement for the Salt River site. Concentrations have exceeded the standard in each of the 17 monitoring years.

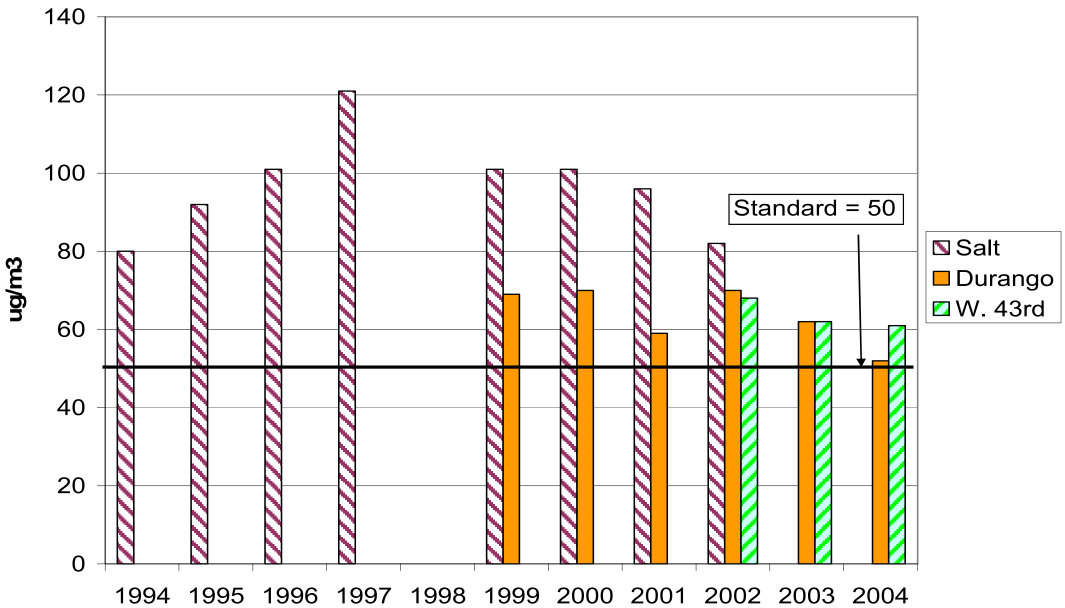


Figure 14. Annual PM_{10} concentrations in the Salt River area

In Tucson, the background site of Corona de Tucson and the rural site of Green Valley have had fairly steady, even trends of PM_{10}, but the four long-term urban sites all show substantial decreases since the mid 1980s. Orange Grove averaged 43.3 $\mu g/m^3$ in 1985-87, but has since decreased 32 percent to a concentration of 29.7 $\mu g/m^3$. South Tucson, Prince Road and Broadway/Swan showed smaller, but substantial, decreases (Figure 15), with similar patterns of an early decrease, followed by a period of gradual increases, and ending with decreasing trends in the last five years.

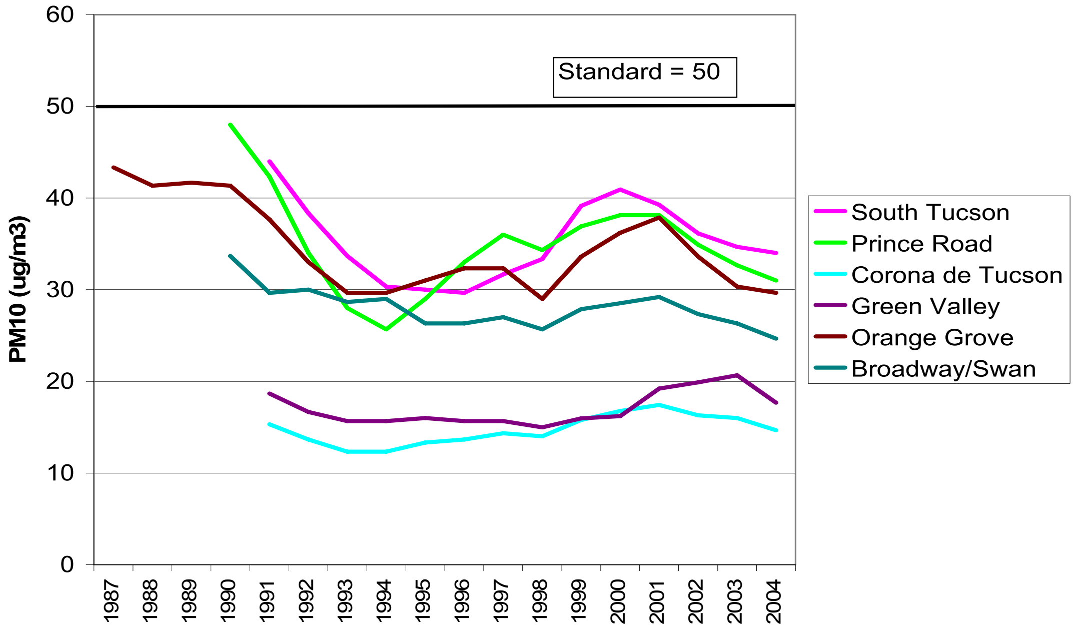


Figure 15: Three-year moving averages of annual average PM_{10} at six metropolitan Tucson sites

These PM_{10} reductions in the urban settings can be attributed to a reduction of coarse particulate emissions from paving roads, alleys and road shoulders, and better controls of dust emissions from construction sites.

Throughout the rest of the state, PM_{10} concentrations have declined since 1985 at many sites. Consider a group of high concentration sites: Douglas, Hayden and Nogales concentrations have been cut in half, Payson and Paul Spur have been reduced threefold, and Rillito and Yuma have decreased 40 percent. For most of the sites, nearly all of the improvement took place from the mid 1980s to the mid 1990s. The percentage improvement during this ten-year period varied from 37 to 62%, depending on the site -- a remarkable decrease. After this point, two sites continued to decrease (Paul Spur and Payson); three sites have increased (Nogales, Yuma, and Rillito); and two sites have remained about the same (Douglas and Hayden). At the beginning of the period, six of the seven sites were above the standard; all have been within the standard since the mid 1990s. In each of these localities, road paving, better industrial dust controls, and (in Payson only) cleaner fireplaces and woodstoves can be given credit for the improvement. All of these PM_{10} emission reductions were accomplished through State Implementation Plan activities led by the Air Quality Division. Figure 16 presents these trends as three-year moving averages.

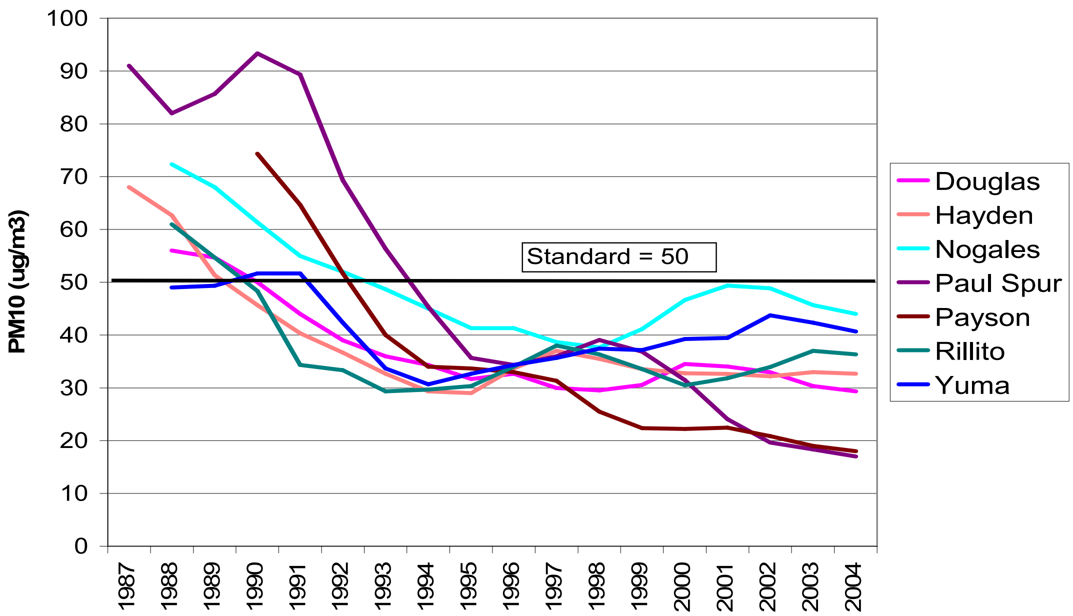


Figure 16: Three-year moving averages of the annual average PM_{10} concentrations at the higher concentration sites in Arizona

PM_{10} concentrations at sites with lower concentrations have decreased, as well, with Ajo concentrations reduced by 50 percent, Bullhead City by 66 percent, and Safford by 15 percent. Other lower concentration sites in the lower elevations were steady or slightly decreasing (Figure 17).

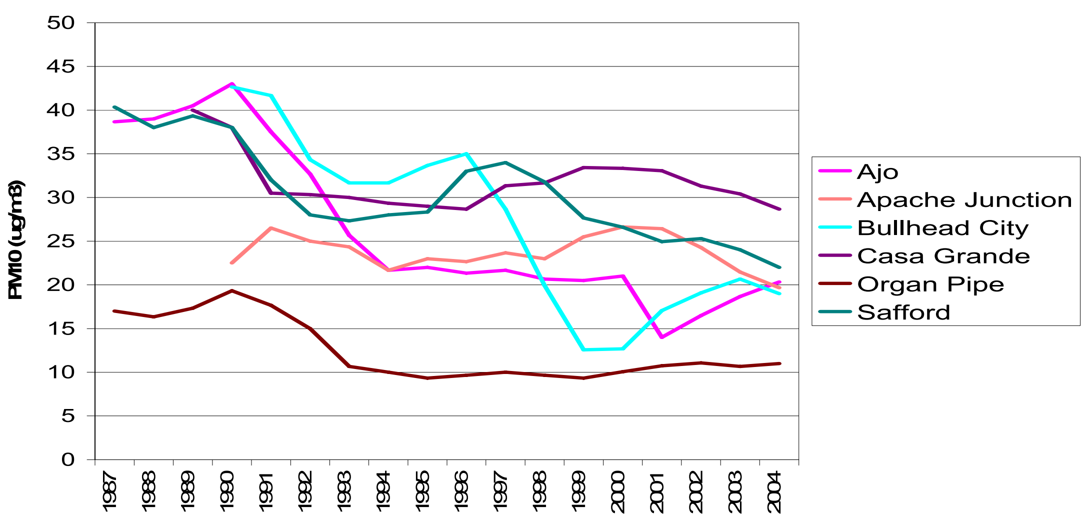


Figure 17: Three-year moving averages of annual average PM_{10} concentrations at lower concentration sites at lower elevations

Low-concentration sites at higher elevations – all within the 50 ug/m3 annual standard for their periods of record, have also noticeably declined since the mid 1980s. Clarkdale decreased 24 percent; Flagstaff, 50 percent; Prescott, 15 percent; and Show Low, 35 percent. (The site in Prescott was moved to Prescott Valley in 2002.) Part of these decreases can be attributed to cleaner-burning wood stoves and fireplaces (Figure 18). What is encouraging in these various sites – both rural and urban – is that not a single one shows a steady, long-term, upward trend, whether urban, industrial, agricultural or rural.

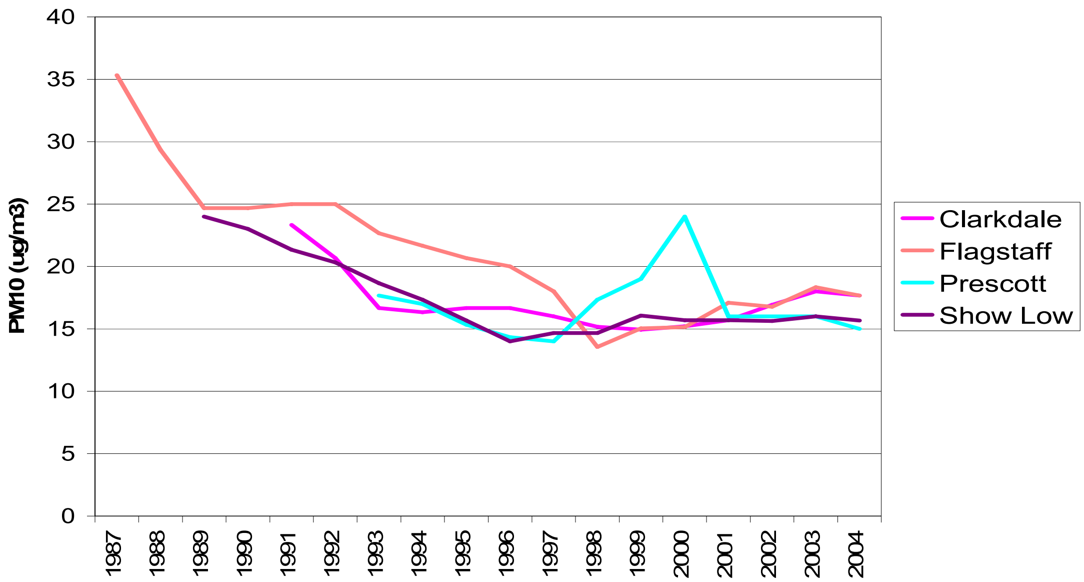


Figure 18: Three-year moving averages of annual average PM_{10} concentrations at low concentration sites at higher elevations

$PM_{2.5}$

As was discussed earlier, $PM_{2.5}$ has not been monitored as long as PM_{10}. Measurements of this fine particle fraction were taken with dichotomous samplers at all sites until the late 1990s, when monitoring with $PM_{2.5}$ reference instruments began. The dichotomous samplers give an approximate cutpoint between fine and coarse particles somewhere in the range of 2.5 to 3.0 microns. Consequently, measurements taken with these samplers should be termed "fine particulates" or "PM_{fine}",   and not "$PM_{2.5}$.". In Arizona, the earliest measurements began in 1991 in the rural cities and towns, in 1994 in Tucson, and the following year in Phoenix.

