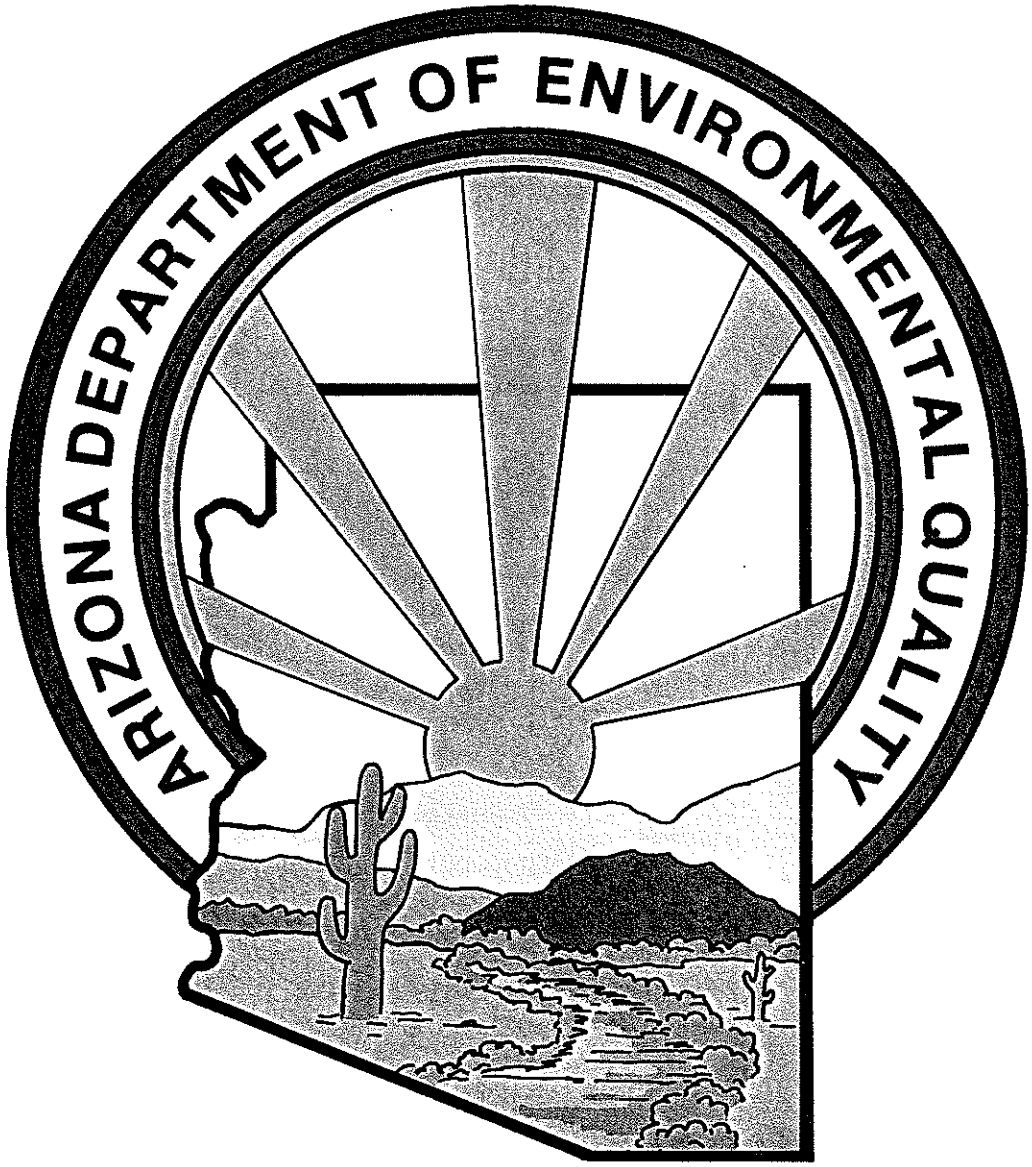
1989

AIR QUALITY CONTROL FOR ARIZONA



ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

August, 1990

1989

A I R Q U A L I T Y C O N T R O L

F O R A R I Z O N A

Annual Report

August 1990

HONORABLE ROSE MOFFORD
Governor
State of Arizona

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY
Randolph Wood, Director

Prepared by The Office of Air Quality

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I BACKGROUND

A. Legal Authority

Arizona derives its authority to regulate air quality from the Federal Clean Air Act and from State Statutes, both of which are described herein. The first Federal Clean Air Act was passed in 1963. It provided for grants to air pollution control agencies and contained the first federal regulatory authority. The Act was amended in 1965, 1967, 1970 and 1977. One important feature of the Act was the establishment of National Ambient Air Quality Standards (NAAQS) in 1970. These standards which are promulgated by the EPA (Environmental Protection Agency) are set at levels which protect public health and welfare. A brief discussion of the standards is provided in the following subsection. B. Air Quality Standards.

Another significant aspect of the Act is the requirement of the states to formulate plans to comply with the NAAQS. Specifically, Section 110 requires states to adopt and submit to EPA a plan which provides for the implementation, maintenance and enforcement of air quality standards within nine months of standard promulgation. This plan is referred to as the State Implementation Plan (SIP) which consists of several different elements. Some of the more important SIP components are listed below:

1. Rules including emission limitations and other measures necessary for attainment and maintenance of the standards.

2. Compliance schedules.

3. Ambient monitoring and data analysis.

4. A permitting program including the requirement for preconstruction review and disapproval of new or modified sources which would interfere with the attainment or maintenance of air quality standards or would significantly deteriorate air quality.

5. Source surveillance.

6. Inspection and testing of vehicles.

7. Provisions to revise the plan.

8. Legal authority to carry out the SIP.

9. Prevention of air pollution emergency episodes.

Arizona's SIP basically contains State rules, county regulations and the nonattainment area plans required for attainment and maintenance of the NAAQS. These documents are transmitted by the Arizona Department of Environmental Quality (DEQ) to EPA. EPA formally approves or disapproves the SIP revisions through Federal Register notices.

State statutes divide jurisdiction over air pollution sources between the State and the counties. The State has exclusive jurisdiction over air pollution sources having potential total emissions of 75 tons or more per day; air pollution sources owned or controlled by State or local government entities; motor vehicles; other mobile air pollution sources over which the State has asserted jurisdiction. All other sources come under county authority. It should be noted, however, that in certain counties which lack air quality control programs, the State has complete jurisdiction including Apache, Cochise, Coconino, Gila, Graham, Greenlee, La Paz, Mohave, Navajo, Yavapai, and Yuma.

In the nonattainment areas, the regional planning agency for each affected area is required to develop a plan to attain and maintain the NAAQS. The county and cities and towns in the area must adopt and implement the plan as expeditiously as practicable. For areas which are nonattainment with respect to carbon monoxide or ozone, the plan includes transportation control measures designed to reduce motor vehicle traffic, to alleviate traffic congestion, to promote the use of cleaner fuels, and other strategies. For areas not meeting particulate (PM10) standards, control strategies such as paving of roads, restricting off-road vehicular traffic, suppressing fugitive dust at construction sites, and other measures are key elements of the plan.

B. Air Quality Standards

The NAAQS which include standards for six pollutants are summarized in Table 1. For each pollutant EPA has adopted primary standards to protect public health and secondary standards to protect public welfare. The states are required to adopt standards which are at least as stringent as the NAAQS. In Arizona, standards are identical to federal standards.

A brief summary of the health and welfare effects which have been considered prior to setting ambient air quality standards is given below.

Pollutant	Health and Welfare Effects (at ambient concentrations)
Carbon Monoxide	Impairs the ability of blood to carry oxygen in the body. Cardiovascular system is primarily affected, causing angina pain in persons suffering from cardiac disease and leg pain in individuals with occlusive arterial disease. Affects other mammals in a similar manner.
Lead	Damages the cardiovascular, renal, and nervous systems resulting in anemia, brain damage, and kidney disease. Preschool age children are particularly susceptible to brain damage effects. Similar effects observed in other mammals. Other adverse effects on animals, microorganisms, and plants.
Nitrogen Dioxide	Impairs the respiratory system, causing a high incidence of acute respiratory diseases. Preschool children are especially at risk. Damages certain plants and materials. Degrades visibility due to its brownish color and its conversion to nitrate particles. Nitrate particles are also a major component of acid rain.
Ozone	Damages the respiratory system, reducing breathing capacity and causing chest pain, headache, nasal congestion, and sore throat. Individuals with chronic respiratory diseases are especially susceptible to ozone. Injures certain plants, trees, and materials.

Particulates	Causes irritation and damage to the respiratory system, resulting in difficult breathing, inducement of bronchitis, and aggravation of existing respiratory diseases. Also, certain polycyclic aromatic hydrocarbons in particulate matter are carcinogenic. Individuals with respiratory and cardiovascular diseases, children, and elderly persons are at the greatest risk. Soils and damages materials. Impairs visibility. Acid rain particulates damage materials, plants, and trees and acidify surface waters, thereby harming aquatic life.
Sulfur Dioxide	Aggravates asthma, resulting in wheezing, shortness of breath, and coughing. Healthy persons exhibit the same responses at higher exposures. Asthmatics and atopic individuals are the most sensitive groups, followed by those suffering from bronchitis, persons with emphysema, bronchiectasis, cardio-vascular disease, the elderly, and children. Damages certain plants and materials. Impairs visibility and contributes to acid deposition due to the its conversion to sulfate particles.

C. Sources

1. Carbon Monoxide (CO)

Motor vehicles are by far the major source of CO, followed by minor sources including aircraft, controlled forestry and agricultural burning, industrial facilities, fireplaces, structural fires, railroads and off-road vehicles. Because CO is emitted mainly at ground level, it is trapped at nighttime when the lower atmosphere is stagnant due to a surface-based temperature inversion. As a result, CO concentrations are much greater during evening and early morning hours. Surface-based temperature inversions occur after sunset due to the cooling of the earth's surface as it loses heat by radiation. After sunrise, solar radiation heats the earth's surface and the lower atmosphere, resulting in dissipation of the temperature inversion. Since inversions are more severe during the fall and winter months, CO concentrations are much higher in these months. As a result, standards are exceeded primarily in October through March.

2. Lead

Lead is emitted primarily by motor vehicles (not equipped with catalytic converters) which burn leaded gasoline. Both the use of leaded gasoline and the lead content of this fuel have decreased substantially. Ambient concentrations of lead have declined well below the standard in Phoenix and Tucson.

3. Nitrogen Dioxide (NO_2)

Motor vehicles are the dominant source of NO_2 emissions, followed by power plants, and industrial and commercial facilities. In addition, NO_2 is also derived from the oxidation of NO (nitric oxide) in the atmosphere. NO is emitted by the same sources that emit NO_2. Concentrations of NO_2 in Arizona are well below the ambient standard.

4. Ozone

Ozone is formed in the atmosphere by the reaction of volatile hydrocarbons with nitrogen oxides (NO and NO_2). This chemical reaction occurs much faster in the presence of sunlight at higher temperatures. Thus, ozone concentrations are greater in the afternoon hours from May to September and occasionally exceed the standard in Phoenix. Days on which ozone concentrations are high are characterized by low wind speeds, late temperature inversion dissipation, and a relatively early wind direction shift. Hydrocarbons and nitrogen oxides, the precursors of ozone, are emitted largely by motor vehicles. Secondary sources of hydrocarbons include gasoline marketing, organic solvent usage, and miscellaneous area sources. For nitrogen oxides, secondary sources include power plants and industrial and commercial boilers.

5. Particulates

Sources of particulate matter vary widely in Arizona by region and season. In Phoenix and Tucson, vehicular traffic on unpaved and paved roads and streets suspend large quantities of dust. Other significant fugitive dust sources include construction activity and windblown dust from disturbed desert. In agricultural areas, farming activity is an additional source of fugitive dust whereas fireplaces and woodstoves emit substantial quantities of smoke in northern Arizona. In rural, industrial areas of the state, tailings piles, surface mines, quarries, material handling and storage, ore crushing and grinding, and haul roads are major sources of particulate matter. Exceedances of particulate standards in the state occur chiefly in the southern and western desert regions.

6. Sulfur Dioxide (SO_2)

In Arizona major sources of SO_2 include copper smelters and coal-fired power plants which are located in rural areas with one exception. There is one coal-fired power plant in Tucson. Generally, SO_2 concentrations near power plants are well below the standards. In the copper smelter areas, however, concentrations occasionally exceed the standards.

II Program Activity In 1989

A. Vehicle Emissions Inspection Program

As a result of 1988 state legislation to strengthen the Vehicle Emissions Inspection Program, all 1981 and newer vehicles are required to meet carbon monoxide and hydrocarbon emission limits under loaded as well as idle conditions. Loaded conditions are obtained by operating the vehicles on a dynamometer to simulate a specified driving speed condition. Data analysis indicates that adoption of the loaded test should reduce carbon monoxide emissions by 4% both in the Phoenix and Tucson metropolitan areas. Another carbon monoxide control strategy implemented in 1989 was the inspection of vehicles registered outside of the nonattainment areas but used to commute into the nonattainment areas. This control measure should reduce carbon monoxide emissions on the order of 0.5 to 1.0% in each of the two nonattainment areas.

During 1989, a Request for Proposal (RFP) was released to lead to a contract to operate the Inspection/Maintenance Program, beginning January 1, 1991. Three bids were received and the successful bidder was Gordon-Darby, Inc., a Kentucky-based firm which currently operates an inspection network testing about 500,000 vehicles annually in Louisville, Kentucky. The new inspection network will provide greater service to the public by operating more test lanes and increasing the daily hours of operation. Also, the test fee will decrease from $7.50 per test to $5.40 per test for all vehicles including diesels.

A summary of contractor (Hamilton Test Systems) and fleet operator testing and inspections plus training conducted by DEQ is given below.

Vehicular Inspection/Maintenance Summary - 1989

Number of initial emission tests:	1,672,128
Number of tampering inspections:	1,430,380
Number of vehicles tested by fleet operators:	189,502
Number of mechanics trained in proper tuneup procedures:	1,449

Improvements in idle emissions of vehicles identified as not meeting standards, as a result of required repairs, were 51% for CO and 43% for HC.

B. Oxygenated Fuels

The Oxygenated Fuels Program, as mandated by H.B. 2206, went into effect October 1, 1989 and continued through March 31, 1990 in Maricopa County. The program mandated the addition of either ethanol or MTBE (methyl tertiary butyl ether) to gasoline sold in the Phoenix carbon monoxide nonattainment area. Both additives increase the oxygen content of the fuel, producing more efficient combustion and reduced overall carbon monoxide emissions. Initial expectations of the two "oxy" fuels marketed were that they would reduce carbon monoxide emissions from motor vehicles by approximately 16%.

DEQ is presently conducting a study which compares vehicle CO emissions from oxy fuels with emissions from non-oxy blended gasoline.

