ADEQ
Arizona Department of Environmental Quality

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AIR QUALITY ANNUAL REPORT 2004

(A.R.S. 49-424.10)

Air Quality Report
A.R.S. §49-424.10

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 2003. 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) 771-4383 or, toll free in Arizona at (800) 234-5677, then enter 771-4383. 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 2003 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 15, 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 61, 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

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.

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

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.

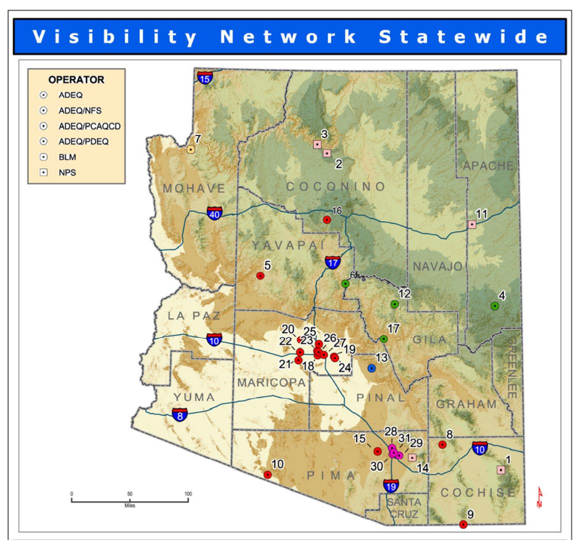


Figure 2 - Wilderness Area Visibility Monitoring Sites

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 or is planned at:

- 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 and
- 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 2003. 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 determined that for larger areas, a network that will satisfy a number of important monitoring objectives should consist of the following five sites.

Type 1 Site: Upwind and Background Characterization

These sites are established to characterize upwind background and transported ozone and its precursor concentrations entering the area. They will also identify areas that are subjected to overwhelming incoming transport of ozone. Type 1 sites are located in the predominant morning upwind direction from the local area of maximum precursor emissions and at a distance sufficient to obtain urban scale measurements. Typically, these sites will be located near the upwind edge of the photochemical grid model domain.

Type 2 and 2a Sites: Maximum Ozone Precursor Emissions Impact

These sites are established to monitor the magnitude and type of precursor emissions in the area where maximum precursor emissions representative of the metropolitan statistical area/consolidated metropolitan statistical area (MSA/CMSA) are expected to exist and are suited for the monitoring of urban air toxic pollutants. Type 2 sites are located immediately downwind (using the same morning wind direction as for locating the Type 1 site) of the area of maximum precursor emissions and are typically placed near the downwind boundary of the central business district or primary area of precursor emissions mix to obtain neighborhood scale measurements. A second Type 2 site may be required depending on the size of the area and should be placed in the second-most predominant morning wind direction.

Type 3 Site: Maximum Ozone Concentration

These sites are intended to monitor maximum ozone concentrations occurring downwind from the area of maximum precursor emissions. Locations for Type 3 sites should be chosen so that urban scale measurements are obtained. Typically, these sites are located 10 to 30 miles from the fringe of the urban area.

Type 4 Site: Extreme Downwind Monitoring

These sites are established to characterize the extreme downwind transported ozone and its precursor concentrations exiting the area and will identify those areas that are potentially contributing to overwhelming ozone transport into other areas. Type 4 sites are located in the predominant afternoon downwind direction from the local area of maximum precursor emissions at a distance sufficient to obtain urban scale measurements. Typically, these sites will be located near the downwind edge of the photochemical grid model domain.

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		**Proposed Installation**
PAMS	**Season**	
Type 1	Pending	Palo Verde – Wintersburg Area
Type 2	1999	Supersite – 17th Avenue and Campbell, Phoenix
Type 2a	2001	South Phoenix – Central and Broadway
Type 3	2001	Queen Valley
Type 3	2002	Tonto National Monument

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 (B_{sg})
- Light absorption by gases (B_{ag})
- Light scattering by particles (B_{sp})
- Light absorption by particles (B_{ap})

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}). Additional particulate matter monitoring includes the two subsets of PM_{10} of coarse (2.5 to 10 microns in size) and fine (less than 2.5 microns in size) particulate matter. These pollutants are monitored in Arizona by industry, county air pollution districts, Indian tribes and ADEQ. The 2003 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 35. Visibility monitoring information is presented beginning on Page 55.

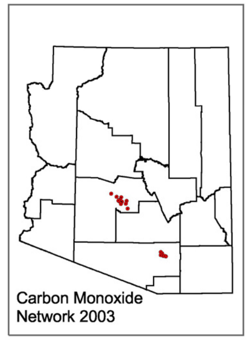
Figure 3 – ADEQ's Phoenix James L. Guyton Supersite monitoring station.

Criteria Pollutants – 2003 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 p.m. and midnight.



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 8-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 2003, 15 monitors were operated in greater Phoenix. Monitors in Apache Junction and Casa Grande were closed during 2002. Table 5 presents the 2003 CO data.

Table 5: 2003 Carbon Monoxide Data (in ppm)
(NAAQS 1-hour 35 ppm, 8-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					
Central Phoenix	5.9	5.4	4.6	3.8	97
Dysart [S] (Opened 7/16/03)	1.8	1.6	1.2	1.1	90
Glendale [S]	5.7	3.5	2.4	2.3	94
Maryvale [S]	5.8	5.7	4.2	4.1	89
Mesa [S]	3.5	3.4	2.5	2.2	92
North Phoenix [S]	4.0	4.0	2.3	2.1	94

Table 5: 2003 Carbon Monoxide Data (in ppm) ***(NAAQS 1-hour 35 ppm, 8-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**	
Phoenix – Greenwood	6.8	6.8	5.4	5.1	98
Phoenix – JLG Supersite	6.7	6.0	4.8	4.2	99
Phoenix – West Indian School	6.8	6.8	5.4	5.3	98
South Phoenix [S]	5.8	5.5	3.6	3.3	92
South Scottsdale [S]	4.1	4.0	2.3	2.2	93
Surprise [S] (Closed 7/15/03)	3.6	1.8	1.2	0.8	98
Tempe – Daley Park	3.8	3.7	2.9	2.4	90
West Chandler [S]	3.9	3.3	2.6	2.6	94
West Phoenix	7.5	7.3	6.2	5.5	96
Pima County					
Tucson – 22nd/Alvernon	6.0	5.8	2.7	2.6	99
Tucson – Cherry/Glenn [S]	4.2	3.9	2.9	2.7	95
Tucson – Children's Park	2.4	2.3	1.5	1.4	99
Tucson – 22nd/Craycroft	4.4	4.3	2.1	1.9	99
Tucson – Downtown	10.0	9.6	3.1	2.7	98
Tucson – Golf Links /Kolb [S]	3.9	3.8	2.2	2.2	98

* Valid Data Recovery is the percentage of valid samples collected of the total number of scheduled sampling hours. There were 8,760 sampling hours in 2003. 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.

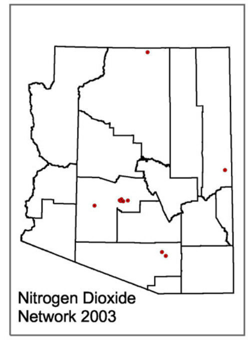
[S] Seasonal monitor, operational during January 1 to April 1 and September 1 to December 31; 5088 sampling hours in non-leap years.

Exceptions: The Tucson – Cherry/Glenn and Tucson - Golf Links/Kolb monitors operated January 1 – March 31 and October 1 - December 31; 4368 sampling hours.

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 2003 at eight urban locations and near three power plants. Table 6 presents the NO_2 data collected in Arizona's urban areas in 2003.

Table 6: 2003 Nitrogen Dioxide (in ppm) ***(NAAQS Annual Mean 0.053 ppm)***			
Site or City	**Annual Average**	**Maximum Value** **One-Hour Average**	**Valid Data * Recovery (%)**
Maricopa County			
Central Phoenix	.0293	.082	80
Palo Verde [S]	N/A	.043	88
Phoenix -- Greenwood	.0343	.101	82
Phoenix -- JLG Supersite [S]	N/A	.080	94
South Scottsdale	N/A	.076	64 #
Tempe – Daley Park	N/A	.062	26 #
West Phoenix #	N/A	.084	50 #
Pima County			
Tucson -- Children's Park	.0171	.056	98
Tucson -- Craycroft	.0172	.062	97

* Valid Data Recovery is the percentage of valid samples collected of the total number of scheduled sampling hours. There were 8,760 sampling hours in 2003. Valid data recovery should be less than 100 percent due to quality assurance testing of the monitors requiring them to be off-line for several hours at a time.

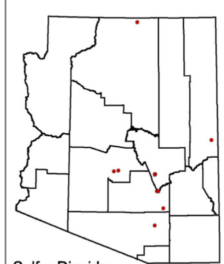
[S] Seasonal Monitors:
Palo Verde operates during summer ozone season, April 1 to October 31; 5136 hours
Phoenix JLG Supersite operates during winter season, January 1 to March 31 and November 1 to December 31; 3624 hours

N/A – Data not available

\# Indicates the data do not satisfy EPA's summary criteria, usually meaning less than 75 percent valid data recovery available. Due to problems with the multi-gas calibrators, the South Scottsdale and West Phoenix monitors were shutdown August 1 to November 1, and the Tempe monitor was shut down August 1 – December 31.

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.


Sulfur Dioxide Network 2003

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 11 $\mu g/m^3$.

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.

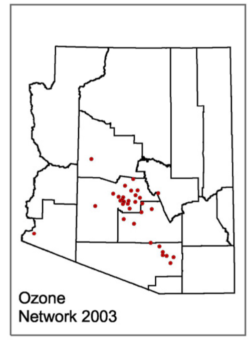
SO_2 is monitored continuously with pulsed fluorescence instruments, most of which are clustered around copper smelters or coal-fired electric power plants. In 2003, ten reporting monitors were sited near copper smelters, two near power plants and three in urban areas. Table 7 presents the SO_2 data collected in Arizona in 2003 from the monitors near copper smelters and in urban areas.

Table 7: 2003 Sulfur Dioxide (in μg/m³) ***(Primary NAAQS Annual Average 80 μg/m³, 24-hour Average365 μg/m³ Secondary NAAQS 3-hour 1300 μg/m³)***						
Site or City	**Annual Average**	**Maximum Value**				**Valid Data Recovery* (%)**
		3-Hour Average		**24-Hour Average**		
		Max Value	**2nd High**	**Max Value**	**2nd High**	
Gila County						
Globe Highway	52	868	800	185	184	98
Hayden - Garfield AV	25	927	918	266	259	98
Hayden - Montgomery Ranch	46	791	726	220	206	98
Hayden - Old Jail, ADEQ	21	532	432	97	89	99
Hayden - Old Jail, ASARCO	19	728	702	111	97	98
Miami - Jones Ranch - PDMI	21	578	406	152	150	99
Miami, Ridgeline -ADEQ	13	252	241	71	58	97
Miami, Town Site - PDMI	13	284	268	86	49	99
Maricopa County						
Central Phoenix	7	37	34	18	18	97
South Scottsdale	4	31	31	13	10	96
Pima County						
Tucson – Craycroft PDEQ	4	34	24	10	10	99
Pinal County						
Hayden Junction	11	386	351	64	58	98
San Manuel	4	15	15	10	7	99

* Valid Data Recovery is the percentage of valid samples collected of the total number of scheduled sampling hours. There were 8,760 sampling hours in 2003. Valid data recovery should be less than 100 percent 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 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 2003, 35 reporting O_3monitors 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 O_3 data collected in Arizona in 2003.

Table 8: 2003 Ozone Data (in ppm), One-Hour Averages
(NAAQS 1-hour 0.08 ppm)

Site or City	Max Value	2nd High	3rd High	4th High	Valid Data Recovery* (%)
Cochise County					
Chiricahua National Monument	.080	.078	.077	.077	95
Coconino County					
Grand Canyon National Park – Hance Camp	.082	.081	.080	.078	99
Gila County					
Tonto National Monument [S]	.112	.103	.097	.096	89
Maricopa County					
Blue Point	.122	.116	.101	.100	97
Cave Creek [S]	.102	.098	.097	.097	96
Central Phoenix	.102	.097	.093	.092	97
Dysart [S] (Opened 7/16/03)	.090	.089	.087	.085	92
Falcon Field [S]	.111	.104	.102	.099	97
Fountain Hills	.117	.106	.102	.100	98

Table 8: 2003 Ozone Data (in ppm), One-Hour Averages ***(NAAQS 1-hour 0.08 ppm)***					
Site or City	**Max Value**	**2nd High**	**3rd High**	**4th High**	**Valid Data Recovery* (%)**
Glendale [S]	.107	.098	.096	.094	97
Humboldt Mt. [S]	.104	.099	.099	.097	95
Maryvale [S]	.099	.098	.095	.093	99
North Phoenix	.113	.105	.099	.098	97
Palo Verde [S]	.088	.086	.082	.082	99
Phoenix - JLG Supersite	.098	.092	.092	.090	99
Pinnacle Peak	.103	.098	.097	.097	96
Rio Verde [S]	.113	.102	.099	.097	95
South Phoenix	.095	.089	.089	.087	98
South Scottsdale	.107	.099	.099	.099	97
Surprise [S] (Closed 07/16/03)	.088	.078	.075	.074	96
Tempe - Daley Park [S]	.109	.099	.098	.096	97
West Chandler [S]	.101	.099	.098	.096	98
West Phoenix	.099	.091	.091	.091	94
Navajo County					
Petrified Forest National Park	.084	.083	.080	.078	99
Pima County					
Green Valley [1]	.082	.074	.073	.072	99
Saguaro National Park East	.098	.092	.091	.090	97
Tucson - Children's Park	.089	.088	.087	.086	99
Tucson - Coachline [1]	.073	.071	.070	.068	99
Tucson – 22nd/Craycroft	.090	.087	.084	.082	99
Tucson - Downtown	.085	.078	.077	.076	99
Tucson - Fairgrounds	.085	.084	.083	.079	99
Tucson - Rose Elementary [1]	.079	.076	.074	.074	99
Tucson - Tangerine	.085	.085	.081	.080	99
Pinal County					
Apache Junction - Maintenance Yard	.105	.096	.094	.091	99
Casa Grande - Airport	.090	.089	.086	.083	94
Combs [S]	.101	.096	.090	.086	99
Maricopa [S]	.093	.092	.085	.085	99
Pinal Air Park [S]	.083	.080	.080	.079	99
Queen Valley [S]	.110	.110	.107	.107	99

Table 8: 2003 Ozone Data (in ppm), One-Hour Averages ***(NAAQS 1-hour 0.08 ppm)***					
Site or City	**Max Value**	**2nd High**	**3rd High**	**4th High**	**Valid Data Recovery* (%)**
Yavapai County					
Hillside [S]	.074	.074	.073	.071	99
Yuma County					
Yuma Game & Fish [S]	.105	.087	.085	.084	99

* Valid Data Recovery is the percentage of valid samples collected of the total number of scheduled sampling hours. There were 8,760 sampling hours in 2003. 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 sampling hours in non-leap years.

[1] Based on data reported to EPA AQS database beginning 7/01/2003.

Table 9: 2003 Ozone Data (in ppm), Eight-Hour Averages ***(NAAQS 8-hour 0.12 ppm)***						
Site or City	**Max Value**	**2nd High**	**3rd High**	**4th High**	**Daily Exceed.**	**Valid Sample Days ***
Cochise County						
Chiricahua National Monument	.077	.075	.073	.073	0	338
Coconino County						
Grand Canyon National Park – Hance Camp	.078	.076	.074	.073	0	358
Gila County						
Tonto National Monument [S]	.093	.088	.086	.084	3	187
Maricopa County						
Blue Point	.103	.088	.087	.086	4	356
Cave Creek[S]	.088	.087	.083	.083	2	204
Central Phoenix	.084	.083	.080	.079	0	355
Dysart [S] (Opened 7/16/03)	.082	.075	.075	.073	0	93

Table 9: 2003 Ozone Data (in ppm), Eight-Hour Averages *(NAAQS 8-hour 0.12 ppm)*						
Site or City	**Max Value**	**2nd High**	**3rd High**	**4th High**	**Daily Exceed.**	**Valid Sample Days ***
Falcon Field [S]	.099	.079	.079	.079	1	210
Fountain Hills	.099	.083	.083	.083	1	363
Glendale [S]	.092	.088	.088	.085	4	210
Humboldt Mt. [S]	.089	.089	.087	.087	5	206
Maryvale [S]	.087	.086	.083	.083	2	214
North Phoenix	.093	.092	.088	.086	4	358
Palo Verde [S]	.080	.080	.080	.075	0	213
Phoenix - JLG Supersite	.083	.082	.082	.075	0	362
Pinnacle Peak	.093	.089	.085	.083	3	350
Rio Verde[S]	.096	.085	.084	.083	2	205
South Phoenix	.083	.079	.077	.076	0	362
South Scottsdale	.097	.085	.085	.079	3	356
Surprise [S] (Closed 07/15/03)	.079	.070	.067	.066	0	101
Tempe - Daley Park [S]	.086	.083	.080	.080	1	205
West Chandler [S]	.082	.079	.079	.078	0	211
West Phoenix	.081	.081	.080	.077	0	342
Navajo County						
Petrified Forest National Park	.077	.075	.074	.074	0	342
Pima County						
Green Valley [1]	.076	.070	.069	.068	0	183
Saguaro National Park East	.087	.084	.080	.078	1	365
Tucson - Children's Park	.080	.080	.079	.076	0	363
Tucson - Coachline [1]	.066	.064	.062	.061	0	184
Tucson – 22nd/Craycroft	.078	.075	.074	.073	0	364
Tucson - Downtown	.071	.069	.069	.068	0	365
Tucson - Fairgrounds	.077	.072	.071	.070	0	363
Tucson - Rose Elementary [1]	.067	.066	.065	.065	0	184
Tucson - Tangerine	.078	.076	.074	.074	0	364
Pinal County						
Apache Junction - Maintenance Yard	.090	.074	.072	.072	1	365
Casa Grande - Airport	.077	.074	.073	.073	0	341
Combs [S]	.081	.073	.073	.072	0	211
Maricopa [S]	.082	.077	.075	.075	0	212

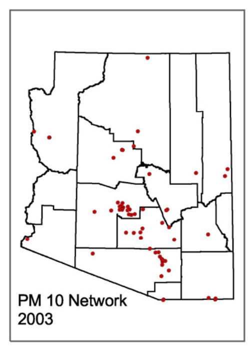
Table 9: 2003 Ozone Data (in ppm), Eight-Hour Averages (NAAQS 8-hour 0.12 ppm)						
Site or City	**Max Value**	**2nd High**	**3rd High**	**4th High**	**Daily Exceed.**	**Valid Sample Days ***
Pinal Air Park [S]	.076	.075	.075	.074	0	211
Queen Valley [S]	.094	.091	.090	.087	4	213
Yavapai County						
Hillside [S]	.070	.069	.068	.067	0	213
Yuma County						
Yuma Game & Fish [S]	.091	.080	.079	.078	1	200

* Valid Sample Days is the number of days with valid data recovery of the total number of scheduled sampling days. Scheduled sampling days for non-seasonal monitors in 2003 was 365. A Valid Sample Day has 18 or more hours of valid data recovery.

[S] Seasonal monitor, operational during April 1 to November 1; 214 sampling days in non-leap years.

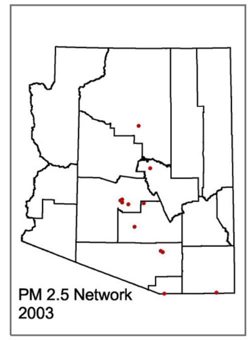
[1] Based on data reported to EPA AQS database beginning 7/01/2003.

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.

The 2003 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 not included in this table. 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 2003. 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: 2003 PM_{10} Data (in Fg/m^3, Standard Conditions)

(NAAQS Annual Average 50Fg/m^{3,} 24-hour Average 150 Fg/m^3)

Bold denotes an exceedance, defined as any daily value greater then 150 Fg/m^3 when rounded to the nearest 10 Fg/m^3 and any annual average value greater than 50 Fg/m^3 when rounded to the nearest 1 Fg/m^3.

Site or City	Method	Annual Average	24-Hour Average		Valid Data Recovery* (%)
			Max Value	2nd High	
Cochise County					
Douglas – Red Cross	Dichot	30	79	71	100
Paul Spur	Partisol	19	**207**	45	95
Coconino County					
Flagstaff – Middle School #	Dichot	20	60	51	89
Sedona – Post Office #	Partisol	27	69	44	70
Gila County					
Hayden – Old Jail	Dichot	36	91	84	93
Miami – Golf Course	Dichot	21	53	49	98
Miami – Ridgeline	Dichot	15	59	39	98
Payson	Partisol	24	99	64	90
Graham County					
Safford	Dichot	23	76	65	98
Maricopa County					
Bethune Elementary School	Dichot	47	145	115	90

Table 10: 2003 PM_{10} Data (in Fg/m^3, Standard Conditions)

(NAAQS Annual Average 50 Fg/m^3, 24-hour Average 150 Fg/m^3)

Bold denotes an exceedance, defined as any daily value greater then 150 Fg/m^3 when rounded to the nearest 10 Fg/m^3 and any annual average value greater than 50 Fg/m^3 when rounded to the nearest 1 Fg/m^3.

Site or City	Method	Annual Average	24-Hour Average		Valid Data Recovery* (%)
			Max Value	2nd High	
Central Phoenix	Hi-Vol	40	114	87	97
Chandler	Hi-Vol	50	**240**	126	98
Dysart # (Opened 7/16/03)	Hi-Vol	36	133	86	100
Estrella	Dichot	29	92	90	100
Glendale	Hi-Vol	36	151	129	100
Higley	Hi-Vol	**62**	**225**	151	95
Maryvale	Hi-Vol	42	151	137	100
Mesa	Hi-Vol	34	**176**	112	100
North Phoenix	Hi-Vol	34	**155**	132	97
Palo Verde	Dichot	26	**158**	108	97
Phoenix – Durango Complex	Hi-Vol	**62**	**195**	128	100
Phoenix – Greenwood	Hi-Vol	**51**	**166**	126	98
Phoenix – JLG Supersite #	Dichot	37	**169**	131	90
Phoenix - West 43rd Avenue	Hi-Vol	**62**	**157**	154	98
South Phoenix	Hi-Vol	**52**	**164**	135	98
South Scottsdale	Hi-Vol	36	**172**	124	100
Surprise # (Closed 7/15/03)	Hi-Vol	20	42	32	88
Tempe	Dichot	36	**158**	119	97
West Chandler	Hi-Vol	42	**206**	**197**	97
West Phoenix	Hi-Vol	46	**158**	136	98
Mohave County					
Bullhead City – ADEQ	Dichot/ Partisol	20	121	45	95

Table 10: 2003 PM_{10} Data (in Fg/m^3, Standard Conditions)

(NAAQS Annual Average 50 Fg/m^3, 24-hour Average 150 Fg/m^3)

Bold denotes an exceedance, defined as any daily value greater then 150 Fg/m^3 when rounded to the nearest 10 Fg/m^3 and any annual average value greater than 50 Fg/m^3 when rounded to the nearest 1 Fg/m^3.