Nogales, Douglas, and Flagstaff have shown flat trends, while Payson's is significantly down by 47 percent. Yuma, on the other hand, shows increased concentrations from 1991 - 1993 to 2000 – 2002 of 48 percent. Exceedances of the annual $PM_{2.5}$ standard occurred for four years in Payson and for one year in Higley. Payson, Nogales, and the central area of Phoenix have the highest concentrations of fine particulates. Flagstaff and the urban fringe of Tucson (the Tangerine and Fairgrounds sites) have the lowest concentrations. Fine particulate trends in metropolitan Phoenix decrease from 1995 through 1998 but increase slightly thereafter through 2004. Inconsistent with this latter trend, Apache Junction concentrations have decreased steadily since 1999. Monitoring began at a new site in southwest Phoenix in 2004, at 43rd Avenue and Broadway. Its concentration in the first year of monitoring was just within the standard (14.8 vs. 15.0 ug/m^3). In metropolitan Tucson, the two sites with the longest records show that Orange Grove has decreased significantly since monitoring began and that the Central site has increased since 2001. These data are presented in Table 25 and Figures 19, 20, and 21.

Table 25a. Annual PM_{fine} and $PM_{2.5}$ Concentrations Throughout Arizona (in $\mu g/m^3$)

Statewide					
	Yuma	**Flagstaff**	**Payson**	**Nogales**	**Douglas**
1991	7.6	N/A	**17.9**	12.3	8.5
1992	5.7	N/A	**17.2**	12.6	7.9
1993	6.1	5.4	13.0	9.7	7.9
1994	8.3	4.9	**15.8**	10.4	8.1
1995	7.2	5.8	**15.7**	14.3	7.7
1996	8.7	11.2	14.4	13.3	8.3
1997	6.0	5.0	12.2	11.3	6.0
1998	8.3	4.7	10.9	12.5	6.8
1999	7.9	8.4 *	9.8 *	12.5 *	7.9*
2000	8.7	6.9 *	10.0 *	12.8 *	7.1*
2001	10.0	7.1 *	8.8 *	10.7 *	7.2*
2002	N/A	7.1 *	10.0 *	12.1 *	7.4*
2003	N/A	5.6 *	8.9 *	11.3 *	6.4*
2004	N/A	6.8*	9.5*	10.8*	7.1*

Table 25b. Annual PM_{fine} and $PM_{2.5}$ Concentrations in the Phoenix Metropolitan Area(in $\mu g/m^3$)							
	Higley	**Tempe**	**Supersite**	**ASU West**	**Estrella**	**West PHX**	**Apache Junction**
1995	**15.4**	10.0	12.6	11.1	11.7	N/A	N/A
1996	11.1	10.0	13.4	10.5	11.1	N/A	N/A
1997	10.4	9.8	12.1	9.1	7.9	N/A	N/A
1998	9.4	9.4	10.9	8.3	7.1	N/A	N/A
1999	11.1	10.7 *	12.2 *	9.1	8.9	N/A	7.4 *
2000	10.0	10.3 *	11.4 *	8.5	7.7	13.8 *	7.2 *
2001	N/A	9.3 *	9.2 *	N/A	7.4	10.8 *	6.2 *
2002	N/A	10.3 *	11.6 *	N/A	6.7	12.5*	6.3 *
2003	N/A	9.6 *	11.2 *	N/A	7.3	10.6 *	6.3 *
2004	N/A	N/A	9.7*	N/A	N/A	11.6*	5.5*

Table 25c. Annual PM_{fine} and $PM_{2.5}$ Concentrations in the Tucson Metropolitan Area(in µg/m^3)						
	Orange Grove	**22/Cray-croft**	**Tangerine**	**Fairgrounds**	**Central**	**Children's Park**
1994	9.4	7.9	5.3	5.8	8.9	N/A
1995	8.9	8.6	5.3	5.1	8.9	N/A
1996	8.2	6.4	4.9	4.7	7.7	N/A
1997	8.7	7.3	5.1	5.5	8.4	N/A
1998	7.3	6.3	5.0	5.0	7.5	N/A
1999	9.6 *	7.5	N/A	N/A	7.2	8.7 *
2000	7.7 *	N/A	N/A	N/A	7.8	6.8 *
2001	7.6 *	6.0	N/A	N/A	7.6	6.8*
2002	6.3*	8.6	N/A	N/A	8.3	6.6*
2003	6.4*	7.5	N/A	N/A	9.7	6.5*
2004	5.8*	N/A	N/A	N/A	N/A	6.6*

Bold values in yellow exceed the annual standard of 15 µg/m^3.

N/A – Not available.

* Data are from federal reference monitors, not dichot monitors.

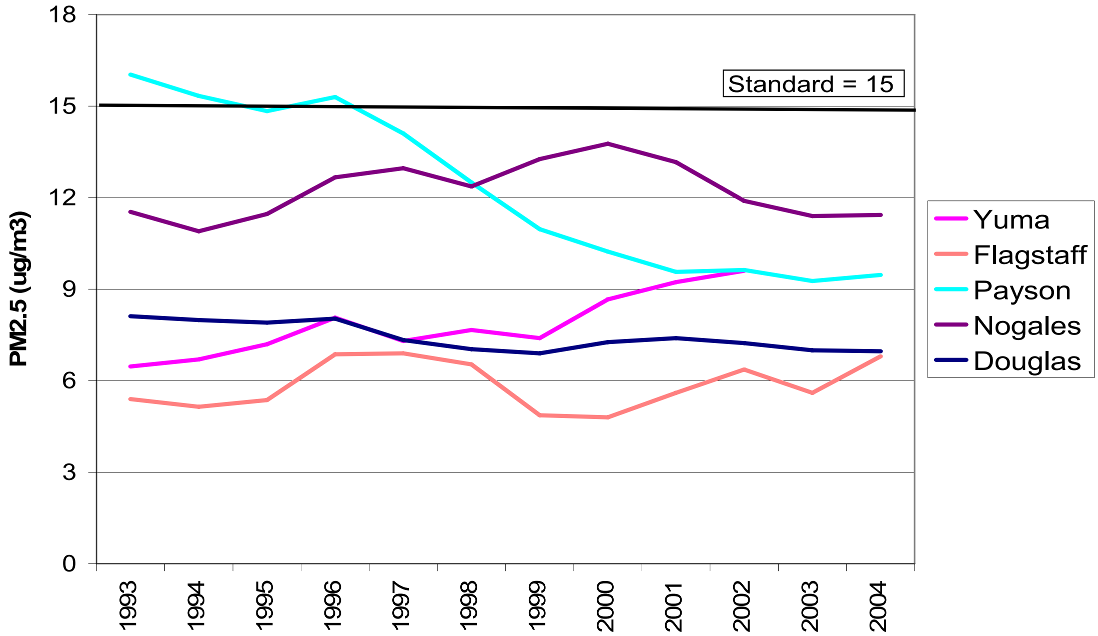


Figure 19: Statewide three-year moving averages of annual averages of $PM_{2.5}$

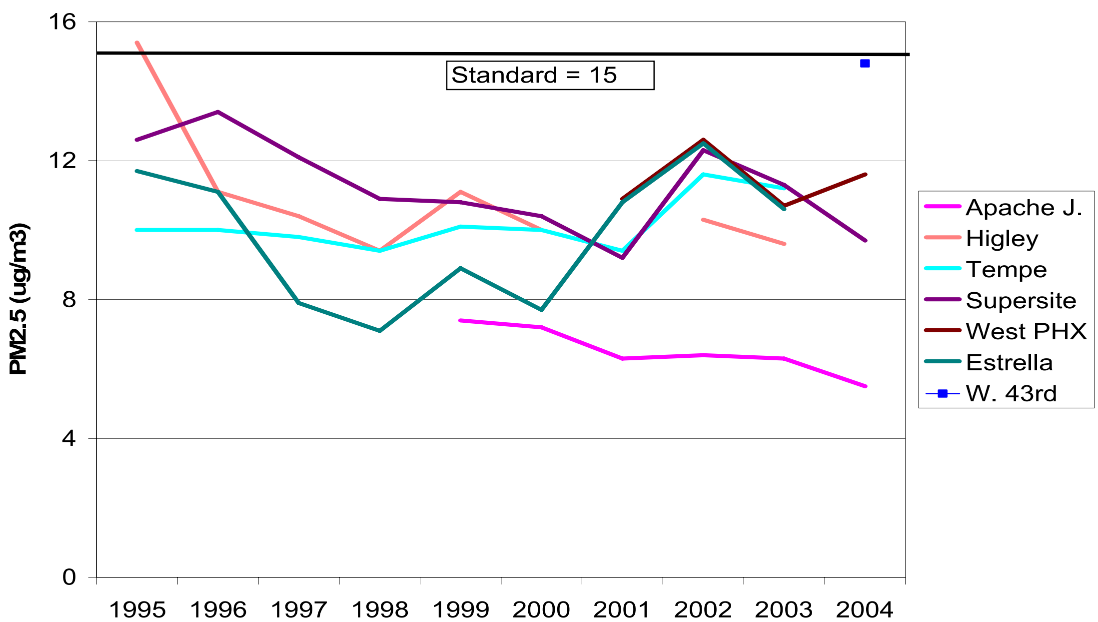


Figure 20: Metropolitan Phoenix annual averages of $PM_{2.5}$

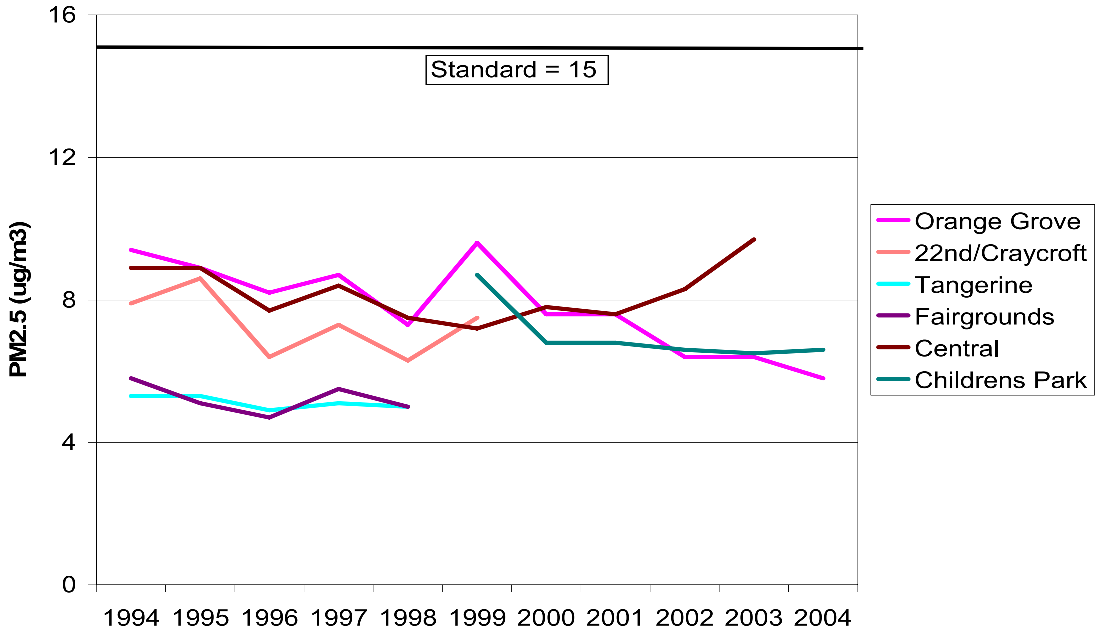


Figure 21: Metropolitan Tucson annual averages of $PM_{2.5}$

Visibility

Optical measurements of visibility have been made continuously since 1993 in Tucson and since 1994 in Phoenix. Light extinction – the degree to which light is reduced by its interaction with particles and gases in the atmosphere – is measured continuously with transmissometers. These measurements have been divided into six categories: the mean of the dirtiest 20 percent of all hours, the mean of all hours and the mean of the cleanest 20 percent of all hours – for both the entire day and the 5 to 11 a.m. period. The units of measurement are inverse megameters (Mm^{-1}): the higher the light extinction value in Mm^{-1}, the more visibility is reduced. Table 26 and Figures 22 and 23 present these data.

Table 26a: Light Extinction in Phoenix (in Mm^{-1})						
Phoenix						
Year	**All Hours**			**5-11 a.m.**		
	Dirtiest 20%	**Mean**	**Cleanest 20%**	**Dirtiest 20%**	**Mean**	**Cleanest 20%**
1994	N/A	64	29	N/A	70	33
1995	141	77	38	137	80	43
1996	134	78	43	130	80	45
1997	131	81	48	136	87	53
1998	133	78	45	136	84	50
1999	127	72	38	128	77	42
2000	131	74	38	134	80	42
2001	118	69	36	118	73	42
2002	124	75	42	125	79	46
2003	131	72	36	135	78	42
2004	121	69	35	126	75	42

N/A - Data not available

Table 26b: Light Extinction in Tucson (in Mm^{-1})						
Tucson						
	All Hours			**5-11 a.m.**		
Year	**Dirtiest 20%**	**Mean**	**Cleanest 20%**	**Dirtiest 20%**	**Mean**	**Cleanest 20%**
1993	101	60	34	139	74	37
1994	95	59	36	109	68	41
1995	104	62	35	116	69	38
1996	99	62	37	113	71	40
1997	93	60	36	108	68	38
1998	102	57	28	119	69	34
1999	90	57	35	107	65	38
2000	98	56	27	114	66	31
2001	96	55	26	109	66	33
2002	87	49	24	109	61	29
2003	88	52	26	107	62	30
2004	97	58	27	113	67	32

Distinct trends from these tabular data are somewhat difficult to discern, partly because of the year-to-year variability and partly because the long-term changes for most categories are rather small. Rather than plotting all of these data, this report is limited to the "all hours" categories, since both the "5-11 a.m." and "all hours" trends are virtually identical. Note that Phoenix light extinction values no longer include the dirtiest 20% category for 1994. The fourth quarter of that year, when many of the dirtiest 20% days would occur, was found to have too scant data recovery. In Figures 22 and 23 these light extinction data have been plotted as three-year moving averages. The first year shown, 1996, is the average of 1994, 1995, and 1996, and so on.