In order to perform this testing, it was necessary for ADEQ to develop and start up a laboratory capable of conducting constant volume sampling (CVS) of motor vehicle emissions. The CVS procedure requires emission testing of vehicles while they are operated on a dynamometer to simulate a typical driving cycle. This is the same procedure used by EPA and the manufacturers to test new motor vehicles. The equipment, technical staff, and procedures needed to operate a CVS laboratory are much more sophisticated than the requirements for routine testing at the inspection stations. In addition to testing vehicles in the CVS laboratory, failure rate data from the inspection stations were analyzed. This analysis revealed an 18% decrease in carbon monoxide failure rates in Phoenix during the oxygenated fuels season. In Tucson, where oxygenated fuel usage is not mandatory until late 1990, no significant change in the carbon monoxide failure rate was observed.

In conjunction with the mandatory use of oxygenated fuels, DEQ and the Department of Transportation and the Department of Weights and Measures conducted a public education campaign. The goals of this campaign were to inform the public regarding:

- Benefits of oxygenated fuels.
- Geographical and seasonal requirements of the program.
- Sources of information regarding the effects of fuels on vehicle performance and maintenance.

In order to meet these goals, television, radio, and newspaper advertisements were run extensively. In addition, brochures were widely distributed and a consumer information line was operated. A speakers bureau and training of automotive service professionals were also provided. Based on inquires received on the information line, public concern about the fuels declined dramatically as Phoenix area drivers adapted to the change. Ultimately, no vehicle maintenance or repair problems were found to have been caused by oxygenated fuels.

C. Air Quality Fund

DEQ actively participates in the implementation of air quality improvement projects financed through the State Air Quality Fund (AQF). This fund is maintained by a $1.50 fee included in the cost of each motor vehicle registration and implementation in Arizona. In managing the fund, ADEQ evaluates proposed research and implementation projects and awards grants for selected activities. A listing of these projects, by type and associated funding, is shown in the table at the end of this section. A brief description of certain projects follows:

COMPRESSED NATURAL GAS (CNG)

CNG, or compressed natural gas, has been identified by the Legislature as a desirable alternative fuel for use by state agencies and departments, and political subdivisions throughout Arizona. Each year the DEQ provides up to $250,000 in grant awards for the purpose of providing these political entities with the financial assistance required to expand existing CNG fleets and related facilities, or to initiate new CNG projects. In 1989, DEQ has approved grant funding for CNG conversion programs in Scottsdale, Glendale, and Tucson.

REPORTS TO LEGISLATURE AND TECHNICAL ASSISTANCE

Funded by the AQF, the DEQ, with the support of the Arizona Departments of Weights and Measures and Transportation, is responsible for developing data and reporting on the following:

1. The benefits, test methods and feasibility of testing gasoline and diesel powered vehicles for oxides of nitrogen emissions.

2. The air quality benefits derived from the emissions testing of vehicles registered in areas contiguous to the nonattainment areas for automotive related pollutants.

3. The effectiveness of the vehicle emissions testing program in reducing carbon monoxide and other pollutants.

4. Air quality effects of the Arizona Oxygenated Fuels Program and Reid Vapor Pressure (RVP) regulations.

5. The cost effectiveness of the carbon monoxide reduction measures contained in statute, and recommendations as to how effectiveness may be increased and costs decreased.

6. The causes of carbon monoxide concentrations of air quality monitors which exceed federal standards, and recommendations concerning specific traffic flow improvements that may reduce such concentration.

7. Toxic emissions associated with the use of alternative fuels.

TRAFFIC REDUCTION

A $400,000 statutory appropriation from the AQF, through ADOT, provides assistance for improvements to public transit in the major metropolitan areas of the state. To date, these subsidies have provided new or extended bus service in the Phoenix and Tucson areas, as well as a metropolitan Phoenix van pool service between residential communities and major regional employers.

Maricopa County is the recipient of a grant to implement a multifaceted program consisting of a regional Trip Reduction Program (TRP), development of a Trip Reduction Ordinance (TRO) and the continuation of the annual "Clean Air" (voluntary No-Drive) campaign.

The Maricopa TRP is a county-wide program that provides employer training, technical assistance to employers, dissemination of information, surveys of commuting patterns, analysis of the survey data, review of plans developed by employers, monitoring and enforcement activities and other support activities designed to comply with the TRP mandated by the Legislature in 1988. The purpose of the TRP is to reduce the total vehicle miles traveled by company employees by encouraging commuting by car and van pooling, buses, bicycling, or other alternatives to the single occupant automobile.

The Regional Public Transportation Authority (RPTA) was responsible for the continued implementation of the second year of the Maricopa County Clean Air Campaign in 1989. The success of the 1989 campaign was mirrored in a 13% increase in bus ridership and was due in large part to the voluntary cooperation between and in-kind contributions from RPTA, the Phoenix Metropolitan Chamber of Commerce and the Arizona Broadcasters Association.

Like Maricopa County, Pima County is actively involved in the continued implementation of a TRP and received a grant from DEQ to support this activity. The Pima County TRP has been in effect since the summer of 1988 and was originally adopted by Pima County and the cities and towns within the county in April of 1988. The Pima County voluntary no drive day campaign, "Spare the Air", has proven very successful in improving public awareness of air pollution caused by automobile use.

Other travel reduction programs funded wholly or in part by the AQF include the following. (A full list is in the Air Quality Fund Allocations Table at the end of this section).

1) City of Phoenix Traffic Synchronization Network

Purpose: To improve continuity of traffic flow and to prevent central computer system failure from defeating computerized traffic light synchronization.

2) City of Scottsdale Trip Reduction Coordinator Position

Purpose: To assist in the identification of employer participants in a community Transportation Management Authority, in the expansion of city ride-share activities and in the greater use of bicycles.

3) City of Tucson Bicycle Handbook

Purpose: To produce 43,000 bicycle handbooks for Tucson and Phoenix to educate riders on laws, maintenance, recreational options, and information referral. Tucson estimates 16 tons/year reductions in vehicle emissions due to the program.

4) City of Avondale Express Bus Route

Purpose: To grant AQF seed money to extend a Phoenix Transit bus line into Avondale. According to Phoenix Transit, ridership continues to increase on the Avondale leg of the route.

5) City of Mesa Sun Runner Bus Route

Purpose: To grant seed money to start a seasonal bus route targeted to East Mesa winter residents. Surveys have indicated a sizeable number of working commuters on the route as well as seasonal residents.

FORMALDEHYDE AND ACETALDEHYDE

Studies to determine ambient concentrations of formaldehyde and acetaldehyde were conducted in Phoenix and Tucson during December 1989 and January 1990. The purpose of these studies is to determine what effect if any oxygenated fuels use has on ambient aldehyde concentrations. Samples were collected over a twenty-four-hour period on cartridges containing a chemically coated packing which reacts with aldehydes. The Phoenix study was a follow-up to a baseline study conducted in December 1988 and January 1989 prior to the mandatory use of oxygenated fuels. Nitrogen oxides (NO_x) concentrations were also measured at each aldehyde site. The corresponding NO_x concentrations were used to normalize the aldehyde concentrations for the Phoenix "before and after" comparison. A comparison of the normalized data indicates no significant change in concentrations of formaldehyde or acetaldehyde from oxygenated fuel usage. The Tucson study was to establish an aldehyde baseline prior to the mandatory use of oxygenated fuels starting in October 1990.

RESIDENTIAL WOODSTOVE ORDINANCE GUIDANCE

The Department has contracted with Southwest Strategies, Inc. to assist the City of Flagstaff with the development of an ordinance to reduce woodsmoke pollution by systematic replacement of woodstoves with EPA certified stoves. These technologically advanced stoves emit less particulates and are more heat efficient than non-certified stoves. The contractor also developed a guidance document for communities considering regulation of residential wood combustion. DEQ will distribute this report and encourage and assist other Arizona communities to adopt woodsmoke ordinances to improve air quality.

PHOENIX AND TUCSON BROWN CLOUD STUDIES

A pilot study of the chemical constituents and sources of the winter haze in the Phoenix metropolitan area was conducted by the Arizona Department of Environmental Quality during December 1988 and January 1989.

The results of that study show that particles of carbon, nitrates, and sulfates are the predominant species found in fine particulates which researchers have concluded are the major cause of urban visibility impairment.

Visibility and related air contaminants vary in time and space. The study found nearly uniform concentrations in the lowest 120 feet of the air over central Phoenix; however, significant variations occurred between measurements in south Scottsdale and central Phoenix. The previously observed daily cycle of visibility degrading in the morning hours to a minimum about noon, followed by improvement in the afternoon, was confirmed during the study by photographs. Thus, the focus of the laboratory analysis and data interpretation was on samples collected during the morning hours.

Overall, motor vehicle usage was found to be the primary source of fine particulates, with considerably smaller contributions from wood burning and soil. Yet, during one visibility episode in the south Scottsdale area, wood burning appeared to be a major contributor.

Subsequent to the pilot study the Arizona legislature passed Senate Bill 1029 which authorizes use of Air Quality Fund monies for conducting "brown cloud" research. The Desert Research Institute, with experts in the field of visibility research have been retained to perform a comprehensive brown cloud study in the Phoenix area starting with a field study conducted from September 1989 - January 1990, a final report is due in the Fall of 1990. At the same time a pilot brown cloud study was performed by the consultant team in Tucson. Results from the Tucson pilot study will be used to design a comprehensive study in Tucson.

SMOKE MANAGEMENT

Controlled forestry burns are one of the largest sources of air pollution in Arizona. In 1989 it is estimated that over 12,000 tons of particulate and approximately 200,000 tons of carbon monoxide were released from controlled burns primarily conducted on U.S. National Forest and Indian Lands. DEQ's efforts to regulate this source have not been sufficient to prevent occasional intrusions of smoke into scenic and sensitive areas in unacceptable amounts. In order to improve our regulatory approach, DEQ has hired a consultant, Air Quality/Land Management Systems, to produce a report that provides information regarding management activities by other states and agencies, state-of-the-art monitoring and modeling methods and potential regulatory formats for DEQ. The report will focus on controlled/ prescribed burns related to agricultural/forest/rangeland land management activities.

SCENIC AND SENSITIVE AREAS

In order to further protect air quality in pristine areas of the state, an evaluation report was prepared by AeroVironment Inc. for DEQ. Included in this report are:

- review of federal and industrial studies of air quality and visibility in pristine areas of Arizona and adjacent states
- review of federal and state regulatory programs for visibility protection
- options and recommendations for visibility monitoring in scenic and sensitive areas of Arizona

This information will be used to develop a state program for visibility protection.

ROAD DUST ABATMENT PROGRAM

The Department contracted with the Arizona State University Center for Advanced Research in Transportation (CART) to assist with unpaved road emission impact research. The first part of the project was the compilation of the Consumers Guide to Dust Control Technologies. This document discusses dust control products including considerations for selecting generic categories of products and financing options for municipalities. This document also provides product information summaries for those products available in Arizona.

The second part of this project is concerned with the development of mathematical relationships between particulate concentrations in the ambient air and their causative factors, namely, road characteristics and traffic conditions. These relationships would be used as guidelines by Arizona communities and transportation agencies in determining control measures required for unpaved roads. Midwest Research Institute (MRI) has been retained as the contractor to work with CART in conducting field measurements.

AGRICULTURAL DUST CONTROL

DEQ has sponsored two projects investigating alternative methods of agricultural tillage to reduce particulate emissions. The goal of these projects is to quantify the reduction of particulate emissions when using other than conventional tillage methods and demonstrate the usefulness and benefits of these agricultural methods to Arizona farmers. The Hohokam RC&D (Resource Conservation and Development Council) is the subcontractor for East Hohokam NRCD (Natural Resource Conservation District) on one of the projects. The NRCD is utilizing conservation tillage which refers to any tillage program which reduces soil or water loss compared to conventional tillage. Other benefits include fuel savings and improved soil texture. The University of Arizona, Department of Agricultural Engineering, is the contractor on the other tillage project. The University is also utilizing conservation tillage with farm machines that combine field operations to realize the same benefits as listed above.

Another agricultural project supported by the AQF is focused on revegetation of retired farmland. The purpose of the research is to demonstrate techniques for reestablishing vegetative cover on retired farmland to reduce windblown dust. The University of Arizona's Cooperative Extension Service is the contractor for this project.

D. PM10 SIPs

A brief summary of activities is given below.

- Hayden - Control requirements were incorporated as conditions of the operating permit for ASARCO's copper ore crushing, milling, and concentrating operations. Although issuance of the permit is pending, ASARCO has implemented many of the control measures called for in the permit. After conducting a public hearing, these permit conditions were incorporated into the SIP.

- Paul Spur - Control requirements were developed as operating permit conditions for Chemstar's lime plant, and a public hearing was held. The SIP should be adopted by DEQ in July, 1990.

- Rillito - Work continues on the development of control options.

- Yuma - Sampling study has been completed.

- Douglas, Nogales - Preliminary analysis indicates that the evaluation must be expanded into the neighboring Mexican communities.

E. Stationary Source Compliance

Surveillance of all stationary major sources was continued throughout the state for the purpose of determining compliance with state and federal regulations. ADEQ also regulated minor sources in counties where no local air pollution control program existed. These counties were: Apache, Cochise, Coconino, Gila, Graham, Greenlee, La Paz, Mohave, Navajo, Yavapai and Yuma. Elements of this regulatory program include:

- Unannounced inspections of air pollution sources
- Investigations in response to complaints from public, private and legislative contacts.
- Observations and reviews of emission tests of regulated sources
- Review and determination of conditions for operating permits of existing facilities
- Review of installation permit applications and determination of conditions for the construction of new sources
- Technical assistance and cooperation with local and federal regulatory agencies
- NESHAPS (National Emission Standards for Hazardous Air Pollutants) inspections of regulated sources
- Review and determination of compliance of asbestos management plans developed by schools in accordance with AHERA (Asbestos Hazard Emergency Response Act)

In order to develop and maintain a more stringent enforcement and compliance program, three additional Compliance Engineer positions were authorized.

For the purpose of allowing more public input, state legislation was enacted which requires DEQ to publish notices on each permit under final review. These public notices provide citizens with the opportunity to comment on proposed permitting decisions. Accordingly, notices of permit review were published for all permits issued after September, 1989.

The requirement to install and operate continuous emission monitors for SO_2 at Salt River Project's Navajo Generating Station at Page was included in their permit in 1989. This action was taken in order to ensure compliance with state emission standards.

Presently, there are approximately 530 air pollution sources regulated under the state air pollution permit program. This consists of 26 major sources, 302 minor sources and 202 portable sources. The major sources consist of 6 power plants, 2 portland cement companies, 3 copper smelters, 2 lime manufacturing plants, 9 copper mines, 1 papermill and 1 printing operation. One hazardous waste incineration facility and one petroleum refinery are in process of obtaining installation permits.

F. Review of Air Quality Rules

As a result of a five-year rule review analysis conducted in 1988, ADEQ proposed major rewriting and updating of some air quality rules to conform with changes in federal requirements and for purpose of clarity, conciseness, and understanding.