Site or City	Method	Annual Average	24-Hour Average		Valid Data Recovery* (%)
			Max Value	2nd High	
Navajo County					
Show Low	Partisol	18	58	51	95
Pima County					
Ajo	Partisol	23	139	129	89
Organ Pipe Cactus National Monument # (Closed 2/12/03)	Dichot	11	33	11	100
Rillito - ADEQ	Dichot	40	118	76	97
Rillito - APCC	Hi-Vol	34	**256**	105	99
South Tucson - ADEQ	Dichot	30	119	59	100
South Tucson - PDEQ	Hi-Vol	34	150	128	99
Tucson - Broadway/Swan	Hi-Vol	27	122	66	100
Tucson - Corona de Tucson - ADEQ	Dichot	18	98	47	100
Tucson - Corona de Tucson - PDEQ	Hi-Vol	17	104	47	98
Tucson - Craycroft	Dichot	27	66	55	90
Tucson - Orange Grove - ADEQ	Dichot	30	126	53	100
Tucson - Orange Grove, PDEQ	Hi-Vol	29	120	97	98
Tucson - Prince Road	Hi-Vol	31	126	56	98
Tucson - Santa Clara	Hi-Vol	27	146	63	97
Tucson - Tangerine	Hi-Vol	19	125	50	98
Tucson - U of A Central	Dichot	32	130	59	98
Pinal County					
Apache Junction Maintenance Yard (North)	Hi-Vol	20	95	82	93

Table 10: 2003 PM_{10} Data (in Fg/m^3, Standard Conditions)

(NAAQS Annual Average 50Fg/m^{3,} 24-hour Average 150 Fg/m^3)

Bold denotes an exceedance, defined as any daily value greater then 150 Fg/m^3 when rounded to the nearest 10 Fg/m^3 and any annual average value greater than 50 Fg/m^3 when rounded to the nearest 1 Fg/m^3.

Site or City	Method	Annual Average	24-Hour Average		Valid Data Recovery* (%)
			Max Value	2nd High	
Apache Junction Maintenance Yard (South) #	Hi-Vol	20	91	35	93
Apache Junction Fire Station #	Hi-Vol	27	103	46	100
Casa Grande Downtown	Hi-Vol	32	99	85	100
Coolidge Maintenance Yard	Hi-Vol	35	106	95	93
Eloy City Complex	Hi-Vol	42	154	114	93
Mammoth – County Complex	Hi-Vol	16	89	69	98
Pinal Air Park	Hi-Vol	29	108	105	100
Pinal County Housing Complex	Hi-Vol	**61**	**289**	**171**	97
Riverside Maintenance Yard	Hi-Vol	24	101	90	100
Stanfield #	Hi-Vol	46	**171**	123	89
Santa Cruz County					
Nogales – Post Office	Dichot/ Partisol	38	**184**	**162**	100
Yavapai County					
Clarkdale – NW (#2)	Dichot	19	68	62	83
Clarkdale – SE (1)	Dichot	23	59	50	94
Prescott Valley #	Partisol	14	68	52	86
Yuma County					
Yuma – Courthouse	Dichot/ Partisol	38	127	93	95
Mexico					
Agua Prieta – Fire Station	Dichot	**60**	**172**	122	98
Nogales – Fire Station #	Dichot	**65**	**183**	144	82

See next page for footnotes.

*Valid data recovery is the percentage of valid samples collected of the total number of scheduled samples. There were 61 monitoring days scheduled in 2003 for monitors on the every 6th day schedule. Rillito - APCC was the only site following the every 3rd day schedule (122 observations in 2003).

#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.

Note: Rillito – APCC follows a 1-in-3 day sample schedule

Table 11: 2003 PM2.5 Data (in Fg/m^3, Local Conditions)
(NAAQS Annual Average 15Fg/m^3, 24-hour Average 65 Fg/m^3)

City or Site	Method	Annual Average	24-Hour Avg		Valid Data Recovery* (%)
			Max	2nd High	
Cochise County					
Douglas - Red Cross [2] #	FRM	6.4	13.3	11.7	89
Coconino County					
Flagstaff - Middle School [2] #	FRM	5.7	16.9	12.5	72
Gila County					
Payson [2]	FRM	9.1	25.8	21.6	95
Payson [3] #	FRM	9.0	25.1	24.9	78
Maricopa County					
Bethune Elementary School [2] # (Opened 3/22/03, STN)	FRM	12.5	25.0	24.3	85
Phoenix - JLG Supersite [3] #	FRM	11.3	31.5	27.3	94
Phoenix – JLG Supersite [3] (STN)	FRM	11.4	33.9	33.0	92
Phoenix - West 43rd [2] (Opened 3/22/03, STN)	FRM	12.3	30.0	30.0	96
Tempe - Community Center [3]	FRM	9.6	48.4	29.7	97
West Phoenix [3]	FRM	10.7	29.1	26.3	96
Pima County					
Tucson - Children's Park [3]	FRM	6.5	18.8	18.3	91
Tucson - Children's Park [2] (STN)	FRM	7.6	24.7	18.4	97
Tucson - Orange Grove [1]	FRM	6.5	18.0	18.0	96

Table 11: 2003 PM2.5 Data (in Fg/m^3, Local Conditions) ***(NAAQS Annual Average 15Fg/m^3, 24-hour Average 65 Fg/m^3)***					
City or Site	**Method**	**Annual Average**	**24-Hour Avg**		**Valid Data Recovery* (%)**
			Max	**2nd High**	
Pinal County					
Apache Junction - Fire Station [3] #	FRM	6.3	38.0	25.7	89
Casa Grande - Downtown [2]	FRM	8.4	32.2	26.7	89
Santa Cruz County					
Nogales - Post Office [2]	FRM	11.3	37.0	35.0	93
Nogales - Post Office [2]	FRM	10.6	35.5	33.5	95

*Valid data recovery is the percentage of valid samples collected of the total number of scheduled samples.
[1] Samples collected every day – 365 sample days in 2003.
[2] Samples collected every sixth day – 61 sample days in 2003.
[3] Samples collected every third day – 121 sample days in 2003.
[#]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.
STN – Speciation Trends Network, not to be used for NAAQS compliance.

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 2002 or 2003. The data are presented in Table 12 and Table 13.

Table 12: 2002-2003 Eight-Hour CO Compliance (in ppm)	2002-2003 One-Hour CO NAAQS Compliance Values by County		
NAAQS for one-hour CO: The highest of the second-highest values in a two-year period must not exceed 35 ppm. NOTE: Pinal County monitors closed in 2002.	County	Exceedances	Violations
	Maricopa	0	0
	Pima	0	0
	Summary: 20 of 20 monitors in compliance		

Table 12: 2002-2003 One-Hour CO Compliance (in ppm)					
City or Site	**2002**		**2003**		**Compliance Value**
	Max Value	**2nd High**	**Max Value**	**2nd High**	
Maricopa County					
Central Phoenix	6.0	5.8	5.9	5.4	5.8
Glendale S	4.1	3.9	5.7	3.5	3.9
Maryvale S	8.0	6.9	5.8	5.7	6.9
Mesa S	4.9	4.8	3.5	3.4	4.8
North Phoenix S	4.5	4.5	4.0	4.0	4.5
Phoenix - Greenwood	7.3	6.8	6.8	6.8	6.8
Phoenix - JLG Supersite	5.7	5.4	6.7	6.0	6.0
Phoenix - West Indian School	7.7	7.3	6.8	6.8	7.3
South Phoenix S	6.5	6.5	5.8	5.5	6.5
South Scottsdale S	5.5	4.3	4.1	4.0	4.3
Surprise S (Closed 7/15/2003)	4.2	2.4	3.6	1.8	2.4
Tempe – Daley Park S	4.9	4.7	3.8	3.7	4.7
West Chandler S	3.5	3.2	3.9	3.3	3.3
West Phoenix	8.6	7.9	7.5	7.3	7.9
Pima County					
Tucson - 22nd/Alvernon	5.7	5.1	6.0	5.8	5.8
Tucson - Cherry/Glenn S	3.9	3.8	4.2	3.9	3.9

Table 12: 2002-2003 One-Hour CO Compliance (in ppm)					
City or Site	2002		2003		Compliance Value
	Max Value	2nd High	Max Value	2nd High	
Tucson - Children's Park	2.5	2.5	2.4	2.3	2.5
Tucson - 22nd/Craycroft	3.8	3.8	4.4	4.3	4.3
Tucson - Downtown	6.6	5.1	10.0	9.6	9.6
Tucson - Golf Links/Kolb [S] (Opened 9/27/2002)	4.9	4.2	3.9	3.8	4.2

[S]Seasonal monitor, operational Jan. 1 to April 1 and Sept. 1 to Dec. 31

Table 13. 2002-2003 Eight-Hour CO Compliance (in ppm)

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

2002-2003 Eight-Hour CO NAAQS Compliance Values by County		
County	Exceedances	Violations
Maricopa	0	0
Pima	0	0
Summary: 20 of 20 monitors in compliance		

Table 13: 2002-2003 Eight-Hour CO Compliance (in ppm)					
City or Site	2002		2003		Compliance Value
	Max Value	2nd High	Max Value	2nd High	
Maricopa County					
Central Phoenix	4.4	4.1	4.6	3.8	4.1
Glendale [S]	3.2	2.7	2.4	2.3	2.7
Maryvale [S]	5.0	5.0	4.2	4.1	5.0
Mesa [S]	3.5	3.5	2.5	2.2	3.5
North Phoenix [S]	3.3	2.7	2.3	2.1	2.7
Phoenix - Greenwood	5.4	5.1	5.4	5.1	5.1
Phoenix - JLG Supersite	4.2	4.2	4.8	4.2	4.2

Table 13: 2002-2003 Eight-Hour CO Compliance (in ppm)					
City or Site	2002		2003		Compliance Value
	Max Value	2nd High	Max Value	2nd High	
Phoenix - West Indian School	5.5	5.4	5.4	5.3	5.4
South Phoenix [S]	3.8	3.7	3.6	3.3	3.7
South Scottsdale [S]	3.0	2.8	2.3	2.2	2.8
Surprise [S] (Closed 7/15/2003)	1.2	1.1	1.2	.8	1.1
Tempe - Daley Park [S]	3.4	3.4	2.9	2.4	3.4
West Chandler [S]	2.2	2.2	2.6	2.6	2.6
West Phoenix	5.5	5.5	6.2	5.5	5.5
Pima County					
Tucson - 22nd/Alvernon	2.6	2.5	2.7	2.6	2.6
Tucson - Cherry/Glenn [S]	2.6	2.3	2.9	2.7	2.7
Tucson - Children's Park	1.6	1.6	1.5	1.4	1.6
Tucson - 22nd/Craycroft	2.0	1.9	2.1	1.9	1.9
Tucson - Downtown	3.7	2.3	3.1	2.7	2.7
Tucson - Golf Links/Kolb [S] (Opened 9/27/2002)	3.3	2.6	2.2	2.2	2.6

[S] *Seasonal monitor, operational from Jan. 1 to April 1 and Sept. 1 to Dec. 31*

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 2003 averages.

Table 14: 2002 Nitrogen Dioxide Average NAAQS Compliance Values		
County	Exceedances	Violations
Maricopa	0	0
Pima	0	0
Summary: 9 of 9 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 80 Fg/m^3 (approximately 0.03 ppm) and the maximum 24-hour block average standard is 365 Fg/m^3 (approximately 0.14 ppm). To demonstrate attainment, neither standard can be exceeded in a calendar year. In addition, the averages must be based upon hourly data that are 75 percent complete. 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.

The secondary three-hour standard is 1300 Fg/m^3 (approximately 0.50 ppm) and is 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.

In Arizona, the maximum concentration sites – all near copper smelters – comply with these standards; the concentrations being no higher than 67 percent of the three-hour, 73 percent of the 24-hour and 51 percent of the annual average standards. Sites near power plants are close to background levels, with annual averages from less than 1 to 8 Fg/m^3. See Table 7 for the 2003 averages.

Table 15: 2003 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: 13 out of 13 monitors in compliance						

Ozone

The NAAQS include standards for one-hour O_3 and eight-hour O_3. The one-hour standard 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. A daily exceedance 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 2003. Therefore, no compliance table for 1-hour data is included here.

As there have been no violations of the 1-hour O_3 standard since 1996, on May 15, 2001, EPA found that Maricopa County had reached attainment for the 1-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 1-hour standard, was submitted to EPA on April 21, 2004.

On April 15, 2004, the Phoenix area was designated nonattainment for the new, more stringent, 8-hour ozone standard. The 1-hour standard will be revoked one year following the effective date of the 8-hour designation or June 15, 2005. However, certain of the control measures developed and implemented for the 1-hour standard are required to remain in place to ensure continued progress toward attainment of the new 8-hour standard.

EPA developed the eight-hour O_3 standards 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 2001 – 2003.

Table 16: 2001 to 2003 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.*	2001 to 2003 Eight-Hour Ozone NAAQS Compliance Values, By County				
	County	Eight-Hour Exceedances			Sites in Violation
		2001	2002	2003	
	Cochise	0	0	0	0
	Coconino	0	0	0	0
	Gila	N/A	5	3	N/A
	Maricopa	27	55	32	2
	Navajo	N/A	0	0	N/A
	Pima	0	3	1	0
	Pinal	0	1	5	0
	Yavapai	0	4	0	0
	Yuma	0	N/A	1	N/A
	Summary: 29 of 30 monitors in compliance				

Table 16: 2001 to 2003 Eight-Hour Ozone Compliance (in ppm)

City or Site	Fourth-Highest Value			Three-Year Average
	2001	2002	2003	
Cochise County				
Chiricahua National Monument	0.067	0.074	0.073	0.071
Coconino County				
Grand Canyon National Park – Hance Camp	0.070	0.079	0.073	0.074
Gila County				
Tonto National Monument	N/A	0.087	0.084	N/A
Maricopa County				
Blue Point	0.080	0.086	0.086	0.084
Cave Creek	0.083 [#]	0.086	0.083	0.084
Central Phoenix	0.075	0.076	0.079	0.076
Falcon Field [S]	0.081	0.084	0.079	0.081
Fountain Hills	0.083	0.086	0.083	0.084
Glendale [S]	0.078	0.083	0.085	0.082

Table 16: 2001 to 2003 Eight-Hour Ozone Compliance (in ppm)				
City or Site	**Fourth-Highest Value**			**Three-Year Average**
	2001	**2002**	**2003**	
Humboldt Mt. [S]	0.085	0.090	0.087	**0.087**
Maryvale [S]	0.074	0.084	0.083	0.080
Mesa (Closed 11/01/02)	0.074	0.072	N/A	N/A
North Phoenix	0.086	0.085	0.086	**0.085**
Palo Verde [S]	0.074	0.078	0.075	0.075
Phoenix – JLG Supersite	0.079	0.076	0.075	0.076
Pinnacle Peak	0.085	0.084	0.083	0.084
Rio Verde [S]	0.083	0.085	0.083	0.083
South Phoenix	0.076	0.081	0.076	0.077
South Scottsdale	0.079	0.079	0.079	0.079
Surprise [S] (Closed 7/15/2003)	0.071	0.079	0.066 [#]	0.072
Tempe [S]	0.079	0.080	0.080	0.079
West Chandler [S]	0.078	0.083	0.078	0.079
West Phoenix	0.075	0.084	0.077	0.078
Navajo County				
Petrified Forest National Park	N/A	0.055 [#]	0.074	N/A
Pima County				
Saguaro National Park East	0.067	0.077	0.078	0.074
Tucson - Children's Park	0.069	0.073	0.076	0.072
Tucson - 22nd/Craycroft	0.069	0.075	0.073	0.072
Tucson - Downtown	0.065	0.072	0.068	0.068
Tucson - Fairgrounds	0.066	0.072	0.070	0.069
Tucson - Tangerine	0.067	0.075	0.074	0.072
Pinal County				
Apache Junction - Maintenance Yard	0.078	0.079	0.072	0.076

Table 16: 2001 to 2003 Eight-Hour Ozone Compliance (in ppm)				
City or Site	**Fourth-Highest Value**			**Three-Year Average**
	2001	**2002**	**2003**	
Casa Grande - Airport	0.074	0.077	0.073	0.074
Combs [S]	N/A	0.068	0.072	N/A
Maricopa [S]	N/A	0.068	0.075	N/A
Pinal Air Park [S]	N/A	0.070	0.074	N/A
Queen Valley [S]	0.079	0.083	0.087	0.083
Yavapai County				
Hillside [S]	0.076	0.089	0.067	0.077
Yuma County				
Yuma Game & Fish	0.068	N/A	0.078	N/A

Bold values indicate monitors in violation of the standard.

[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, 2003 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 Fg/m^3 for the annual arithmetic mean concentration and 150 Fg/m^3 for the 24-hour average concentration.

The annual standard is met when the three-year average of the annual means is less than or equal to 50Fg/m^3. The annual average is determined by calculating quarterly (three month) averages of the samples collected during that quarter; a minimum of 75 percent of the samples must be present to produce a valid annual average. The four quarterly averages are used to produce the annual average. This value is rounded to the nearest 1 Fg/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 Fg/m^3 for comparison with the standard to determine if it is an exceedance (i.e., a sample value of 154 Fg/m^3 is not an exceedance; a sample value of 155 Fg/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 2001 to 2003 data.

Table 17: 2001 to 2003 Annual Average PM_{10} Compliance (in µg/m^3, Standard Conditions)

NAAQS: The three-year average of annual averages is less than or equal to 50 Fg/m^3.

Annual averages are rounded to nearest 1 Fg/m^3 for comparison to the standard.

NOTE: Final EPA Compliance figures for sites with averages marked with '#' may differ from values published here.

2001 to 2003 PM_{10} Annual Average NAAQS Compliance Values, By County				
County	Sites above Standard			Sites in Violation
	2001	2002	2003	
Cochise	0	0	0	0
Coconino	0	0	0	0
Gila	0	0	0	0
Maricopa	2	7	5	5
Mohave	0	0	0	0
Navajo	0	0	0	0
Pima	0	0	0	0
Pinal	0	2	0	0
Santa Cruz	0	0	0	0
Yavapai	0	0	0	0
Yuma	0	0	0	0
Summary: 51 of 56 monitors in compliance				

Table 17: 2001 to 2003 Annual Average PM_{10} Compliance (in Fg/m^3) **Bold** denotes value above the standard.				
City or Site	**2001**	**2002**	**2003**	**Three-Year Average**
Cochise County				
Douglas – Red Cross	29[#]	32	30	30
Paul Spur	20	16	19	18
Coconino County				
Flagstaff – Middle School	18[#]	17[#]	20[#]	18
Sedona	12[#]	15[#]	27[#]	18
Gila County				
Hayden – Old Jail	31[#]	34[#]	36	34
Miami – Golf Course	23	23	21	22
Miami – Ridgeline	14	13	15	14
Payson	22	26[#]	24	24
Graham County				
Safford	23	26	23	24
Maricopa County				
Central Phoenix	38	43	40	40
Chandler	48	**56**	50	**51**
Estrella	26[#]	31	29	29
Gilbert (Closed 6/1/2002)	39	40	N/A	N/A
Glendale	33	30	36	33
Higley	50	**63**	**62**	**58**
Maryvale	38	45	42	42
Mesa	30	36	34	33
North Phoenix	30	37	34	34
Palo Verde	23[#]	29	26	26
Phoenix – Durango Complex	**59**	**70**	**62**	**64**

Table 17: 2001 to 2003 Annual Average PM_{10} Compliance (in Fg/m^3) **Bold** denotes value above the standard.				
City or Site	**2001**	**2002**	**2003**	**Three-Year Average**
Phoenix – Greenwood	49	**55**	**51**	**52**
Phoenix – JLG Supersite	30	35[#]	37[#]	34
Phoenix – Salt River (Closed 12/31/2002)	94	81	N/A	N/A
Phoenix – West Forty Third	N/A	**68**[#]	**62**	N/A
South Phoenix	50	**60**	**52**	**54**
South Scottsdale	33	37	36	35
Surprise (Closed 7/15/2003)	27	32	20[#]	26
Tempe – Community Center	31	35	36	34
West Chandler	34	39	42	38
West Phoenix	43	**53**	46	47
Mohave County				
Bullhead City – ADEQ	17[#]	19[#]	20	19
Kingman – Praxair NE	13	14[#]	N/A	N/A
Kingman – Praxair SW	12	14[#]	N/A	N/A
Navajo County				
Show Low	16[#]	16[#]	18	17
Pima County				
Ajo	14	19	23	19
Organ Pipe Cactus National Monument (Closed 2/12/2003)	10[#]	11[#]	11[#]	11
Rillito – ADEQ	34	37	40	37
Rillito – APCC	26	31	34	30
South Tucson – ADEQ	25	29	30	28
South Tucson – PDEQ	31	39	34	35
Tucson – Broadway/Swan	26	26	27	26

Table 17: 2001 to 2003 Annual Average PM_{10} Compliance (in Fg/m^3) **Bold** denotes value above the standard.				
City or Site	**2001**	**2002**	**2003**	**Three-Year Average**
Tucson – Corona de Tucson (ADEQ)	16	15#	18	16
Tucson – Corona de Tucson (PDEQ)	16	15	17	16
Tucson – 22nd/Craycroft	23	26	27	25
Tucson – Orange Grove (PDEQ)	29	33	30	31
Tucson – Prince Road	33	34	31	33
Tucson – Santa Clara	26	28	27	27
Tucson – Tangerine	17	19	19	18
Tucson – U of A Central	25	27	32	28
Pinal County				
Apache Junction – Maintenance Yard (North)	23	21#	20	21
Apache Junction – Maintenance Yard (South)	23	21#	20	21
Casa Grande – Downtown	29	30#	32	30
Casa Grande – Eleven Mile Corner (Closed 7/22/02)	47	**63**#	N/A	N/A
Coolidge – Maintenance Yard	32	33#	35	33
Eloy	35	47#	42	41
Mammoth	23	19#	16	19
Pinal Air Park	27	30#	29	29
Pinal County Housing Complex	N/A	**57**#	**61**	N/A
Stanfield	42	**60**#	46	49
Santa Cruz County				
Nogales – Post Office	48	51	38	46
Yavapai County				
Clarkdale – NW (#2)	36	19	19	25
Clarkdale – SE (#1)	44	28	23	32

Table 17: 2001 to 2003 Annual Average PM_{10} Compliance (in Fg/m^3)

Bold denotes value above the standard.

City or Site	2001	2002	2003	Three-Year Average
Prescott (Closed 6/25/02)	16#	13#	N/A	N/A
Yuma County				
Yuma – Juvenile Center/Courthouse	41#	48#	38	42
Mexico				
Agua Prieta – Fire Station	**62**	**68**	**60**	**64**
Nogales – Fire Station	**67**	**69#**	**65**	**67**

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.

Table 18: 2001 to 2003 Maximum 24-Hour Average PM_{10} Compliance (in µg/m^3, Standard Conditions)

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

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

NOTE: Final EPA Compliance figures for sites with averages marked with '#' may differ from values published here.

2001 to 2003 PM_{10} Maximum 24-Hour Compliance Values, By County

	Sites with Exceedances			Sites in Violation
	2001	2002	2003	
Cochise	0	0	1	1
Coconino	0	0	0	0
Gila	0	0	0	0
Maricopa	3	3	14	13
Mohave	0	0	0	0
Navajo	0	0	0	0
Pima	0	3	1	1
Pinal	0	2	2	1
Santa Cruz	1	1	1	1
Yavapai	0	0	0	0
Yuma	0	0	0	0

Summary: 39 of 56 monitors in compliance

Table 18: 2001 to 2003 Maximum 24-Hour Average PM$_{10}$ Compliance (in Fg/m^3)
Bold denotes value above the standard.