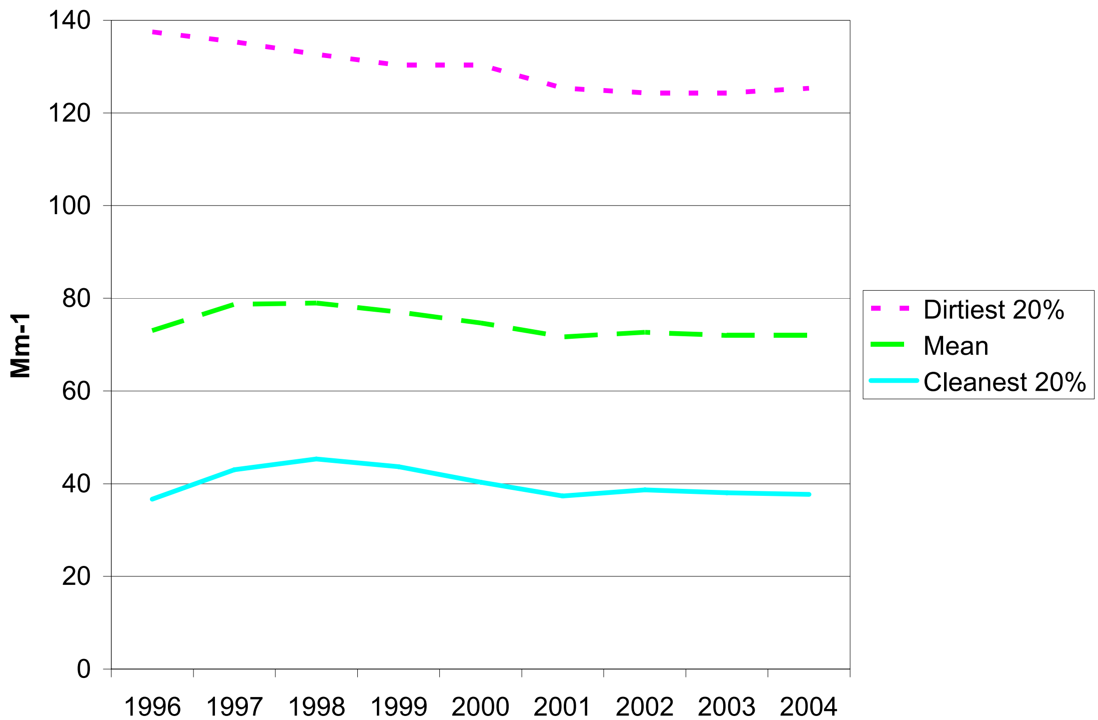


Figure 22: Light extinction trends for Phoenix, shown as three-year moving averages, for all hours

Considering Phoenix first, the steady improvement through 2002 in the 20% dirtiest category is evident. The most recent period in this category is 10% lower than the first period. For both the mean and 20% cleanest days, however, the steadily downward trend of the dirtiest 20% category is replaced by a more complicated trend – one in which the first two periods increase through 1998, but the subsequent periods gradually decrease and eventually level out. The change from the most recent to the first period for these two categories is near zero: a 1% decrease for the mean and a 4% increase for the cleanest. What's happened in this ten-year period is that the worst visibility days have gotten somewhat better (10%), but the mean and 20% cleanest days have about the same degree of visibility degradation at the end as at the beginning, albeit with a slight rise in the early years.

Unlike Phoenix, visibility in Tucson has improved between for all three statistics: the dirtiest, the mean, and the cleanest (Figure 23). The improvement in the 20% dirtiest days has been the same as Phoenix – 10% -- but considerably greater improvements have been realized in the other two categories: 12% for the mean and 27% for the cleanest 20%. All trends in both cities level off in the last years, suggesting that urban visibility has stabilized.

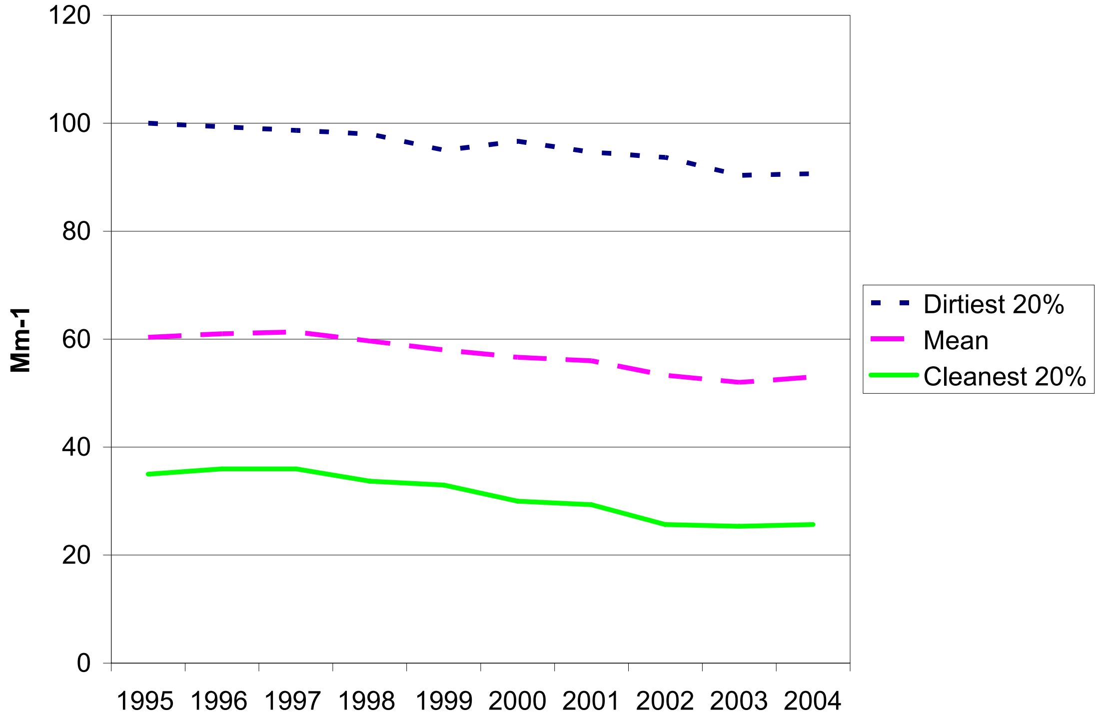


Figure 23: Light extinction trends for Tucson, shown as three-year moving averages, for all hours

Since it's impossible for an observer to distinguish between the various grades of the cleanest 20%, perhaps the overall Phoenix-Tucson trends appear the same to their respective residents. That is, over this eleven-year period, there has been a 10% decrease in the light extinction values for the dirtiest days in both cities. Residents of each metropolitan area, then, have observed improved visibility for these haziest of days. While the worst of the brown clouds are still quite evident, especially on winter mornings, their frequency and severity over both cities have diminished.

An interesting intercity trend (Figure 24) appears in the cleanest 20% category, where, in the first years of monitoring, Tucson and Phoenix had equal values. As the 1990s progressed, however, Tucson's cleanest days grew decidedly cleaner, while Phoenix's cleanest days had increased light extinction for the first half of the period, followed by a gradual decrease and leveling off to the the light extinction value of the initial three-year period (1994 – 1996). The result is that in 2002 – 2004, Tucson's cleanest days were 35% cleaner than in Phoenix (26 Mm^{-1} vs 38 Mm^{-1}).

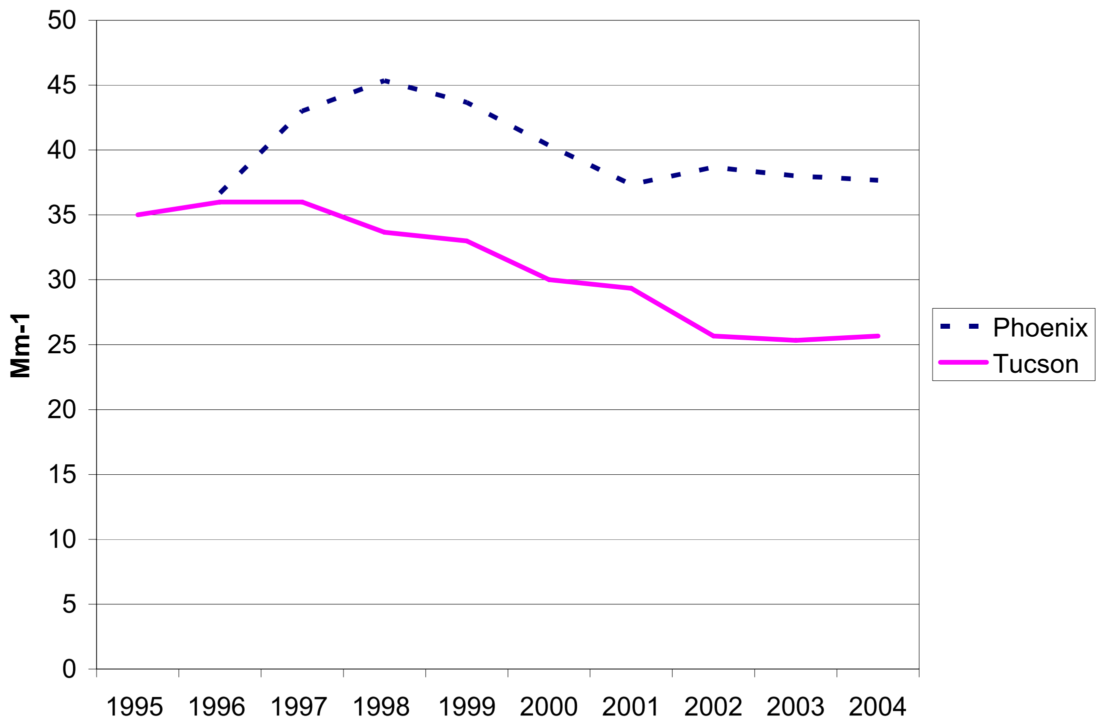


Figure 24: Light extinction trends for all hours for Tucson and Phoenix: three-year moving averages for the cleanest 20% days

Seasonal patterns also vary between the two cites, with the mean and dirtiest 20 percent of all hourly light extinction values in Phoenix showing more pronounced winter and fall maxima than the Tucson counterparts (Figure 25). Both cities show little seasonal variation in the cleanest 20 percent of all hours. The seasonal light extinction values in Phoenix are considerably higher than Tucson's: for the dirtiest 20 percent of all hours, 52 percent higher in winter, 19 percent higher in spring, 13 percent higher in summer and 49 percent higher in fall. The poorer visibility in Phoenix comes as no surprise to those Arizonans familiar with both airsheds.

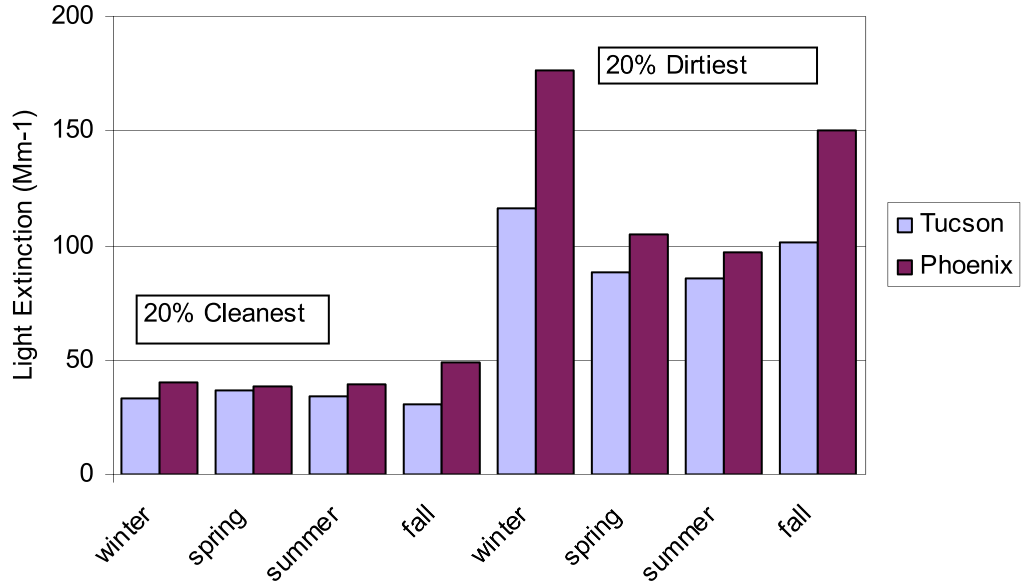


Figure 25: Seasonal variation in light extinction of the 20% cleanest and 20% dirtiest days in Tucson and Phoenix

In the following, final, discussion of visibility, light scattering is compared between the urban and rural areas of the state (Figure 26). In each statistical category rural light scattering is considerably lower than the urban. On the dirtiest 20% days, light scattering values in Phoenix are 3.5 times higher than in the rural areas, while values in Tucson are nearly twice as high. Values for the mean and 20% cleanest days show similar results. An interesting comparison between urban and rural areas is that the light scattering values on the worst 20% days in the rural areas are roughly equal to the mean of the urban areas.

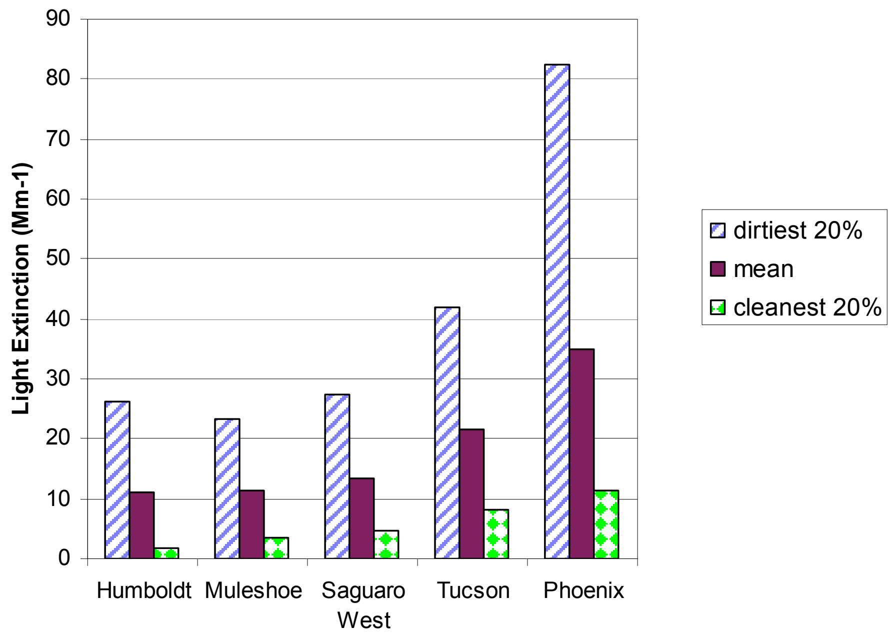


Figure 26: Comparison of light scattering on the 20% cleanest, mean, and 20% dirtiest days for urban and rural areas.