The changes in Chapter 2 of Title 18 include:

- Article 1 - Definitions have been rewritten and updated, and many have been moved to new definitions sections in Articles 3 and 5. New sections have been added for materials incorporated by reference and jurisdiction over stationary sources.

- Article 2 - Ambient air quality standards have been updated and the rules concerning attainment areas have been updated and clarified.

- Article 3 - Two new rules are added providing definitions and requirements for visibility protection. Although a few other changes are made for federal conformity, the bulk of the permitting process contained in the article will not be revised until a later rulemaking.

- Article 5 - A new definition section is added and some rules are renumbered for clarity. All of the rules in the article concerning existing stationary source performance standards have been updated and rewritten.

- Article 6 - The rules for emissions from mobile sources have been rewritten for clarity and an amendment is proposed concerning the use of locomotives as off-road machinery.

- Article 7 - As nonferrous smelter orders no longer exist, the article is proposed for repeal.

- Article 8 - New source performance standards have been updated.

- Article 9 - National Emission Standards for Hazardous Air Pollutants (NESHAP) and associated test methods have been updated.

- Article 11 - As the two rules in the article simply reiterate statutory provisions, the article is proposed for repeal. The jurisdiction rule was incorporated into Article 1.

Appendices: Appendix 7, relating to Nonferrous Smelter Orders, was repealed; Appendix 9 was revised to conform with changes made in the Arizona Testing Manual.

AQF PROJECTIONS/PROJECT SUMMARY
FISCAL YEAR 1989/1990

FUND BALANCE AS OF 7/1/89			$ 3,880,816
ADD: Estimated fee revenue thru 6-30-90			3,881,000
Estimated interest thru 6-30-90			200,000
TOTAL FUNDS AVAILABLE THRU 6-30-90			$ 7,961,816
LESS: ESTIMATED COMMITTMENTS AS OF			
Administration		$ 102,622	
Alternative Fuels		1,746,136	
Constant Volume Sampling	$ 662,551		
Oxygenated Fuels Public Education	508,585		
CNG HURF Reimbursement/Fleet Conversion (250,000 ea. FY89 & FY90)	500,000		
Grant - Scottsdale CNG Program	75,000		
Reports to Legislature & Technical Assistance		428,626	
Carbon Monoxide SIP Revision	200,000		
Energy and Environmental Analysis, Inc.	115,388		
U of A Cost Effectiveness	43,238		
DEQ Reports to Legislature (FY 90)	50,000		
Air Quality Compliance Committee	20,000		
Traffic Reduction		3,031,615	
ADOT Transit Subsidies	400,000		
Grant - TRP & No Drive, Maricopa County	1,465,371		
Grant - TRO & No Drive, Pima County	726,750		
Grant - Avondale Park and Ride	86,800		
Grant - El Mirage Dial-a-Ride	10,000		
Grant - Mesa Peak Season Transit	61,104		
Grant - Phoenix Traffic Signal Syncronization	153,000		
Grant - Scottsdale Trip Reduction Coordinator	40,590		
Grant - Tucson Bicycle Manual	8,000		
Grant - Tucson Trolley Demonstration	80,000		
Monitoring and Research		1,212,095	
Aldehyde Studies	16,985		
Technical and Research Staff	156,110		
Brown Cloud Studies - Phoenix and Tucson Pilot	1,000,000		
Pima County Monitors	14,000		
Pinal County Monitors	25,000		
Rural Projects		444,398	
Unpaved Road Dust	224,600		
Agricultural Dust Control	109,497		
Wood Stove Regulation	48,000		
PRISMS	18,001		
Scenic and Sensitive Areas Protection	44,300		
New Urban Grants (from FY 90 RFP)		700,000	
TOTAL COMMITTMENTS THRU 6-30-90			7,665,492

III. AIR QUALITY MONITORING NETWORKS

A. Monitoring Networks

In Arizona, ambient air monitoring is conducted by a number of governmental agencies and regulated industries. A list of these monitoring network operators and the areas monitored is given below.

Agency or Industry	Area Monitored
Arizona Public Service Co.	Joseph City
ASARCO, Inc.	Hayden
Century Power Corp. (Formerly Alamito Corp.)	Springerville
Cyprus Miami Mining Corp.	Miami
Magma Copper Co.	San Manuel
Maricopa County Health Dept.	Phoenix Metropolitan Area
National Park Service	National Monuments and Parks
Pima County Health Dept.	Tucson Metropolitan Area
Pinal County Air Quality Control District	Pinal County
Salt River Project	Page and St. Johns
Southern California Edison Co.	Bullhead City, AZ and Laughlin, NV

Agency or Industry	Area Monitored
Tucson Electric Power Co.	Tucson

Maps indicating the locations of the Phoenix, Tucson and statewide monitoring stations are provided in Figures 1, 2, and 3. The Maricopa and Pima County networks are operated primarily to monitor urban-related air pollution. In contrast, the industrial networks are operated to monitor emissions from certain industrial facilities. State monitors are employed for a variety of purposes, including urban, industrial, rural and background surveillance. Finally, the National Park Service sites in Arizona have the unique objective of monitoring visibility in pristine areas in accordance with federal regulations for visibility protection. Included in this activity are measurements of various optical parameters as well as pollutant concentrations.

B. Data Reporting

Ambient air quality data collected in 1989 by the various networks above are summarized in Section IV of this report. In addition, Maricopa and Pima Counties and some of the companies publish annual reports which include summaries of their data.

Raw data files are maintained by each of the network operators and are available upon request to them. In addition, the U.S. Environmental Protection Agency (EPA) stores raw data submitted quarterly by Maricopa and Pima Counties and the State. EPA analyzes these data for the purposes of evaluating progress in attaining and maintaining the NAAQS and reporting trends in air quality to the President and Congress.

Maricopa and Pima Counties report pollutant concentrations in the Phoenix and Tucson urban areas each day to the public via television, radio, newspapers and telephone. The data are reported in pollutant standard index (PSI) units, that is, units of concentrations relative to the standards. These reports include the descriptor words, good, moderate, unhealthy, very unhealthy, or hazardous, depending on pollutant levels.

The industrial operators submit either monthly or quarterly data reports to the state, depending on the type of facility. In addition, they are required to report any exceedance of an air quality standard by the next working day. The report includes an explanation of the causes of the exceedance and corrective actions to be taken, if possible, to prevent future occurrences.

IV. AIR QUALITY DATA FOR 1989

Table 2 lists the counties and towns monitored in the state and the pollutants for which data are listed.

1989 data summaries, which are tabulated in Tables 3 through 10, consist of the following:

- Mean concentrations for the calendar year
- Highest concentrations for shorter time intervals
- Number of exceedances of air quality standards
- Number of samples collected or hours monitored

In the data summaries, the following abbreviations and footnotes were used:

GENERAL

NA	Not Applicable
NR	Not Reported

OPERATORS

APS	Arizona Public Service Company
ASARCO	ASARCO
CENT	Century Power Corporation
CM	Cyprus Miami Mining Corporation
Magma	Magma Copper Company
Maricopa	Maricopa County Department of Health Services, Bureau of Air Pollution Control
NPS	National Park Service
Pima	Pima County Health Department, Air Quality Control District
Pinal	Pinal County Air Quality Control District
SRP	Salt River Project
SCE	Southern California Edison Company
State	Arizona Department of Environmental Quality
TEP	Tucson Electric Power Company

EQUIPMENT

Carbon Monoxide	
GFC	Gas filter correlation
Nitrogen Dioxide	
Chem	Chemiluminescent
Ozone	
Chem	Chemiluminescent
UV	Ultraviolet absorption
TSP	
Hi-Vol	High volume air sampler
PM-10	
SA321B	Sierra Andersen 321B hi-vol
SA1200	Sierra Andersen 1200 hi-vol
Wed	Wedding hi-vol
Dichot	Dichotomous
Imp.	Improve
Sulfur Dioxide	
Coul	Coulometric
Flame	Flame photometric
Fluor	Fluorescent

Footnotes:

a. New site
b. Site terminated
c. Mean value based on a limited number of samples
d. Site operated on a seasonal schedule
e. Site operated on an event basis
f. Units for Pb are ng/m^3
g. Data for Pb and SO_4 are for particles smaller than 2.5 um

V. AIR QUALITY TRENDS

A. Carbon Monoxide

In 1989 concentrations in Phoenix were essentially the same as in 1988, but over the past 10 years, they have declined substantially. These trends are indicated by the second highest 8-hr. concentrations and the number of exceedances of the 8-hr. standard which are plotted in Figures 4 and 5. Because it is a neighborhood scale site, the trend for the Roosevelt Street station is more consistent than the pattern for the Indian School Road station, a microscale site.

In Tucson a similar trend is indicated except that concentrations leveled out two years earlier in 1987. Data for the microscale site, 22nd & Alvernon, were plotted because very few exceedances were monitored at the neighborhood scale stations in Tucson. In fact, no violations of the 8-hr. standard have occurred at 22nd & Alvernon since 1984.

B. Lead

In Tucson ambient lead concentrations have remained at 0.09 - 0.10 ug/m^3 (maximum quarterly average) at the Prince Road site since 1987. However, in Phoenix lead concentrations have continued to decline and are now virtually the same as in Tucson. These trends are reflected in the data for the Prince Road (Tucson) and McDowell Road (Phoenix) sites which monitor the highest concentrations in each city (see Figure 6). It should be noted that some of the 24-hr. measurements which were used to compute the quarterly averages are near the minimum detectable limit of 0.03 ug/m^3. Therefore, there is no significant difference between 0.09 ug/m^3 at Prince Road in Tucson and 0.10 ug/m^3 at McDowell Road in Phoenix in 1989. Finally, it is interesting to note the parallel between the carbon monoxide and lead trends for each city. In Tucson concentrations of both pollutants leveled out in 1987 whereas a decreasing trend has continued in Phoenix.

C. Nitrogen Dioxide

It is difficult to clearly define nitrogen dioxide trends in the Phoenix and Tucson urban areas due to a sparsity of monitoring data. In Phoenix annual average levels fluctuated between 30 and 59 ug/m^3 from 1981 to 1985 at the only active monitoring site. Although data recovery was low, these data for the central Phoenix monitoring station (1845 E. Roosevelt) indicate compliance with the annual standard of 100 ug/m^3. Monitoring at this and two other sites in the Phoenix urban area was resumed in 1990.

In Tucson more extensive data have been obtained for one site, 22nd & Craycroft. As in Phoenix, annual average concentrations fluctuated but over a smaller range, between 30 and 40 ug/m^3 during the period of 1982 to 1989.

D. Ozone

In Phoenix an increase in ozone concentrations occurred from 1979 through 1981, followed by an overall decrease through 1989 (see Figures 7 & 8). Peak values from the graphs are 0.17 ppm in 1981 and 22 exceedances of the standard in 1980 for the 5-site network. In 1989 no exceedances were monitored as the second highest 1-hour concentration was 0.12 ppm which corresponds to the 1-hour health standard.

In Tucson a similar pattern is evident except that concentrations leveled out at 0.09 ppm from 1986 through 1989. No exceedances of the standard were monitored as the second highest 1-hr concentration peaked at 0.12 ppm in 1981 and 1982. The Yuma data do not reflect the same trends observed for Phoenix and Tucson. In fact, no long-term trend is apparent, but rather, a series of increases, decreases, and plateaus have occurred. Another noteworthy aspect of the Yuma data is the fact that concentrations are equal to or slightly higher than ozone levels in Tucson, despite the vast difference in population.

E. PM10

Phoenix PM10 levels have declined since 1985 at both trend sites, South Phoenix (4732 S. Central) and Central Phoenix (1845 E. Roosevelt - see Figure 9). This reduction has been greater at South Phoenix even though concentrations increased slightly in 1989 at this site. Street paving in this area is the probable cause of reduced levels of PM10. However, both sites still exceed the annual standard of 50 ug/m^3. In Tucson concentrations at the trend site (3401 W. Orange Grove) decreased from 1985 through 1987 and increased thereafter (see Figure 9). These variations were relatively small, however, and the site has remained in compliance with the annual standard.

In other areas of the state PM10 concentrations for the most part have not changed significantly since sampling began in 1985 with two exceptions (see Table 11). At Paul Spur the annual average has fluctuated substantially from 56 ug/m^3 to 122 ug/m^3 during the past five years. In Hayden the annual PM10 concentration has continuously decreased from 58 ug/m^3 to 46 ug/m^3 except in 1986 when it was 80 ug/m^3.

F. TSP

TSP sampling continues in various background, rural and small urban areas of Arizona where particulate concentrations are relatively low. In most of these areas, TSP concentrations have not varied substantially over the last 7 years (see Table 12). However, in a few towns including Apache Junction, Bullhead City and Mammoth the annual means have increased significantly. These increases in TSP concentrations have occurred in recent years in Bullhead City and Mammoth whereas a long-term increase is indicated for Apache Junction. Urban growth in the Apache Junction and Bullhead City areas is the likely cause for these upward trends. In Mammoth the monitoring site may have been affected by excessive emissions from a nearby sand and gravel facility in recent years.

G. Sulfur Dioxide

Compliance with the 3-hr ambient standard lapsed in Hayden and San Manuel in 1989 (see Figure 10). This trend was especially evident in Hayden where the number of exceedances increased to six. Moreover, these six exceedances equated to four violations of the 3-hr standard, the greatest number of violations over the past four years. In fact, the only previous violation of an ambient standard during this period was a 3-hr violation in Hayden in 1987. In contrast only one exceedance of the 3-hr standard has been monitored in Miami in the past four years.

TABLE 1

SUMMARY OF AMBIENT AIR QUALITY STANDARDS-STATE AND FEDERAL STDS.(a)
In ug/m^3 (and ppm)

Pollutant	Averaging Time	Primary	Secondary
Carbon Monoxide(b)	1-hour	40 (35)	40 (35)
	8-hour	10 (9)	10 (9)
Nitrogen Dioxide	Annual	100 (.05)	100 (.05)
Ozone	1-hour	235 (.12)	235 (.12)
PM10	24-hour, Annual	150,50	150,50
Sulfur Dioxide	3-hour	-----	1300 (.5)
	24-hour	365 (.14)	-----
	Annual	80 (.03)	-----
Lead	Calendar Quarter	1.5	1.5

SUMMARY OF EMERGENCY EPISODE LEVELS-STATE AND FEDERAL
In ug/m^3 (and ppm)

Pollutant	Averaging Time	Alert	Warning	Emergency	Significant Harm
Carbon Monoxide	1-hour	---	---	---	(125)
	4-hour	---	---	---	(75)
	8-hour	(15)	(30)	(40)	(50)
Nitrogen Dioxide	1-hour	1130(.6)	2260(1.2)	3000(.6)	3750(2.0)
	24-hour	282(.15)	565(.3)	750(.4)	938(.5)
Ozone	1-hour	400(.2)	800(.4)	1000(.5)	1200(.6)
PM10	24-hour	350(-)	420(-)	500(-)	600(-)
Sulfur Dioxide	24-hour	800(.3)	1600(.6)	2100(.8)	2620(1.0)
Sulfur Dioxide (c)(d) and Particulates combined	24-hour	65000(-)	261000(-)	393000(-)	490000(-)

(a) Standards are not to be exceeded more than once per year with two exceptions. In the case of ozone and PM_{10}, compliance is determined by the number of days on which the O_3 or PM_{10} standard is exceeded. The number of exceedance days per year, based on a 3-year running average, is not to exceed 1.0.