City or Site	2001		2002		2003		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.	
Cochise County							
Douglas – Red Cross	137#	0	127	0	79	0	<1.0#
Paul Spur	55	0	63	0	**207**	**6.4**	**2.1**
Coconino County							
Flagstaff – Middle School	47#	0	49#	0	60#	0	<1.0#
Sedona	23#	0	55#	0	69#	0	<1.0#
Gila County							
Hayden – Old Jail	141	0	122#	0	91	0	<1.0#
Miami – Golf Course	108	0	55	0	53	0	<1.0
Miami – Ridgeline	104	0	52	0	59	0	<1.0
Payson	62	0	46#	0	99	0	<1.0#
Graham County							
Safford	68	0	87	0	76	0	<1.0#
Maricopa County							
Central Phoenix	124	0	81	0	114	0	<1.0
Chandler	146	0	128	0	**240**	**6.0**	**2.0**
Estrella	122#	0	92	0	92	0	<1.0#
Glendale	110	0	88	0	151	0	<1.0
Higley	**176**	**6.0**	138	0	**225**	**6.0**	**12.0#**
Maryvale	123	0	142	0	151	0	<1.0
Mesa	98	0	102	0	**176**	**6.0**	**2.0**
North Phoenix	99	0	80	0	**155**	**6.0**	**2.0**
Palo Verde	71#	0	100	0	**158**	**6.4**	**2.1#**

Table 18: 2001 to 2003 Maximum 24-Hour Average PM_{10} Compliance (in Fg/m^3)
Bold denotes value above the standard.

City or Site	2001		2002		2003		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.	
Phoenix – Durango Complex	**189**	**6.0**	**232**	**12.0**	**195**	**6.0**	**8.0**
Phoenix – Greenwood	145	0	116	0	**166**	**6.0**	**2.0**
Phoenix – JLG Supersite	109	0	72 #	0	**169 #**	**6.0**	**2.0 #**
Phoenix – Salt River	**281**	**49.0**	**249**	**12.4**	N/A	N/A	N/A
Phoenix – West Forty Third	N/A	N/A	**172#**	**6.0**	**157**	**6.0**	**N/A**
South Phoenix	143	0	137	0	**164**	**6.0**	**2.0**
South Scottsdale	110	0	64	0	**172**	**6.0**	**2.0**
Surprise (Closed 7/15/2003)	107	0	81	0	42 #	0	<1.0#
Tempe – Community Center	109	0	65	0	**158**	**6.0**	**2.0**
West Chandler	134	0	80	0	**206**	**13.7**	**4.6**
West Phoenix	142	0	122	0	**158**	**6.4**	**2.1**
Mohave County							
Bullhead City – ADEQ	39#	0	56#	0	121	0	<1.0#
Kingman – Praxair NE	37	0	44#	0	N/A	N/A	N/A
Kingman – Praxair SW	36	0	45#	0	N/A	N/A	N/A
Navajo County							
Show Low	58#	0	53#	0	58	0	<1.0#
Pima County							
Ajo – ADOT	34	0	50	0	139	0	<1.0
Organ Pipe Cactus National Monument (Closed 2/12/2003)	23	0	27#	0	33#	0	<1.0#

Table 18: 2001 to 2003 Maximum 24-Hour Average PM$_{10}$ Compliance (in Fg/m^3) **Bold** denotes value above the standard.							
City or Site	**2001**		**2002**		**2003**		**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.**	
Rillito – ADEQ	89	0	70	0	118	0	<1.0#
Rillito – APCC (1-in-3 day schedule)	77	0	**199**	**3.1**	**256**	**3.1**	**2.1**
South Tucson - ADEQ	113	0	64	**0**	119	0	<1.0
South Tucson – PDEQ	134	0	**200**	**2.0**	150	0	<1.0
Tucson – Broadway/Swan	120	0	62	0	122	0	<1.0
Tucson – Corona de Tucson (ADEQ)	134	0	30#	0	98	0	<1.0#
Tucson – Corona de Tucson (PDEQ)	133	0	40	0	104	0	<1.0
Tucson – 22nd/Craycroft	115	0	53	0	66	0	<1.0
Tucson – Orange Grove (PDEQ)	111	0	**171**	**1.0**	120	0	<1.0
Tucson – Prince Road	125	0	83	0	126	0	<1.0
Tucson – Santa Clara	131	0	86	0	146	0	<1.0
Tucson – Tangerine	81	0	63	0	125	0	<1.0
Tucson – U of A Central	122	0	56	0	130	0	<1.0
Pinal County							
Apache Junction – Maintenance Yard (North)	49	0	62#	0	95	0	<1.0#
Apache Junction – Maintenance Yard (South)	94	0	62#	0	91	0	<1.0#
Casa Grande – Downtown	104	0	69 #	0	99	0	<1.0#
Casa Grande – Eleven Mile Corner (Closed 7/22/02)	146	**0**	150#	0	N/A	N/A	**N/A**
Coolidge – Maintenance Yard	73	0	106 #	0	106	0	<1.0 #

Table 18: 2001 to 2003 Maximum 24-Hour Average PM_{10} Compliance (in Fg/m^3) **Bold** denotes value above the standard.							
City or Site	**2001**		**2002**		**2003**		**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.**	
Eloy – City Complex	142	0	146#	0	154	0	<1.0#
Mammoth – County Complex	99	0	53#	0	89	0	<1.0#
Pinal Air Park	103	0	62#	0	108	0	<1.0#
Pinal County Housing Complex (Opened 8/1/2002)	N/A	N/A	**166** #	N/A	**289**	**12.0**	**N/A**
Stanfield	134	0	**352**#	**12.9**	**171**	**6.4**	**6.4**#
Santa Cruz County							
Nogales – Post Office	**213**	**6.9**	**188**	**6.0**	**184**	**12.3**	**8.4**
Yavapai County							
Clarkdale – NW (#2)	141	0	127	0	68	0	<1.0
Clarkdale – SE (#1)	122	0	86	0	59	0	<1.0
Prescott (Closed 6/25/02)	32#	0	19#	0	N/A	N/A	N/A
Yuma County							
Yuma – Juvenile Center/Courthouse	150 #	1	125	0	127	0	<1.0#

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.

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 (µg/m^3) for the annual arithmetic mean concentration and 65 µg/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 2003.

The annual $PM_{2.5}$ standard is met when the three-year average of annual means is less than or equal to 15.0 µg/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.

Table 19: 2001 to 2003 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 to15 µg/m^3

2001 to 2003 $PM_{2.5}$ Annual Average NAAQS Compliance Values, By County

	Sites with Exceedances			Sites in Violation
	2001	2002	2003	
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
Pinal	0	0	0	0
Santa Cruz	0	0	0	0

Summary: 11 of 11 federal reference monitors in compliance

Table 19: 2001 to 2003 Annual Average $PM_{2.5}$ Compliance (in µg/m^3)

City or Site Federal Reference Monitors	2001	2002	2003	Three-Year Avg
Cochise County				
Douglas – Red Cross	7.2#	7.4#	6.4#	7.0#
Coconino County				
Flagstaff – Middle School	7.1#	7.2#	5.7#	6.7#
Gila County				

Table 19: 2001 to 2003 Annual Average $PM_{2.5}$ Compliance (in µg/m³)				
City or Site Federal Reference Monitors	**2001**	**2002**	**2003**	**Three-Year Avg**
Payson	8.9#	10.0#	9.0#	9.3#
Maricopa County				
Phoenix – JLG Supersite	9.2	11.6#	11.3	10.7#
Tempe – Community Center	9.4	10.4	9.6	9.8
West Phoenix	10.9#	12.6#	10.7	11.4#
Pima County				
Tucson – Children's Park	6.8#	6.6	6.5	6.6#
Tucson – Orange Grove	7.6#	6.4	6.5	6.8#
Pinal County				
Apache Junction – Fire Station	6.3	6.4	6.3 #	6.3
Casa Grande – Downtown	7.7	8.5	8.4	8.2
Santa Cruz County				
Nogales – Post Office	10.7	12.2	11.3	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: 2001 to 2003 24-Hour Average $PM_{2.5}$ Compliance (in µg/m³, 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 µg/m³ for comparison to the standard.

2001 to 2003 $PM_{2.5}$ 24-Hour Average NAAQS Compliance Values, By County				
	Sites with Exceedances			Sites in Violation
	2001	2001	2003	
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
Pinal	0	0	0	0
Santa Cruz	0	0	0	0
Summary: 11 of 11 federal reference monitors in compliance				

Table 20: 2001 to 2003 24-Hour Average $PM_{2.5}$ Compliance (in µg/m³)				
City or Site Federal Reference Monitors	**98th Percentile Samples**			**Three-Year Average**
	2001	**2002**	**2003**	
Cochise County				
Douglas – Red Cross	24.4#	13.9#	11.7#	16.7#
Coconino County				
Flagstaff – Middle School	16.4#	12.0	16.9#	15.1#
Gila County				
Payson	24.0	21.2	24.9#	23.4#
Maricopa County				
Phoenix – JLG Supersite	25.0	31.9	24.2	27.0
Tempe – Community Center	22.7	21.6	25.0	23.1
West Phoenix	30.4#	36.2#	25.9	30.8
Pima County				
Tucson – Children's Park	15.1#	20.2	13.2	16.2
Tucson – Orange Grove	20.4#	21.5	15.9	19.3
Pinal County				
Apache Junction – Fire Station	13.1	13.1	21.1 #	15.8
Casa Grande – Downtown	16.7	20.8	26.7	21.4
Santa Cruz County				
Nogales – Post Office	25.7	25.4	35.0	28.7

#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 2003. 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
Humboldt Mountain *Mazatzal Wilderness and Pine Mountain Wilderness*	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
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})				
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**
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
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
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

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.

Along with the particulate matter sampling, ADEQ also operated transmissometers and nephelometers in Phoenix and Tucson. Data from these instruments through

2003 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 2002 (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 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
Phoenix Nephelometer	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
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

Table 22: Phoenix and Tucson Urban Haze Data 1998 to 2002 (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 (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
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

N/A – Not available

Special Projects

Introduction

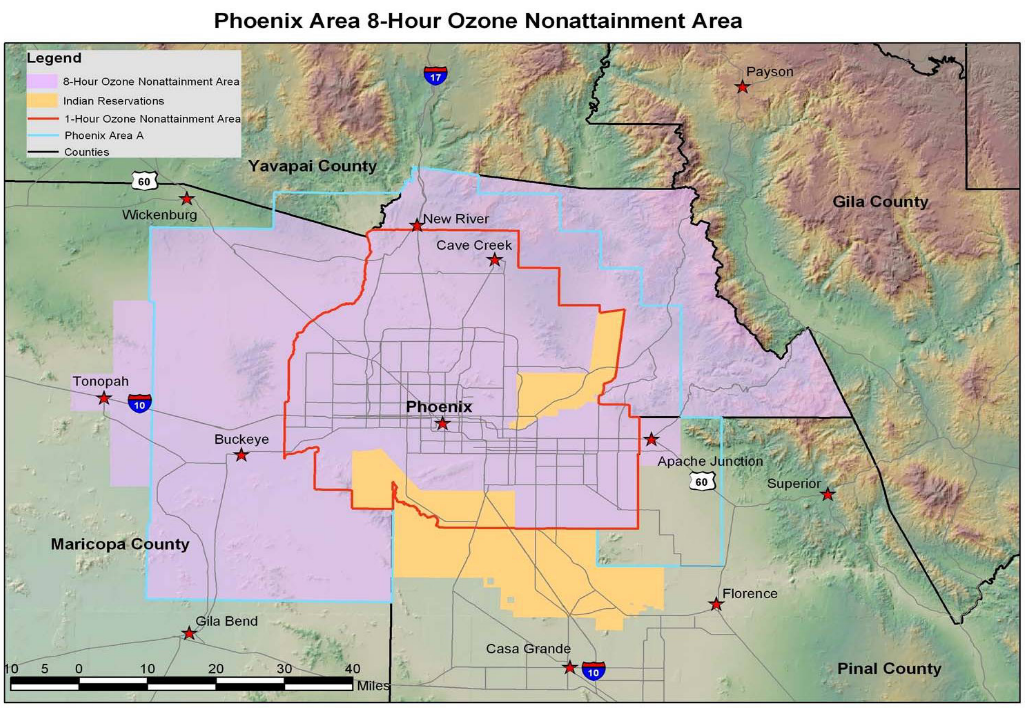
Figure 4 - Yuma West Monitoring Station, Western Arizona/Sonora Border Air Quality Study

In addition to ADEQ's statewide regulatory ambient air monitoring program, the Air Quality Division undertook several special projects during 2003 and the first half of 2004. 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.

8-Hour Ozone Nonattainment Area Boundaries

After the U.S. EPA proposed a new 8-hour average standard for O_3 in 1997, court challenges ensued. In 2001, the U.S. Supreme Court upheld the constitutionality of the Clean Air Act, and the Court of Appeals for the District of Columbia Circuit upheld the 8-hour average O_3 standard. EPA was required to complete designations and classifications of nonattainment areas and to promulgate the nonattainment area boundaries by April 15, 2004. Governors were required to submit recommended boundaries to EPA by July 15, 2003. EPA's presumptive nonattainment boundary area was the entire Phoenix-Mesa-Scottsdale Metropolitan Statistical Area, including both Maricopa and Pinal Counties. The boundary recommended by ADEQ Director Owens for submittal to EPA by the Governor was larger than the 1-hour nonattainment area and wholly contained within Maricopa County. After negotiations and further consideration of the eleven factors for boundary determinations, on April 15, 2004, EPA designated the Phoenix-Mesa-Scottsdale area as a nonattainment area for 8-hour ozone and promulgated a boundary description that included only the Apache Junction portion of Pinal County and an expanded portion Maricopa County as nonattainment for the 8-hour ozone standard. The following map (Figure 5) displays both the 1-hour and 8-hour nonattainment boundaries.

Figure 5



On the same date, EPA classified the nonattainment area as "Basic" under Subpart 1 of Part D, Title I of the Clean Air Act. This classification became effective June 15, 2004. A State Implementation Plan (SIP) to attain this standard must be submitted to EPA by June 15, 2007 and must demonstrate attainment by June 15, 2009. EPA has announced its intent to revoke the 1-hour ozone standard nationwide effective June 15, 2005. Control strategies necessary to attain the 1-hour standard must remain in effect.

On April 30, 2004, EPA promulgated Phase I of the 8-Hour Ozone Standard Implementation Strategy, effective June 15, 2004. Phase II of the 8-Hour Ozone Implementation Strategy is expected by early 2005. Phase II will address transportation conformity. Litigants have challenged EPA's authority to classify nonattainment areas under Subpart 1. Depending on the outcome of the litigation, further technical analysis may be necessary. The outcome of this litigation may not have much impact on how the State addresses the 8-hour O_3 pollution problem.

8-Hour Ozone Forecasting Program

Although still designated as a 1-hour O_3 nonattainment area, Maricopa County must also comply with the recently upheld 8-hour O_3 standard. This standard has been identified by the EPA as a better measure of exposure to ground-level O_3. Since exposure is averaged over an eight hour period, the standard is lower than the one hour standard – 0.08 parts per million versus 0.12 parts per million. During 2002, ADEQ air quality forecasters developed a "practice" forecasting regimen implemented during the O_3 season of April 1 through September 30. O_3 forecasting experience was gained and subsequently applied to improve the methods used from 2003 and through the present. Although not disseminated, a formal forecast page was also developed that indicated the previous day's maximum O_3 concentrations as well as those expected the next 72 hours. During the 2003 O_3 season, this page was posted on the internet for public access along with an inter-active map showing the locations of each O_3 monitor. An O_3 forecast voice recording system is also installed so that citizens without computer access can obtain air quality information reachable at 602-771-2367 and toll free at 1-800-234-5677, extension 771-2367. Additionally, a method to make available daily maximum 8-hour O_3 concentrations on the ADEQ web site for the entire monitoring network is underway.

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 percent 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. A revised SIP was submitted to EPA in February 2004. Supplements will be submitted through February 2005. 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.

In addition, more attention will be paid to agricultural land and implementation of the ADEQ Agricultural Best Management Practices (BMPs) general permits. The Arizona Department of Agriculture provides compliance assistance to ensure use of Agricultural BMPs. Commercial farmers must implement at least one BMP for cropland, non-cropland, and tillage and harvest activities.

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 Aug. 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 Fg/m3, exceeding the National Ambient Air Quality Standard of 150 Fg/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 Aug. 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 Feb. 19, 2004. ADEQ continues to work with the stakeholder group to the attainment demonstration and SIP to EPA by February 2005. All Best Available Control Measures must be adopted and implemented by Aug. 16, 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.

Yuma Wind Forecast

The Yuma area is nonattainment for particulate matter and recently developed a NEAP to address activities that generate dust during high wind events. In an effort to alert citizens to the high wind events and minimize activities that could generate dust, ADEQ began issuing three-day wind forecasts for Yuma and the vicinity at the request of the public. The forecasts are made and posted to the ADEQ website Sunday-Friday between 9-10 a.m. (http://www.azdeq.gov/environ/air/ozone/yumawind.pdf).

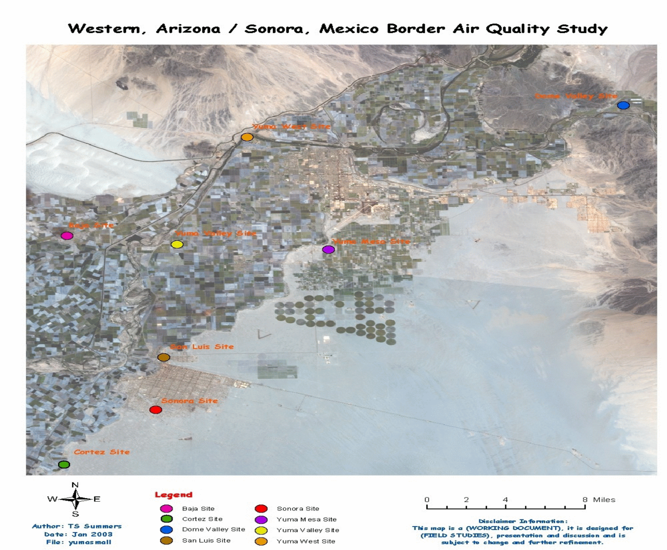


Figure 6 – Map of Western Arizona/Sonora Border Air Quality Study monitoring locations.

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. In order 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 early 2005 and should operate for about a year to provide enough information for the modeling and risk assessment phases of the project.

Urban Air Toxics Monitoring Program

Congress listed 188 hazardous air pollutants (HAPs, also referred to as air toxics) in the Clean Air Act that have been associated with a wide variety of adverse health effects. Of these, the EPA has determined that 33 HAPs constitute the greatest threat to public health in urban areas. HAPs are emitted by a wide variety of anthropogenic sources such as automobiles, commercial and retail entities and large industrial sources. ADEQ conducts monitoring for HAPs as part of the Urban Air Toxics Monitoring Program. The data are entered into the EPA's Air Quality Subsystem (AQS) and National Air Toxics Assessment (NATA) databases.

Air Toxics monitoring includes volatile organic compound (VOC) canister sampling and carbonyl cartridge sampling over 24-hour time frames (midnight to midnight); Photochemical Ambient Monitoring Stations (PAMS) monitoring consists of the same type of samples, but over 3-hour time frames. The 24-hour VOC canisters are analyzed at the EPA contract laboratory for both air toxics compounds and PAMS compounds during the PAMS season (May through October), and for air toxics compounds the remainder of the year.

In 2003, the PAMS and air toxics monitoring sites were: JLG Supersite in Phoenix; Queen Valley near the edge of Tonto National Forest and north of the junction of Highways 60 and 79; and South Phoenix, which is a Maricopa County site near Central Avenue and Broadway Road.

Joint Air Toxics Assessment Project (JATAP)

The first phase of the Joint Air Toxics Assessment Project (JATAP) began in February 2003 and is ongoing. Funding is provided through EPA Region 9 and EPA's Office of Air Quality, Planning and standards (OAQPS). The purpose of this initial small scale study is to determine which HAPs are of most concern in the metropolitan Phoenix area with a specific focus on South Phoenix and the Gila River Indian Community. The basic goals of the monitoring work are data collection (including emissions inventory, VOC sampling, and particulate speciation results, validation and analysis. Monitoring locations include: the South Phoenix site, the West 43rd Avenue site, and the St. Johns site on the Gila River Indian Community.

This project is a prelude to a much larger, more comprehensive tribal/state/federal/local air toxics project that has been in the planning stages for two years by a coalition of tribes and local and regional agencies. Carried out through the Institute for Tribal Environmental Professionals (ITEP) in Flagstaff, this 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).

The larger goal of JATAP is to carry out a HAPs project that would cover the entire Phoenix area, including its three principal Indian reservations; consist of work in air modeling and risk assessment, as well as emissions and air monitoring; and could be completed in four years. Beginning in 2005, with the aide of a $500,000 grant from the U.S. EPA, the JATAP group will collect ambient HAPs data for one year at six sites in metropolitan Phoenix and its three Indian reservations.

Phoenix Area Visibility Index

In April 2002, ADEQ established the Visibility Index Oversight Committee (VIOC) in response to legislation (House Bill 2538, First Regular Session 2001)"to establish options for a visibility standard or other method to track progress in improving visibility in the Phoenix area." The Visibility Index Oversight Committee assisted ADEQ in developing the index. In early 2002, ADEQ awarded a contract to BBC Research and Consulting to develop and conduct a public survey. BBC completed the field survey in August of 2002. Based upon the survey results ADEQ and the Committee formed a recommended Visibility Index in March of 2003.

Committee Recommendation

Recommended Visibility Index for Area A	
1. Index Categories	
Category	**Deciview Range**
Excellent	14 or less
Good	15 to 20
Fair	21 to 24
Poor	25 to 28
Very Poor	29 or greater
2. Averaging	
4-Hour Rolling Average	
3. Statistic for Reporting Period	
Highest Daily Average Deciview Value, as measured during daylight hours (adjusted monthly)	
4. Environmental Goal Show continued progress through 2018 Move days in the poor/very poor categories up to the fair category Move days in the fair category up to the good/excellent categories Progress assessment to be conducted every 5 years through 2018	

ADEQ expanded the Phoenix area urban haze monitoring network. This was completed during the Fall of 2003 and included the addition of one transmissometer (a total of two for the metropolitan area), four nephelometers and five digital cameras, all with near real-time posting to a newly designed web site. The network was deployed to represent the West Valley, Central Phoenix and East Valley as well as views of familiar landmarks such as the White Tank Mountains, Estrella Mountains, Camelback Mountain, Superstition Mountains and the downtown Phoenix area. ADEQ made available to the public a website designed to present the index and near-real time data and imagery in December 2003. The website is available at www.Phoenixvis.net.

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 or series of SIPs to be submitted to EPA prior to the January 31, 2008, 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 and PM (particulate matter) 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 104 incidents. During the calendar year of 2003, HART responded to seven incidents: one chlorine leak, one industrial fire, one garbage dump fire, three forest fires (Cherry Fire outside of Cherry, Aspen Fire outside of San Manuel, and Kinishba Fire outside of Whiteriver), in addition to monitoring in Kingman, Lake Havasu, Yuma, and Quartzsite related to the major wildland fires in California in October and November 2003. Through October 2004, HART responded to six 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).

Trends

Introduction

Whether air quality meets the standards is an important question, 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 three sites in greater Phoenix, and the 24-hour and annual PM_{10} standards at a few urban and rural sites. Visibility – the aspect of the urban atmosphere that is most obvious to the population – is measured continuously in Tucson and Phoenix. This discussion examines the trends in these three common air pollutants and urban visibility in Arizona.

Figure 7 - *1999 Average Best & Average Worst Visibility Impairment in the Phoenix Area*

Carbon Monoxide

Since the mid to late 1970s, CO concentrations have declined by as much as two-thirds. In Tucson, the maximum annual eight-hour concentration of CO at 22nd Street and Alvernon declined from 12 in 1978 to 2.7 parts per million (ppm) in 2003 (Figure 8).

In Phoenix at 18th Street and Roosevelt (Central Phoenix), the decline was from 23.0 to 4.6 ppm (Figure 9). The number of exceedances of the eight-hour standard – 9.5 ppm – 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. Only one exceedance was recorded by this network in 1997-2003. 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.