Conclusions

Since monitoring of air pollutants began in the late 1960s in Arizona, considerable progress has been made in reducing concentrations of lead, SO_2, and CO. Lead has been reduced to near background levels; SO_2 concentrations near copper smelters, which chronically exceeded the standards until the mid-1980s, are now well within these standards; and CO concentrations, which regularly exceeded standards in neighborhoods and near busy intersections in Phoenix (and to a far lesser extent in Tucson), now meet the standards. One-hour O_3 concentrations in Phoenix have met the standard since 1997, the first years since monitoring began. Phoenix one-hour ozone concentrations in the 1980s and early 1990s ranged as high as 0.18 parts per million (the standard is 0.12 ppm), in contrast to the highest, most recent reading of 0.14 ppm in 1996. In 1995-1997, 12 monitoring sites in greater Phoenix exceeded the eight-hour O_3 standard; in 2002 - 2004 only one site exceeded the standard.

Elevated concentrations of PM_{10} have been reduced substantially since the mid-1980s, with decreases of 20 to 70 percent in the urban areas and in most rural cities and towns. In Payson and at some industrial sites, PM_{10} concentrations have been reduced by as much as two-thirds. By 2004, monitored violations of the PM_{10} standard – a once common occurrence at many sites only ten years ago – were limited to a few sites. Fine particulates concentrations ($PM_{2.5}$) have decreased in Phoenix and Tucson since the mid 1990s; for example, at the centrally located Phoenix Supersite, the decrease has been 21 percent; at 22nd and Craycroft, in east-central Tucson, the decrease has been 24 percent. Fine particulate trends in rural Arizona, however, have not shown consistency from site to site: Nogales has been steady; Yuma and Flagstaff have increased (by 48 and 26%, respectively); and Douglas and Payson have decreased (by 14 and 48%, respectively).

In spite of the continued growth in Arizona, not a single air pollutant at any site shows a consistent upward trend. Most standards are met all of the time, with the exceptions being the eight-hour O_3 standard on occasional summer days in Phoenix and the PM_{10} standards on both an episodic and annual basis at those sites affected by localized dense emissions. This improved air quality -- resulting from emission control programs at the federal, state and local levels -- has benefited the respiratory health of the citizenry and can be considered a consequence of the public support for a cleaner environment.

Appendix 1 – Site Index

Site Index – Ambient Air Monitoring Locations in Arizona in 2004								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Apache County								
Greer Water Treatment Plant (Mt Baldy)	34° 04'	109° 26'	ADEQ, USFS	Bscat, MET, IMPROVE	Class I	Regional	Visibility	8255
TEP - Springerville – Coalyard	34° 19'	109° 09'	TEP	PM_{10}	SPM	Unknown	Source Impact	6900
TEP - Springerville – Coyote Hills	34° 10'	109° 13'	TEP	NO_2, PM_{10}, SO_2	SPM	Unknown	Source Impact	6600
Cochise County								
Chiricahua NM Entrance Station (3.5 miles west of monument headquarters)	32° 00'	109° 23'	NPS	CASTNET, Bscat, IMPROVE, MET, O_3	Class I	Regional	Visibility	5130
Douglas Red Cross (1445E 15th St.)	31° 20'	109° 30'	ADEQ	IMPROVE, PM_{10}, $PM_{2.5}$	SLAMS (PM_{10}, $PM_{2.5}$), Class I	Neighbor-hood	Population	4100
Muleshoe Ranch (Galiuro Wilderness)	32° 21'	110° 14'	ADEQ	Bscat, MET	Class I	Regional	Visibility	4400
Naco Border Station (218 1st St.)	31° 20'	109° 57'	ADEQ	Bscat	SPM	Neighbor-hood	Population	4623

Site Index – Ambient Air Monitoring Locations in Arizona in 2004								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Paul Spur Chemical Lime Plant	31° 22'	109° 49'	ADEQ	PM_{10}, MET	SLAMS (PM_{10})	Middle	Source Impact	4192
Coconino County								
Flagstaff Middle School (755 N. Bonito)	35° 12'	111° 38'	ADEQ	PM_{10}, $PM_{2.5}$	SLAMS	Neighbor-hood	Population	6906
Grand Canyon NP Hance (South Rim, 2.5 miles west of village)	35° 58'	111° 59'	NPS	O_3, MET, Bscat, IMPROVE, CASTNET	Class I	Regional	Visibility	7438
Grand Canyon NP Indian Garden (4.5 miles from Bright Angel trailhead)	36° 05'	112° 08'	NPS	IMPROVE, Bscat,	Class I	Regional	Visibility	3832
SRP - Page - Navajo Generating Station (3 miles east of Page)	36° 55'	111° 24'	SRP	O_3, NO_2, PM_{10}, SO_2	SPM	Urban	Source Impact	3648
Sedona Post Office (190 W. Highway 89A)	34° 52'	111° 45'	ADEQ	PM_{10}	SPM	Neighbor-hood	Population	4220
Sycamore Canyon (Camp Raymond)	35° 08'	111° 58'	ADEQ, NPS	Bscat, IMPROVE, MET	Class I	Regional	Visibility	6693

Site Index – Ambient Air Monitoring Locations in Arizona in 2004								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Gila County								
ASARCO - Globe Highway	33° 01'	110° 45'	ASARCO	SO_2	SPM	Regional	Source Impact	1950
ASARCO - Hayden - Garfield AVE	33° 00'	110° 47'	ASARCO	SO_2	SPM	Neighbor-hood	Source Impact	2090
ASARCO - Montgomery Ranch	33° 00'	110° 47'	ASARCO	SO_2	SPM	Regional	Source Impact	2325
Hayden - Old Jail (Canyon Drive)	33° 00'	110° 47'	ADEQ, ASARCO	PM_{10}, SO_2	SLAMS (ADEQ SO_2 and PM_{10}) SPM (ASARCO SO_2)	Neighbor-hood	Source Impact	2050
PDMI - Miami – Golf Course	33° 24'	110° 49'	PDMI	PM_{10}	SPM	Neighbor-hood	Source Impact	3320
PDMI - Miami – Jones Ranch (Cherry Flats Rd.)	33° 23'	110° 51'	PDMI	SO_2	SPM	Neighbor-hood	Source Impact	4094
PDMI - Miami – Town Site (Sullivan St.)	33° 23'	110° 52'	PDMI	SO_2	SPM	Neighbor-hood	Source Impact	3390
Miami – Ridgeline (4030 Linden St.)	33° 23'	110° 52'	ADEQ, PDMI	PM_{10}, SO_2	SLAMS (ADEQ SO_2) SPM (PDMI PM_{10})	Neighbor-hood	Source Impact	3560

Site Index – Ambient Air Monitoring Locations in Arizona in 2004								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Payson Well Site (204 W. Aero Dr.)	34° 14'	111° 20'	ADEQ	PM_{10}, $PM_{2.5}$	SLAMS	Neighbor-hood	Population	4910
Pleasant Valley – Ranger Station (Sierra Ancha USFS Wilderness)	34° 05'	110° 56'	ADEQ, USFS	IMPROVE, Bscat, MET	Class I	Regional	Visibility	5133
Tonto NM (Tonto Natl Forest)	33° 39'	111° 07'	ADEQ, USFS	IMPROVE, NO_{TL}, O_3	Class I	Regional	Visibility	2579
Graham County								
Safford (523 Tenth Ave.)	32° 49'	109° 43'	ADEQ	PM_{10}	SLAMS	Neighbor-hood	Population	2950
Maricopa County								
ADEQ Building (1110 W Washington)	33° 26'	112° 05'	ADEQ	Visibility (camera)	SPM (Urban Haze)	Urban	Urban Haze	1079
Banner Mesa Medical Center (525 W Brown AVE)	33° 26'	111° 50'	ADEQ	Visibility (camera & Bext)	SPM (Urban Haze)	Urban	Urban Haze	1485
Bethune Elementary School (1310 S. 15th Ave.)	33° 26'	112° 05'	ADEQ	PM_{10}, Speciated $PM_{2.5}$	SPM, STN	Neighbor-hood	Population	324

Site Index – Ambient Air Monitoring Locations in Arizona in 2004								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Blue Point (Usery Pass and Bush Highway)	33° 33'	111° 36'	MCESD	MET, O_3	SLAMS (MET) NAMS (O_3)	Urban	Maximum Concentration	1575
Buckeye (SR 85 & Buckeye RD)	33° 22'	112° 37'	MCESD	CO, MET, NO_2, O_3, PM_{10}	SLAMS	Neighbor-hood	Population	837
Cave Creek (37109 N. Lava Lane)	33° 49'	112° 01'	MCESD	MET, O_3	SLAMS	Urban	Maximum Concentration	1916
Central Phoenix (1845 E. Roosevelt)	33° 27'	112° 02'	MCESD	CO, MET, NO_2, O_3, PM_{10}, SO_2	SLAMS (MET) NAMS (CO, NO_2, O_3, PM_{10}, SO_2)	Neighbor-hood	Population	1116
Chandler (1475 E. Pecos Rd.)	33° 17'	111° 49'	MCESD	MET, PM_{10}	SLAMS (MET) NAMS (PM_{10})	Neighbor-hood	Population	1171
Durango Complex (2702 AC Esterbrook Blvd.)	33° 25'	112° 07'	MCESD	MET, PM_{10}	SLAMS	Middle	Maximum Concentration	1575
Dysart 16825 N Dysart	33° 38'	112° 20'	MCESD ADEQ	CO, O3, ADEQ(Bscat)	SPM, Bscat (Urban Haze)	Neighbor-hood	Population	870
Estrella (15099 W. Casey Abbott Dr., Goodyear)	33° 23'	112° 22'	ADEQ	Bscat	SPM (Urban Haze)	Neighbor-hood	Population	1000

Site Index – Ambient Air Monitoring Locations in Arizona in 2004								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Estrella Community College (3000 N Dysart RD)	33° 29'	112° 21'	ADEQ	Visibility (camera)	SPM (Urban Haze)	Urban	Urban Haze	997
Falcon Field (4530 E. McKellips)	33° 27'	112° 04'	MCESD	MET, O_3	SLAMS	Urban	Population	1017
Fountain Hills (16426 E. Palisades)	33° 37'	111° 43'	MCESD	MET, O_3	SLAMS (MET) NAMS (O_3)	Neighbor-hood	Maximum Concentration	1444
Glendale (6000 W. Olive)	33° 33'	112° 12'	MCESD	CO, MET, O_3, PM_{10}	SLAMS (CO, MET, O_3), NAMS (PM_{10})	Neighbor-hood	Population	1171
Greenwood (I-10 and 27th Avenue)	33° 28'	112° 07'	MCESD	CO, MET, NO_2, PM_{10}	SLAMS	Microscale	Maximum Concentration	1110
Higley (15500 S. Higley Rd.)	33° 18'	111° 43'	MCESD	MET, PM_{10}	SLAMS (MET) SPM (PM_{10})	Neighbor-hood	Population	1250
Humboldt Mountain (Pine Mountain Wilderness)	33° 58'	111° 47'	MCESD	O_3	SLAMS	Regional	Background/ Transport	5230
JLG Supersite (4530 N. 17 Ave.)	33° 30'	112° 05'	ADEQ	Bscat, CO, NO_2, Met, O_3, PM_{10}, $PM_{2.5}$, VOC, Speciated $PM_{2.5}$	SPM (Urban Haze) SLAMS (CO, NO_2, O_3, $PM_{2.5}$) PAMS (Type 2) STN	Neighbor-hood	Population	1115

Site Index – Ambient Air Monitoring Locations in Arizona in 2004								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Maryvale (6180 W. Encanto) Closed 03/31/2004	33° 28'	112° 20'	MCESD	CO, O_3, PM_{10}	SLAMS	Neighbor-hood	Population	1050
Mesa (370 S. Brooks)	33° 24'	111° 51'	MCESD	CO, MET, PM_{10}	SLAMS	Neighbor-hood	Population	1221
Mesa City Building (Lewis & Main)	33° 24'	111° 49'	ADEQ	Bext	SPM (Urban Haze)	Urban	Urban Haze	1115
North Mountain Summit (North Mountain)	33° 35'	112° 05'	ADEQ	Visibility (camera)	SPM (Urban Haze)	Urban	Urban Haze	1640
North Phoenix (601 E. Butler)	33° 33'	112° 04'	MCESD	CO, MET,O_3, PM_{10},	SLAMS	Neighbor-hood	Population	1243
Palo Verde (36248 W. Elliot Rd.)	33° 20'	112° 50'	ADEQ	O_3, PM_{10}	SLAMS	Regional	Background	870
Phoenix Transmissometer Receiver (3600 N 2nd AVE)	33° 29'	112° 04'	ADEQ	Bext	SPM (Urban Haze)	Urban	Urban Haze	1115

Site Index – Ambient Air Monitoring Locations in Arizona in 2004								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Phoenix Transmissometer Transmitter (2000 W Bethany RD)	33° 29'	112° 04'	ADEQ	Bext	SPM (Urban Haze)	Urban	Urban Haze	1115
Pinnacle Peak (25000 N. Windy Walk)	33° 42'	111° 51'	MCESD	MET, O_3	SLAMS	Urban	Maximum Concentration	2625
Rio Verde (25608 N. Forest Rd.)	33° 43'	111° 40'	MCESD	O_3	SLAMS	Urban	High Downwind Concentration	1640
South Phoenix (33 W. Tamarisk)	33° 24'	112° 04'	MCESD	CO, MET, O_3, PM_{10}	NAMS (PM_{10}) SLAMS (CO, MET, O_3)	Neighbor-hood	Population	1083
South Scottsdale (2857 N. Miller)	33° 28'	111° 55'	MCESD	CO, MET, NO_2, O_3, PM_{10}, SO_2	SLAMS (CO, MET) NAMS (NO_2, O_3, PM_{10}, SO_2)	Urban/ Neighbor-hood	Population	1227
Tempe (1525 S College AVE)	33° 35'	111° 55'	MCESD	CO, MET, NO_2, O_3	SPM	Neighbor-hood	Population	1181
Tempe Community Center (3340 S. Rural Rd.) Closed 07/26/2004	33° 23'	111° 55'	ADEQ	$PM_{2.5}$	SLAMS	Neighbor-hood	Population	1110