(b) In ~~ug~~ mg/m^3 (and ppm)
(c) State
(d) In (ug/m^3)^2

Table 2
1989 Counties and Towns Monitored

COUNTY AND TOWN	CARBON MONOXIDE	LEAD	NITROGEN DIOXIDE	OZONE	PM10	TSP	SULFUR DIOXIDE
APACHE:							
St. Johns			X	X		X	X
Springerville			X		X	X	X
COCHISE:							
Chiricahua		X			X		
Douglas					X		
Paul Spur					X		
COCONINO:							
Flagstaff					X		
Grand Canyon		X		X	X	X	
Page			X	X		X	X
Sedona						X	
GILA:							
Hayden					X		X
Miami					X		X
Payson					X		
Winkleman							X

Table 2 (Cont'd)
1989 Counties and Towns Monitored

COUNTY AND TOWN	CARBON MONOXIDE	LEAD	NITROGEN DIOXIDE	OZONE	PM10	TSP	SULFUR DIOXIDE
GRAHAM:							
Safford					X		
MARICOPA:							
Glendale	X			X	X		
Mesa	X			X	X		
New River				X			
Phoenix	X	X		X	X	X	X
Scottsdale	X			X	X		
MOHAVE:							
Bullhead City			X		X	X	X
Davis Dam						X	X
Holiday Shores					X	X	X
Riviera					X	X	X
NAVAJO:							
Joseph City					X	X	
Petrified Forest		X			X		
Show Low					X		

Table 2 (Cont'd)
1989 Counties and Towns Monitored

COUNTY AND TOWN	CARBON MONOXIDE	LEAD	NITROGEN DIOXIDE	OZONE	PM10	TSP	SULFUR DIOXIDE
PIMA:							
Ajo					X		
Green Valley					X		
Organ Pipe (NM)					X		
Rillito					X		
Saguaro		X		X	X		X
Sahuarita						X	
Tucson					X		
PINAL:							
Apache Junction					X	X	
Casa Grande					X		
Mammoth						X	
Marana						X	
Oracle							X
San Manuel							X
Stanfield					X		
Tonto		X			X		

Table 2 (Cont'd)
1989 Counties and Towns Monitored

COUNTY AND TOWN	CARBON MONOXIDE	LEAD	NITROGEN DIOXIDE	OZONE	PM10	TSP	SULFUR DIOXIDE
SANTA CRUZ:							
Nogales					X	X	
YAVAPAI:							
Clarkdale					X		
Montezuma Castle (NM)						X	
Nelson						X	
Prescott						X	
YUMA:							
Yuma				X	X		

Table 3
1989 Carbon Monoxide Data (in ppm)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	1-HR. AVERAGE MAX.	1-HR. AVERAGE 2ND HIGH	8-HR. AVERAGE MAX.	8-HR. AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF 8-HR STANDARD DAY	NO. OF EXCEEDANCES OF 8-HR STANDARD TIMES	NO. OF SAMPLES
MARICOPA										
AZ Highway	21st & Lewis	State	GFC	13.5[d]	13.0	10.1	9.6	2	2	1942
Glendale	6000 W. Olive	Maricopa	GFC	14	12	8.0	5.7	0	0	8543
Mesa	B'way & Brooks	Maricopa	GFC	7	6	4.2	3.9	0	0	7163
Phoenix	4732 S. Central	Maricopa	GFC	14	13	6.7	6.5	0	0	8522
Phoenix	1845 E. Roosevelt	Maricopa	GFC	15	14	11.2	10.3	2	2	8702
Phoenix	601 E. Butler Drive	Maricopa	GFC	16	14	6.4	6.0	0	0	8450
Phoenix	2750 W. Indian School	Maricopa	GFC	18	17	13.1	12.2	18	20	7615
Phoenix	3847 W. Earll	Maricopa	GFC	22	21	15.3	12.6	8	10	8056
Scottsdale	2857 N. Miller	Maricopa	GFC	12	11	7.2	6.9	0	0	8671
Scottsdale	13665 N. Scotts-dale	Maricopa	GFC	8	8	4.4	4.2	0	0	8250
Scottsdale	24301 N. Alma Sch.	Maricopa	GFC	5	5	4.3	3.8	0	0	5623

Table 3 (Cont'd)
1989 Carbon Monoxide Data (in ppm)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	1-HR. AVERAGE MAX.	1-HR. AVERAGE 2ND HIGH	8-HR. AVERAGE MAX.	8-HR. AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF 8-HR STANDARD DAY	NO. OF EXCEEDANCES OF 8-HR STANDARD TIMES	NO. OF SAMPLES
PIMA:										
Tucson	150 W. Congress	Pima	NDIR	9.7	9.4	6.5	5.8	0	0	8581
Tucson	22nd & Craycroft	Pima	NDIR	9.5	9.1	5.0	4.3	0	0	8228
Tucson	22nd & Alvernon	Pima	NDIR	14.6	13.7	7.9	7.1	0	0	8591

STATE AND FEDERAL STANDARD (PPM): 1-Hour Average 35; 8-Hour Average 9

Table 4
1989 Lead Data (in ug/m^3)
In TSP or PM10

COUNTY AND CITY	SITE LOCATION	OPERATOR	IN	QUARTERLY AVERAGE 1	2	3	4	NO. OF SAMPLES 1	2	3	4
COCHISE:											
Chiricahua N.M.	Faraway Ranch	NPS	PM10	3.75[F,G]	3.23	2.14	3.94	22	15	23	17
COCONINO:											
Grand Canyon N.M.	Hopi Point	NPS	PM10	1.39[F,G]	1.28	1.61	1.60	24	24	27	17
MARICOPA:											
Glendale	6000 W. Olive	Maricopa	PM10	.03	.02	.03	N/S	15	15	14	N/S
Phoenix	1845 E. Roosevelt	Maricopa	TSP	.07	.05	.04	.08	15	15	14	14
			PM10	.06	.04	.04	.08	15	15	15	16
Phoenix	4732 S. Central	Maricopa	PM10	.06	.03	.03	.07	15	15	15	16
Phoenix	1826 W. McDowell	Maricopa	TSP	.10	.07	.06	.10	15	15	15	14
Scottsdale	2857 N. Miller Rd.	Maricopa	PM10	.04	.03	.03	.05	15	15	15	16
Phoenix	3847 W. Earll	Maricopa	PM10	.06	.04	.03	.07	15	15	15	16
NAVAJO:											
Petrified Forest	1 mi. N. of Park Hdqtrs.	NPS	PM10	1.61[F,G]	1.99	1.91	2.52	25	26	26	16

Table 4 (Cont'd)
1989 Lead Data (in ug/m^3)
In TSP or PM10

COUNTY AND CITY	SITE LOCATION	OPERATOR	IN	QUARTERLY AVERAGE 1	2	3	4	NO. OF SAMPLES 1	2	3	4
PIMA:											
Saguaro N.M.	Rincon Mtn. Unit	NPS	PM10	5.03[F,G]	3.29	2.88	5.82	18	23	21	17
Tucson	1016 W. Prince Rd.	Pima	TSP	.06	.04	.01	.04	14	14	15	16
Tucson	Broadway & Swan	Pima	TSP	.04	.00	.00	.01	14	14	16	16
PINAL:											
Tonto	Maintenance Station	NPS	PM10	7.54[F,G]	3.18	4.00	7.29	25	26	26	16

State and Federal Standard (ug/m^3): Calendar Quarter Average
(Primary and Secondary) 1.5

Table 5
1989 Nitrogen Dioxide Data (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	AVERAGE	MAXIMUM 1-HOUR	MAXIMUM 24-HOUR	NO. OF 1-HOUR SAMPLES
APACHE:							
St. Johns	Mesa Parada	SRP	Chem.	8	46	14	8040
Springerville	Airport	Cent	Chem.	4	38	13	7839
Springerville	4 mi. NE of Town	Cent	Chem.	4	36	13	7461
Springerville	1 mi. NNE of Unit 1 Stack	Cent	Chem.	4	58	13	8143
Springerville	1 mi. ESE of Unit 1 Stack	Cent	Chem.	4	203	56	8225
Springerville	1 mi. SSE of Unit 1 Stack	Cent	Chem.	4	60	17	8603
Springerville	12.2 mi. SE of Unit 1 Stack	Cent	Chem.	4	55	19	7509
COCONINO:							
Page	Glen Canyon Dam	SRP	Chem.	4	83	29	7953
MOHAVE:							
Bullhead City	224 N. Main St.	SCE	Chem.	39	132	73	8438
PIMA:							
Tucson	22nd & Craycroft	Pima	Chem.	34	165	34	8397
Tucson	150 W. Congress	Pima	Chem.	51[c]	149	147	2306
Tucson	4591 N. Pomona Ave.	Pima	Chem.	43	175	175	5918

STATE AND FEDERAL STANDARD (ug/m^3): Annual Average
(Primary and Secondary) 100

Table 6
1989 Ozone Data (in ppm)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	1-HR. MAX.	AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF STANDARD	COMPLIANCE STATUS EXCEEDANCES	NO. OF SAMPLES
APACHE:								
St. Johns	Mesa Parada	SRP	U.V.	.08	.08	0	0	7268
COCHISE:								
Chiricahua N.M.[a]	Western Entrance to N.M.	EPA	U.V.	.09	.09	0	0	5760
COCONINO:								
Grand Canyon	Hopi Pt.	NPS	U.V.	.07	.06	0	0	3279
Grand Canyon	4 mi. W. of Hopi Pt.	EPA	U.V.	.08	.08	0	0	4205
Page	Glen Canyon Dam	SRP	U.V.	.10	.10	0	0	8531
MARICOPA:								
Glendale	6000 W. Olive	Maricopa	U.V.	.11	.11	0	0	8257
Mesa	Broadway & Brooks	Maricopa	U.V.	.10	.10	0	0	8282
New River[d]	DSet Lab	State	U.V.	.11	.10	0	0	1607
Phoenix	1845 E. Roosevelt	Maricopa	U.V.	.11	.10	0	0	7778
Phoenix	601 E. Butler.	Maricopa	U.V.	.10	.10	0	0	8458
Phoenix	600 N. 40th Street	State	U.V.	.12	.12	0	0	3211
Phoenix	3847 W. Earll	Maricopa	U.V.	.11	.11	0	0	8137
Phoenix	3315 W. Indian Sch.	Maricopa	U.V.	NR	NR	NR	NR	NR
Phoenix	4732 S. Central	Maricopa	U.V.	.09	.09	0	0	8314

Table 6 (Cont'd)
1989 Ozone Data (in ppm)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	1-HR. AVERAGE MAX.	2ND HIGH	NO. OF EXCEEDANCES OF STANDARD	COMPLIANCE STATUS EXCEEDANCES	NO. OF SAMPLES
MARICOPA: (Cont'd)								
Scottsdale	2857 N. Miller Rd.	Maricopa	U.V.	.10	.10	0	0	7567
Scottsdale	13665 N.Scottsdale	Maricopa	U.V.	.11	.10	0	0	8677
Scottsdale	24301 N. Alma Sch.	Maricopa	U.V.	.10	.10	0	0	8216
PIMA:								
Saguaro NM E	3905 S.Old Spanish Trail	NPS	U.V.	.10	.09	0	0	8062
Tucson	150 W. Congress	Pima	U.V.	.09	.09	0	0	8579
Tucson	22nd & Craycroft	Pima	U.V.	.08	.08	0	0	8454
Tucson	4591 N. Pomona	Pima	U.V.	.09	.09	0	0	6559
YUMA:								
YUMA[d]	1485 2nd Ave	State	U.V.	.12	.10	0	0	3914

STATE AND FEDERAL STANDARD: (Primary and Secondary) The standard is .12 ppm (235 ug/m^3) for the maximum daily 1-hour concentration. Compliance status is determined by computing the average number of days that the 1-hour standard has exceeded per year for the past three years. No more than 1.0 exceedances per year over the last three years is permitted.

Table 7
1989 PM10 Data (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	ANNUAL ARITHMETIC MEAN	24-HR.AVERAGE MAX	24-HR.AVERAGE 2ND HIGH	EXCEEDANCES OF: 150ug/m3	NO. OF SAMPLES
APACHE:								
Springerville	4 mi. NE of Town	Cent.	Dichot	14	85	38	0	408
Springerville	1 mi. NNE of Unit 1 Stack	Cent.	Dichot	20	52	47	0	59
COCHISE:								
Chiricahua N.M.	Faraway Ranch	NPS	Improve	10	49	26	0	76
Douglas	City Park	State	SA1200	55[c]	159	128	1	44
Paul Spur	Housing Area	State	SA321B	122	303	303	11	47
COCONINO:								
Flagstaff	Cherry St. & Agassiz	State	Wedding	24[c]	79	68	0	30
Grand Canyon	Hopi Pt.	NPS	Improve	10	35	28	0	89
GILA:								
Hayden	Jail	State	Wedding	46	90	88	0	53
Miami Tailings	Southwest Gas Yard on Highway 88	State	SA1200	28[c]	63	55	0	17
Payson	County Courthouse	State	SA321B	79	276	190	5	57
GRAHAM:								
Safford	523 10th Ave	State	SA321B	44	107	91	0	55

Table 7 (Cont'd)
1989 PM10 Data (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	ANNUAL ARITHMETIC MEAN	24-HR.AVERAGE MAX	24-HR.AVERAGE 2ND HIGH	EXCEEDANCES OF: 150ug/m3	NO. OF SAMPLES
MARICOPA:								
Glendale	6000 W. Olive	Maricopa	SA321B	37	99	85	0	44
Phoenix	4732 S. Central	Maricopa	SA321B	55	116	104	0	61
Phoenix	3847 W. Earll	Maricopa	SA321B	70	228	175	3	56
Phoenix	1845 E. Roosevelt	Maricopa	SA321B	56	137	130	0	60
Scottsdale	2857 N. Miller Rd.	Maricopa	SA321B	42	103	84	0	60
MOHAVE:								
Bullhead City	224 N. Main St.	SCE	SA321B	52	183	100	1	59
Holiday Shores[a]	1436 Tonto Dr.	SCE	SA321B	-[c]	123	120	0	36
Riviera[a]	Ft. Mohave	SCE	SA321B	37	128	112	0	60
NAVAJO:								
Joseph City	3rd & Tanner St.	APS	Wedding	26	69	65	0	177
Petrified Forest	1 Mi. N. of Park Hdqtrs.	NPS	Improve	10	25	25	0	89
Show Low	Deduce of Clubs Ave.	State	SA1200	24	83	46	0	47