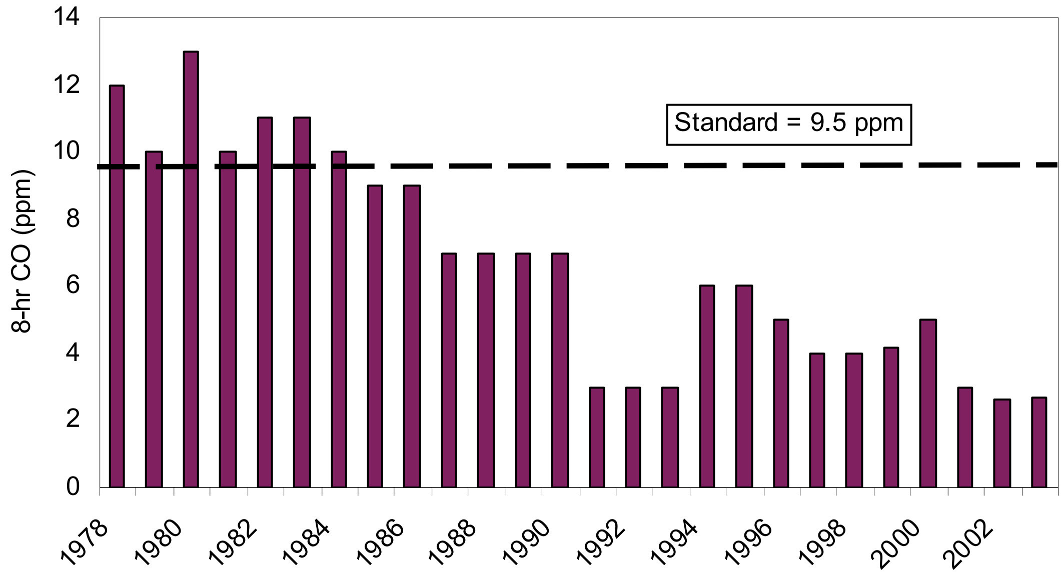


Figure 8: Eight-hour carbon monoxide maxima at 22nd Street and Alvernon Way in Tucson

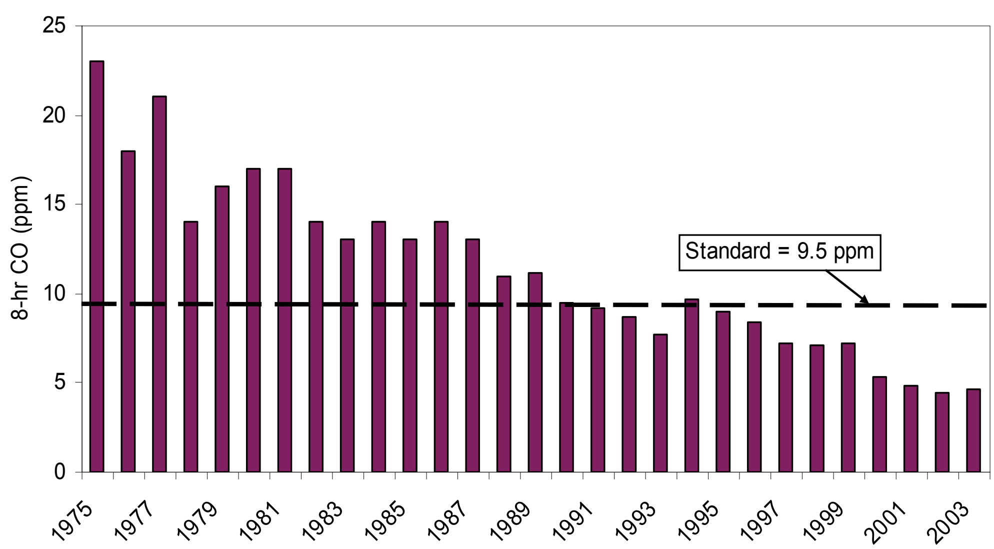


Figure 9: Maximum eight-hour carbon monoxide concentrations at Central Phoenix: 1975-2003

Ozone

One-Hour Ozone Concentrations

Maximum one-hour average O_3 concentrations have remained steady in Tucson and Yuma, but have declined in Phoenix since 1980 (Figure 10). Yuma and Tucson have met the one -hour standard of 0.124 ppm 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 since 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 NOx, changes in emissions would not be expected to translate into proportional changes in concentration.

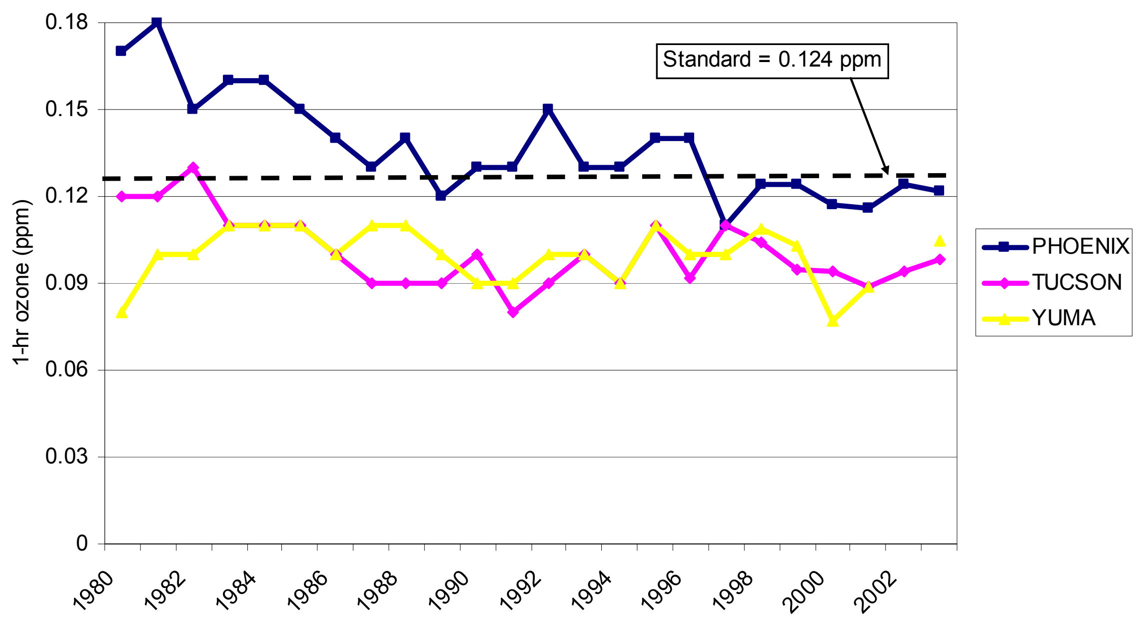


Figure 10: Maximum one-hour ozone concentrations in three cities

Eight-Hour Ozone Concentrations

A new eight-hour O_3 standard, proposed by EPA in 1997 and officially implemented in 2004, is expressed as the three-year average of the annual fourth-highest concentration, not to exceed 0.08 parts per million. 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 does 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).

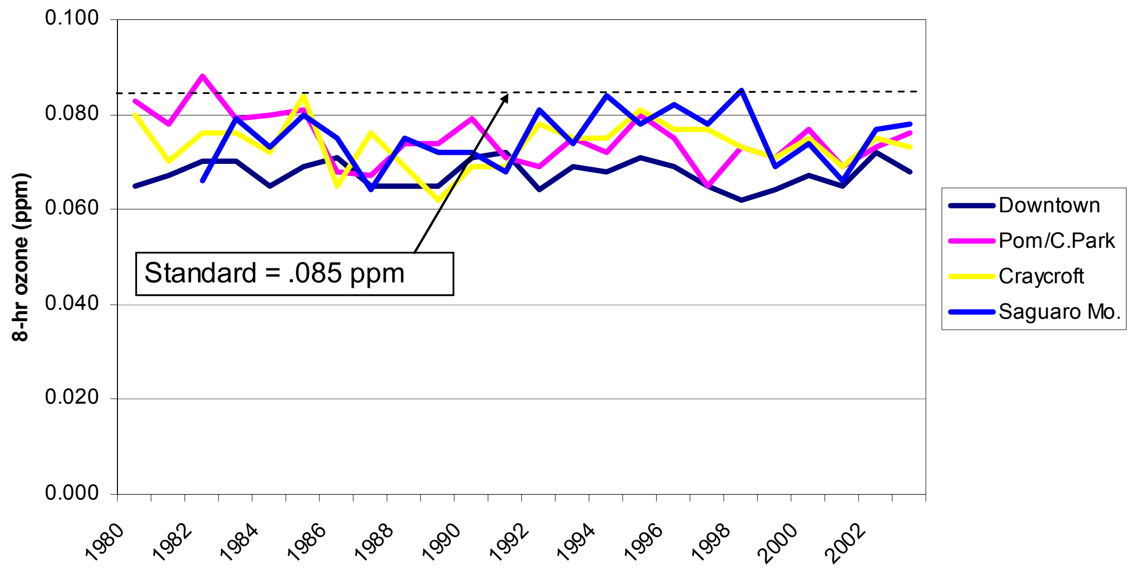


Figure 11: Annual fourth-highest eight-hour ozone concentrations in Tucson

In contrast to the within-standard concentrations in Tucson, 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 2003. The standard of 0.084 ppm is the de facto, or operational standard, in contrast to the statutory standard of 0.08 ppm. This operational standard takes into account the precision of the instrumental method and the rounding off to the nearest 0.01 ppm. In metropolitan Phoenix, these elevated eight-hour O_3 concentrations have occurred at fewer monitoring sites and at lower values in 2003 than in 1995, although the 1997 - 2002 trend is virtually even. For instance, of the 20 sites operational both in 1995 or 1996 and 2003, 14 recorded fourth-highest values greater than 0.084 ppm in 1995, but only three in 2003. The values have decreased through time as well, with typical fourth-highest concentrations decreasing from 1995-96 to 2003: Blue Point Bridge, 0.098 to 0.088; Mesa, 0.092 to 0.076; Phoenix Supersite, 0.102 to 0.079; and North Phoenix, 0.095 to 0.087 ppm. Nearly all of this improvement took place between 1995 and 1997, with the trends in the number of exceeding sites, the number of exceedances, and the numerical values of the concentrations being flat since 1997. 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 seven years ago than in 2003. However, in 2003, six sites in the network recorded fourth-highest values greater than 0.084, with the highest value of 0.090 recorded at Humboldt Mt.

Looking at the specific statistical form of the standard – the three-year average of the annual fourth-highest eight-hour ozone concentration – metropolitan Phoenix has exceeded 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 2003: the first being 1995 to 1997 and the last 2001 to 2003. In the first two three-year periods (Table 23), 11 and 12 monitoring sites, respectively, had average fourth-highest values exceeding 0.084 ppm (or 84 ppb). In the last two periods, the numbers of such sites had decreased to five and three, respectively. The magnitude of these three-year averages has decreased substantially, as well. The highest average for the period ending in 1997 was 96.3 ppb; the highest average in 2003 was 11 percent lower, just above the standard at 85.7 ppb. These trends are consistent with the decreasing one-hour maximum ozone trends; however, most of the decrease in eight-hour ozone concentrations occurred in the mid 1990s. Since 1997, the trends at most sites have leveled off, suggesting that the eight-hour standard will be difficult to achieve 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 billion (ppb) and Bold values in yellow cells equal or exceed the operational standard of 85.0 ppb)

Site	1995-1997	1996-1998	1997-1999	1998-2000	1999-2001	2000-2002	2001-2003
Emergency Mgmt	**96.3**	**87.3**	84.7	82.3	76.3	Closed	Closed
North Phoenix	**93.7**	**92.3**	**88.0**	**86.3**	**85.3**	**85.7**	**85.6**
Salt River Pima	**93.0**	**90.7**	84.3	Closed	Closed	Closed	Closed
Phoenix Supersite	**92.7**	**85.3**	73.7	72.7	72.3	77.0	76.6
Blue Point	**90.3**	**89.3**	**86.0**	**88.7**	**85.3**	84.3	84.0
Apache Junction	**90.0**	**86.0**	81.7	81.3	79.7	79.7	76.3
Mesa	**89.7**	**85.3**	81.0	79.3	77.3	73.7	Closed
Pinnacle Peak	**89.0**	**86.7**	81.0	81.7	82.0	**85.0**	84.0
Fountain Hills	**89.0**	**85.0**	82.3	81.7	81.0	84.7	84.0
Falcon Field	**89.0**	**85.0**	82.3	81.7	81.0	80.0	81.3
Mount Ord	**88.0**	**90.7**	**87.3**	88.7	84.7	Closed	Closed
South Scottsdale	84.3	80.7	75.3	76.0	76.0	78.7	78.3
West Phoenix	84.3	84.7	**85.3**	**86.0**	82.3	80.0	78.6

Table 23: Three-Year Averages of the Annual Fourth-Highest Eight-Hour Ozone Concentrations in Phoenix and Environs ***(Units are in parts per billion (ppb) and Bold values in yellow cells equal or exceed the operational standard of 85.0 ppb)***							
Site	1995-1997	1996-1998	1997-1999	1998-2000	1999-2001	2000-2002	2001-2003
Maryvale	84.0	83.7	81.3	83.0	78.3	79.0	80.0
Humboldt Mountain	83.7	**88.0**	**86.0**	**86.3**	84.7	**85.0**	**87.3**
Maximum	**96.3**	**92.3**	**88.0**	**88.7**	**85.3**	**85.7**	**87.3**
n ≥ 85.0 ppb	11	12	5	5	2	3	2

Illustrated in Figure 12 are the three-year average data from those monitoring sites in Table 23 that have recorded one or more averages above the standard of 84 ppb. This figure clearly shows that virtually all of the downward trends that occurred between 1995 and 2003 took place in the first two thirds of this period. Since 1999 – 2001, the overall trend at these sites has been even, with an equal mix of steady, upward, and downward trends.

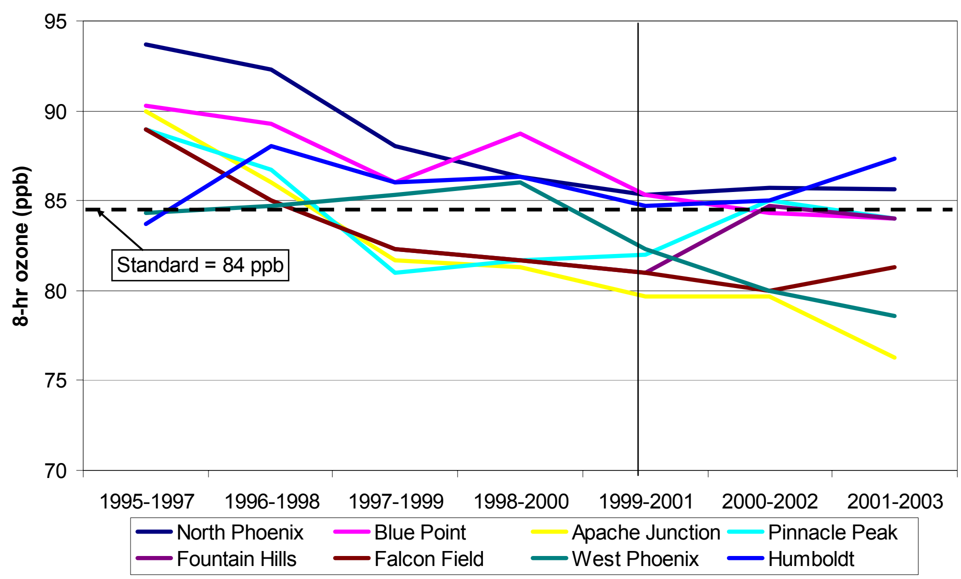


Figure 12: Phoenix area eight-hour ozone trends: three-year averages of the annual fourth high concentrations

Particulates

PM_{10}

The concentrations of PM_{10} have decreased considerably throughout the state in both urban and rural settings. Nonetheless, this pollutant, more than any other, continues to exceed its annual standard. For example, annual PM_{10} concentrations in South Phoenix averaged 68.7 $\mu g/m^3$ from 1985 through 1987, but only 54.0 $\mu g/m^3$ in 2001-2003, a decrease of 21 percent but still over the standard. Similar percentage decreases occurred from the 1980s at Central Phoenix and West Phoenix (Figures 13a and b).

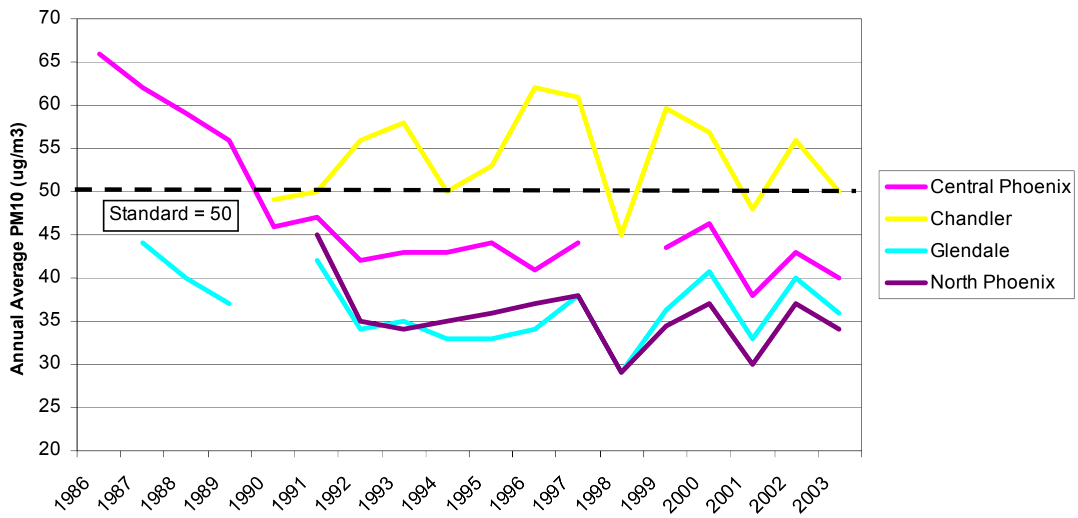


Figure 13a: Annual Average PM_{10} trends at four metropolitan Phoenix sites with moderate PM_{10} levels.

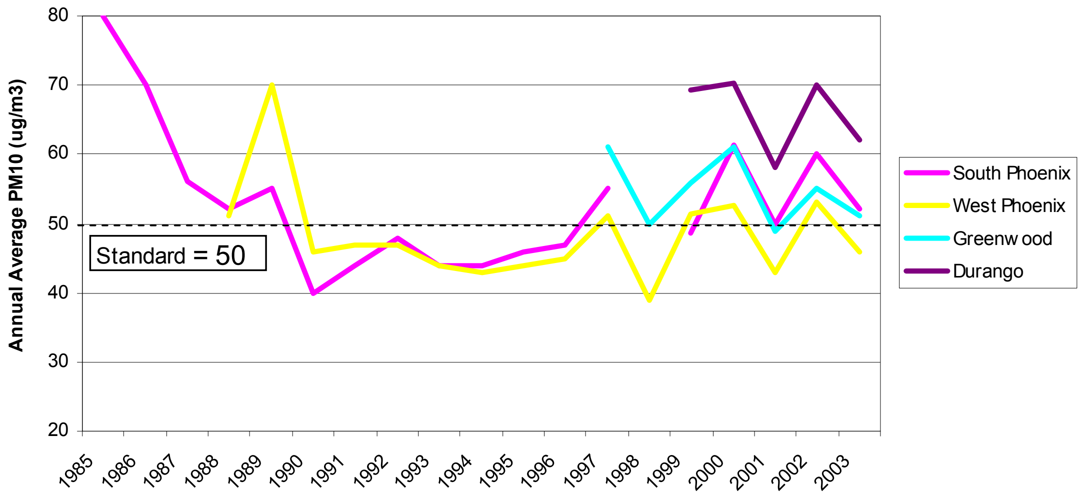


Figure 13b: PM_{10} trends at four metropolitan Phoenix sites with higher PM_{10} levels

Despite these improvements in the PM_{10} particulates concentrations, 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 43 monitor years, 20 (47 percent) 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, near the industrial Salt River area, may be subject to emissions from the industrial and area 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 through prevailing winds. Two miles southwest of West Phoenix, Greenwood combines the high regional concentrations with its close proximity to a major arterial street and major freeway.

Table 24: Annual PM_{10} Concentrations for 12 Years in Metropolitan Phoenix (in $\mu g/m^3$)									
	Central Phoenix	*Chandler*	*Glendale*	*North Phoenix*	*South Phoenix*	*West Phoenix*	*Mesa*	*South Scottsdale*	*Greenwood*
1992	42	**56**	34	35	48	47	29	34	N/A
1993	43	**58**	35	34	44	44	35	34	N/A
1994	43	50	33	35	44	43	36	38	N/A
1995	44	**56**	33	36	46	44	35	36	N/A
1996	41	**62**	34	37	47	45	33	35	N/A
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**
2000	46	**57**	41	37	**61**	**53**	37	40	**61**
2001	38	48	33	30	50	43	30	33	49
2002	43	**56**	40	37	**60**	**53**	36	37	**55**
2003	40	50	36	34	**52**	46	34	36	**51**

Bold values in yellow cells exceed the annual standard of 50 Fg/m3. *Does not satisfy EPA summary criteria of 75 percent data recovery. N/A – Data not available

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 been twice the standard in four of the nine monitoring years.

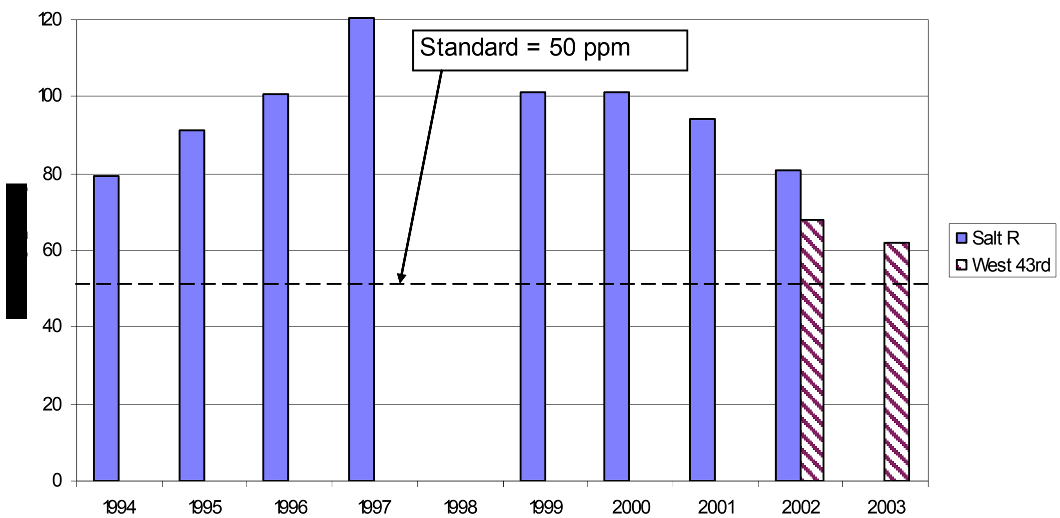


Figure 14. Annual PM_{10} concentrations in the Salt River area

In Tucson, the background site of Corona de Tucson and the rural site of Green Valley have had steady, even trends of PM_{10}, but the four long-term urban sites all show substantial decreases. Orange Grove averaged 43.3 $\mu g/m^3$ in 1985-87, but steadily decreased in the next 10 years and then leveled out to a concentration in 2001-2003 of 30.3 $\mu g/m^3$ – a decrease of 30 percent. South Tucson, Prince Road and Broadway/Swan showed smaller, but substantial, decreases (Figure 15) and similar patterns of an early decrease followed by a steady trend.