Site Index – Ambient Air Monitoring Locations in Arizona in 2004								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Vehicle Emissions Laboratory (600 N 40th ST)	33° 27'	112° 00'	ADEQ	MET, Bscat	SPM Urban Haze (Bscat)	Urban	Meteorology	1050
West Chandler (163 S. Price)	33° 18'	111° 53'	MCESD	CO, MET, O_3, PM_{10}	SLAMS	Neighbor-hood	Population	1120
West Forty Third (3940 W Broadway)	33°24'	112° 08'	MCESD	MET, PM_{10}, Speciated $PM_{2.5}$	SPM (PM_{10}), STN	Neighbor-hood	Maximum Concentration	1030
West Indian School (3315 W. Indian School Rd.)	33°30'	112° 08'	MCESD	CO, MET	NAMS (CO) SLAMS (MET)	Micro	Maximum Concentration/ Source Impact	1115
West Phoenix (3847 W. Earll)	33° 29'	112° 08'	ADEQ, MCESD	CO, MET, NO_2, O_3, PM_{10}, $PM_{2.5}$, Speciated $PM_{2.5}$	SPM (ADEQ $PM_{2.5}$) SLAMS (MET, NO_2, O_3) NAMS (CO, PM_{10}), STN	Neighbor-hood	Population	1096
Mohave County								
Bullhead City (990 Hwy 95)	35° 09'	114° 33'	ADEQ	PM_{10}	SLAMS	Neighbor-hood	Population	560
Kingman – Praxair NE #1 (I-40 and Griffith Road)	35" 01'	114° 08'	Praxair	PM_{10}	SPM	Middle	Source Impact	3000

Site Index – Ambient Air Monitoring Locations in Arizona in 2004								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Kingman – Praxair SW #2 (I-40 and Griffith Road)	35" 01'	114° 09'	Praxair	PM_{10}	SPM	Middle	Source Impact	3000
Navajo County								
Petrified Forest NP (1 mile north of park headquarters)	35° 05'	109° 46'	NPS	Bscat, IMPROVE,MET, O_3	Class I	Regional	Visibility	5778
Show Low (Deuce of Clubs Avenue)	34° 15'	110° 02'	ADEQ	PM_{10}	SLAMS	Neighbor-hood	Population	1924
Pima County								
22nd St. & Alvernon (3895 E. 22nd)	32° 12'	110° 54'	PDEQ	CO	NAMS	Micro	Maximum Concentration	2516
22nd St. & Craycroft (1237 S. Beverly)	32° 12'	110° 52'	ADEQ, PDEQ	Bscat, CO, O_3, NO_2, SO_2,	SPM (ADEQ Urban Haze Bscat) SLAMS (PDEQ CO, O_3, NO_2, SO_2)	Neighbor-hood	Population	2582
Ajo (Well Road)	32° 25'	112° 50'	ADEQ	PM_{10}, MET	SLAMS (PM_{10})	Neighbor-hood	Population	1800
Broadway & Swan (4625 E. Broadway)	32° 13'	110° 53'	PDEQ	PM_{10}	NAMS	Middle	Maximum Concentration	2532

Site Index – Ambient Air Monitoring Locations in Arizona in 2004								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Cherry & Glenn (2745 N. Cherry)	32° 15'	110° 56'	PDEQ	CO	SPM	Neighbor-hood	Population	2400
Children's Park (400 W. River Rd.)	32° 17'	110° 58'	ADEQ, PDEQ	Bscat, CO, NO_2, O_3, $PM_{2.5}$, Speciated $PM_{2.5}$	SPM ($PM_{2.5}$ & ADEQ Urban Haze Bscat) SLAMS (NO_2, O_3) NAMS (CO), STN	Urban, Neighbor-hood	Population	2286
Coachline (9597 N Coachline Blvd)	32° 22'	111° 07'	PDEQ	O_3, $PM_{2.5}$	SPM	Neighbor-hood	Population	2227
Corona De Tucson (22000 S. Houghton Rd.)	32° 00'	110° 47'	PDEQ	PM_{10}	SLAMS (PDEQ)	Regional	Background	3078
Geronimo (2498 N. Geronimo)	32° 15'	110° 57'	PDEQ	PM_{10}	SPM (For AQI Purposes Only)	Neighbor-hood	Population	2580
Golf Links & Kolb (2601 S. Kolb Rd)	32° 11'	110° 50'	PDEQ	CO	SPM	Neighbor-hood	Population	2660
Green Valley (601 N. La Canada Dr.)	31° 52'	110° 59'	PDEQ	PM_{10}	SLAMS	Neighbor-hood	Population Explosure	2903
Orange Grove (3401 W. Orange Grove Road)	32° 19'	111° 02'	PDEQ	$PM_{10,}$ $PM_{2.5}$	SLAMS (PDEQ $PM_{10,}$ $PM_{2.5}$)	Neighbor-hood	Maximum Concentration/ Population	2175

Site Index – Ambient Air Monitoring Locations in Arizona in 2004								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Organ Pipe Cactus NM (1 mile SSW of visitor center)	31° 58'	112° 48'	ADEQ	PM_{10}, IMPROVE, Bscat	SLAMS (PM_{10})	Regional	Background/ Transport, Visibility	1847
Prince Road (1016 W. Prince Rd.)	32° 16'	110° 59'	PDEQ	PM_{10}	NAMS	Micro	Source Impact	2315
Rillito (8820 W. Water)	32° 25'	111° 10'	ADEQ, APCC	PM_{10}	SLAMS (ADEQ) SPM (APCC)	Neighbor-hood	Source Impact	2055
Rose Elementary (710 W. Michigan St.)	32° 10'	110° 58'	PDEQ	PM_{10}	SPM	Urban	Population	2550
Saguaro NP East (3905 S. Old Spanish Trail)	32° 11'	110° 44'	PDEQ, NPS	O_3, IMPROVE	SPM, Class I	Urban	Visibility	3081
Saguaro NP West	32° 14'	111° 10'	ADEQ, NPS	Bscat, MET, IMPROVE	Class I	Regional	Visibility	2473
Santa Clara (6910 S. Santa Clara Ave.)	32° 07'	110° 58'	PDEQ	PM_{10}	SLAMS	Neighbor-hood	Population	2540
South Tucson (1601 S. 6th Ave.)	32° 12'	110° 58'	PDEQ	PM_{10}	SLAMS (PDEQ)	Neighbor-hood	Population	2440

Site Index – Ambient Air Monitoring Locations in Arizona in 2004								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Tangerine (12101 N. Camino De Oeste)	32° 25'	110° 04'	PDEQ	O_3, PM_{10}	SLAMS	Urban	Population	2638
Tucson Downtown (190 W. Pennington)	32° 13'	110° 58'	PDEQ	CO, O_3	SLAMS	Neighbor-hood	Population	2365
Tucson Fairgrounds (11330 S. Houghton)	32° 03'	110°46'	PDEQ	O_3	SLAMS	Neighbor-hood	Population	3078
Tucson Transmissometer Transmitter (U of A Clinical Sci. Bldg 1501 N. Campbell)	32° 14'	110° 57'	PDEQ, ADEQ	Bext	SPM (Urban Haze)	Urban	Urban Haze	2551
Tucson Transmissometer Receiver (150 W. Congress)	32° 13'	110° 58'	PDEQ, ADEQ	Bext	SPM (Urban Haze)	Urban	Urban Haze	2551
Tucson – U of A Central (1100 N. Fremont Ave.)	32° 13'	110° 57'	ADEQ	Bscat	SPM (Urban Haze)	Neighbor-hood	Population	2580
Pinal County								

Site Index – Ambient Air Monitoring Locations in Arizona in 2004								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Apache Junction Fire Station (3955 E. Superstition Blvd. TE)	33° 25'	111° 30'	PCAQCD	$PM_{2.5}$, PM_{10}	SLAMS	Neighbor-hood	Population	1750
Apache Junction Maintenance Yard (305 E. Superstition)	33° 25'	111° 52'	PCAQCD	O_3, MET	SLAMS	Neighbor-hood	Population	1750
ASARCO - Hayden Junction (Hwy 177)	33° 00'	110° 50'	ASARCO	SO_2	SPM	Unknown	Source Impact	2080
Casa Grande Airport (660 W. Aero Dr.)	32° 54'	111° 46	PCAQCD	O_3, MET	SLAMS	Neighbor-hood	Population/ Transport	1410
Casa Grande Downtown (401 Marshall Rd.)	32° 52'	111° 45'	PCAQCD	PM_{10}, $PM_{2.5}$	SLAMS	Neighbor-hood	Population	1378
Combs (301 E. Combs Rd.)	33° 13'	111° 33'	PCAQCD	O_3	SPM	Neighbor-hood	Population	1178
Coolidge Maintenance Yard (212 E. Broadway)	32° 58'	111° 30'	PCAQCD	PM_{10}	SLAMS	Neighbor-hood	Population	1444
Cowtown Road (37580 W. Maricopa)	33° 00'	111° 59'	PCAQCD	MET, PM_{10}	SPM	Neighbor-hood	Population	1214

Site Index – Ambient Air Monitoring Locations in Arizona in 2004

City/Site and Address	Lat.	Long.	Operator	Parameters Measured	Classification	Scale	Objective	Elev. (feet)
Eloy City Complex (620 N. Main St.)	32° 45'	111° 33'	PCAQCD	PM_{10}	SLAMS	Neighbor-hood	Population	1562
Mammoth County Complex (118 S. Catalina)	32° 43'	110° 39'	PCAQCD	PM_{10}	SLAMS	Neighbor-hood	Population/ Background	2920
Maricopa (44625 W. Garvey Rd.)	33° 03'	110° 39'	PCAQCD	O_3	SPM	Neighbor-hood	Population/Exposure	1178
Pinal Air Park (Water Well # 2, Marana)	32° 31'	111° 20'	PCAQCD	PM_{10}	SLAMS	Regional	Background/ Transport	1870
Pinal County Housing Complex (970 N Eleven Mile Corner Rd.)	32° 54'	111° 34'	PCAQCD	MET, PM_{10}	SPM	Microscale	Source Impact	1440
Queen Valley (10 S. Queen Anne Dr.)	32° 17'	111° 17'	PCAQCD, ADEQ	Bscat, IMPROVE, VOC, NO_{TL}, O_3	SPM (NO_{TL}, O_3) PAMS (VOC),Class I	Regional	Visibility	2080
Riverside Maintenance Yard (56964 E. Florence)	33° 06'	110° 58'	PCAQCD	PM_{10}	SPM	Neighbor-hood	Source Impact	540
San Manuel (1st & Douglas Ave.)	32° 36'	110° 38'	ADEQ	SO_2	SPM	Neighbor-hood	Source Impact	1089

Site Index – Ambient Air Monitoring Locations in Arizona in 2004								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Stanfield (36697 W. Papago Dr.)	32° 53'	111° 57	PCAQCD	PM_{10}	SPM	Neighbor-hood	Population	1296
Santa Cruz								
Nogales Post Office (300 N. Morley Ave.)	31° 20'	110° 56'	ADEQ	PM_{10}, $PM_{2.5}$, MET	SLAMS	Neighbor-hood	Population	3858
Yavapai County								
Clarkdale – NW (#2) (northwest of cement plant)	34° 45'	112° 05'	PCC	PM_{10}	SPM	Unknown	Source Impact	3500
Clarkdale – SE (#1) (southeast of CTI flyash silo)	34° 45'	112° 05'	PCC	PM_{10}	SPM	Unknown	Source Impact	3500
Hillside (Sheriff's Repeater Station)	34° 25'	112° 57'	ADEQ	O_3, IMPROVE	SPM, Class I	Regional	Background/ Transport, Visibility	4918
Ike's Backbone (Pine Mountain Wilderness)	34° 20'	111° 40'	ADEQ, USFS	IMPROVE, Bscat	Class I	Regional	Visibility	5232
Nelson – East (1/2 mile east of Flintkote lime plant)	35° 31'	113°17'	ADEQ	MET	SPM	Neighbor-hood	Source Impact	5472

Site Index – Ambient Air Monitoring Locations in Arizona in 2004								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Prescott (221 S. Cortez) Closed 3/01/2004	34° 32'	112° 28'	ADEQ	PM_{10}	SPM	Neighbor-hood	Population	5210
Prescott Valley (7601 E. Civic Circle) Opened 3/12/2003	34° 35'	112° 19'	ADEQ	PM_{10}	SPM	Neighbor-hood	Population	5100
Yuma County								
Dome Valley (5110 S. Avenue 18 E) Opened 5/13/2004	32° 29'	114° 46'	ADEQ	MET	SPM	N/A	Special Study	180
San Luis (767 N. 1st Ave.) Opened 5/13/2004	32° 29'	114° 46'	ADEQ	MET	SPM	N/A	Special Study	115
Yuma – Courthouse (2440 W. 28th St.)	32° 40'	114° 39'	ADEQ	PM_{10}	SLAMS	Neighbor-hood	Population	210
Yuma Game & Fish (9140 E. 28th St.) Opened 4/14/2004	32° 40'	114° 28'	ADEQ	O_3	SLAMS	Neighbor-hood	Maximum Concentration	200
Yuma Mesa (2186 W. County 15th St.) Opened 5/13/2004	32° 36'	114° 38'	ADEQ	MET	SPM	N/A	Special Study	190

Site Index – Ambient Air Monitoring Locations in Arizona in 2004								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Yuma Valley (11486 S. Farm Rd.) Opened 5/13/03	32° 37'	114° 45'	ADEQ	MET	SPM	N/A	Special Study	90
Mexico								
Agua Prieta Fire Station (Calle 6 & AVE 15)	31°19'	109°33'	ADEQ	PM_{10}, MET	SPM	Neighbor-hood	Population	3937
Baja	32°34'	115°0'	ADEQ	MET	SPM	Neighbor-hood	Population	45
Cortez	32°22'	114°52'	ADEQ	MET	SPM	Neighbor-hood	Population	69
Sonora Nogales Fire Station (Northwest corner of Lopaz and Mantels)	31°20'	110°57'	ADEQ	PM_{10}	SPM	Neighbor-hood	Population	3945
Sonora	32°25'	114°47'	ADEQ	MET	SPM	Neighbor-hood	Population	109

Sites shown in the site index table are based on the best information available at the date of publication.