Table 7 (Cont'd)
1989 PM10 Data (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	ANNUAL ARITHMETIC MEAN	24-HR.AVERAGE MAX	24-HR.AVERAGE 2ND HIGH	EXCEEDANCES OF: 150ug/m3	NO. OF SAMPLES
PIMA:								
Ajo	Well Rd.	State	SA321B	41[c]	123	86	0	41
Corona De Tucson	22000 S. Haughton	Pima	SA1200	17	60	40	0	55
Green Valley	245 W. Esperanza	Pima	SA1200	21	50	40	0	58
Organ Pipe (NM)	Visitors Center	State	SA321B	19	65	50	0	58
Rillito	Gremmler Residence	APCC	Wedding	36	136	117	0	294
Rillito	Gremmler Residence	State	SA321B	94[c]	170	156	2	28
Saguaro N.M.	Rincon Mtn. Unit	NPS	Improve	16	46	45	0	71
Tucson	Broadway & Swan	Pima	SA1200	35	80	70	0	58
Tucson	150 W. Congress St.	Pima	SA1200	55	220	200	3	290
Tucson	Golf Link & Harrison	Pima	SA1200	29	100	100	0	57
Tucson	.5 mi. E. of Irvington & Alvernon	TEP	SA321B	27	63	57	0	60
Tucson	3401 W. Orange Grove	Pima	SA321B	44	130	120	0	341
Tucson	1016 W. Prince Rd.	Pima	SA1200	53	110	100	0	59
Tucson	1810 S. 6th Ave.	Pima	SA1200	49	110	90	0	59

Table 7 (Cont'd)
1989 PM10 Data (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	ANNUAL ARITHMETIC MEAN	24-HR.AVERAGE MAX	24-HR.AVERAGE 2ND HIGH	EXCEEDANCES OF: 150ug/m3	NO. OF SAMPLES
PIMA: (Cont'd)								
Tucson	2nd St. & Palm Ave.	Pima	SA1200	43	100	90	0	57
Tucson	7290 E. Tang Verde	Pima	SA1200	36	90	60	0	59
PINAL:								
Apache Junction	County Court	Pinal	Wedding	16[c]	30	23	0	9
Casa Grande	401 Marshall Rd.	State	Wedding	43[c]	105	85	0	27
Oracle	Behind Courthouse	Magma	SA321B	N/A				
San Manuel	Townsite	Magma	SA321B	N/A				
Stanfield	County Courthouse	Pinal	Wedding	13[c]	23	21	0	11
Tonto	Maintenance Station	NPS	Improve	16	28	28	0	78
SANTA CRUZ:								
Nogales	U.S. Post Office	State	SA321B	63	244	168	2	58
YAVAPAI:								
Clarkdale	Clarkdale, Fire Sta.	State	Wedding	24[c]	48	38	0	31
YUMA:								
Yuma	1485 2nd Ave.	State	Dichot	52[c]	150	139	0	35
Yuma[b]	201 S. 2nd Ave.	State	Dichot	37[c]	77	67	0	43
STATE AND FEDERAL STANDARDS (ug/m^3):				Annual Arithmetic Mean		24-Hour Average		
Primary & Secondary				50		150		

Table 8
1989 TSP Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL GEOMETRIC MEAN	24-HR. AVERAGE MAX.	2ND HIGH	NO. OF EXCEEDANCES OF 24-HR. STATE STANDARDS PRIMARY	SECONDARY	NO. OF SAMPLES
APACHE:								
St. Johns	Airport	SRP	20	41	39	0	0	59
St. Johns	Mesa Parada	SRP	12	75	34	0	0	60
St. Johns	Patterson Wellfield	SRP	14	61	57	0	0	61
Springerville	Airport	Cent.	19	61	49	0	0	52
Springerville	4 mi. NE of Town	Cent.	11	54	52	0	0	51
Springerville	1 mi. NNE of Unit 1 Stack	Cent.	24	102	93	0	0	61
Springerville[a]	12.2 mi SE of Unit 1 Stack	Cent.	11	53	51	0	0	57
COCONINO:								
Page	Glen Canyon Dam	SRP	19	51	44	0	0	59
Grand Canyon	Hopi Point	State	15	50	43	0	0	54
Page	Airport	SRP	49	125	115	0	0	54
Sedona	Post Office	State	30	53	52	0	0	46

Table 8 (Cont'd)
1989 TSP Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL GEOMETRIC MEAN	24-HR. AVERAGE MAX.	24-HR. AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF 24-HR. STATE STANDARDS PRIMARY	NO. OF EXCEEDANCES OF 24-HR. STATE STANDARDS SECONDARY	NO. OF SAMPLES
MARICOPA:								
Phoenix	1845 E. Roosevelt	Maricopa	110	206	191	0	8	59
Phoenix	1826 W. McDowell	Maricopa	120	283	259	1	18	59
MOHAVE:								
Bullhead City	224 N. Main St.	SCE	113	357	251	1	25	60
Davis Dam	Katherine Landing	SCE	-	48	46	0	0	23
Holiday Shores[a]	1436 Tonto Dr.	SCE	-	245	231	0	2	35
Riviera	Ft. Mohave	SCE	58	252	222	0	2	61
NAVAJO:								
Joseph City	3rd St. N. & Tanner	APS	54	129	123	0	0	60
PIMA:								
Corona De Tucson	22000 S. Houghton	Pima	37[c]	61	53	0	0	14
Green Valley	245 W. Esperanza	Pima	37	87	85	0	0	55
Sahuarita	Junior High School	Pima	39	87	82	0	0	58
Tucson	3401 W. Orange Grove	Pima	97	180	169	0	2	54
Tucson	1810 S. 6th Ave	Pima	96	264	253	1	3	58
Tucson	2nd St. & Palm Ave	Pima	76	157	133	0	1	56

Table 8 (Cont'd)
1989 TSP Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL GEOMETRIC MEAN	24-HR. AVERAGE MAX.	2ND HIGH	NO. OF EXCEEDANCES OF 24-HR. STATE STANDARDS PRIMARY	SECONDARY	NO.OF SAMPLES
PINAL:								
Apache Junction	Maintenance Yard	Pinal	60	118	112	0	0	8
Mammoth	County Courthouse	Pinal	51	97	85	0	0	9
Marana	Pinal Air Park	Pinal	59	125	117	0	0	11
YAVAPAI:								
Clarkdale	Clarkdale Fire Sta.	State	52[c]	85	74	0	0	16
Montezuma Castle (NM)	Maintenance Bldg.	State	25	51	45	0	0	57
Nelson	.3 mi.W. of Lime Plant	State	90	476	387	4	14	51
Prescott	City Administration	State	46	90	86	0	0	51

Table 9
1989 Sulfur Dioxide Data (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	ANNUAL AVERAGE	MAX. AVERAGE 3-HR.	MAX. AVERAGE 24-HR.	NO. OF EXCEEDANCES OF STANDARDS 3-HR. DAYS	3-HR. TIMES	24-HR. TIMES	1-HR. SAMPLES
APACHE:										
St. Johns	Mesa Parada	SRP	Fluor.	7	66	20	0	0	0	7984
Springerville	4 mi. NE of Town	Cent.	Fluor.	3	45	10	0	0	0	7704
Springerville	Airport	Cent.	Fluor.	3	26	10	0	0	0	7741
Springerville	1 mi. NNE of Unit 1 Stack	Cent.	Fluor.	5	76	18	0	0	0	8569
Springerville	1 mi. ESE of Unit 1 Stack	Cent.	Fluor.	5	89	18	0	0	0	8578
Springerville	1 mi. SSE of Unit 1 Stack	Cent.	Fluor.	5	113	29	0	0	0	8605
Springerville	12.2 mi. SE of Unit 1 Stack	Cent.	Fluor.	3	42	18	0	0	0	8512
COCONINO:										
Page	Glen Canyon Dam	SRP	Fluor.	9	255	64	0	0	0	8531

Table 9 (Cont'd)
1989 Sulfur Dioxide Data (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	ANNUAL AVERAGE	MAX. AVERAGE 3-HR.	MAX. AVERAGE 24-HR.	NO. OF EXCEEDANCES OF STANDARDS 3-HR. DAYS	3-HR. TIMES	24-HR. TIMES	1-HR. SAMPLES
GILA:										
Hayden	Town Hall	Asarco	Fluor.	36	940	328	0	0	0	7890
Hayden	Jail	Asarco	Fluor.	21	979	223	0	0	0	7699
Hayden	Hayden Junction	Asarco	Fluor.	10	585	93	0	0	0	7762
Hayden	Montgomery Ranch	Asarco	Fluor.	55	2125	413	2	2	2	7764
Hayden	Jail	State	Fluor.	24	697	183	0	0	0	8636
Miami[b]	Cities Serv.Bldg.	State	Fluor.	10	563	73	0	0	0	8023
Miami	Jones Ranch	State	Fluor.	15	789	162	0	0	0	7504
Miami	Jones Ranch	Cyprus-M	Fluor.	15	750	136	0	0	0	8760
Miami[b]	SE of Smelter	State	Fluor.	3	241	42	0	0	0	8012
Miami	Wheatfield/Burch Pump Sta.	Cyprus-M	Fluor.	1	153	19	0	0	0	8760
Miami	Town Site	Cyprus-M	Fluor.	7	387	61	0	0	0	8760
Winkelman	1 mi. N of Jct. 77 & 177	Asarco	Fluor.	72	1643	382	4	4	1	7861

Table 9 (Cont'd)
1989 Sulfur Dioxide Data (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	ANNUAL AVERAGE	MAX. 3-HR.	MAX. 24-HR.	NO. OF EXCEEDANCES OF STANDARDS 3-HR. DAYS	3-HR. TIMES	24-HR. TIMES	1-HR. SAMPLES
MARICOPA:										
Phoenix	1845 E. Roosevelt	Maricopa	Fluor.	6	34	16	0	0	0	8428
MOHAVE:										
Bullhead City	224 N. Main St.	SCE	Fluor.	7	170	47	0	0	0	8455
Davis Dam	Katherine Landing	SCE	Fluor.	-	136	21	0	0	0	2794
Holiday Shores[a]	1436 Tonto Dr.	SCE	Fluor.	-	118	16	0	0	0	5667
Riviera	Ft. Mohave	SCE	Fluor.	2	121	34	0	0	0	8476
PIMA:										
Saguaro N.M.E	3905 S. Old Spanish Trail	NPS	Coul.	0			0	0	0	8003
Tucson	22nd & Craycroft	Pima	Fluor.	18	34	18	0	0	0	6856
PINAL:										
Oracle	Courthouse	Magma	Fluor.	4	145	26	0	0	0	8749
Oracle	3 C Ranch	Magma	Fluor.	8	134	43	0	0	0	8751
San Manuel	Townsite	Magma	Fluor.	42	1294	272	0	0	0	8744
San Manuel	Golf Course	Magma	Fluor.	23	334	85	0	0	0	8740
San Manuel	Dormsite	Magma	Fluor.	39	2704	359	1	1	0	8749

Table 9 (Cont'd)
1989 Sulfur Dioxide Data (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	ANNUAL AVERAGE	MAX. 3-HR.	MAX. 24-HR.	NO. OF EXCEEDANCES OF STANDARDS 3-HR. DAYS	3-HR. TIMES	24-HR. TIMES	1-HR. SAMPLES
PINAL (Cont'd):										
San Manuel	Minesite	Magma	Fluor.	25	379	93	0	0	0	8746
San Manuel	L.D.S. Church	State	Fluor.	21	631	267	0	0	0	8434
San Manuel	Elks	Magma	Fluor.	64	3220	445	1	1	1	8750
San Manuel	Hospital	Magma	Fluor.	42	1881	279	1	1	0	8747

STATE AND FEDERAL STANDARDS (ug/m^3):	Annual Average	24-Hour Average	3-Hour Average
Primary	80	365	-----
Secondary	--	---	1300

Table 10
1989 Sulfates Data (in ug/m^3)
in TSP & PM10

COUNTY AND CITY	SITE LOCATION	OPERATOR	IN	ANNUAL AVERAGE	24-HOUR AVERAGE MAX.	24-HOUR AVERAGE 2ND HIGH	NO. OF SAMPLES
COCHISE:							
Chiricahua	Faraway Ranch	NPS	PM10	1.0[G]	3.1	2.7	77
Paul Spur	Housing Area	State	PM10	4.0	88.9	16.7	47
COCONINO:							
Grand Canyon	Hopi Point	State	TSP	1.5	3.9	3.6	27
Grand Canyon	Hopi Point	NPS	PM10	0.7[G]	2.3	2.1	92
GILA:							
Hayden	Jail	State	PM10	2.3	1.8	1.7	53
GRAHAM:							
Safford	523 10th Ave	State	PM10	1.7	6.8	6.1	55
MARICOPA:							
Glendale	6000 W. Olive	Maricopa	PM10	3.7	13.1	7.3	43
Phoenix	1845 E. Roosevelt	Maricopa	PM10	3.7	8.9	8.0	58
Phoenix	4732 S. Central	Maricopa	PM10	3.2	9.5	6.0	60
Phoenix	3847 W. Earll	Maricopa	PM10	3.9	11.7	8.1	55
Scottsdale	2857 N. Miller Rd.	Maricopa	PM10	3.2	9.0	6.8	60

Table 10 (Cont'd)
1989 Sulfates Data (in ug/m^3)
in TSP & PM10

COUNTY AND CITY	SITE LOCATION	OPERATOR	IN	ANNUAL AVERAGE	24-HOUR AVERAGE MAX.	2ND HIGH	NO. OF SAMPLES
NAVAJO:							
Petrified Forest	1 mi. N. of Park Hdqtrs.	NPS	PM10	0.9[G]	2.6	2.1	93
Show Low	Deuce of Clubs Ave.	State	PM10	0.7	3.6	3.4	47
PIMA:							
Ajo	Well Rd.	State	PM10	1.5[c]	4.9	3.9	41
Organ Pipe (NM)	Visitor's Center	State	PM10	1.4	4.3	3.8	58
Rillito	Gremmler Residence	State	PM10	4.5[c]	11.0	7.4	28
Saguaro (NM)	Rincon Mtn Unit	NPS	PM10	1.2[G]	2.7	2.5	79
Tucson	.5 mi. E of Irvington & Alvernon	TEP	PM10	3.7	9.7	7.9	60
PINAL:							
Casa Grande	401 Marshall Rd.	State	PM10	1.5[c]	3.2	3.1	27
Tonto	Maintenance Station	NPS	PM10	1.1[G]	2.6	2.3	81
SANTA CRUZ:							
Nogales	U.S. Post Office	State	PM10	2.6	5.9	4.7	57
YAVAPAI:							
Montezuma Castle (NM)	Maintenance Bldg.	State	TSP	2.3	5.8	5.1	57
Nelson	0.3 mi. W. of Lime Plant	State	TSP	2.7	6.8	5.9	51

TABLE 11 CORRECTED
PLEASE INSERT

TABLE 11

PM_{10} Concentrations in Various Cities
Annual Arithmetic Mean ($\mu g/m^3$)

SITE	1985	1986	1987	1988	1989	1990
Ajo	41[a]	36[a]	39[a]	42[a]	41[a]	44[a]
Bullhead City	--	--	--	37	52	39
Apache Junction	--	--	22[a]	22	16[a]	23[a]
Casa Grande	--	60[a]	36	44	43[a]	32
Clarkdale	--	--	--	--	24[a]	28[a]
Douglas (City Park)	62[a]	59	52	57	55[a]	38[a]
Flagstaff	39[a]	38	29[a]	21[a]	24[a]	29
Hayden	68	80	56	52	46	35
Joseph City	--	--	20	25	26	21
Nogales	56[a]	76[a]	72	69	63	52
Organ Pipe	18[a]	16	17	16	19	23
Paul Spur	106[a]	111	56	79	122	79[a]
Payson	--	--	40[a]	77[a]	79	67
Rillito	66	55	59	69	94[a]	40
Safford	49[a]	40	32	42	44	28
Show Low	--	32[a]	25[a]	23	23	22

[a] Mean value based on a limited number of samples.