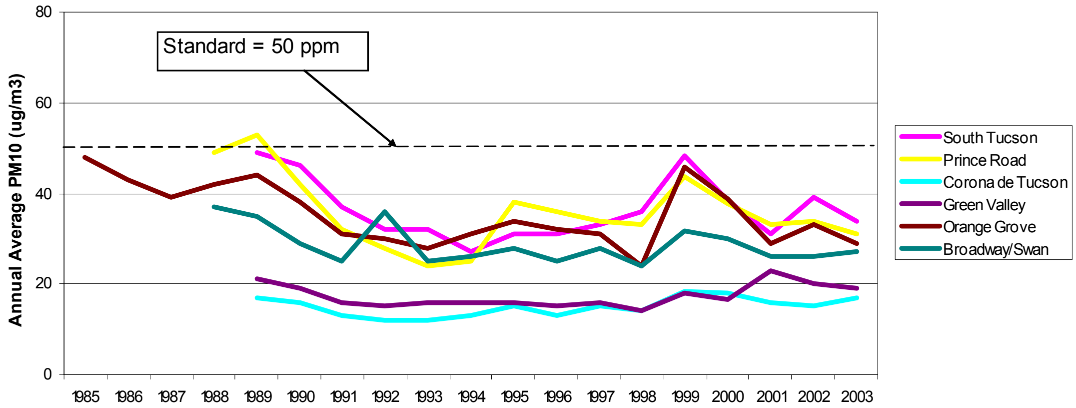


Figure 15: Annual Average PM10 trends at six metropolitan Tucson sites

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

Throughout 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. In each of these localities, road paving and better industrial dust controls can be given credit for most of the improvement (Figure 16).

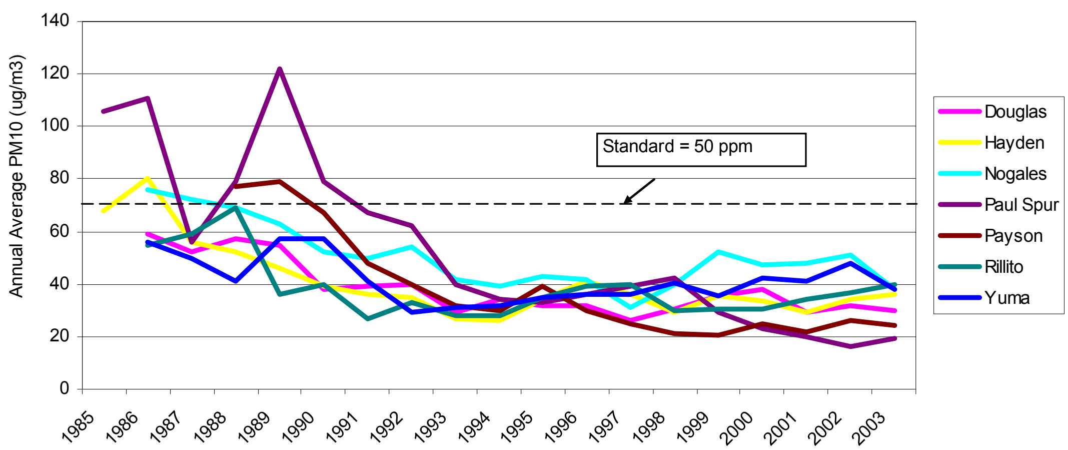


Figure 16: Annual Average PM_{10} concentrations at the higher concentration sites in Arizona

PM_{10} concentrations at the 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).

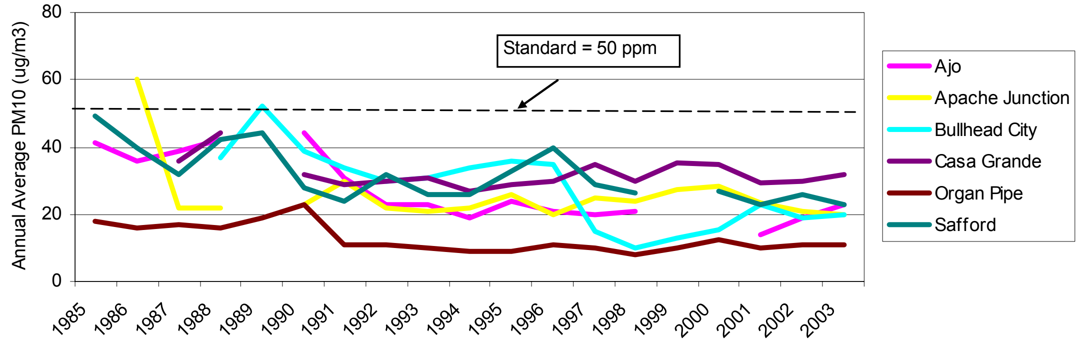


Figure 17: Annual Average PM_{10} concentrations at lower concentration sites at lower elevations

With the exception of Montezuma's Castle, a background site that has leveled off, all of the higher-elevation, low-concentration sites showed decreasing trends for PM_{10}. Clarkdale decreased 38 percent; Flagstaff, 69 percent; Joseph City, 45 percent; Nelson, 45 percent; and Show Low, 56 percent. Part of these decreases may be attributed to cleaner-burning wood stoves and fireplaces (Figure 18). What is encouraging in these various sites is that not a single one shows an upward trend, whether urban, industrial, agricultural or rural.

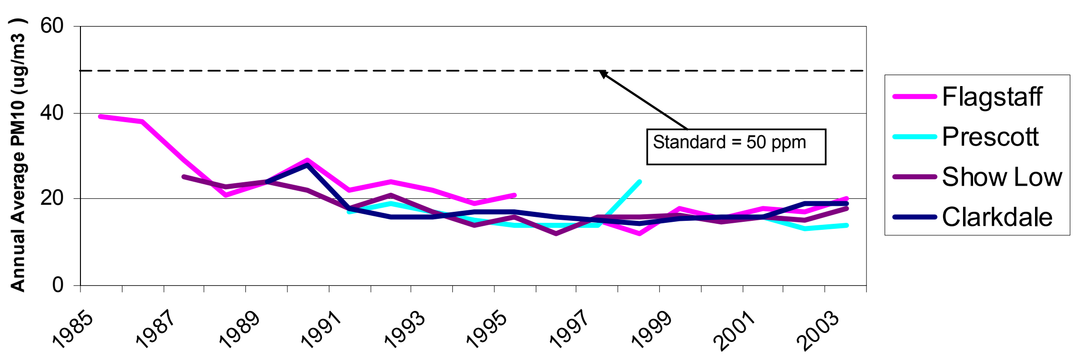


Figure 18: Annual Average PM_{10} concentrations at low concentration sites at higher elevations

$PM_{2.5}$

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 2000. These 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 smaller cities and towns, in 1994 in Tucson, and in 1995 in Phoenix. In any case, slight downward trends at some urban sites are apparent. Nogales, Yuma and Flagstaff have shown overall level (or flat) trends, while Payson's is significantly down by 39 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 appear to decrease through 2000 and increase slightly through 2003. In metropolitan Tucson, the only two sites with a continuous record show that Orange Grove has decreased significantly since 1999 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**
1991	7.6	N/A	**17.9**	12.3
1992	5.7	N/A	**17.2**	12.6
1993	6.1	5.4	13.0	9.7
1994	8.3	4.9	**15.8**	10.4
1995	7.2	5.8	**15.7**	14.3
1996	8.7	11.2	14.4	13.3
1997	6.0	5.0	12.2	11.3
1998	8.3	4.7	10.9	12.5

Table 25a: Annual PM_{fine} and $PM_{2.5}$ Concentrations Throughout Arizona (in µg/m³)				
Statewide				
1999	7.9	8.4 *	9.8 *	12.5 *
2000	8.7	6.9 *	10.0 *	12.8 *
2001	N/A	7.1 *	8.8 *	10.7 *
2002	N/A	7.1 *	10.0 *	12.1 *
2003	N/A	5.6 *	8.9 *	11.3 *

Table 25b: Annual PM_{fine} and $PM_{2.5}$ Concentrations in the Phoenix Metropolitan Area(in µg/m³)

	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 *

Table 25c: Annual PM_{fine} and $PM_{2.5}$ Concentrations in the Tucson Metropolitan Area(in $\mu g/m^3$)						
	Orange	22 Cray	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*

Bold values exceed the annual standard of 15 $\mu g/m^3$.
N/A – Not available.
* Data are from federal reference monitors, not dichot monitors.

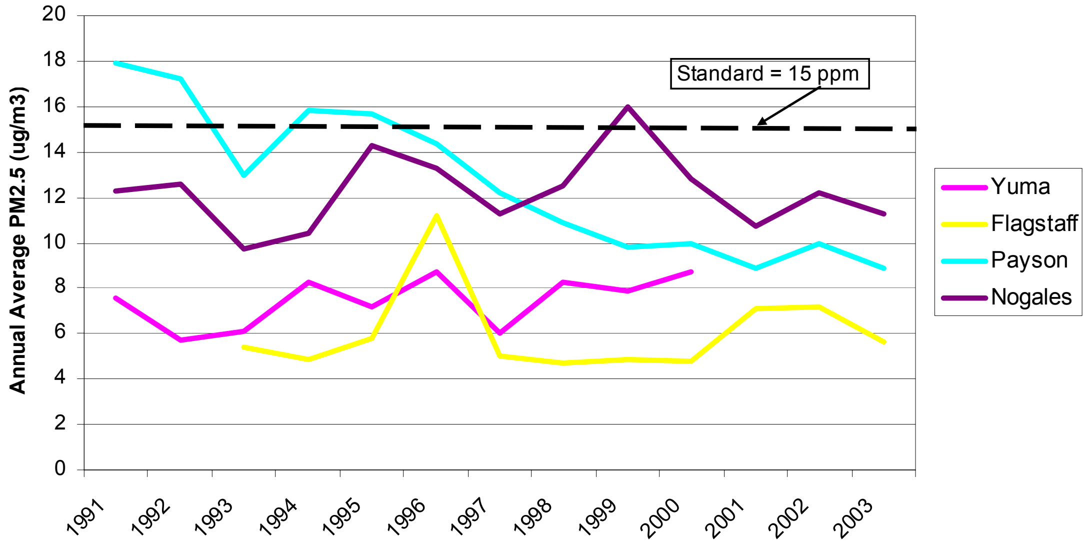


Figure 19: Statewide Annual Average $PM_{2.5}$ trends

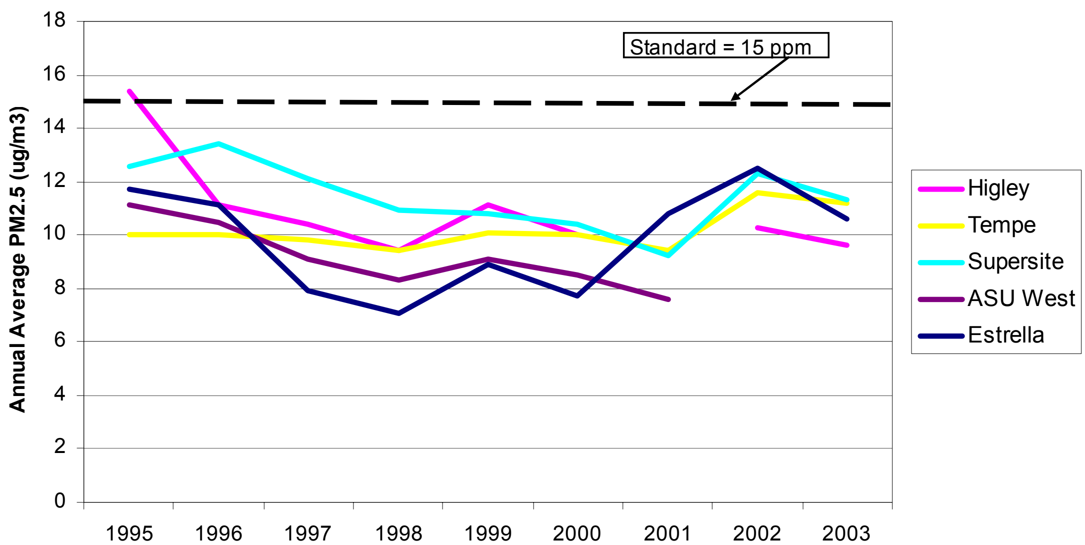


Figure 20: Metropolitan Phoenix Annual Average $PM_{2.5}$ trends

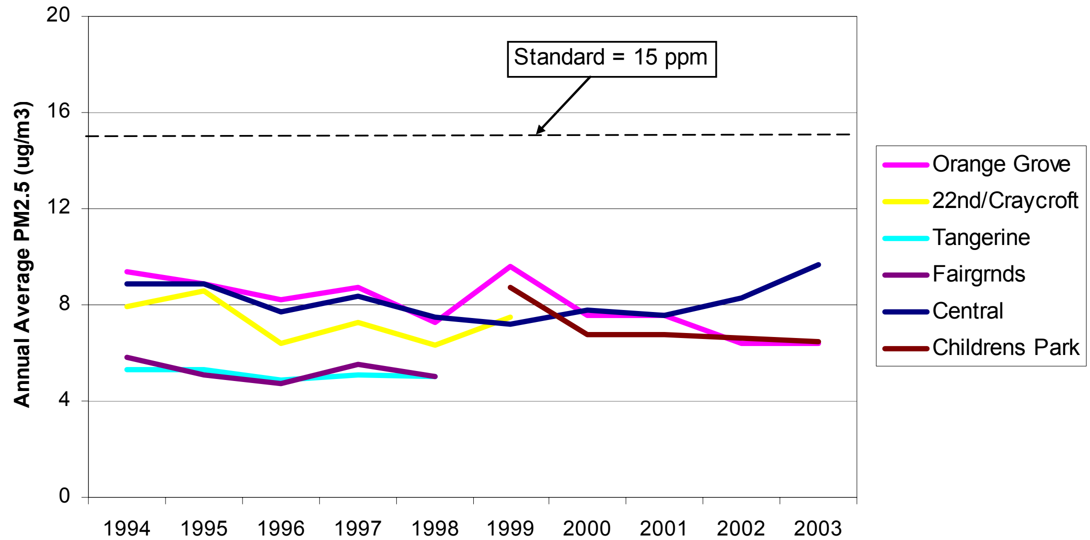


Figure 21: Metropolitan Tucson Annual Average PM_{fine} and $PM_{2.5}$ trends

Visibility

Optical measurements of visibility have been made continuously since 1993 in Tucson and since 1994 in Phoenix. Light extinction – the degree to which sunlight is reduced by its interaction with fine 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. Table 26 and Figures 22 and 23 present these data.

Table 26a: Light Extinction in Phoenix and Tucson (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

N/A - Data not available

Table 26b: Light Extinction in Phoenix and Tucson (in Mm-1)						
Tucson						
Year	**All Hours**			**5-11 a.m.**		
	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

Distinct trends from these tabular data are somewhat difficult to discern, in part because of the year-to-year variability. Rather than plotting 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 percent category for 1994. The fourth quarter of that year, when many of the dirtiest 20 percent 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.

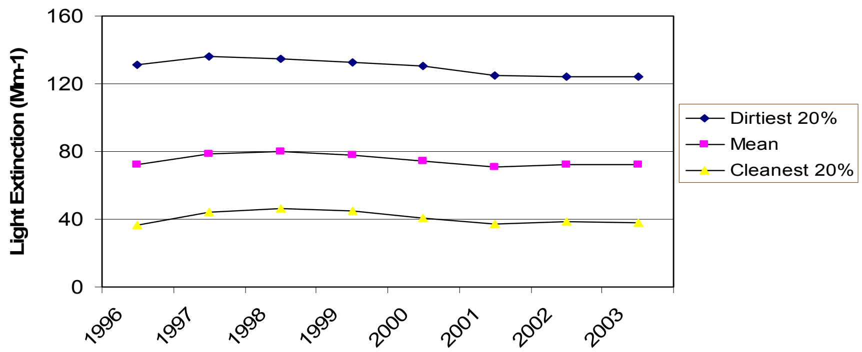


Figure 22: Light extinction trends for Phoenix, shown as three-year moving averages, for all hours

Considering Phoenix first, the steady improvement in the 20 percent dirtiest category is evident. The most recent period in this category is 10 percent lower than the first period. For both the mean and 20 percent cleanest days, however, the steadily downward trend of the dirtiest 20 percent category is replaced by a more complicated trend – one in which the first two periods increase, through the period ending in 1998, but the subsequent periods gradually decrease. The net percentage change from the most recent to the first period for these two categories is close to zero: a 1 percent 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 percent), but the mean and 20 percent 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 1993 and 2003 for all three statistics: the dirtiest, the mean, and the cleanest (Figure 23). The improvement in the 20 percent dirtiest days has been the same as Phoenix – 10 percent -- but considerably greater improvements have been realized in the other two categories: 16 percent for the mean and 28 percent for the cleanest 20 percent.

Since it is difficult for an observer to distinguish between the various grades of the cleanest 20 percent, perhaps the overall Phoenix-Tucson trends look the same. That is, over this ten-year period, there has been a 10 percent decrease in the light extinction values for the dirtiest days in both cities. Residents of each metropolitan area, then, have observed a steady, gradual improvement in visual air quality for these haziest of days. While the worst of the brown clouds are still quite evident, especially on winter mornings, their severity over both cities has diminished.

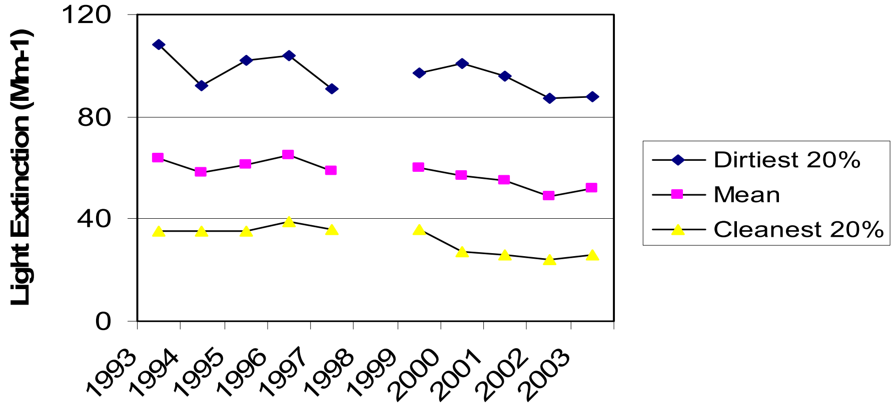


Figure 23: Light extinction trends for Tucson, shown as three-year moving averages, for all hours

An interesting intercity trend (Figure 24) appears in the cleanest 20 percent 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 improved over the 1996-98 maxima, but by not nearly as much. The result is that in 2001 - 2003. Tucson's cleanest days were 35 percent cleaner than in Phoenix (25 Mm-1 vs 38 Mm-1).

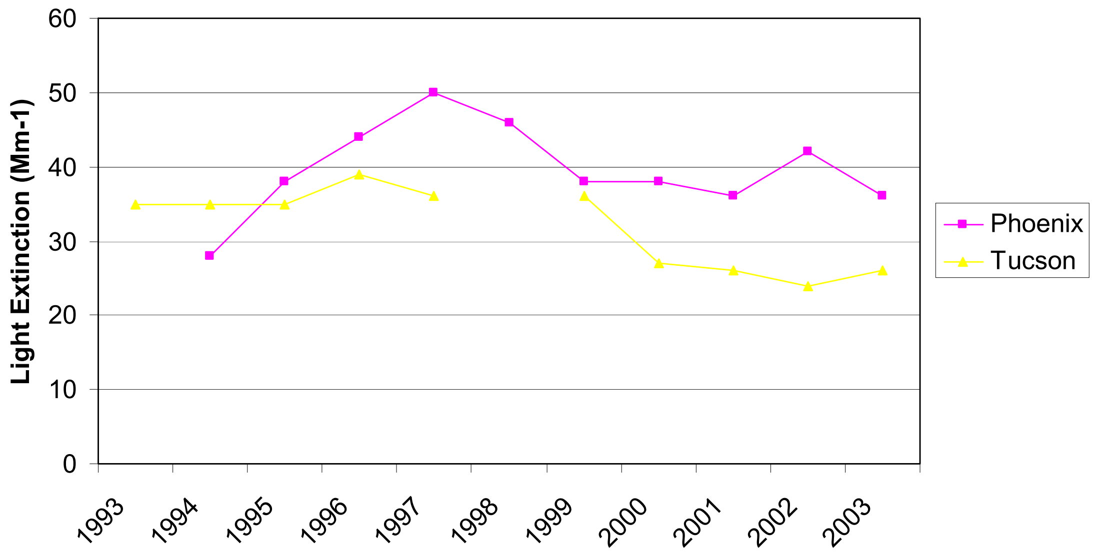


Figure 24: Light extinction trends for all hours for Tucson and Phoenix: three-year moving averages for the cleanest 20 percent days

Seasonal patterns also vary between the two cities, 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 almost no 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. These measurements of the poorer visibility in Phoenix will come as no surprise to those Arizonans familiar with both airsheds.

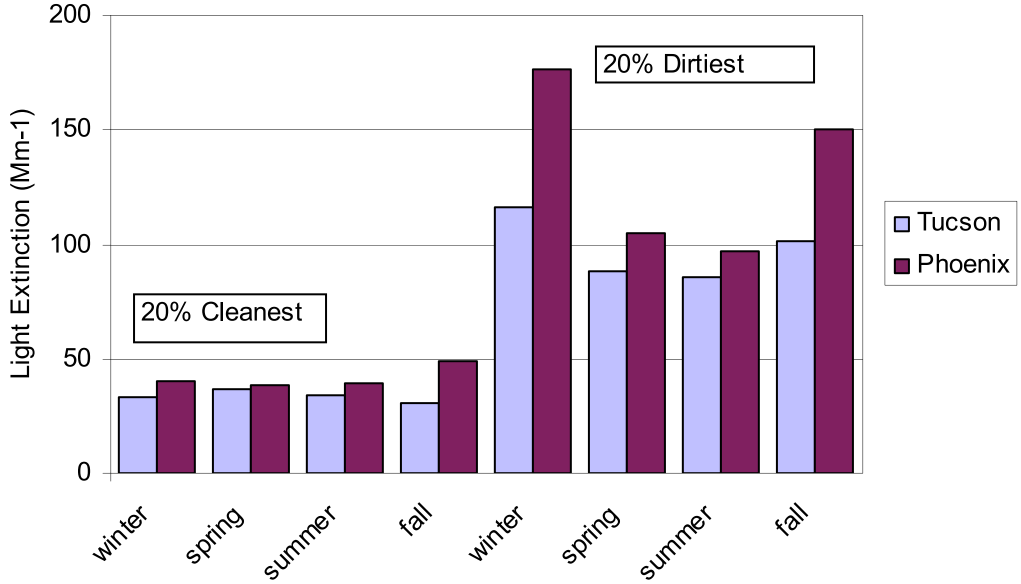


Figure 25: Seasonal variation in light extinction of the 20 percent cleanest and 20 percent dirtiest days in Tucson and Phoenix

In the following, final, discussion of visibility, the light scattering as measured by the nephelometer is compared between the urban and rural areas of the state (Figure 26). The variation of light scattering between rural and urban locations is very apparent in each category. On the dirtiest 20 percent days, light scattering values in the Phoenix area are approximately 3.5 times greater than in the rural areas, while values in the Tucson area are nearly 2 times greater. Values for the mean and 20 percent cleanest days show similar results. An interesting comparison between urban and rural areas is the light scattering values on the worst 20 percent days in the rural areas are approximately equal to the median of the urban areas.