N/A – Not available

Appendix 2 – Acronyms and Abbreviations

ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
AgBMP	Agricultural Best Management Practices
APCC	Arizona Portland Cement Co.
APS	Arizona Public Service
Area A	Designated Phoenix metropolitan area
ASARCO	ASARCO, Inc.
ASU	Arizona State University
B_{abs}	Light absorption
B_{ag}	Light absorption by gasses
B_{ap}	Light absorption by particles
B_{ext}	Light extinction
B_{scat}	Light scattering
B_{sg}	Light scattering by gasses
B_{sp}	Light scattering by particles
BACM	Best Available Control Measures
BHP	BHP Copper, Inc.
CAAA	1990 Clean Air Act Amendments
CASTNET	Clean Air Status and Trends Network
CFR	Code of Federal Regulations
Class I	Federally designated park or wilderness area with mandated visibility protection
CMSA	Consolidated Metropolitan Statistical Area
CO	Carbon monoxide
CTOC	Cap and Trade Oversight Committee
Delta T	Difference between two levels of temperature measurements
EPA	U.S. Environmental Protection Agency
FMIC	Ft. McDowell Indian Community
FRM	Federal Reference Method
GRIC	Gila River Indian Community
HAPs	Hazardous Air Pollutants
HART	Hazardous Air Response Team
HC	Hydrocarbon
IMPROVE	Interagency Monitoring of Protected Visual Environments
ITEP	Institute for Tribal Environmental Professionals
km	Kilometers
m	Meters
MAG	Maricopa Association of Governments
MCAQD	Maricopa County Air Quality Division
MET	Meteorological measurements (wind, temperature, relative humidity)
mm	Millimeter
Mm^{-1}	Inverse megameter
MSA	Metropolitan Statistical Area

$\mu g/m^3$	Micrograms per cubic meter
MSM	Most Stringent Measures
NAAQS	National Ambient Air Quality Standards
NAMS	National Air Monitoring Station
NEAP	Natural Event Action Plan
NM	National Monument
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_X	Sum of NO and NO_2
NPS	National Park Service
O_3	Ozone
PAMS	Photochemical Assessment Monitoring Station
Pb	Lead
PCC	Phoenix Cement Company
PDEQ	Pima County Department of Environmental Quality
PDMI	Phelps Dodge Miami Inc.
PCAQCD	Pinal County Air Quality Control District
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter $\leq$ 2.5 microns
PM_{10}	Particulate Matter $\leq$ 10 microns
ppb	parts per billion
ppm	parts per million
Pressure	Barometric air pressure
RH	Relative Humidity
SCE	Southern California Edison
SIP	State Implementation Plan
SLAMS	State and Local Air Monitoring Station
SO_2	Sulfur Dioxide
SO_4^{--}	Sulfate
SPM	Special Purpose Monitor
SRP	Salt River Project
SRPMIC	Salt River Pima-Maricopa Indian Community
STN	Speciation Trends Network
TEOM	Tapered Element Oscillating Microbalance
TEP	Tucson Electric Power
TSP	Total Suspended Particulates
U of A	University of Arizona
USFS	U.S. Forest Service
VOC	Volatile Organic Compounds
VIOC	Visibility Index Oversight Committee
Wind	Wind speed and direction
WMAT	White Mountain Apache Tribe

Appendix 3 – Related Web Sites

Air Explorer (http://www.epa.gov/airexplorer/)
Air Explorer is a collection of user friendly visualization tools for air quality analysts. It is linked directly to the EPA's Air Quality Subsystem database.

AirWeb: Protecting Air Quality (http://www2.nature.nps.gov/ard/)
Learn about how the National Park Service Air Resources Division and the Fish and Wildlife Service Air Quality Branch strive to preserve, protect, enhance and understand the air quality and other resources of our national parks and refuges.

Arizona Department of Environmental Quality (www.azdeq.gov)
ADEQ's Web site contains information on air quality, news releases, public meetings and many other services that can provided that help to protect a safe and healthy environment.

Earth 911: Making Every Day Earth Day! (www.earth911.org)
That's their mission "to make every day an earth day!" so you can act on today's environmental issues, in order to preserve and maintain for today and tomorrow.

Earth's Biggest Environment Search Engine (www.webdirectory.com)
This Web site is a directory to numerous environmental subjects, from air to wildlife.

Environmental Protection Agency (www.epa.gov)
On EPA's Web site, you can find information about the federal government's role in environmental protection.

EPA – Air and Radiation (www.epa.gov/oar/oaqps)
You'll breathe easier when you see EPA's air quality planning and standards Web site. They have from what's new in air to the latest projects, programs and contracts.

EPA's – AIRNow (www.epa.gov/airnow/)
Easy access to local air quality forecasts, real-time data, air quality index (AQI), animated color contours of measured AQI values for geographic areas and more.

EPA's Air Quality Database (www.epa.gov/air/data/index.html)
EPA's air quality database contains extensive air data. On this site, you can find the sources that contribute to emissions, the equipment and facilities that monitor the air, maps on any air-related information, and contact information for experts on specific issues regarding air and environment.

EPA – Region 9 (http://www.epa.gov/region09/)
Learn about EPA activities in Arizona, California, Hawaii, Nevada and the Pacific Islands at the Region 9 website.

FirstGov (www.firstgov.gov)
Through this Web site, you can find more than 1,000 federal and state environmental agencies with details about the environment and how you can be a political environmental advocate.

The Interagency Monitoring of Protected Visual Environments Project (http://vista.cira.colostate.edu/improve/)
On this site, you can take a look at photos of what haze (pollution) can do to the beautiful views of our nation. You can also take a look at what is being done and how you can get involved to improve the views of our nation.

Inter Tribal Council of Arizona, Inc. (www.itcaonline.com)
The site lists the member tribes and includes information about environmental monitoring programs.

Maricopa County Air Quality Information (www.maricopa.gov/envsvc/airqual.asp)
Maricopa County's Environmental Services' Web site has specific descriptions plus current and historical data on the county's air monitors.

National Tribal Environmental Council (www.ntec.org)
NTEC is a tribal government membership organization with 160 member tribes that work to protect and preserve the reservation environment.

National Weather Service (www.nws.noaa.gov)
Dive into the latest occurrences and studies of your weather and atmosphere. There are links to local weather service agencies in each state.

Visibility Web Cameras (http://www.phoenixvis.net)
This page provides an overview of all Phoenix Visibility Web Cameras. Digital images from Web-based cameras are updated every 15 minutes.

Pima County Air Quality Information (www.deq.co.pima.az.us)
The Pima County Department of Environmental Quality's Web site has information about air, water and waste programs, and the latest news and regulations that affect Pima County.

Pinal County Air Quality Information (http://co.pinal.az.us/airqual/monitoring.asp)
Current air quality information from the Pinal County Air Quality Control District.

Pollen Information (www.pollen.com)
Does it feel like something is in the air? Visit pollen.com to find out about what kinds of allergens are in your air and when they are there.

The United States National Park Service (www.nps.gov)
Information about our national parks.

Visibility Information Exchange Web System (VIEWS)
(http://vista.cira.colostate.edu/views/)
The Visibility Information Exchange Web System is an online exchange of visibility data, research, and ideas designed to support the Regional Haze Rule enacted by the U.S. Environmental Protection Agency (EPA) to reduce regional haze in national parks and wilderness areas. In addition to this primary goal, VIEWS supports global efforts to better understand the effects of air pollution on visibility and to improve air quality in general.

Weather and Air Quality in the Southwest (www.weathersmith.com)
This site contains weather forecasts and air quality information for Phoenix and Tucson.

Western States Air Resources Council (www.westar.org)
WESTAR is composed of 15 western states that have come together to discuss and exchange information on western regional air quality issues.

Appendix 4 – Maps

This section contains maps displaying monitor locations and location information.

Ambient Air Monitors 2004
This map shows the location of monitors operated by ADEQ, county agencies, private industry and federal agencies.

Air Quality Monitor Networks – Phoenix and Tucson Metropolitan Areas
These maps identify the locations of monitors of criteria pollutants in Arizona's two largest metropolitan areas.

Air Quality Division Nonattainment Areas
This map identifies the areas in Arizona that are nonattainment for PM_{10}, SO_2, CO and O_3.

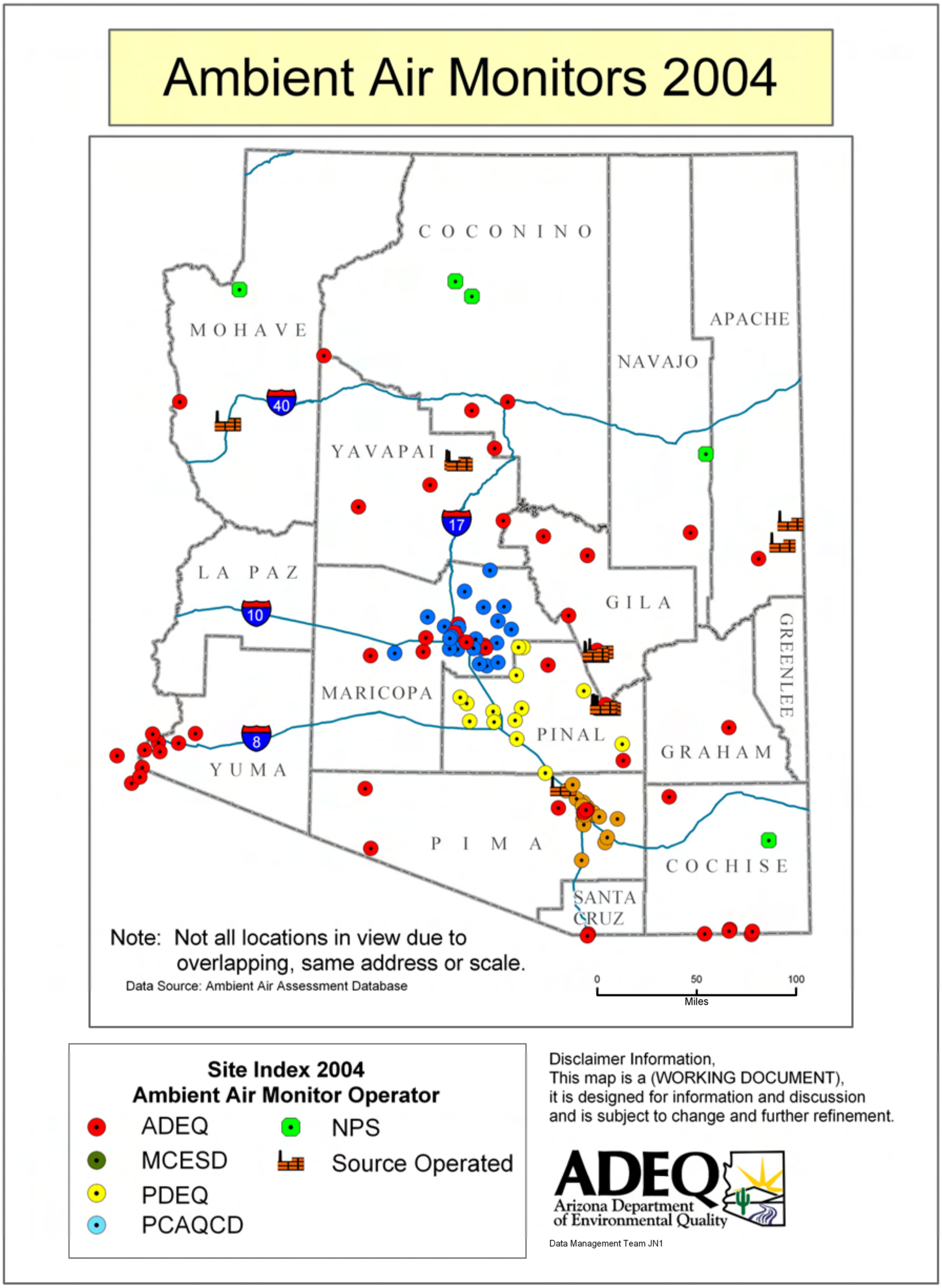
Ozone Network Statewide
This map displays the location of ozone monitors operated by ADEQ, private industry, county agencies, and the National Park Service.