Annual standard - 50 $\mu g/m^3$

TABLE 11

PM10 Concentrations in Various Cities

Annual Arithmetic Mean (ug/m^3)

SITE	1985	1986	1987	1988	1989
Ajo	41[a]	36[a]	39[a]	42[a]	41[a]
Apache Junction	--	--	22[a]	22	--
Casa Grande	--	60[a]	36	44	43[a]
Douglas (City Park)	62[a]	59	52	57	55[a]
Flagstaff	39[a]	38	29[a]	21[a]	24[a]
Hayden	68	80	56	52	46
Joseph City	--	--	20	25	26
Nogales	56[a]	76[a]	72	69	63
Organ Pipe	18[a]	16	17	16	19
Paul Spur	106[a]	111	56	79	122
Payson	--	--	40[a]	77[a]	79
Rillito	66	55	59	69	94[a]
Safford	49[a]	40	32	42	44
Show Low	--	32[a]	25[a]	23	23

[a] - Mean value based on a limited number of samples.

Annual standard - 50 ug/m^3

TABLE 12

TSP CONCENTRATION IN VARIOUS CITIES
Annual Geometric Mean (ug/m^3)

SITE	1983	1984	1985	1986	1987	1988	1989
Apache Junction	51	61	65	60[a]	79	87	c
Bullhead City	84	93	96	80	76	79	113
Clarkdale	52	59	50[a]	56	54	50[a]	52[a]
Grand Canyon	5	11	11	10	11	12	16
Green Valley	27	39	37	39	39	31	37
Mammoth	37	41	41	47[a]	58	71	c
Montezuma Castle[b]	24	33	22	23	22[a]	20	25
Nelson	42	75[a]	84	72	57	67[a]	90
Page	44	43	44	39	44	44	49
Prescott*	62	71	81	73[a]	52	43	46
Springerville	12	18	15	16	17	20[a]	19
St. Johns	22	22	24	18	21	19	20
Stanfield	92	115	92	86[a]	123	118[a]	d

* Prescott relocated in 1987

[a] Mean value based on a limited number of samples.

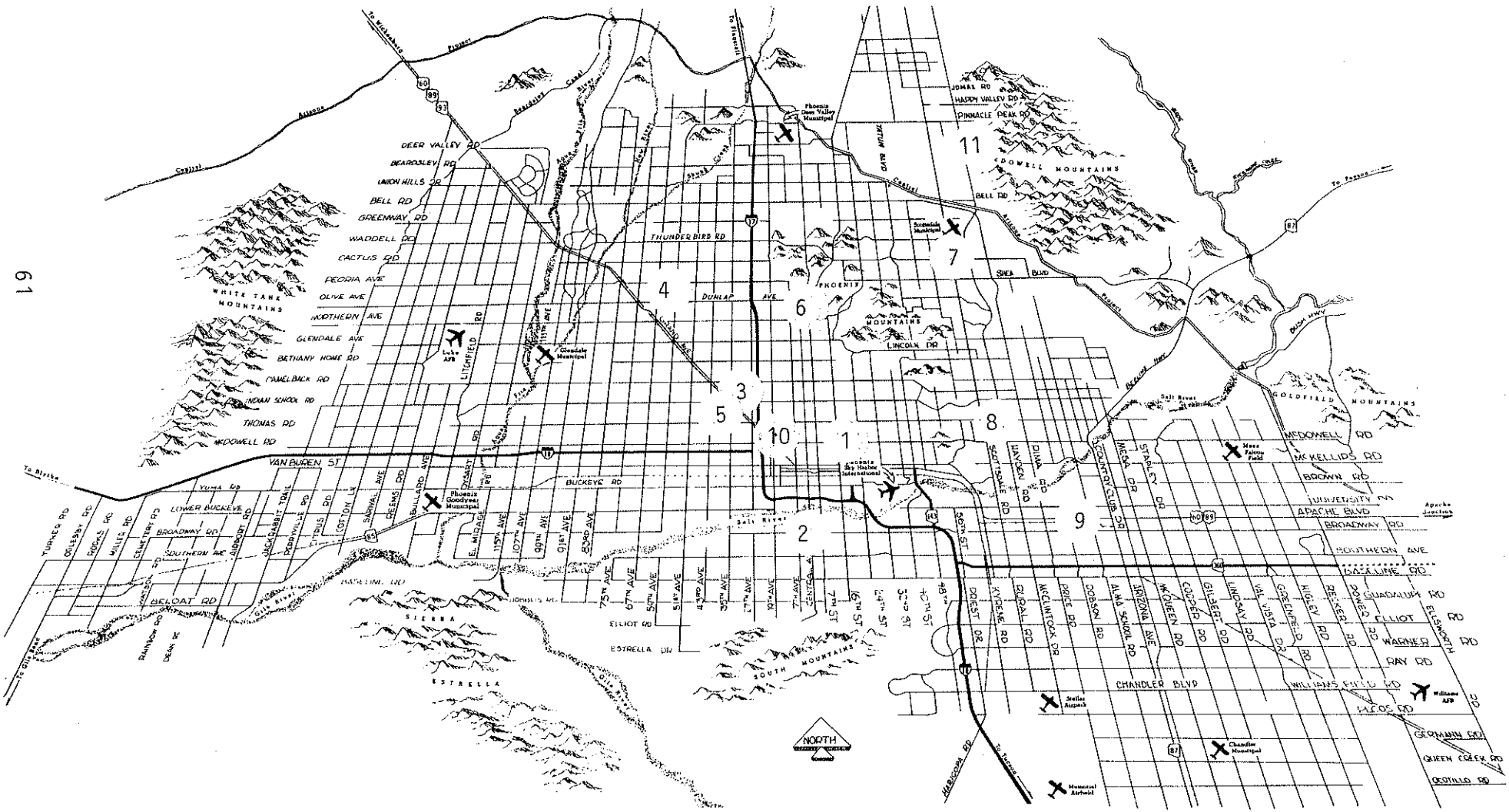
[b] Site changed to PM10 in 1990.

[c] Very few samples collected.

[d] Site discontinued.

Figure 1

Maricopa County Monitoring Network



PHOENIX METROPOLITAN AREA

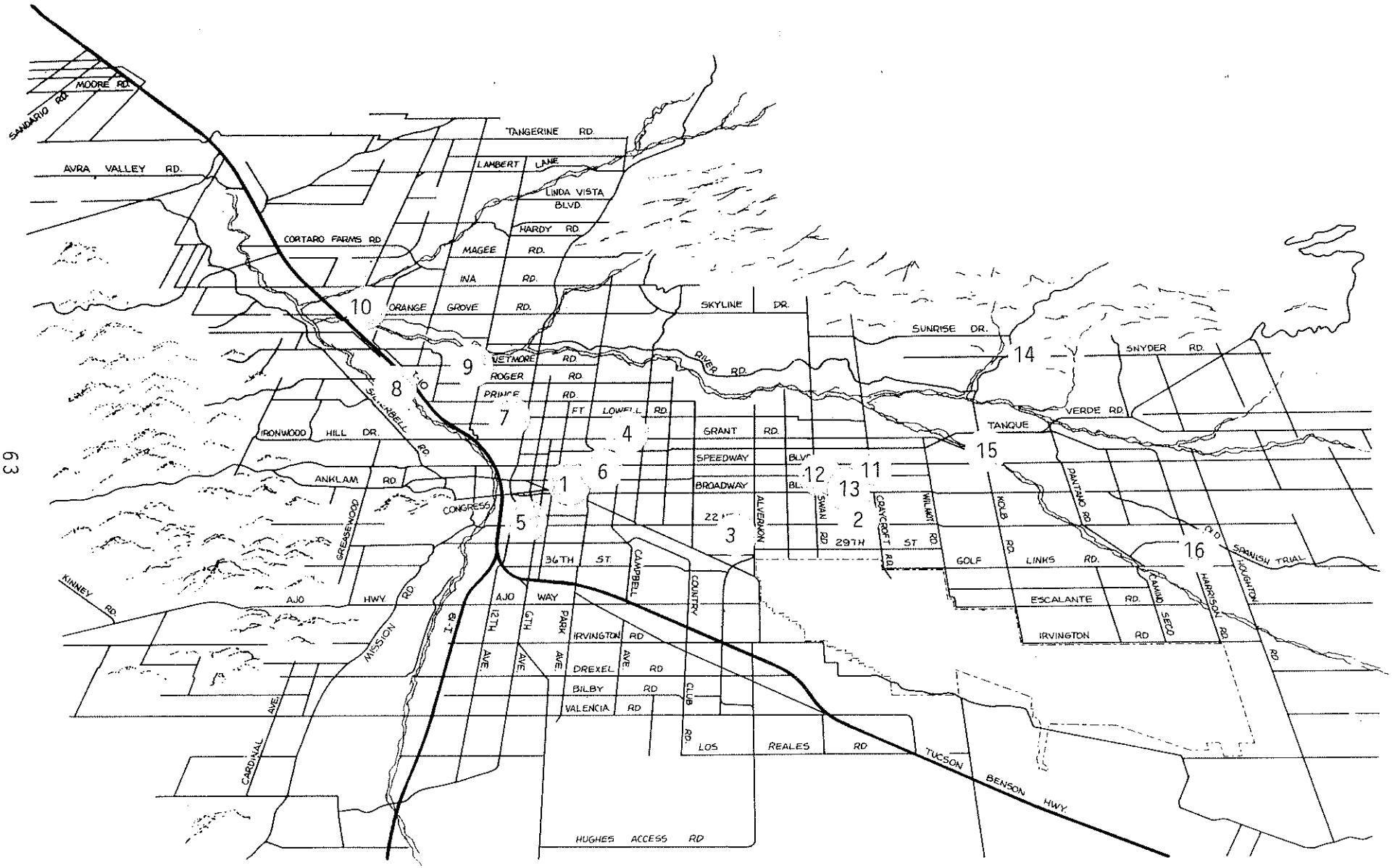
Map Key for Figure 1

Maricopa County Network

Map Number	Site
1	1845 East Roosevelt - Phoenix
2	4732 South Central - Phoenix
3	3333 West Indian School - Phoenix
4	6000 West Olive Avenue - Glendale
5	3847 West Earll - Phoenix
6	601 East Butler - Phoenix
7	13665 North Scottsdale - Scottsdale
8	2857 West Miller Road - Scottsdale
9	Broadway & Brooks - Mesa
10	1826 West McDowell - Phoenix
11	24301 North Alma School - Scottsdale

Figure 2

Pima County Monitoring Network



TUCSON METROPOLITAN AREA

Map Key for Figure 2

Pima County Network

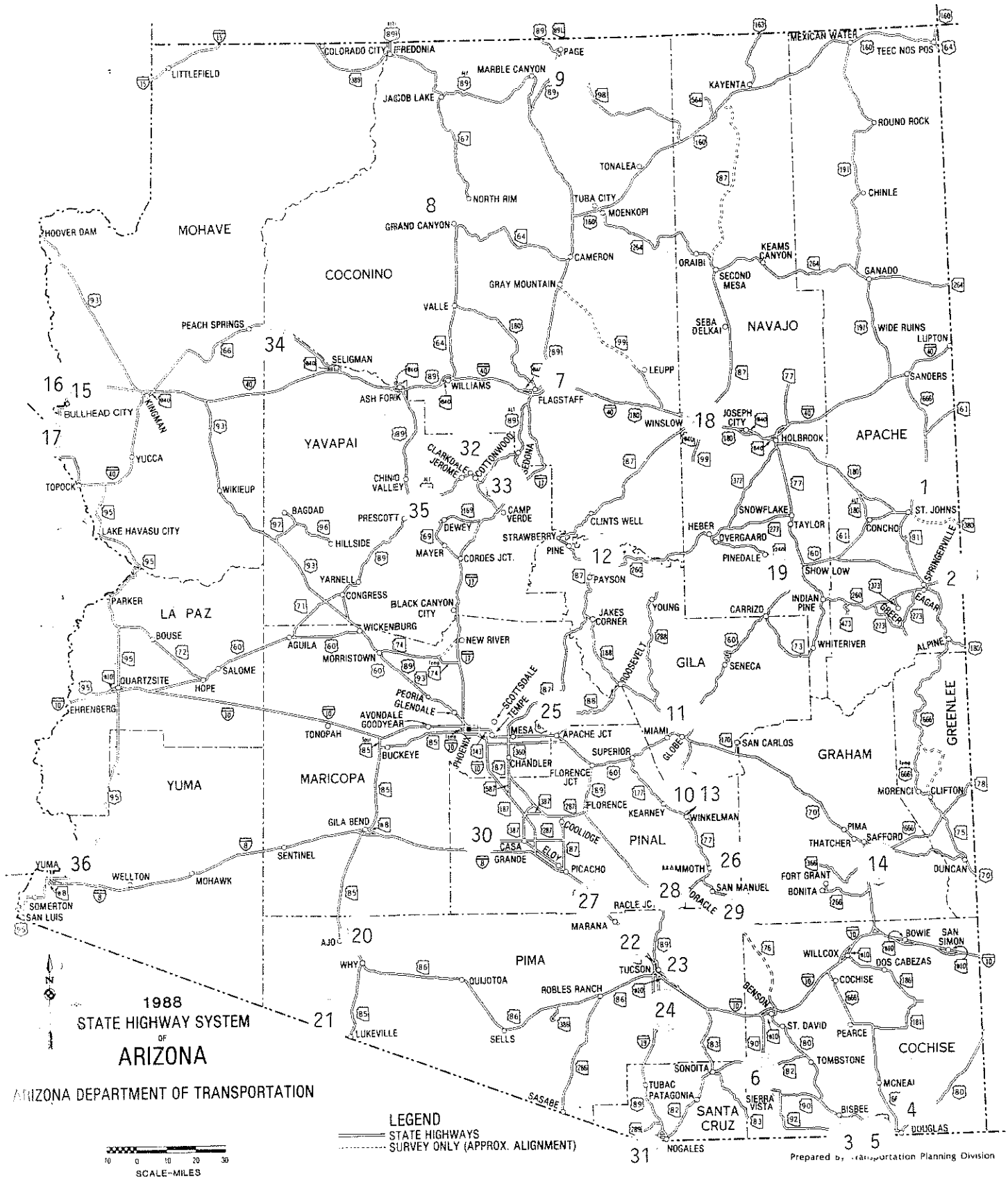
Map Number	Site
1	150 West Congress Street
2	22nd and Craycroft
3	22nd and Alvernon
4	2745 North Cherry
5	South Tucson - 1810 South 6th Avenue
6	2nd Street and Palm Avenue
7	1016 West Prince Road
8	Silverbell Park - 3600 North Silverbell
9	4591 North Pomona Avenue
10	3401 West Orange Grove
11	Highland Park - 346 North Cloverland
12	4575 East Broadway
13	Broadway and Craycroft
14	Sabino Canyon