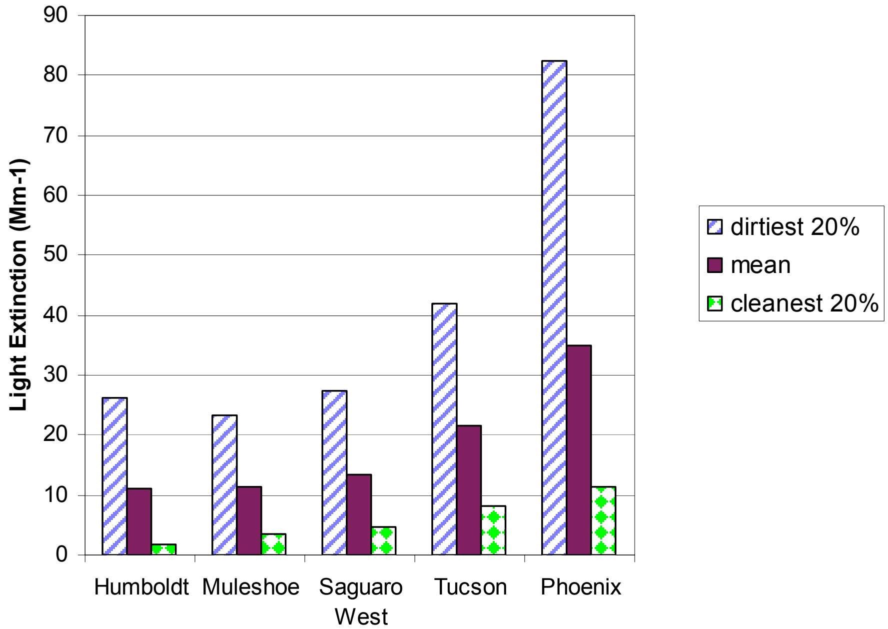


Figure 26: Comparison of light scattering on the 20 percent cleanest, mean, and 20 percent dirtiest days for urban and rural areas.

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 met the standard in 1997-2001, the first years since monitoring began. Phoenix one-hour ozone concentrations in the 1980s and early 1990s ranged as high as 0.15 to 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, 11 monitoring sites in greater Phoenix exceeded the new eight-hour O_3 standard; in 1999-2001 only two sites exceeded the standard (0.08 ppm).

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 smaller cities and towns. In Payson and at some industrial sites, PM_{10} concentrations have been reduced by as much as two-thirds. By 2001, 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, respectively; for example, at the centrally located Phoenix Supersite, the decrease has een 21 percent; at 22nd and Craycroft, in east-central Tucson, the decrease has been 24 percent. The Phoenix decreases are inconsistent with the increasing trends in light extinction, caused primarily by small particles.

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 most of the time, with the exceptions being the eight-hour O_3 standard during Phoenix summers and the PM_{10} standards on both an episodic and annual basis at those sites affected by localized dense emissions. These improving air quality trends, resulting from control programs at the federal, state and local levels, have improved the respiratory health of the citizenry and can be considered a testament to the public support for a cleaner environment.

Appendix 1 – Site Index

Site Index – Ambient Air Monitoring Locations in Arizona in 2003								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Apache County								
Greer – Water Treatment Plant (Mt Baldy)	34E 04'	109E 26'	ADEQ, USFS	Bscat, MET, IMPROVE	Class I	Regional	Visibility	8255
Springerville – Coalyard	34E 19'	109E 09'	TEP	PM_{10}	SPM	Unknown	Source Impact	6900
Springerville – Coyote Hills	34E 10'	109E 13'	TEP	NO_2, PM_{10}, SO_2	SPM	Unknown	Source Impact	6600
Cochise County								
Bisbee Airport (2 miles north of Bisbee Junction)	31E 22'	109E 53'	ADEQ	MET	SPM	Urban	Population	4780
Chiricahua National Monument (3.5 miles west of monument headquarters)	32E 00'	109E 23'	NPS	CASTNET, IMPROVE, MET, O_3	Class I	Regional	Visibility	5130
Douglas – Cemetery (1505 5th St.)	31E 20'	109E 33'	ADEQ	MET	SPM	Neighbor-hood	Population	4100
Douglas – Red Cross (1445-1449 15th St.)	31E 20'	109E 30'	ADEQ	PM_{10}, $PM_{2.5}$	SLAMS	Neighbor-hood	Population	4100

Site Index – Ambient Air Monitoring Locations in Arizona in 2003								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Muleshoe Ranch – Muleshoe Ranch Preserve (Galiuro Wilderness)	32E 21'	110E 14'	ADEQ	Bscat, IMPROVE, MET	Class I	Regional	Visibility	4400
Naco – Border Patrol Crossing (2188 1st St.)	31E 20'	109E 57'	ADEQ	Bscat	SPM	Neighbor-hood	Population	4623
Paul Spur – Naco Road (East of Chemical Lime Plant)	31E 22'	109E 49'	ADEQ	PM_{10}, MET	SLAMS (PM_{10})	Middle	Source Impact	4192
Coconino County								
Flagstaff – Middle School (755 N. Bonito)	35E 12'	111E 38'	ADEQ	PM_{10}, $PM_{2.5}$	SLAMS	Neighbor-hood	Population	6906
Grand Canyon National Park – Hance Camp (South Rim, 2.5 miles west of village)	35E 58'	111E 59'	NPS	O_3, MET, IMPROVE, CASTNET	Class I	Regional	Visibility	7438
Grand Canyon National Park – Indian Gardens (4.5 miles from Bright Angel trailhead)	36E 05'	112E 08'	NPS	IMPROVE	Class I	Regional	Visibility	3832
Page – Navajo Generating Station (3 miles east of Page)	36E 55'	111E 24'	SRP	O_3, NO_2, PM_{10}, SO_2	SPM	Urban	Source Impact	3648
Sedona – Post Office (190 W. Highway 89A)	34E 52'	111E 45'	ADEQ	PM_{10}	SPM	Neighbor-hood	Population	4220

Site Index – Ambient Air Monitoring Locations in Arizona in 2003								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Sycamore Canyon (Camp Raymond)	35E 08'	111E 58'	ADEQ, NPS	Bscat, IMPROVE, MET	Class I	Regional	Visibility	6693
Gila County								
Globe Highway	33E 01'	110E 45'	ASARCO	SO_2	SPM	Regional	Source Impact	1950
Hayden – Garfield Avenue	33E 00'	110E 47'	ASARCO	SO_2	SPM	Neighbor-hood	Source Impact	2090
Hayden – Montgomery Ranch (NE, NE, Sec 4, T 5S, R 15E)	33E 00'	110E 47'	ASARCO	SO_2	SPM	Regional	Source Impact	2325
Hayden – Old Jail (Canyon Drive)	33E 00'	110E 47'	ADEQ, ASARCO	PM_{10}, SO_2	SLAMS (ADEQ SO_2 and PM_{10}) SPM (ASARCO SO_2)	Neighbor-hood	Source Impact	2050
Miami – Golf Course	33E 24'	110E 49'	PDMI	PM_{10}	SPM	Neighbor-hood	Source Impact	3320
Miami – Jones Ranch (Cherry Flats Rd.)	33E 23'	110E 51'	PDMI	SO_2	SPM	Neighbor-hood	Source Impact	4094

Site Index – Ambient Air Monitoring Locations in Arizona in 2003								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Miami – Ridgeline (4030 Linden St.)	33E 23'	110E 52'	ADEQ, PDMI	PM_{10}, SO_2	SLAMS (ADEQ SO_2) SPM (PDMI PM_{10})	Neighbor-hood	Source Impact	3560
Miami – Town Site (Sullivan St.)	33E 23'	110E 52'	PDMI	SO_2	SPM	Neighbor-hood	Source Impact	3390
Payson (204 W. Aero Dr.)	34E 14'	111E 20'	ADEQ	PM_{10}, $PM_{2.5}$	SLAMS	Neighbor-hood	Population	4910
Pleasant Valley – Ranger Station (Sierra Ancha USFS Wilderness)	34E 05'	110E 56'	ADEQ, USFS	IMPROVE, Bscat, MET	Class I	Regional	Visibility	5133
Tonto National Monument – Maintenance Station (Tonto National Forest)	33E 39'	111E 07'	ADEQ, USFS	IMPROVE, O_3	Class I	Regional	Visibility	2579
Graham County								
Safford (523 Tenth Ave.)	32E 49	109E 43'	ADEQ	PM_{10}	SLAMS	Neighbor-hood	Population	2950
Maricopa County								
Bethune Elementary School (1310 S. 15th Ave.) Opened 01/03/2003	33E 26	112E 05'	ADEQ	PM_{10}, Speciated $PM_{2.5}$	SPM, STN	Neighbor-hood	Population	324

Site Index – Ambient Air Monitoring Locations in Arizona in 2003								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Blue Point (Usery Pass and Bush Highway)	33E 33'	111E 36'	MCESD	MET, O_3	SLAMS (MET) NAMS (O_3)	Urban	Maximum Concentration	1575
Cave Creek (37109 N. Lava Lane)	33E 49'	112E 01'	MCESD	MET, O_3	SLAMS	Urban	Maximum Concentration	1916
Central Phoenix (1845 E. Roosevelt)	33E 27'	112E 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.)	33E 17'	111E 49'	MCESD	MET, PM_{10}	SLAMS (MET) NAMS (PM_{10})	Neighbor-hood	Population	1171
Estrella (15099 W. Casey Abbott Dr., Goodyear)	33E 23'	112E 22'	ADEQ	PM_{10}	SPM (Urban Haze)	Neighbor-hood	Population	1000
Falcon Field (4530 E. McKellips, Mesa)	33E 27'	112E 04'	MCESD	MET, O_3	SLAMS	Urban	Population	1017
Fountain Hills (16426 E. Palisades)	33E 37'	111E 43'	MCESD	MET, O_3	SLAMS (MET) NAMS (O_3)	Neighbor-hood	Maximum Concentration	1444
Glendale (6000 W. Olive)	33E 33'	112E 12'	MCESD	CO, MET, O_3, PM_{10}	SLAMS (CO, MET, O_3), NAMS (PM_{10})	Neighbor-hood	Population	1171

Site Index – Ambient Air Monitoring Locations in Arizona in 2003								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Higley (15500 S. Higley Rd.)	33E 18'	111E 43'	MCESD	MET, PM_{10}	SLAMS (MET) SPM (PM_{10})	Neighbor-hood	Population	1250
Humboldt Mountain (Pine Mountain wilderness)	33E 58'	111E 47'	MCESD	O_3	SLAMS	Regional	Background/ Transport	5230
Maryvale (6180 W. Encanto)	33E 28'	112E 20'	MCESD	CO, O_3, PM_{10}	SLAMS	Neighbor-hood	Population	1050
Mesa (370 S. Brooks)	33E 24'	111E 51'	MCESD	CO, MET, O_3, PM_{10}	SLAMS	Neighbor-hood	Population	1221
North Phoenix (601 E. Butler)	33E 33'	112E 04'	MCESD	CO, MET,O_3, PM_{10},	SLAMS	Neighbor-hood	Population	1243
Palo Verde (36248 W. Elliot Rd.)	33E 20'	112E 50'	ADEQ	NO_2, O_3, Pb, PM_{10}	SLAMS	Regional	Background	870
Phoenix – Durango Complex (2702 AC Esterbrook Blvd.)	33E 25'	112E 07'	MCESD	MET, PM_{10}	SLAMS	Middle	Maximum Concentration	1575
Phoenix – Greenwood (I-10 and 27th Avenue)	33E 28'	112E 07'	MCESD	CO, MET, NO_2, PM_{10}	SLAMS	Microscale	Maximum Concentration	1110

Site Index – Ambient Air Monitoring Locations in Arizona in 2003								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Phoenix – JLG Supersite (4530 N. 17 Ave.)	33E 30'	112E 05'	ADEQ	Bscat, CO, NO_2, Met, O_3, PM_{10}, $PM_{2.5}$, Speciated $PM_{2.5}$	SPM (Urban Haze) SLAMS (CO, NO_2, O_3, $PM_{2.5}$) PAMS (Type 2) STN	Neighbor-hood	Population	1115
Phoenix – North Mountain Summit (North Mountain)	33E 35'	112E 05'	ADEQ	Visibility	SPM (Urban Haze)	Urban	Urban Haze	1640
Phoenix – Salt River (3045 S. 22nd Ave.)	33E 21'	112E 06'	ADEQ, MCESD	PM_{10}	SPM	Middle	Maximum Concentration	984
Phoenix – Transmissometer (Phoenix Baptist Hospital)	33E 29'	112E 04'	ADEQ	Bext	SPM (Urban Haze)	Urban	Urban Haze	1115
Phoenix – Transmissometer Receiver (Sunshine Hotel)	33E 29'	112E 04'	ADEQ	Bext	SPM (Urban Haze)	Urban	Urban Haze	1115
Phoenix – Vehicle Emissions Laboratory (600 N. 40th St.)	33E 27'	112E 00'	ADEQ	MET, Bscat, Speciated $PM_{2.5}$	SPM (Urban Haze), STN	Urban	Meteorology	1050
Phoenix - West Forty Third (3940 W Broadway)	33E24'	112E 08'	MCESD	MET, PM_{10}, Speciated $PM_{2.5}$	SPM (PM_{10}), STN	Neighbor-hood	Maximum Concentration	1030

Site Index – Ambient Air Monitoring Locations in Arizona in 2003								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Phoenix – West Indian School (3315 W. Indian School Rd.)	33E30'	112E 08'	MCESD	CO, MET	NAMS (CO) SLAMS (MET)	Micro	Maximum Concentration/ Source Impact	1115
Pinnacle Peak (25000 N. Windy Walk)	33E 42'	111E 51'	MCESD	MET, O_3	SLAMS	Urban	Maximum Concentration	2625
Rio Verde (25608 N. Forest Rd.)	33E 43'	111E 40'	MCESD	O_3	SLAMS	Urban	High Downwind Concentration	1640
South Phoenix (33 W. Tamarisk)	33E 24'	112E 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)	33E 28'	111E 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
Surprise (18600 N. Reems)	33E 39'	112E 33'	MCESD	CO, O_3, PM_{10}	SPM	Neighbor-hood	Population	1312
Tempe – Daley Park (College Avenue)	33E 35'	111E 55'	MCESD	CO, MET, NO_2, O_3	SPM	Neighbor-hood	Population	1181
Tempe – Community Center (3340 S. Rural Rd.)	33E 23'	111E 55'	ADEQ	PM_{10}, $PM_{2.5}$	SLAMS (Urban Haze)	Neighbor-hood	Population	1110

Site Index – Ambient Air Monitoring Locations in Arizona in 2003								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
West Chandler (163 S. Price)	33E 18'	111E 53'	MCESD	CO, MET, O_3, PM_{10}	SLAMS	Neighbor-hood	Population	1120
West Phoenix (3847 W. Earll)	33E 29'	112E 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)	35E 09'	114E 33'	ADEQ	PM_{10}	SLAMS	Neighbor-hood	Population	560
Kingman – Praxair NE #1 (I-40 and Griffith Road)	35" 01'	114E 08'	Praxair	PM_{10}	SPM	Middle	Source Impact	3000
Kingman – Praxair SW #2 (I-40 and Griffith Road)	35" 01'	114E 09'	Praxair	PM_{10}	SPM	Middle	Source Impact	3000
Navajo County								
Petrified Forest National Park (1 mile north of park headquarters)	35E 05'	109E 46'	NPS	Bscat, IMPROVE, MET, O_3	Class I	Regional	Visibility	5778
Show Low (Deuce of Clubs Avenue)	34E 15'	110E 02'	ADEQ	PM_{10}	SLAMS	Neighbor-hood	Population	1924

Site Index – Ambient Air Monitoring Locations in Arizona in 2003								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Pima County								
Ajo – ADOT (Well Road)	32E 25'	112E 50'	ADEQ	PM_{10}, MET	SLAMS (PM_{10})	Neighbor-hood	Population	1800
Green Valley (601 N. La Canada Dr.)	31E 52'	110E 59'	PDEQ	PM_{10}	SLAMS	Neighbor-hood	Population Explosure	2903
Organ Pipe Cactus National Monument (1 mile SSW of visitor center)	31E 58'	112E 48'	ADEQ	PM_{10}, IMPROVE	SLAMS (PM_{10})	Regional	Background/ Transport, Visibility	1847
Rillito (8820 W. Water)	32E 25'	111E 10'	ADEQ, APCC	PM_{10}	SLAMS (ADEQ) SPM (APCC)	Neighbor-hood	Source Impact	2055
Saguaro National Park – East (3905 S. Old Spanish Trail)	32E 11'	110E 44'	PDEQ	O_3, IMPROVE	SPM, Class I	Urban	Visibility	3081
Saguaro National Park – West	32E 14'	111E 10'	ADEQ	Bscat, MET, IMPROVE	Class I	Regional	Visibility	2473
South Tucson (1601 S. 6th Ave.)	32E 12'	110E 58'	ADEQ, PDEQ	PM_{10}	SPM (ADEQ Urban Haze) SLAMS (PDEQ)	Neighbor-hood	Population	2440
Tucson – 22nd & Alvernon (3895 E. 22nd)	32E 12'	110E 54'	PDEQ	CO	NAMS	Micro	Maximum Concentration	2516

Site Index – Ambient Air Monitoring Locations in Arizona in 2003								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Tucson – Broadway & Swan (4625 E. Broadway)	32E 13'	110E 53'	PDEQ	PM_{10}	NAMS	Middle	Maximum Concentration	2532
Tucson – Cherry & Glenn (2745 N. Cherry)	32E 15'	110E 56'	PDEQ	CO	SPM	Neighbor-hood	Population	2400
Tucson – Children's Park (400 W. River Rd.)	32E 17'	110E 58'	PDEQ	CO, NO_2, O_3, $PM_{2.5}$, Speciated $PM_{2.5}$	SPM ($PM_{2.5}$) SLAMS (NO_2, O_3) NAMS (CO), STN	Urban, Neighbor-hood	Population	2286
Tucson – Coachline (9597 N Coachline Blvd)	32E 22'	111E 07'	PDEQ	O_3, $PM_{2.5}$	SPM	Neighbor-hood	Population	2227
Tucson – Corona De Tucson (22000 S. Houghton Rd.)	32E 00'	110E 47'	ADEQ, PDEQ	PM_{10}	SPM (ADEQ Urban Haze) SLAMS (PDEQ)	Regional	Background	3078
Tucson – 22nd & Craycroft (1237 S. Beverly)	32E 12'	110E 52'	ADEQ, PDEQ	Bscat, CO, O_3, NO_2, SO_2, PM_{10}	SPM (ADEQ PM_{10} Urban Haze) SLAMS (PDEQ Bscat, CO, O_3, NO_2, SO_2)	Neighbor-hood	Population	2582
Tucson – Downtown (190 W. Pennington)	32E 13'	110E 58'	PDEQ	CO, O_3	SLAMS	Neighbor-hood	Population	2365

Site Index – Ambient Air Monitoring Locations in Arizona in 2003								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Tucson – Fairgrounds (11330 S. Houghton)	32E 03'	110E46'	PDEQ	O_3	SLAMS	Neighbor-hood	Population	3078
Tucson – Geronimo (2498 N. Geronimo)	32E 15'	110E 57'	PDEQ	PM_{10}	SPM (For AQI Purposes Only)	Neighbor-hood	Population	2580
Tucson – Golf Links & Kolb (2601 S. Kolb Rd)	32E 11'	110E 50'	PDEQ	CO	SPM	Neighbor-hood	Population	2660
Tucson – Orange Grove (3401 W. Orange Grove Road)	32E 19'	111E 02'	ADEQ, PDEQ	PM_{10}, $PM_{2.5}$	SPM (ADEQ PM_{10}, Urban Haze) SLAMS (PDEQ PM_{10}, $PM_{2.5}$)	Neighbor-hood	Maximum Concentration/ Population	2175
Tucson – Prince Road (1016 W. Prince Rd.)	32E 16'	110E 59'	PDEQ	PM_{10}	NAMS	Micro	Source Impact	2315
Tucson – Rose Elementary (710 W. Michigan St.)	32E 10'	110E 58'	PDEQ	PM_{10}	SPM	Urban	Population	2550
Tucson – Santa Clara (6910 S. Santa Clara Ave.)	32E 07'	110E 58'	PDEQ	PM_{10}	SLAMS	Neighbor-hood	Population	2540
Tucson – Tangerine (12101 N. Camino De Oeste)	32E 25'	110E 04'	PDEQ	O_3, PM_{10}	SLAMS	Urban	Population	2638
Tucson – Tumamoc Hill (North face of Tumamoc Hill)	32E 13'	111E 12	ADEQ	Visibility	SPM (Urban Haze)	Urban	Urban Haze	2825

Site Index – Ambient Air Monitoring Locations in Arizona in 2003								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Tucson Transmissometer – U of A Clinical Sci. Bldg (1501 N. Campbell)	32E 14'	110E 57'	PDEQ, ADEQ	Bext	SPM (Urban Haze)	Urban	Urban Haze	2551
Tucson Transmissometer Receiver (150 W. Congress)	32E 13'	110E 58'	PDEQ, ADEQ	Bext	SPM (Urban Haze)	Urban	Urban Haze	2551
Tucson – U of A Central (1100 N. Fremont Ave.)	32E 13'	110E 57'	ADEQ	Bscat, PM_{10}	SPM (Urban Haze)	Neighbor-hood	Population	2580
Pinal County								
Apache Junction – Fire Station (3955 E. Superstition Blvd. TE)	33E 25'	111E 30'	PCAQCD	$PM_{2.5}$	SLAMS	Neighbor-hood	Population	1750
Apache Junction – Maintenance Yard (305 E. Superstition)	33E 25'	111E 52'	PCAQCD	CO, O_3, PM_{10}, MET	SLAMS	Neighbor-hood	Population	1750
Casa Grande – Airport (660 W. Aero Dr.)	32E 54'	111E 46	PCAQCD	CO ,O_3, MET	SLAMS	Neighbor-hood	Population/ Transport	1410
Casa Grande – Downtown (401 Marshall Rd.)	32E 52'	111E 45'	PCAQCD	PM_{10}, $PM_{2.5}$	SLAMS	Neighbor-hood	Population	1378
Coolidge – Maintenance Yard (212 E. Broadway)	32E 58'	111E 30'	PCAQCD	PM_{10}	SLAMS	Neighbor-hood	Population	1444
Combs – Queen Creek (301 E. Combs Rd.)	33E 13'	111E 33'	PCAQCD	O_3	SPM	Neighbor-hood	Population	1178

Site Index – Ambient Air Monitoring Locations in Arizona in 2003								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Cowtown Road (37580 W. Maricopa)	33E 00'	111E 59'	PCAQCD	MET, PM_{10}	SPM	Neighbor-hood	Population	1214
Eloy – City Complex (620 N. Main St.)	32E 45'	111E 33'	PCAQCD	PM_{10}	SLAMS	Neighbor-hood	Population	1562
Hayden Junction (Hwy 177)	33E 00'	110E 50'	ASARCO	SO_2	SPM	Unknown	Source Impact	2080
Mammoth – County Complex (118 S. Catalina)	32E 43'	110E 39'	PCAQCD	PM_{10}	SLAMS	Neighbor-hood	Population/ Background	2920
Maricopa (44625 W. Garvey Rd.)	33E 03'	110E 39'	PCAQCD	O_3	SPM	Neighbor-hood	Population/Exp osure	1178
Pinal Air Park (Water Well # 2, Marana)	32E 31'	111E 20'	PCAQCD	PM_{10}	SLAMS	Regional	Background/ Transport	1870
Pinal County Housing Complex (970 N Eleven Mile Corner Rd.)	32E 54'	111E 34'	PCAQCD	MET, PM_{10}	SPM	Microscale	Source Impact	1440
Queen Valley (10 S. Queen Anne Dr.)	32E 17'	111E 17'	ADEQ	IMPROVE, O_3	Class I	Regional	Visibility	2080
Riverside Maintenance Yard (56964 E. Florence)	33E 06'	110E 58'	PCAQCD	PM_{10}	SPM	Neighbor-hood	Source Impact	540
San Manuel (1st & Douglas Ave.)	32E 36'	110E 38'	ADEQ	SO_2	SPM	Neighbor-hood	Source Impact	1089