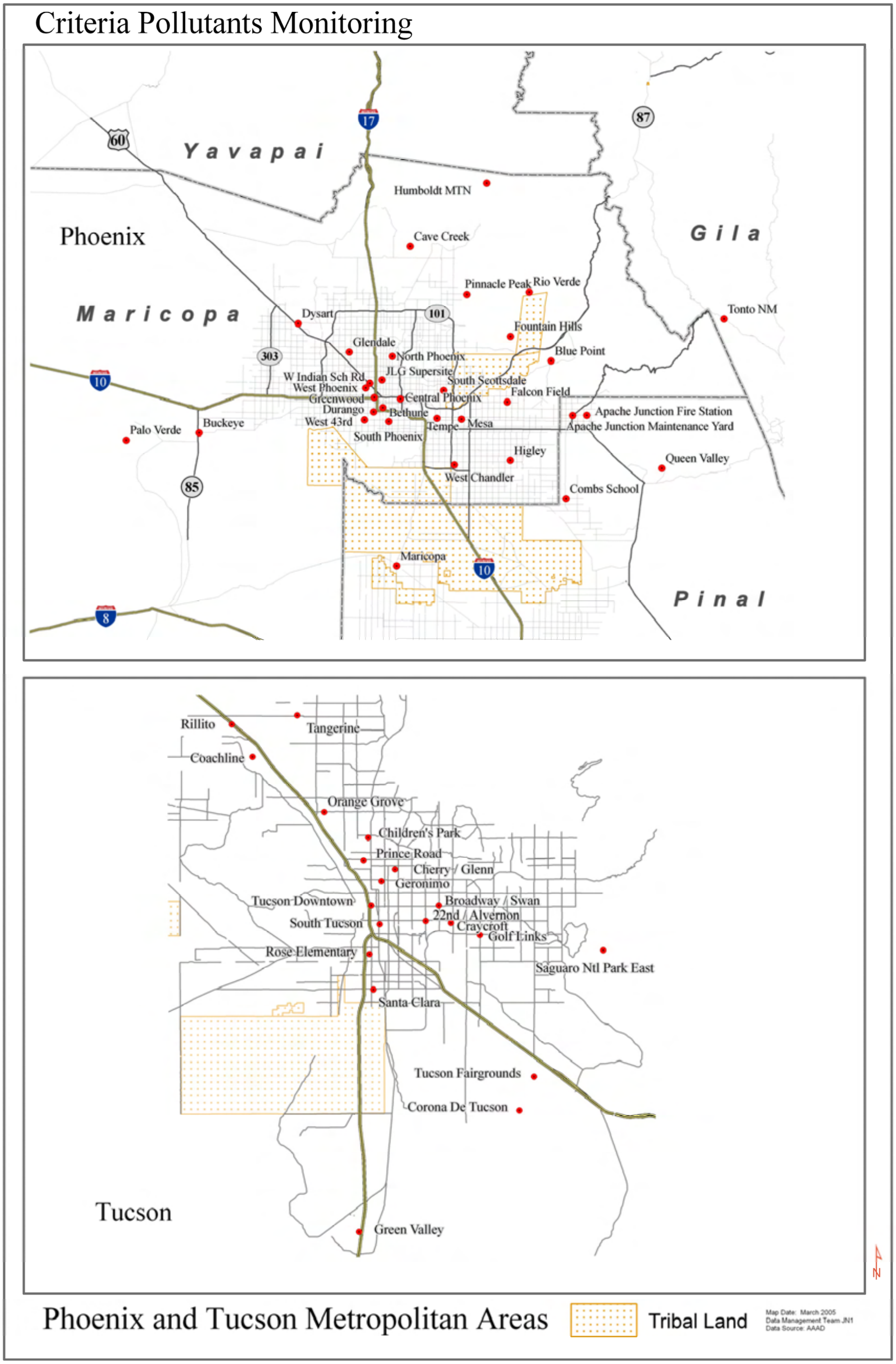
Particulate Network Statewide
The location of particulate monitors is shown on this map.

SO2 Network Statewide
This map shows the location of the SO2 monitors operating in 2004 and includes the maintenance and nonattainment areas.

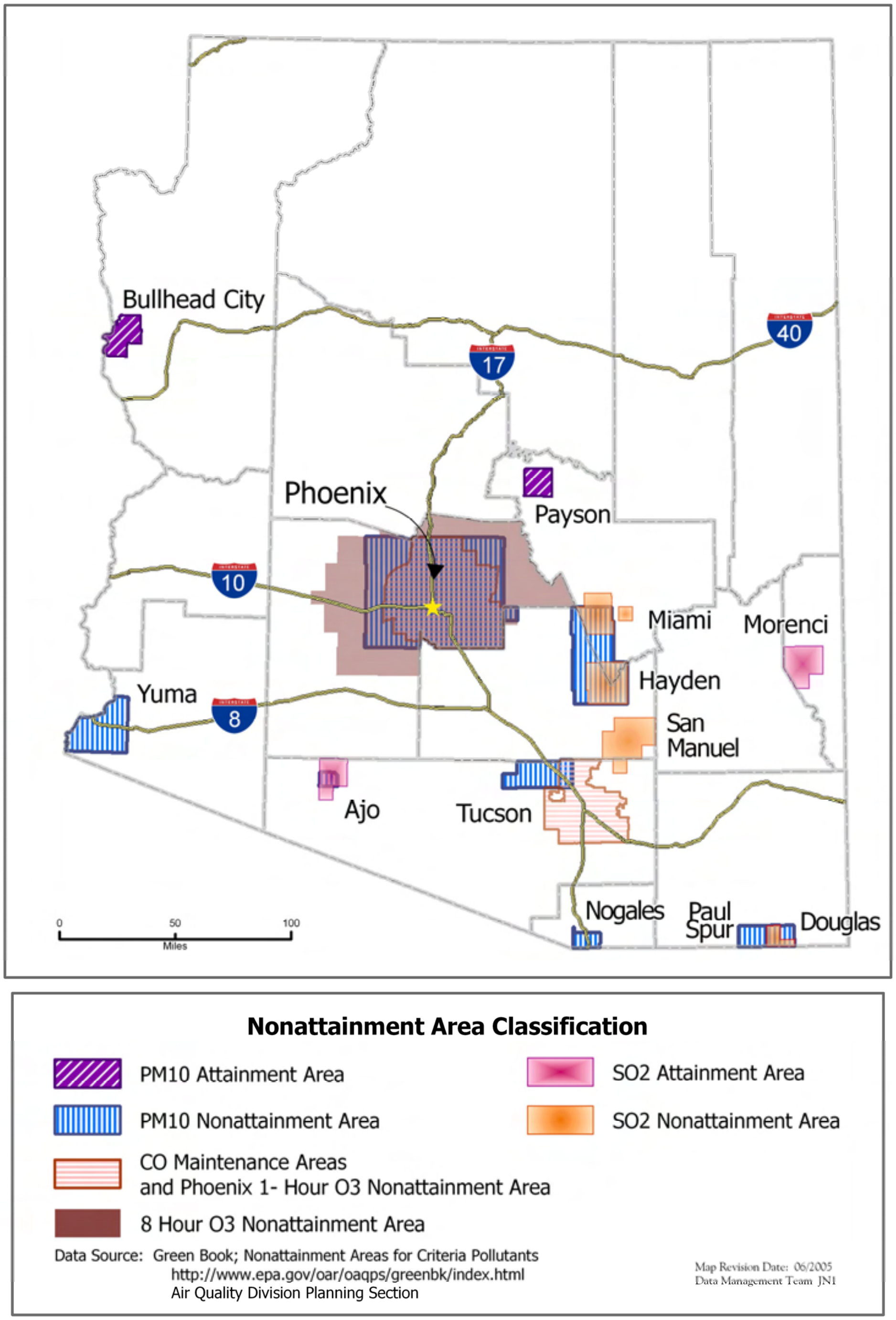
Visibility Network Statewide
Urban and regional haze visibility monitoring sites are shown on this map.

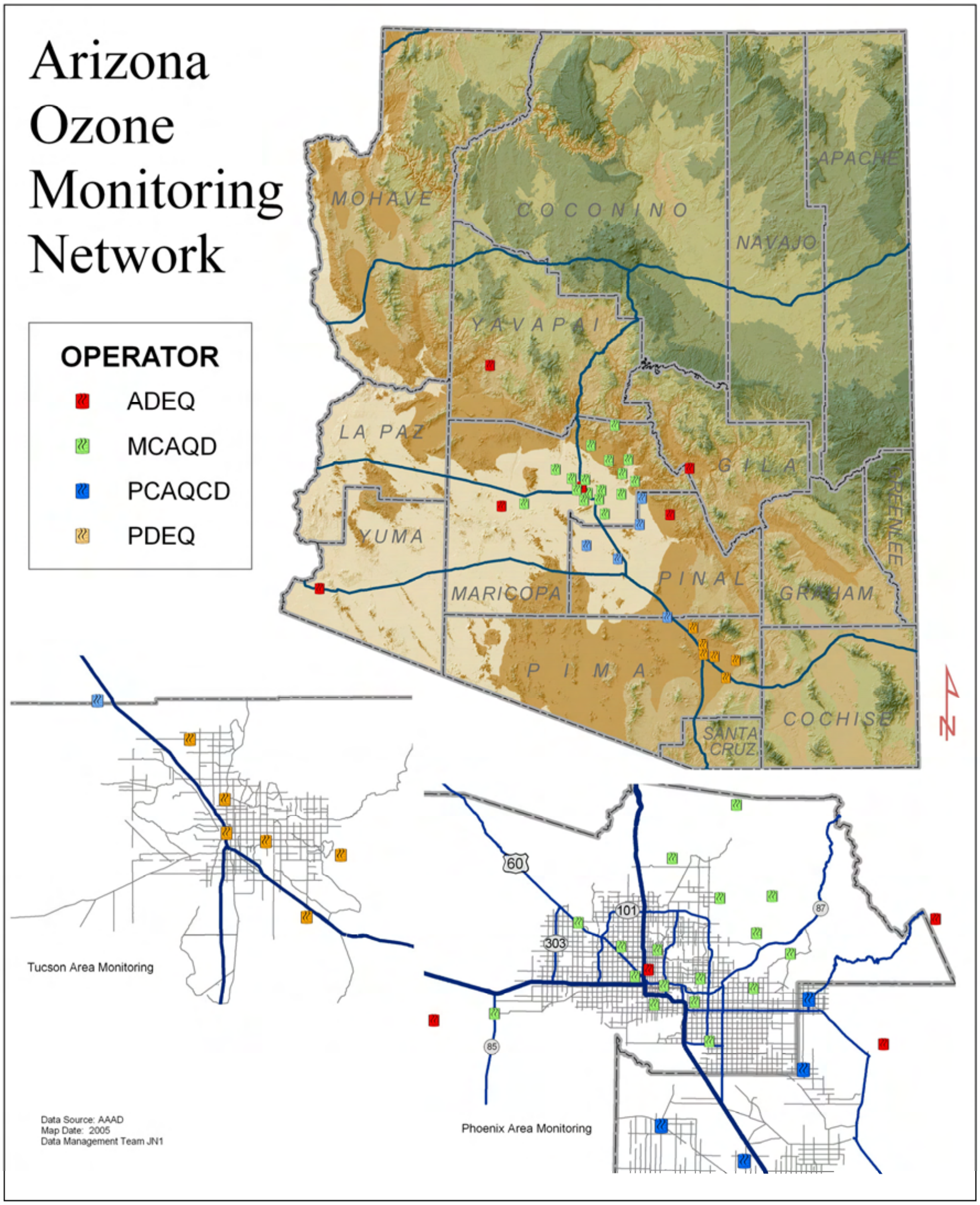
Nephelometers, Transmissometers, Cameras
This map shows the location of each of these types of monitors that ADEQ operates for the study of urban and regional visibility.

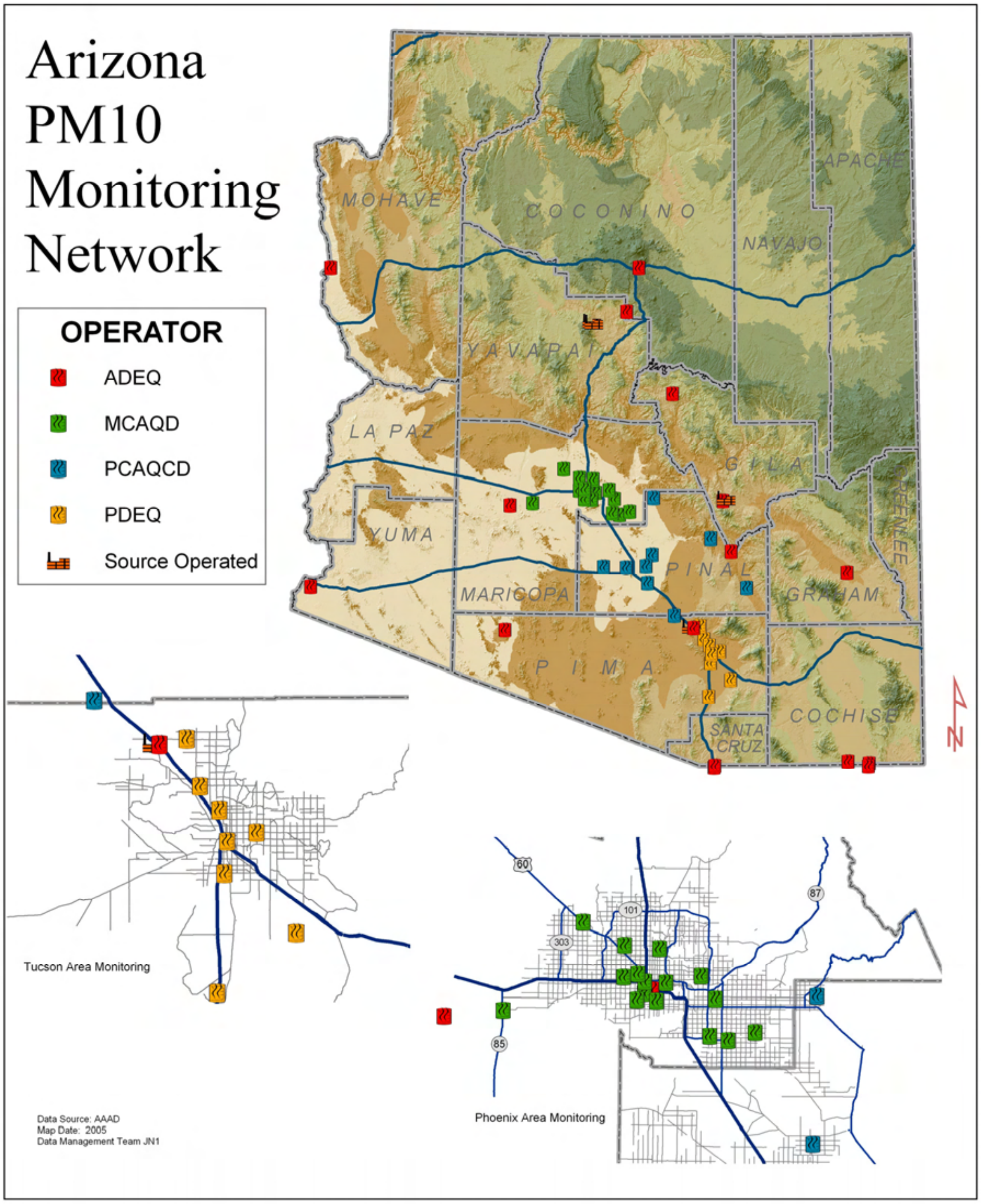

Ambient Air Monitors 2004
COCONINO
MOHAVE
APACHE
NAVAJO
YAVAPAI
LA PAZ
GILA
GREENLEE
MARICOPA
PINAL
GRAHAM
YUMA
PIMA
COCHISE
SANTA CRUZ
40
17
10
8
Note: Not all locations in view due to overlapping, same address or scale.
Data Source: Ambient Air Assessment Database
0
50
100
Miles
Site Index 2004
Ambient Air Monitor Operator
ADEQ
MCESD
PDEQ
PCAQCD
NPS
Source Operated
Disclaimer Information,
This map is a (WORKING DOCUMENT),
it is designed for information and discussion
and is subject to change and further refinement.
ADEQ
Arizona Department of Environmental Quality
Data Management Team JN1