Map Key for Figure 2 (continuation)

15	7290 East Tanque Verde Road
16	2181 South Harrison Road
17	Corona de Tucson - 2200 South Houghton Road
18	Sahuarita Jr. High School - 350 West Helmet Peak Road
19	Green Valley - 241 West Esperanza

Figure 3

State and Industrial
Monitoring Networks



Map Key for Figure 3

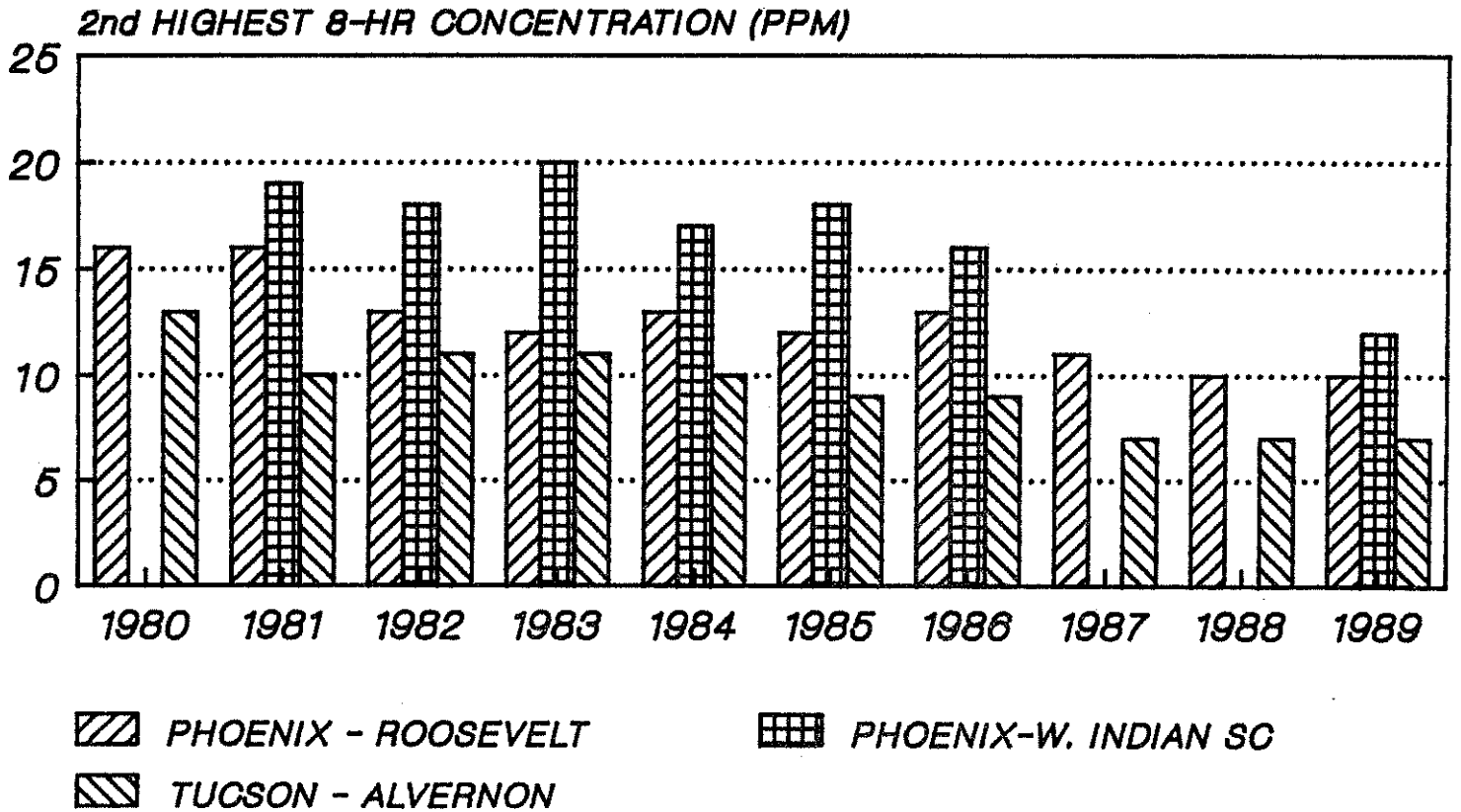
State and Industrial Networks

Nap No.	County &	Town	Map No.	County &	Town
			13		Winkelman
			14	Graham	Safford
1	Apache	St. Johns	15	Mohave	Bullhead City
2		Springerville	16		Davis Dam
3	Cochise	Bisbee	17		Riviera
		Douglas	18	.Navajo	Joseph City
			19		Show Low
5		Paul Spur	20	Pima	Ajo
6		Sierra Vista	21		Organ Pipe
7	Coconino	Flagstaff	22		Rillito
			23		Saguaro N.M.
			24		Sahuarita
8		Grand Canyon	25	Pinal	Apache Junction
9		Page	26		Mammoth
10	Gila	Hayden	27		Marana

Map Key for Figure 3 (continuation)

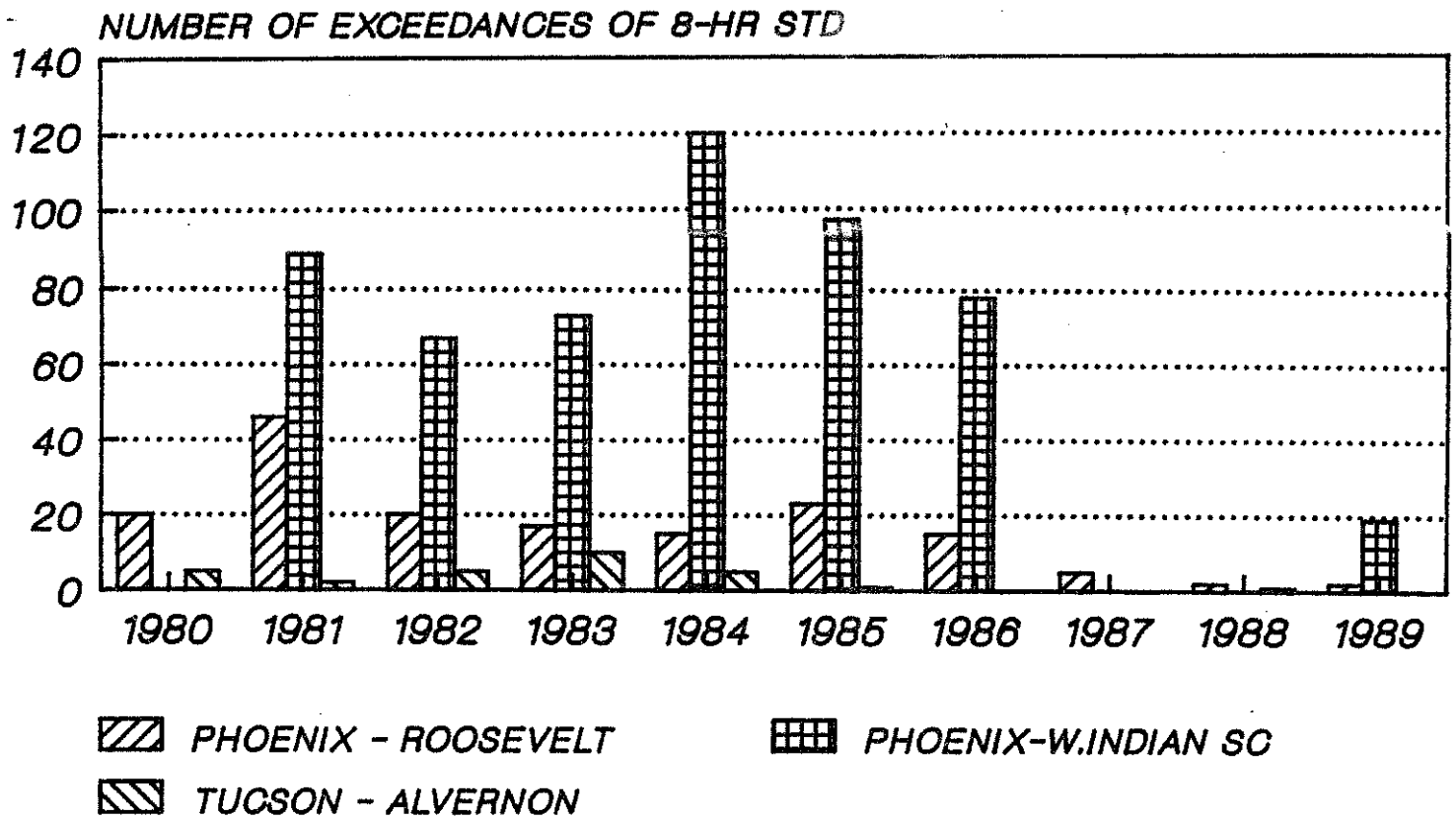
28		Oracle
29		San Manuel
30		Casa Grande, Stanfield
31	Santa Cruz	Nogales
32	Yavapai	Clarkdale
33		Sedona, Montezuma Castle
34		Nelson
35		Prescott
36	Yuma	Yuma