Site Index – Ambient Air Monitoring Locations in Arizona in 2003								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Stanfield (36697 W. Papago Dr.)	32E 53'	111E 57	PCAQCD	PM_{10}	SPM	Neighbor-hood	Population	1296
Santa Cruz								
Nogales – Post Office (300 N. Morley Ave.)	31E 20'	110E 56'	ADEQ	PM_{10}, $PM_{2.5}$, MET	SLAMS	Neighbor-hood	Population	3858
Yavapai County								
Clarkdale – NW (#2) (northwest of cement plant)	34E 45'	112E 05'	PCC	PM_{10}	SPM	Unknown	Source Impact	3500
Clarkdale – SE (#1) (southeast of CTI flyash silo)	34E 45'	112E 05'	PCC	PM_{10}	SPM	Unknown	Source Impact	3500
Hillside (Sheriff's Repeater Station)	34E 25'	112E 57'	ADEQ	O_3, PM_{10} IMPROVE	SPM, Class I	Regional	Background/ Transport, Visibility	4918
Ike's Backbone (Pine Mountain Wilderness)	34E 20'	111E 40'	ADEQ, USFS	IMPROVE	Class I	Regional	Visibility	5232
Nelson – East (1/2 mile east of Flintkote lime plant)	35E 31'	113E17'	ADEQ	MET	SPM	Neighbor-hood	Source Impact	5472
Prescott (221 S. Cortez) Closed 3/01/2003	34E 32'	112E 28'	ADEQ	PM_{10}	SPM	Neighbor-hood	Population	5210

Site Index – Ambient Air Monitoring Locations in Arizona in 2003								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Prescott Valley (7601 E. Civic Circle) Opened 3/12/2003	34E 35'	112E 19'	ADEQ	PM_{10}	SPM	Neighbor-hood	Population	5100
Yuma County								
Dome Valley (5110 S. Avenue 18 E) Opened 5/13/2003	32E 29'	114E 46'	ADEQ	MET	SPM	N/A	Special Study	180
San Luis (767 N. 1st Ave.) Opened 5/13/2003	32E 29'	114E 46'	ADEQ	MET	SPM	N/A	Special Study	115
Yuma – Courthouse (2440 W. 28th St.)	32E 40'	114E 39'	ADEQ	PM_{10}	SLAMS	Neighbor-hood	Population	210
Yuma Game & Fish (9140 E. 28th St.) Opened 4/14/2003	32E 40'	114E 28'	ADEQ	O_3	SLAMS	Neighbor-hood	Maximum Concentration	200
Yuma Mesa (2186 W. County 15th St.) Opened 5/13/2003)	32E 36'	114E 38'	ADEQ	MET	SPM	N/A	Special Study	190
Yuma Valley (11486 S. Farm Rd.) Opened 5/13/03)	32E 37'	114E 45'	ADEQ	MET	SPM	N/A	Special Study	90

Site Index – Ambient Air Monitoring Locations in Arizona in 2003								
City/Site and Address	**Lat.**	**Long.**	**Operator**	**Parameters Measured**	**Classification**	**Scale**	**Objective**	**Elev. (feet)**
Mexico								
Agua Prieta – Fire Station (Calle 6 and Avenue 15)	31E19'	109E33'	ADEQ	CO, PM_{10}, $PM_{2.5}$	SPM	Neighbor-hood	Population	3937
Nogales – Fire Station (Northwest corner of Lopaz and Mantels)	31E20'	110E57'	ADEQ	PM_{10}, MET	SPM	Neighbor-hood	Population	3945

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
Babs	Light absorption
Bag	Light absorption by gasses
Bap	Light absorption by particles
Bext	Light extinction
Bscat	Light scattering
Bsg	Light scattering by gasses
Bsp	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
MCESD	Maricopa County Environmental Services Department
MET	Meteorological measurements (wind, temperature, relative humidity)
mm	Millimeter
Mm-1	Inverse megameter

MSA	Metropolitan Statistical Area
Fg/m3	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
NO2	Nitrogen Dioxide
NOX	Sum of NO and NO2
NPS	National Park Service
O3	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
PM2.5	Particulate Matter $\leq$ 2.5 microns
PM10	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
SO2	Sulfur Dioxide
SO4~	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

AirWeb: Protecting Air Quality
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
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!
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
This Web site is a directory to numerous environmental subjects, from air to wildlife.

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

EPA – Air and Radiation
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
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
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
Learn about EPA activities in Arizona, California, Hawaii, Nevada and the Pacific Islands at the Region 9 website.

FirstGov
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
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.
The site lists the member tribes and includes information about environmental monitoring programs.

Maricopa County Air Quality Information
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
NTEC is a tribal government membership organization with 160 member tribes that work to protect and preserve the reservation environment.

National Weather Service
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
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
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
Current air quality information from the Pinal County Air Quality Control District.

Pollen Information
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
Information about our national parks.

Visibility Information Exchange Web System (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
This site contains weather forecasts and air quality information for Phoenix and Tucson.

Western States Air Resources Council
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 2003
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.

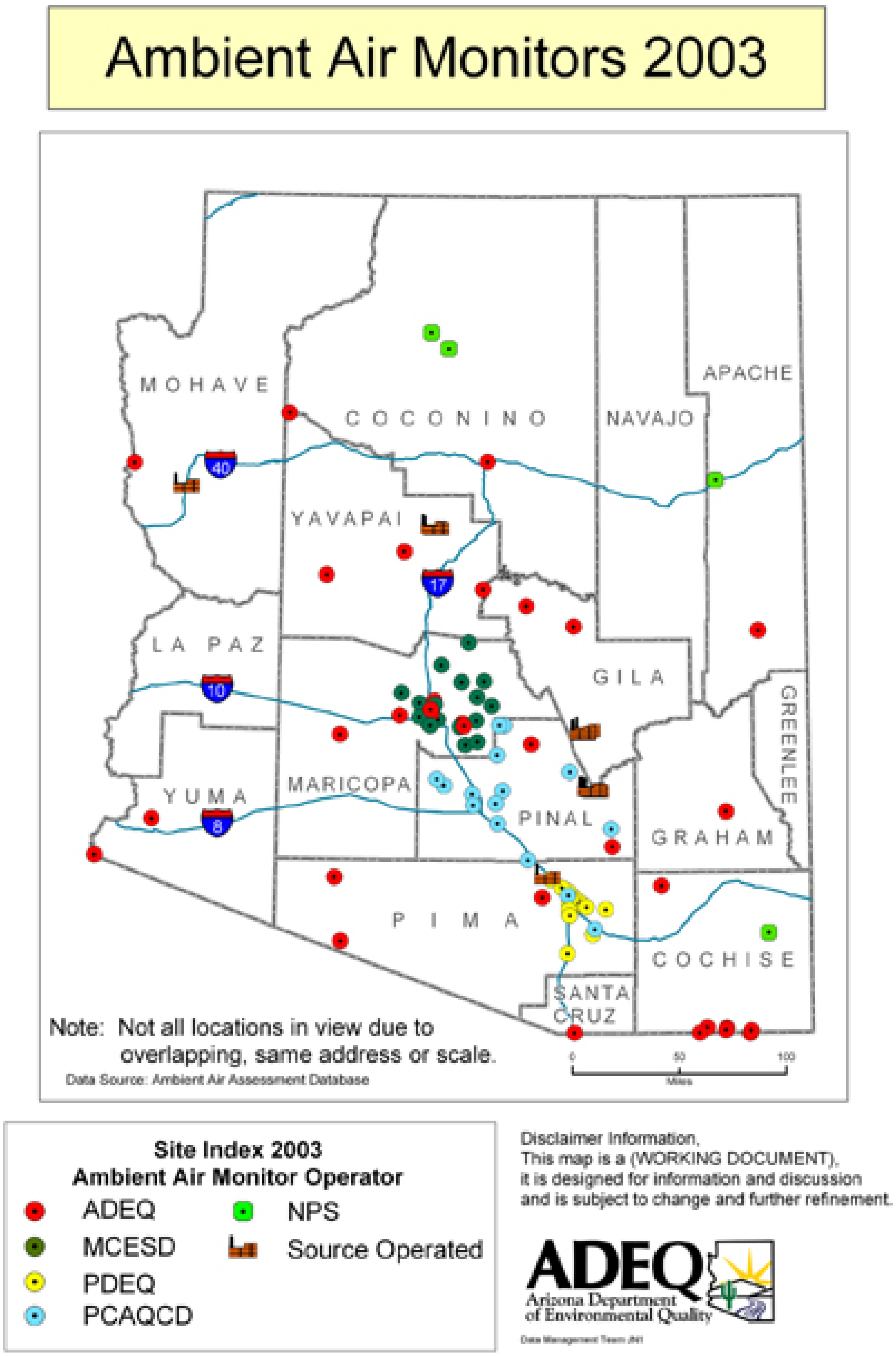
Ozone Network Statewide
This map displays the location of ozone monitors operated by ADEQ, private industry, county agencies, and the National Park Service.

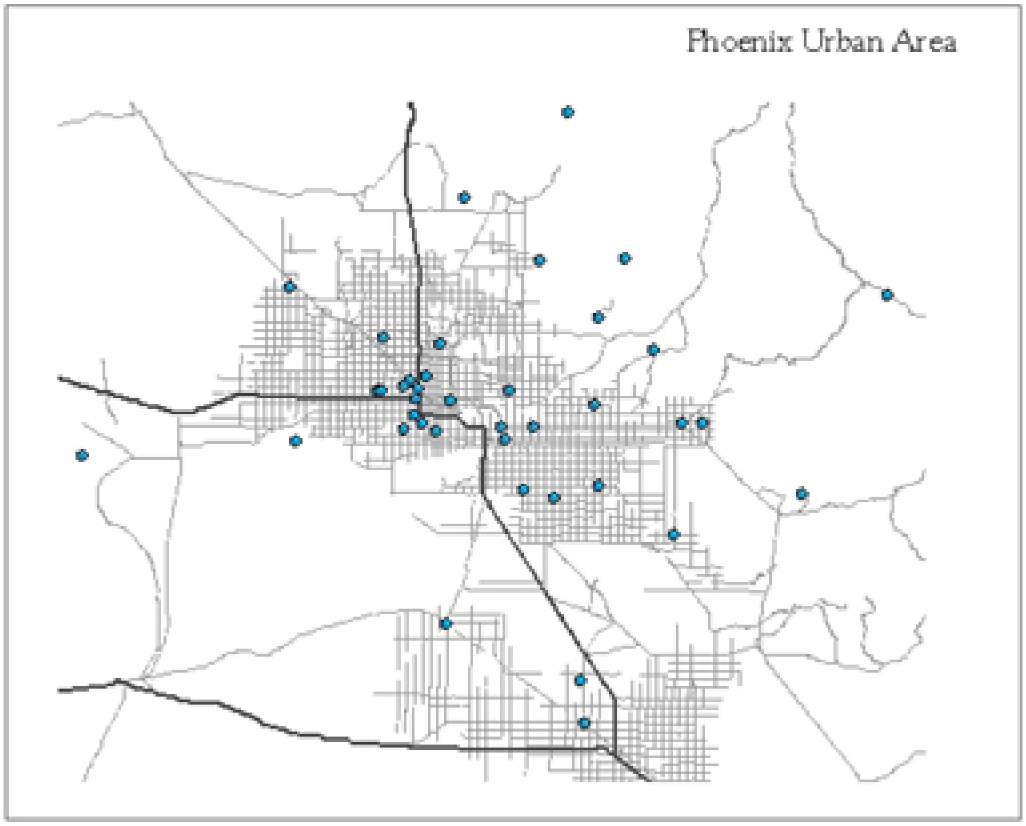
Particulate Network Statewide
The location of particulate monitors is shown on this map.

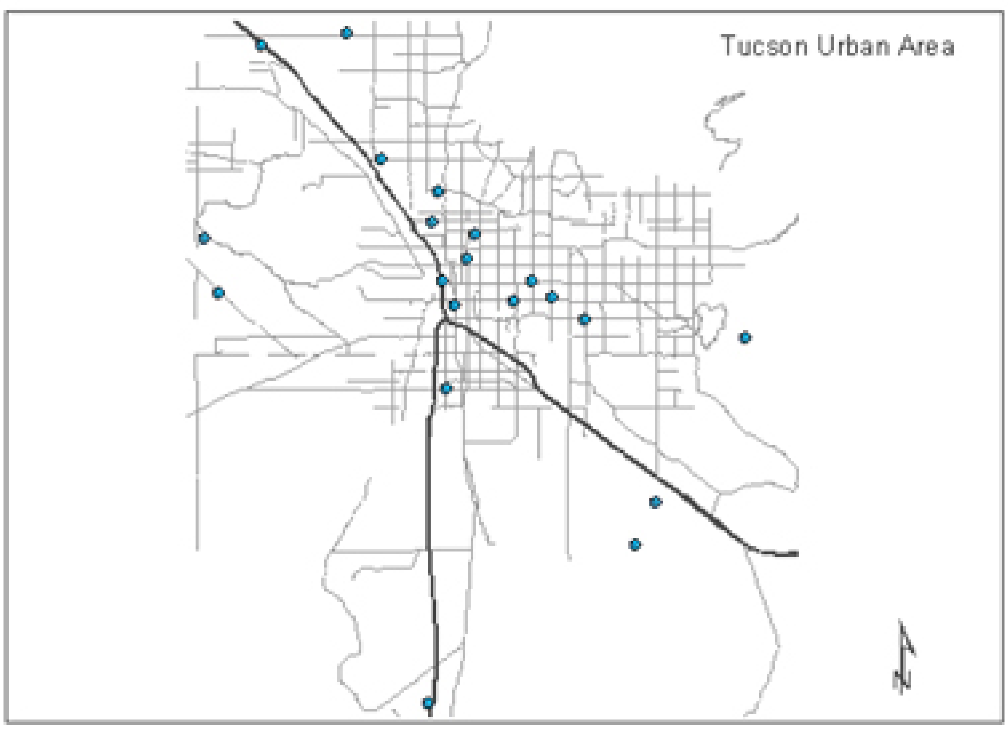
SO2 Network Statewide
This map shows the location of the SO2 monitors operating in 2003 and includes the maintenance and nonattainment areas.

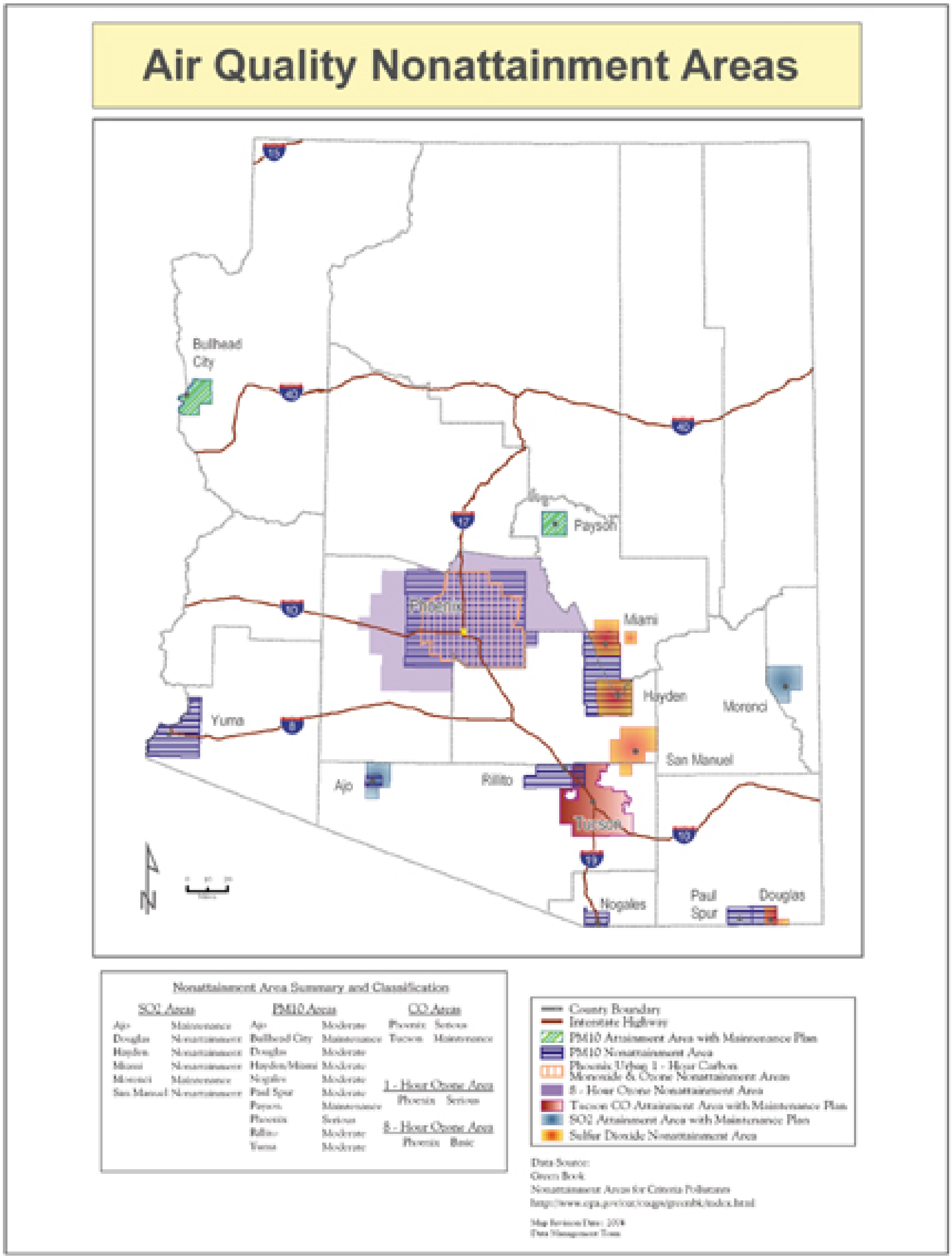
Visibility Network Statewide
Urban and regional haze visibility monitoring sites are shown on this map.

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.

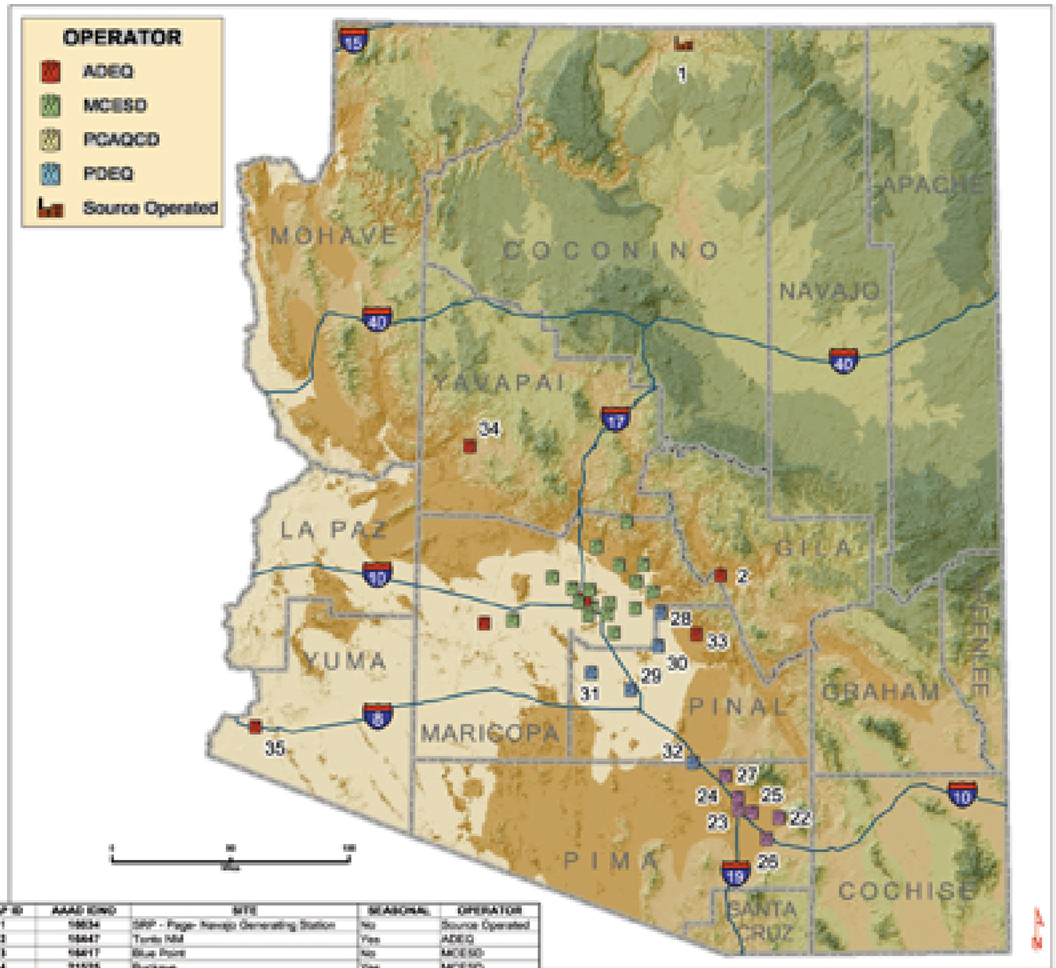

Ambient Air Monitors 2003
MOHAVE
COCONINO
NAVAJO
APACHE
YAVAPAI
LA PAZ
GILA
GREENLEE
MARICOPA
YUMA
PINAL
GRAHAM
PIMA
COCHISE
SANTA CRUZ
40
17
10
8
Note: Not all locations in view due to overlapping, same address or scale.
Data Source: Ambient Air Assessment Database
0
50
100
Miles
Site Index 2003
Ambient Air Monitor Operator
ADEQ
NPS
MCESD
Source Operated
PDEQ
PCAQCD
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


Phoenix Urban Area

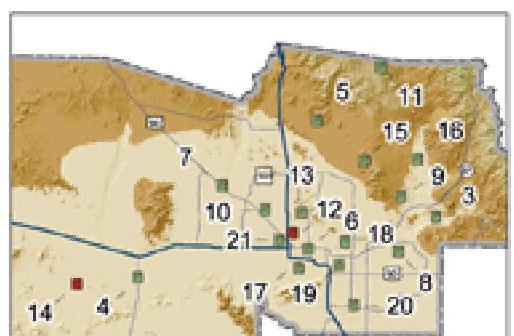

Tucson Urban Area


Air Quality Nonattainment Areas
Bullhead City
Payson
Phoenix
Miami
Hayden
Morenci
Yuma
San Manuel
Ajo
Rillito
Tucson
Nogales
Paul Spur
Douglas
Nonattainment Area Summary and Classification
SO2 Areas
Ajo Maintenance
Douglas Nonattainment
Hayden Nonattainment
Miami Nonattainment
Morenci Maintenance
San Manuel Nonattainment
PM10 Areas
Ajo Moderate
Bullhead City Maintenance
Douglas Moderate
Hayden/Miami Moderate
Nogales Moderate
Paul Spur Moderate
Payson Maintenance
Phoenix Serious
Rillito Moderate
Yuma Moderate
CO Areas
Phoenix Serious
Tucson Maintenance
1 - Hour Ozone Area
Phoenix Serious
8 - Hour Ozone Area
Phoenix Basic
County Boundary
Interstate Highway
PM10 Attainment Area with Maintenance Plan
PM10 Nonattainment Area
Phoenix Urban 1 - Hour Carbon Monoxide & Ozone Nonattainment Areas
8 - Hour Ozone Nonattainment Area
Tucson CO Attainment Area with Maintenance Plan
SO2 Attainment Area with Maintenance Plan
Sulfur Dioxide Nonattainment Area
Data Source:
Green Book
Nonattainment Areas for Criteria Pollutants