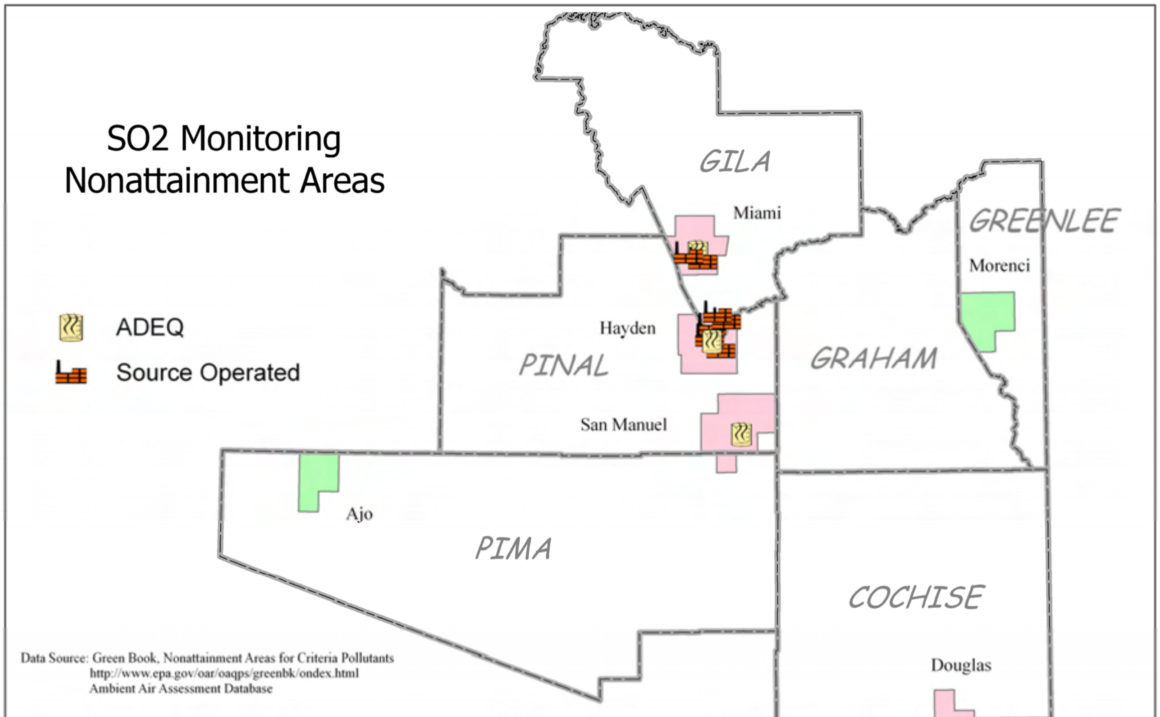

Criteria Pollutants Monitoring
Phoenix
Yavapai
Maricopa
Gila
Pinal
Humboldt MTN
Cave Creek
Pinnacle Peak
Rio Verde
Tonto NM
Dysart
Fountain Hills
Glendale
Blue Point
North Phoenix
JLG Supersite
W Indian Sch Rd
West Phoenix
South Scottsdale
Falcon Field
Greenwood
Central Phoenix
Durango
Bethune
West 43rd
Tempe
Mesa
South Phoenix
Apache Junction Fire Station
Apache Junction Maintenance Yard
Palo Verde
Buckeye
Higley
Queen Valley
West Chandler
Combs School
Maricopa
Rillito
Tangerine
Coachline
Orange Grove
Children's Park
Prince Road
Cherry / Glenn
Geronimo
Tucson Downtown
Broadway / Swan
South Tucson
22nd / Alvernon
Craycroft
Golf Links
Rose Elementary
Saguaro Ntl Park East
Santa Clara
Tucson Fairgrounds
Corona De Tucson
Tucson
Green Valley
Phoenix and Tucson Metropolitan Areas
Tribal Land
Map Date: March 2005
Data Management Team JN1
Data Source: AAAD

Nonattainment and Attainment Areas in Arizona




Arizona Ozone Monitoring Network
OPERATOR
ADEQ
MCAQD
PCAQCD
PDEQ
MOHAVE
COCONINO
NAVAJO
APACHE
YAVAPAI
LA PAZ
GILA
YUMA
MARICOPA
PINAL
GRAHAM
GREENLEE
PIMA
SANTA CRUZ
COCHISE
N
Tucson Area Monitoring
60
101
303
87
85
Phoenix Area Monitoring
Data Source: AAAD
Map Date: 2005
Data Management Team JN1


Arizona
PM10
Monitoring
Network
OPERATOR
ADEQ
MCAQD
PCAQCD
PDEQ
Source Operated
MOHAVE
COCONINO
NAVAJO
APACHE
YAVAPAI
LA PAZ
GILA
GREENLEE
YUMA
MARICOPA
PINAL
GRAHAM
PIMA
SANTA CRUZ
COCHISE
N
Tucson Area Monitoring
Phoenix Area Monitoring
60
101
303
87
85
Data Source: AAAD
Map Date: 2005
Data Management Team JN1



NONATTAINMENT AREA	AAAD ID	COUNTY	SITE	OPERATOR	OBJECTIVE
Hayden					
	16593	Gila	ASARCO - Globe Highway	ASARCO	SPM
	16590	Gila	ASARCO - Hayden - Garfield Ave	ASARCO	SPM
	16591	Gila	ASARCO - Montgomery Ranch	ASARCO	SPM
	16326	Gila	Hayden Old Jail	ADEQ	SLAMS Neighborhood Source Impact
	16326	Gila	ASARCO - Hayden Old Jail	ASARCO	SPM
	16592	Pinal	ASARCO - Hayden Junction	ASARCO	SPM
Miami					
	16382	Gila	Miami Ridgeline	ADEQ	SLAMS Neighborhood Source Impact
	16631	Gila	PDMI - Miami - Jones Ranch	PDMI	SPM Neighborhood Source Impact
	16632	Gila	PDMI - Miami - Townsite	PDMI	SPM Neighborhood Source Impact
San Manuel					
	16397	Pinal	San Manuel	ADEQ	SPM Neighborhood Source Impact

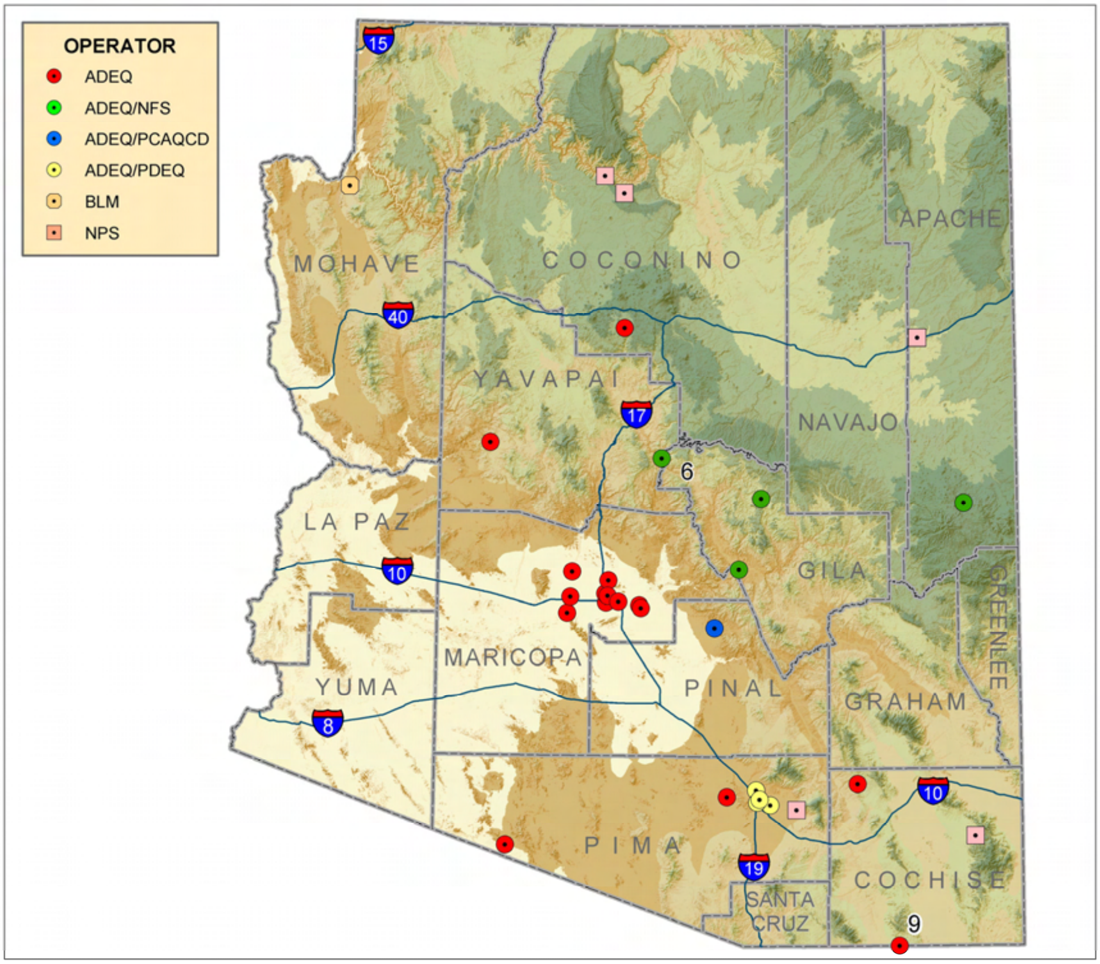
SO2 Nonattainment Classification

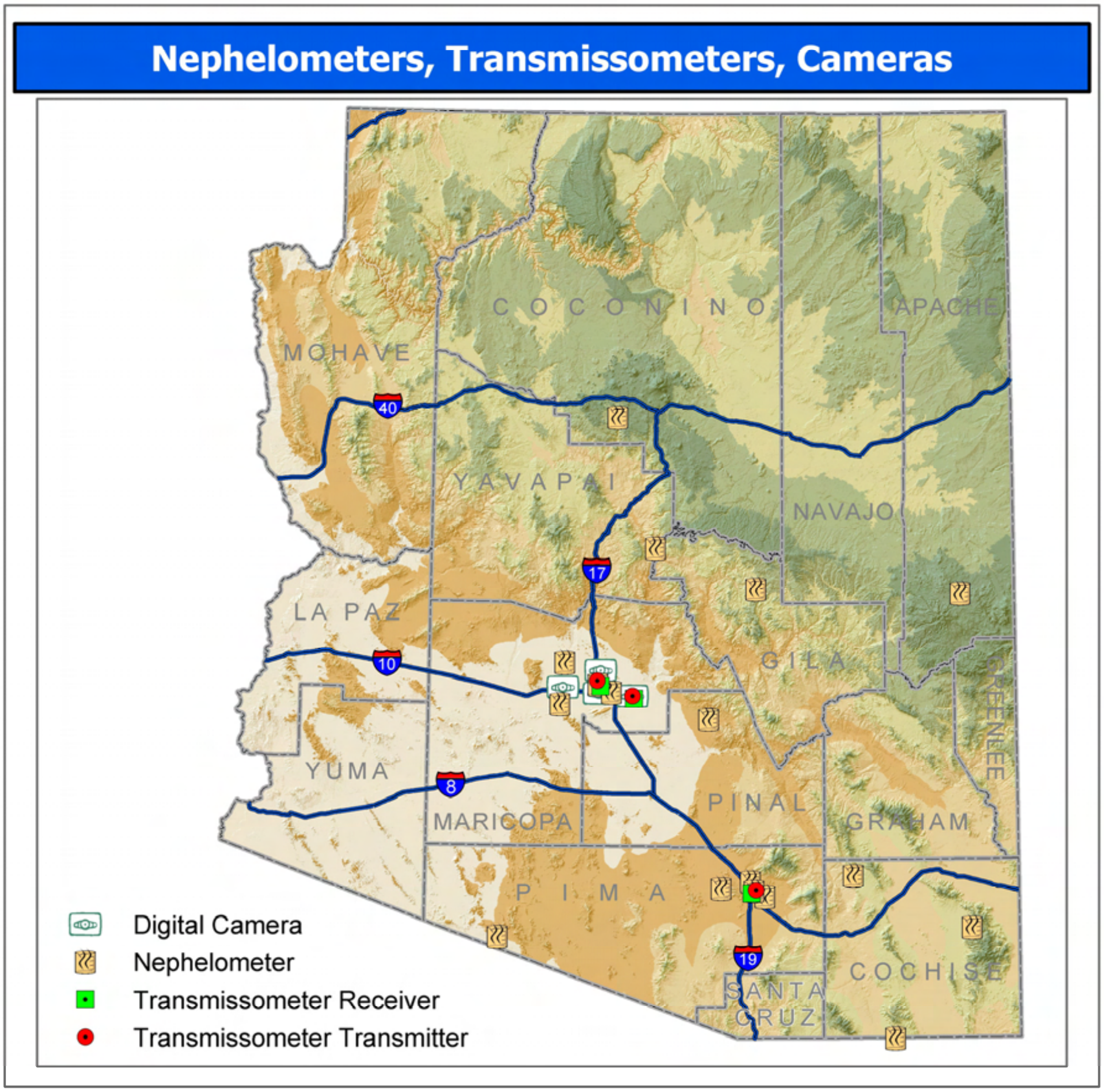
Maintenance

Nonattainment

Map Date: June 2005
Data Management Team jn1

Visibility Network Statewide




Nephelometers, Transmissometers, Cameras
COCONINO
MOHAVE
APACHE
YAVAPAI
NAVAJO
LA PAZ
GILA
GREENLEE
YUMA
MARICOPA
PINAL
GRAHAM
PIMA
COCHISE
SANTA CRUZ
40
17
10
8
19
Digital Camera
Nephelometer
Transmissometer Receiver
Transmissometer Transmitter