FIGURE 4
CARBON MONOXIDE CONCENTRATIONS IN PHOENIX AND TUCSON



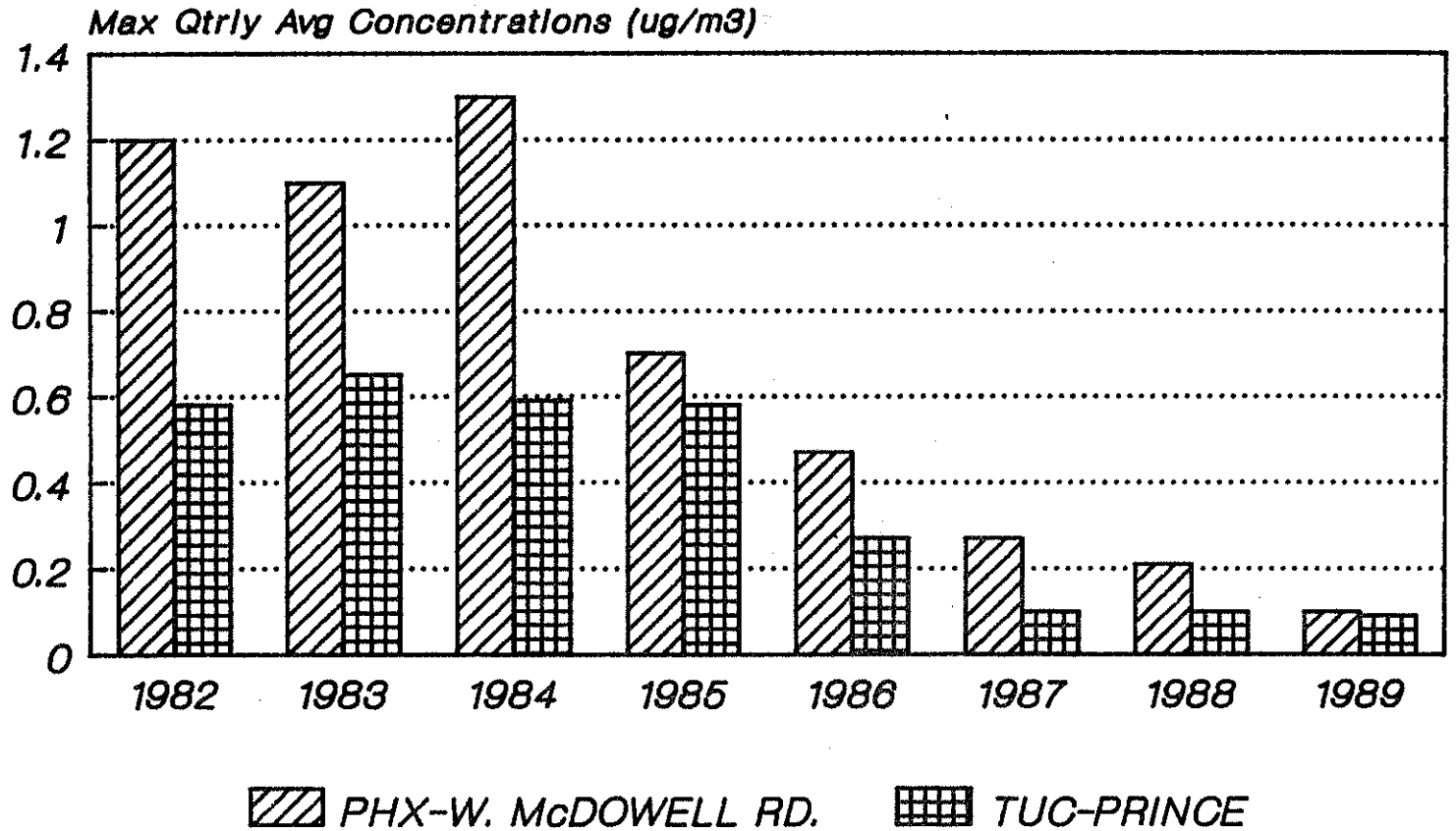
STANDARD IS 9 PPM

FIGURE 5
CARBON MONOXIDE EXCEEDANCES IN PHOENIX AND TUCSON



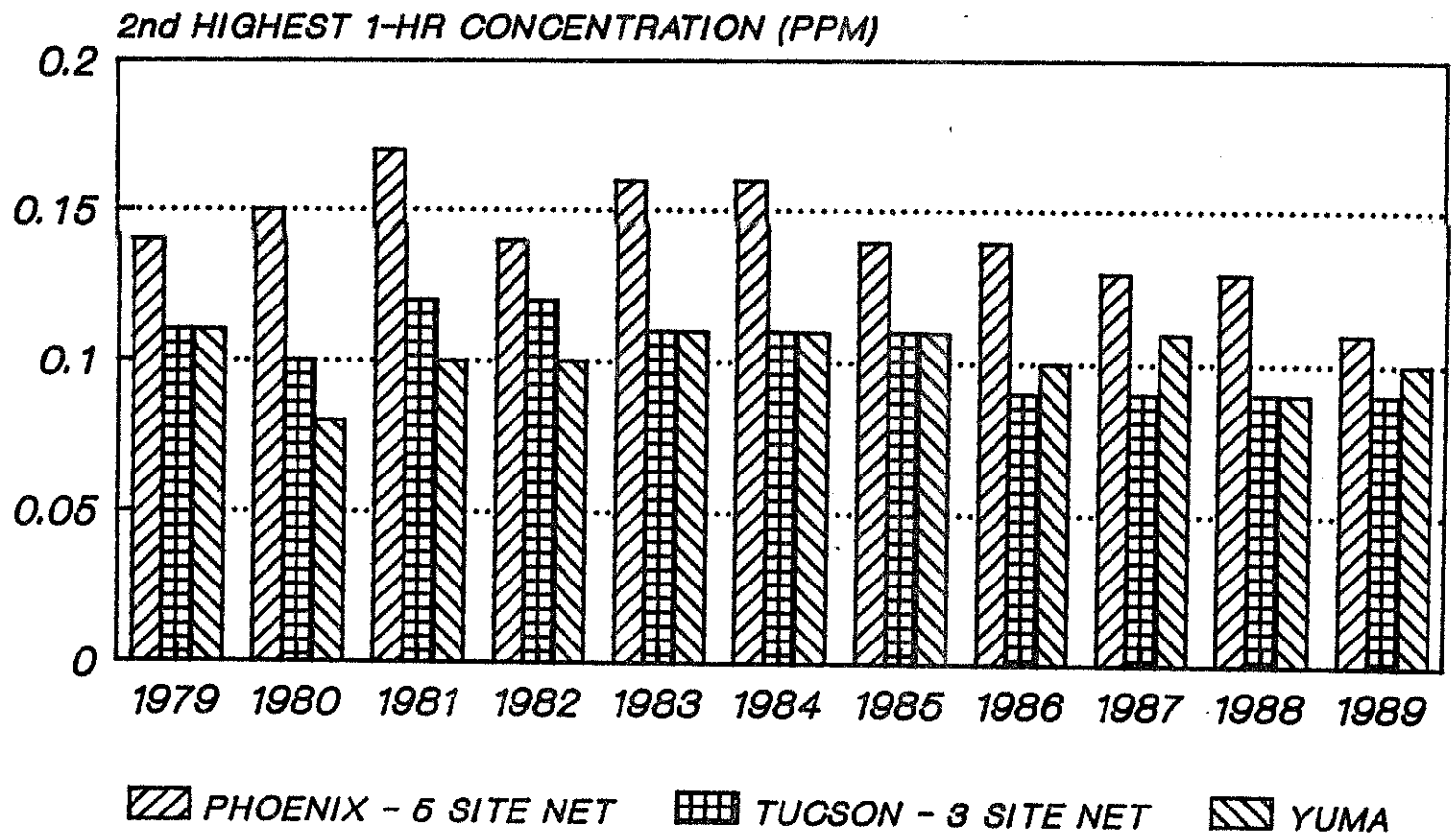
STANDARD IS 9 PPM

FIGURE 6
LEAD CONCENTRATIONS
IN PHOENIX AND TUCSON



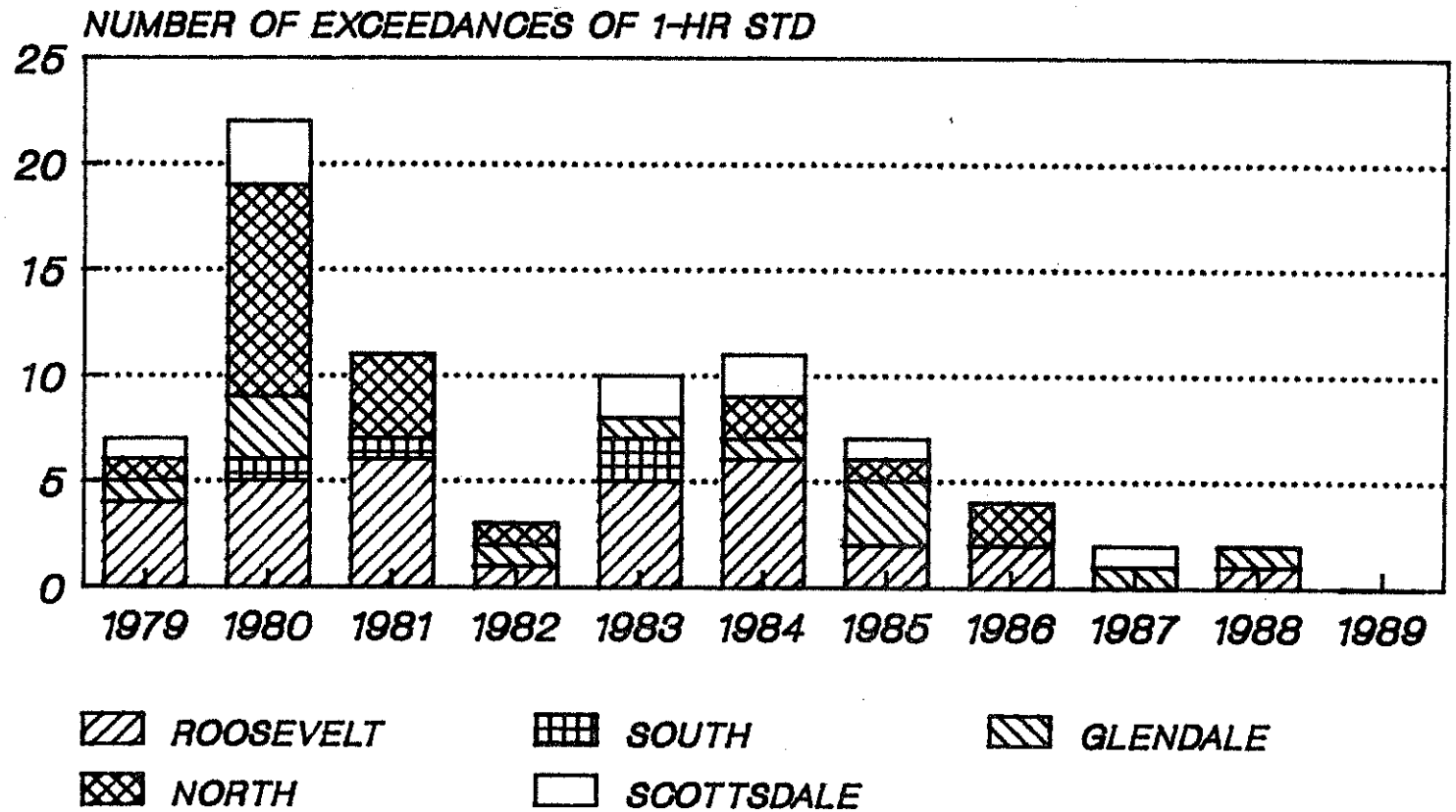
Standard Is 1.5 (ug/m3)

FIGURE 7
OZONE CONCENTRATIONS
IN PHOENIX, TUCSON AND YUMA



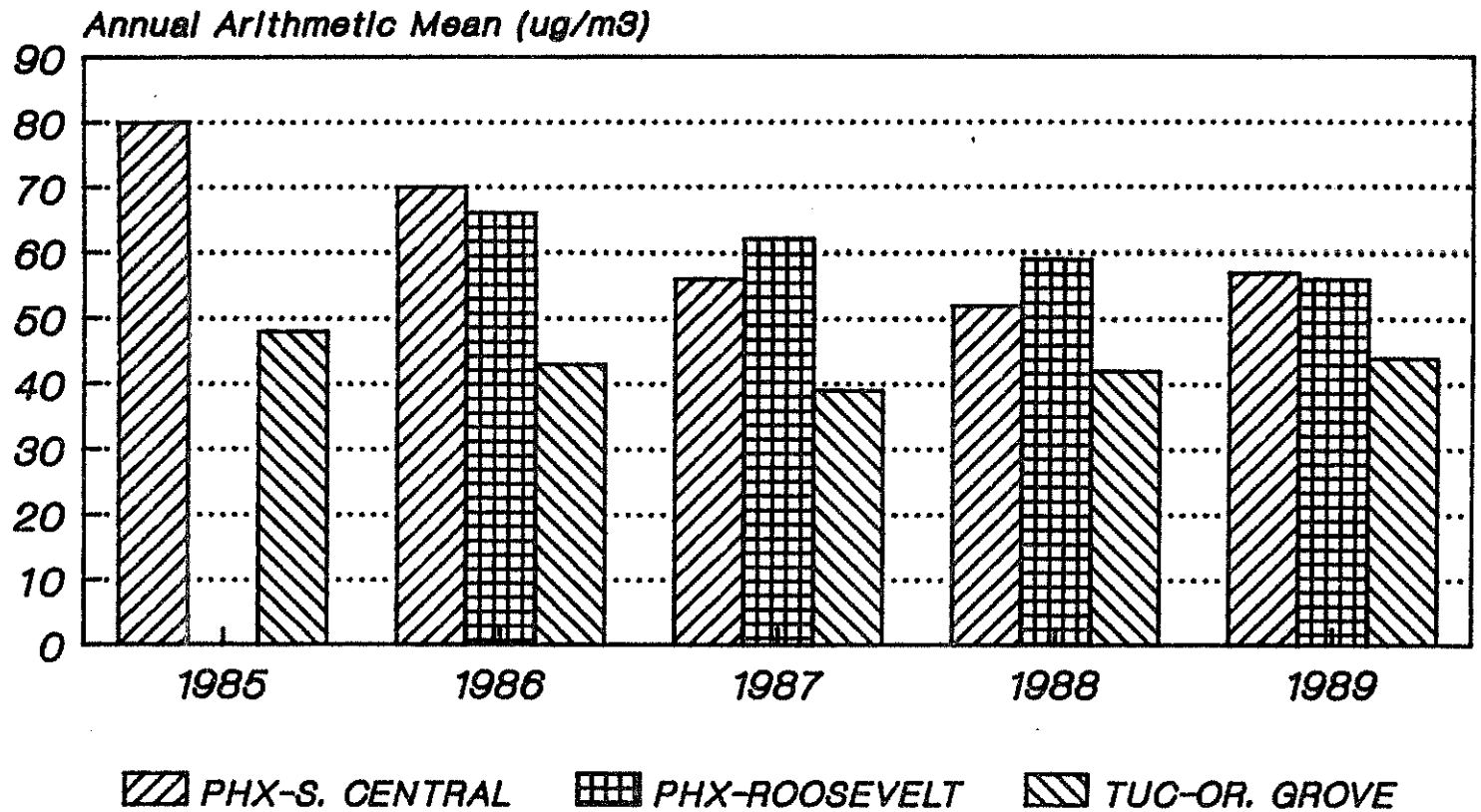
STANDARD IS .12 PPM

FIGURE 8
OZONE EXCEEDANCES
FOR PHOENIX 5 SITE NETWORK



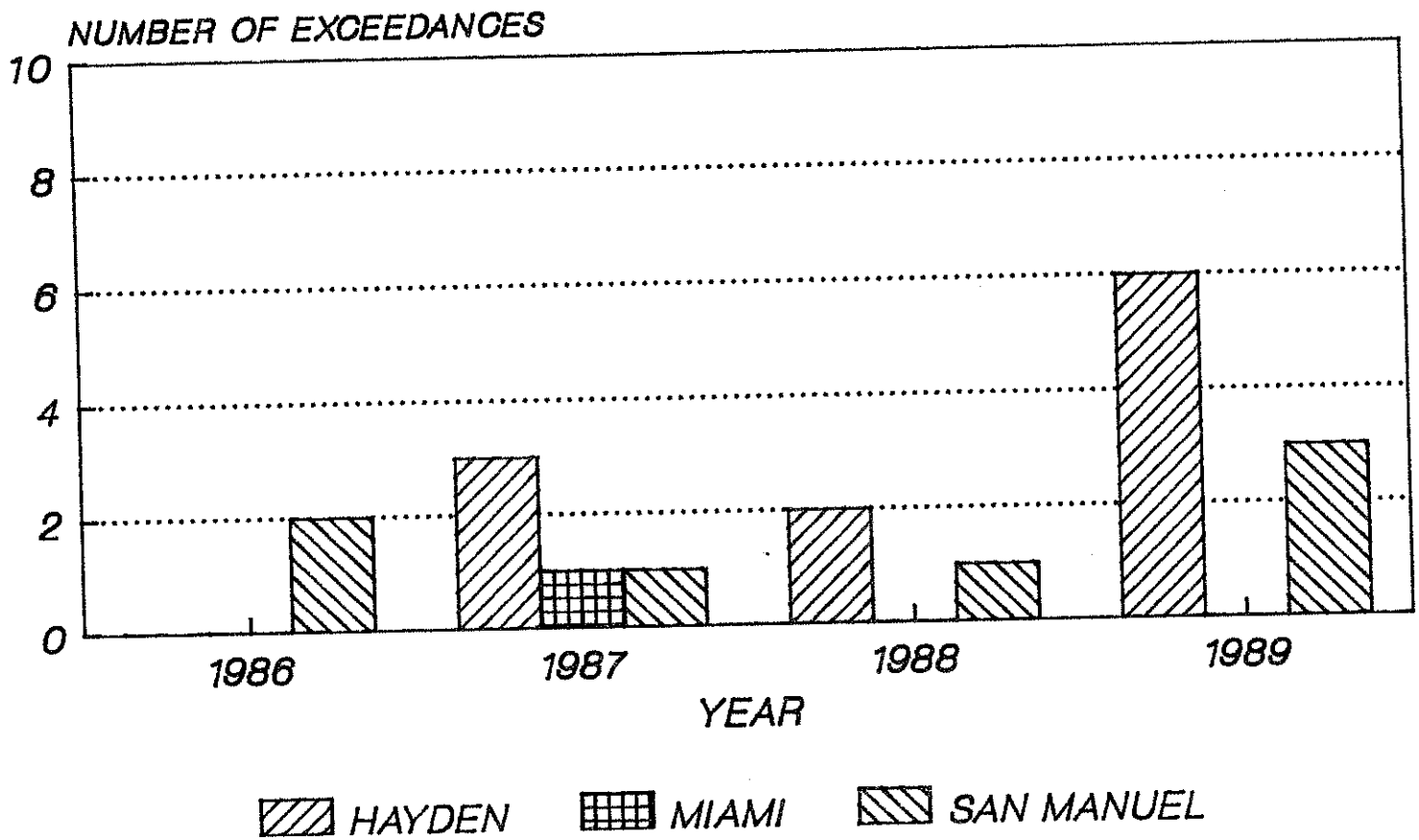
STANDARD IS .12 PPM

FIGURE 9
PM10 CONCENTRATIONS
IN PHOENIX AND TUCSON



Standard is 50 (ug/m3)
Phx-Roosevelt 1985 NA

FIGURE 10
SULFUR DIOXIDE 3 - HR EXCEEDANCES IN SMELTER TOWNS



Air Quality Standard is 1900 ug/m3 (3hr)