Ozone Network Statewide



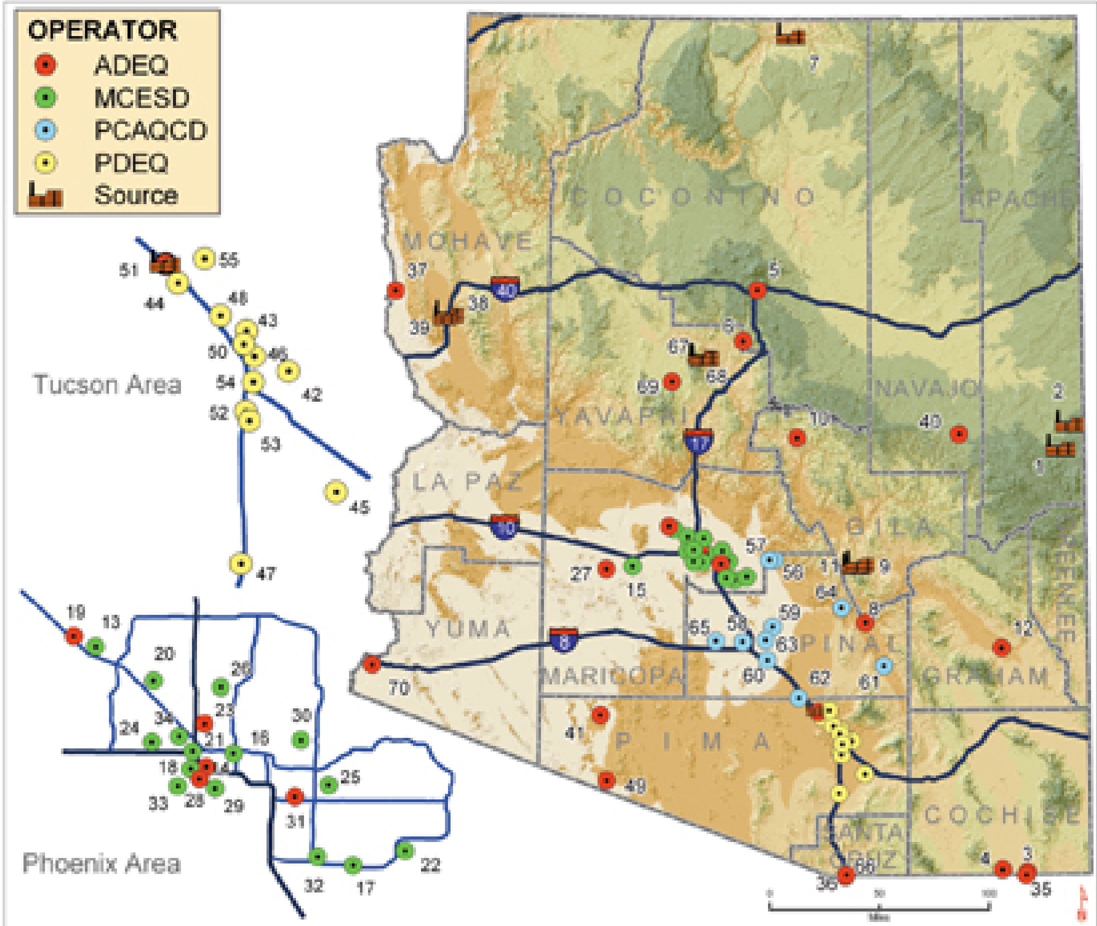
MAP ID	AAAD ID NO	SITE	SEASONAL	OPERATOR
1	10634	SRP - Page- Navajo Generating Station	No	Source Operated
2	10647	Tonto NM	Yes	ADEQ
3	10417	Blue Point	No	MCESD
4	21525	Buckeye	Yes	MCESD
5	10268	Cave Creek	Yes	MCESD
6	10329	Central Phoenix	No	MCESD
7	10050	Dysart	Yes	MCESD
8	10261	Falcon Field	Yes	MCESD
9	10076	Fountain Hills	No	MCESD
10	10075	Glendale	Yes	MCESD
11	10414	Humboldt Mountain	Yes	MCESD
12	10528	JLG Supersite	No	ADEQ
13	10390	North Phoenix	No	MCESD
14	10321	Palo Verde	Yes	ADEQ
15	10406	Pinnacle Peak	No	MCESD
16	10396	Rio Verde	Yes	MCESD
17	10377	South Phoenix	No	MCESD
18	10398	South Scottsdale	No	MCESD
19	10405	Tempe	Yes	MCESD
20	10478	West Chandler	Yes	MCESD
21	10477	West Phoenix	No	MCESD
22	10474	Saguaro Mt Park East	No	PDEQ
23	10501	Children's Park	No	PDEQ
24	10410	22nd / Craycroft	No	PDEQ
25	10671	Downtown	No	PDEQ
26	10672	Fairgrounds	No	PDEQ
27	10669	Tangerine	No	PDEQ
28	10589	Apache Junction Maintenance Yard	No	PCAQCD
29	10267	Casa Grande Airport	No	PCAQCD
30	10657	Combs School	No	PCAQCD
31	10656	Maricopa	No	PCAQCD
32	10552	Pinal Air Park	No	PCAQCD
33	10394	Queen Valley	Yes	ADEQ
34	10715	Hillside	Yes	ADEQ
35	10690	Yuma Game & Fish	Yes	ADEQ



Phoenix Area O3 Monitoring

Map Date: September 2004
Data Management Team JAI

Particulate Network Statewide



MAP ID NO	AAAD ID NO	COUNTY	SITE	INSTRUMENT	OPERATOR
1	16637	Apache	TEP - Springerville - Coalyard	PM10	Source
2	16638	Apache	TEP - Springerville - Coyote Hills	PM10	Source
3	16503	Cochise	Douglas Red Cross	PM2.5, PM10	ADEQ
4	16391	Cochise	Paul Spur Chemical Lime Plant	PM10 Collocated	ADEQ
5	16797	Coconino	Flagstaff Middle School	PM2.5, PM10	ADEQ
6	16513	Coconino	Sedona Post Office	PM10	ADEQ
7	16634	Coconino	SRP - Page- Navajo Generating Station	PM10	Source
8	16326	Gila	Hayden Old Jail	PM10 Collocated	ADEQ
9	16382	Gila	Miami Ridgeline	PM10	Source
10	16317	Gila	Payson Well Site	PM2.5, PM10	ADEQ
11	16629	Gila	PDMI - Miami - Golf Course	PM10 Collocated	Source
12	16508	Graham	Safford	PM10	ADEQ
13	22446	Maricopa	Agua Fria [1]	PM10	MCESD
14	17786	Maricopa	Bethune Elementary School	PM2.5, PM10	ADEQ
15	21525	Maricopa	Buckeye	PM10	MCESD
16	16329	Maricopa	Central Phoenix [1]	PM10	MCESD
17	16369	Maricopa	Chandler	PM10	MCESD
18	16375	Maricopa	Durango Complex	PM10	MCESD
19	19950	Maricopa	Dysart	PM10	MCESD
20	16378	Maricopa	Glendale	PM10	MCESD
21	16372	Maricopa	Greenwood	PM10	MCESD
22	16505	Maricopa	Higley [1]	PM10	MCESD
23	16328	Maricopa	JLG Supersite [1]	PM2.5, PM10, STN	ADEQ
24	16379	Maricopa	Marysvale	PM10	MCESD
25	16380	Maricopa	Mesa	PM10	MCESD
26	16390	Maricopa	North Phoenix	PM10	MCESD
27	16321	Maricopa	Palo Verde	PM10	ADEQ
28	16633	Maricopa	Salt River	PM10	MCESD
29	16377	Maricopa	South Phoenix	PM10	MCESD
30	16398	Maricopa	South Scottsdale	PM10	MCESD
31	16309	Maricopa	Tempe Community Center	PM2.5	ADEQ
32	16478	Maricopa	West Chandler	PM10	MCESD
33	16659	Maricopa	West Forty Third [1]	PM2.5, PM10	MCESD
34	16477	Maricopa	West Phoenix	PM2.5, PM10	MCESD
35	16361	Mexico	Agua Prieta Fire Station	PM10	ADEQ

MAP ID NO	AAAD ID NO	COUNTY	SITE	INSTRUMENT	OPERATOR
36	16399	Mexico	Sonora Nogales Fire Station	PM10	ADEQ
37	16365	Mohave	Bullhead City	PM10	ADEQ
38	16554	Mohave	Praxair - Kingman - NE	PM10	Source
39	16555	Mohave	Praxair - Kingman - SW	PM10	Source
40	16403	Navajo	Show Low	PM10	ADEQ
41	16156	Pima	Ajo	PM10	ADEQ
42	16550	Pima	Broadway / Swan	PM10	PDEQ
43	16551	Pima	Children's Park	PM2.5, STN	PDEQ
44	21580	Pima	Coachline	PM2.5	PDEQ
45	16677	Pima	Corona De Tucson	PM10	PDEQ
46	16678	Pima	Geronimo	PM2.5	PDEQ
47	16685	Pima	Green Valley	PM2.5, PM10	PDEQ
48	16580	Pima	Orange Grove	PM2.5, PM10	PDEQ
49	16681	Pima	Organ Pipe NM	PM10	ADEQ
50	16597	Pima	Prince Road	PM10	PDEQ
51	16499	Pima	Rillito	PM10; Source PM10	Source
52	16670	Pima	Rose Elementary	PM2.5	PDEQ
53	16569	Pima	Santa Clara	PM10	PDEQ
54	16635	Pima	South Tucson	PM10	PDEQ
55	16669	Pima	Tangerine	PM10	PDEQ
56	16358	Pinal	Apache Junction Fire Station	PM10	PCAQCD
57	16589	Pinal	Apache Junction Maintenance Yard	PM10	PCAQCD
58	16588	Pinal	Casa Grande Downtown	PM10	PCAQCD
59	7646	Pinal	Coolidge Maintenance Yard	PM10	PCAQCD
60	16394	Pinal	Eloy City Complex	PM10	PCAQCD
61	16600	Pinal	Mammoth County Complex	PM10	PCAQCD
62	16552	Pinal	Pinal Air Park	PM10	PCAQCD
63	18079	Pinal	Pinal County Housing Complex	PM10	PCAQCD
64	21429	Pinal	Riverside Maintenance Yard	PM10	PCAQCD
65	16636	Pinal	Stanfield	PM10	PCAQCD
66	16511	Santa Cruz	Nogales Post Office	PM2.5, PM10	ADEQ
67	16626	Yavapai	PCC - Clarkdale NW	PM10	Source
68	16628	Yavapai	PCC - Clarkdale SE	PM10	Source
69	18392	Yavapai	Prescott Valley	PM10	ADEQ
70	17837	Yuma	Yuma Courthouse	PM10	ADEQ

[1] TEOM Measurement Location

Data Source: Ambient Air Assessment Database

November 2004, Data Management Team JN1

SO2 Network Statewide

SO2 Area Classification	
Ajo	Maintenance
Douglas	NonAttainment
Hayden	NonAttainment
Maimi	Maintenance
Morenci	NonAttainment
San Manuel	NonAttainment

Area Classification

- Maintenance
- NonAttainment

AAAD_IDNO	COUNTY	SITE	OPERATOR
16638	Apache	TEP - Springerville - Coyote Hills	Source
16634	Coconino	SRP - Page- Navajo Generating STA	Source
16590	Gila	ASARCO - Hayden - Garfield AVE	Source
16593	Gila	ASARCO - Globe Highway	Source
16591	Gila	ASARCO - Montgomery Ranch	Source
16326	Gila	Hayden Old Jail	ADEQ
16326	Gila	ASARCO - Hayden Old Jail	Source
16382	Gila	Miami Ridgeline	ADEQ
16631	Gila	PDMI - Miami - Jones Ranch	Source
16632	Gila	PDMI - Miami - Townsite	Source
16329	Maricopa	Central Phoenix	MCESD
16398	Maricopa	South Scottsdale	MCESD
16410	Pima	22nd / Craycroft	PDEQ
16592	Pinal	ASARCO - Hayden Junction	Source
16397	Pinal	San Manuel	ADEQ

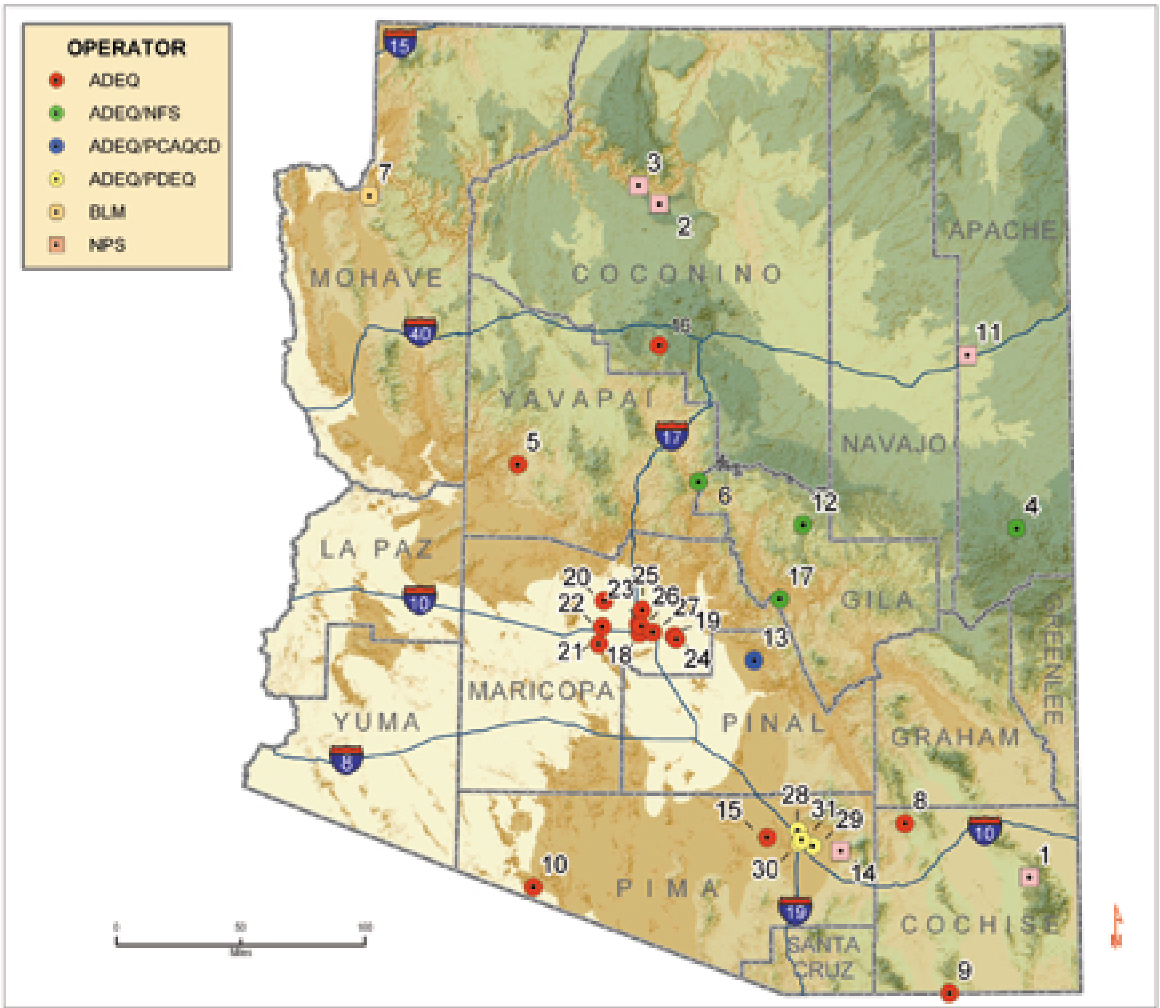
- ADEQ
- MCESD
- PDEQ
- Source

Miami Hayden Area

Note: ADEQ & ASARCO Operated SO2 Monitor, Hayden - Old Jail

Map Date: October 2004
Data Management Team JH

Visibility Network Statewide

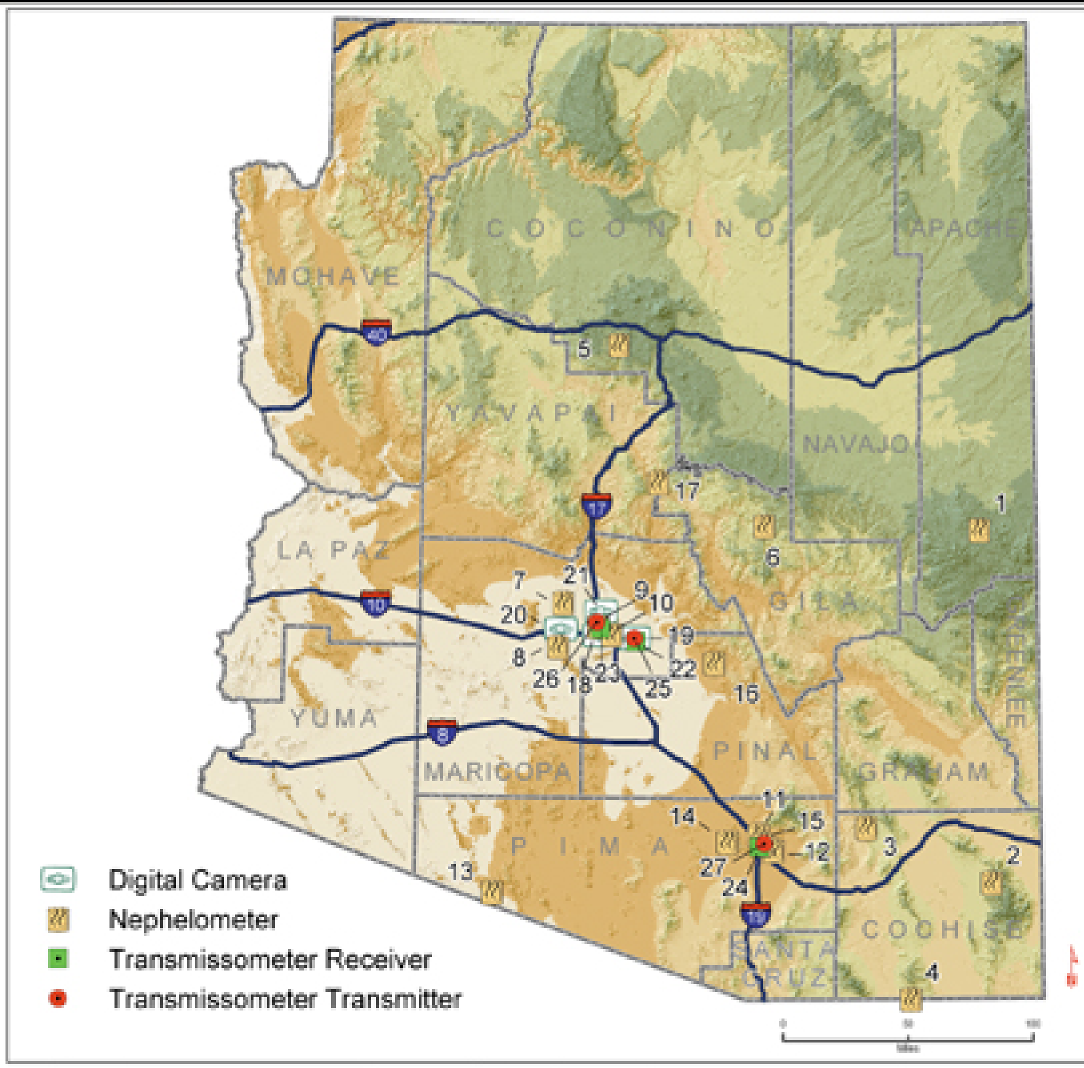


WILDERNESS VISIBILITY NETWORK				
MAP IDNO	AAAD IDNO	SITE	PARAMETER MEASURED	OPERATOR
1	16679	Chiricahua NM Entrance STA	Aerosol, Bext, Bscat	NPS
2	16682	Grand Canyon NP Hance	Aerosol, Bscat	NPS
3	16683	Grand Canyon NP Indian Garden	Aerosol, Bscat	NPS
4	16323	Greer Water Treatment Plant	Aerosol, Bscat	ADEQ/NFS
5	16315	Hillside	Aerosol	ADEQ
6	16421	Ike's Backbone	Aerosol, Bscat	ADEQ/NFS
7	21298	Meadview	Aerosol	BLM
8	16412	Muleshoe Ranch	Bscat	ADEQ
9	16670	Naco Border Station	Bscat	ADEQ
10	16681	Organ Pipe NM	Aerosol, Bscat	ADEQ
11	16473	Petrified Forest NP	Aerosol, Bscat, Bext	NPS
12	16446	Pleasant Valley Ranger STA	Aerosol, Bscat	ADEQ/NFS
13	16394	Queen Valley	Aerosol, Bscat	ADEQ/PCAQCD
14	16474	Saguaro NTL Park East	Aerosol	NPS
15	16475	Saguaro NTL Park West	Aerosol, Bscat	ADEQ
16	16476	Sycamore Canyon	Aerosol, Bscat	ADEQ
17	16447	Tonto NM	Aerosol	ADEQ/NFS

URBAN VISIBILITY NETWORK				
MAP IDNO	AAAD IDNO	SITE	PARAMETER MEASURED	OPERATOR
18	21737	ADEQ Building	Digital Camera	ADEQ
19	19489	Banner Mesa Medical Center	Digital Camera	ADEQ
20	19550	Dysart	Bscat	ADEQ
21	16506	Estrella	Bscat	ADEQ
22	21736	Estrella Community College	Digital Camera (2)	ADEQ
23	16328	JLG Supersite	Aerosol, Bscat	ADEQ
24	19686	Mesa City Building	Bext	ADEQ
25	16480	North Mountain Summit	Digital Camera	ADEQ
26	16829	Vehicle Emissions Laboratory	Bscat	ADEQ
27	16363	Phoenix/Transmissometer Receiver	Bext	ADEQ
28	16551	Children's Park	Bscat	ADEQ/PDEQ
29	16410	22 / Craycroft	Bscat	ADEQ/PDEQ
30	16826	Tucson Transmissometer Receiver	Bext	ADEQ/PDEQ
31	16662	U Of A Central	Bscat	ADEQ/PDEQ

Map Date: October 2004
Data Management Team JH

Nephelometers, Transmissometers, Cameras



Map IDNO	AAAD IDNO	Site	Instrument
1	16323	Greer Water Treatment Plant	Nephelometer
2	16679	Chiricahua NM Entrance Station	Nephelometer
3	16412	Muleshoe Ranch	Nephelometer
4	16579	Naco Border Station	Nephelometer
5	16475	Sycamore Canyon	Nephelometer
6	16446	Pleasant Valley Ranger Station	Nephelometer
7	19550	Dysart	Nephelometer
8	16506	Estrella	Nephelometer
9	16328	JLG Supersite	Nephelometer
10	16363	Vehicle Emissions Laboratory	Nephelometer
11	16551	Children's Park	Nephelometer
12	16419	22nd / Craycroft	Nephelometer
13	16581	Organ Pipe NM	Nephelometer
14	16478	Saguaro NTL Park West	Nephelometer

Map IDNO	AAAD IDNO	Site	Instrument
15	16662	U of A Central	Nephelometer
16	16394	Queen Valley	Nephelometer
17	16421	Ike's Backbone	Nephelometer
18	21737	ADEQ Building	Digital Camera
19	19489	Banner Mesa Medical Building	Digital Camera
20	21736	Estrella Community College	Digital Camera
21	16480	North Mountain Summit	Digital Camera
22	19686	Mesa City Building	Transmissometer Receiver
23	16829	Phoenix Transmissometer Receiver	Transmissometer Receiver
24	16826	Tucson Transmissometer Receiver	Transmissometer Receiver
25	19489	Banner Mesa Medical Center	Transmissometer Transmitter
26	16330	Phoenix Transmissometer Transmitter	Transmissometer Transmitter
27	16656	U of A Clinical Science Building	Transmissometer Transmitter