ARIZONA DEPARTMENT OF HEALTH SERVICES

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1985

AIR QUALITY CONTROL FOR ARIZONA

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Annual Report

June 1986

HONORABLE BRUCE BABBITT
Governor
State of Arizona

ARIZONA DEPARTMENT OF HEALTH SERVICES
Lloyd F. Novick, M.D., Director

Prepared by The Division of Environmental Health Services
Office of Emergency Response and Environmental Analysis

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Table of Contents

List of Tables

List of Figures

1. Introduction

Introduction

The Office of Air Quality Management (OAQM) within the Division of Environmental Health Services (DEHS) of the Arizona Department of Health Services, has primary responsibility for the control of air pollution at the state level. Formerly known as the Bureau of Air Quality Control, the OAQM has control of original state jurisdiction sources and sources in counties where jurisdiction has been asserted. Original jurisdiction sources include:

1. Statutory major sources, which are defined as those capable individually of generating more than 75 tons of air contaminants per day, or that are involved in copper smelting or the refining of crude oil.

2. Mobile sources, which are those capable of being operated in more than one county.

3. Activities of agencies of the State and its political subdivisions.

The State has asserted jurisdiction for all air pollution control matters in Apache, Cochise, La Paz, Navajo, Santa Cruz, Yavapai, and Mohave Counties.

The purpose of the OAQM is to carry out the Legislature's intent "to exercise the police power of this State in a coordinated statewide program to control present and future sources of emission of air contaminants to the end that air polluting activities of every type shall be regulated in a manner that insures health, safety, and general welfare of all of the citizens of the State; protects property values; and, protects plant and animal life". The Rules and Regulations for Air Pollution Control provide for the attainment and maintenance of ambient air quality standards in accordance with the mandate of the Clean Air Act. To accomplish its purpose and fulfill United States Environmental Protection Agency (EPA) program objectives for the State of Arizona, the OAQM is divided into sections with the responsibilities indicated below.

1. <u>Permits and Compliance Section</u>

   a. <u>Permits Unit</u>

      Operation and administration of the State permit system is a vital function of the Permits Unit. This includes the review of applications for installation permits for new or modified sources and operating permits for existing sources. In the case of installation permits, technical data submitted with the application must be evaluated to assure that the planned facility is capable of meeting all regulations. Prevention of significant deterioration or sources in nonattainment areas must also be evaluated. In regards to operating permits, this Section reviews emission tests and inspection reports to determine if the source is in compliance with rules and regulations.

5. Orders of Abatement imposing conditions designed to resolve or mitigate the noncompliance condition(s). These orders are subject to appeal to the Air Pollution Control Hearing Board which may dismiss, uphold or modify the terms of the order.

6. Injunctive relief from the Superior Court of the county concerned may be sought against any source in violation of the terms of an Order of Abatement.

Misdemeanor criminal charges may be filed against a noncomplying source which would subject the sources to fines of up to $1,000 per day for each day that violation(s) are proven. In any case where evidence of air pollution which presents an imminent and substantial endangerment to the health of persons is developed, the Director may request the Attorney General to petition the appropriate Superior Court for an injunction requiring any contributor to immediately stop emitting and to undertake such other actions as may be necessary.

The investigation of citizen complaints of air pollution problems in those areas where the State has jurisdiction is another function of Compliance. These investigations sometimes require development and operation of special monitoring techniques, and may result in enforcement action to resolve.

The Compliance Section trains and certifies visible emissions observers from control agencies and industry in accordance with the approved method for determining the opacity of industrial plumes.

Above and beyond the enforcement remedies available to ADHS in Arizona law, a source is also subject to federal enforcement of the provisions of the approved State Implementation Plan under the Clean Air Act.

Federal enforcement remedies include:

Civil penalties up to $25,000 per day of violation.

Criminal penalties up to $50,000 per day of violation and up to two years imprisonment.

Noncompliance penalties up to the economic value of noncompliance with interim or final emission control requirements.

Enforcement action may be initiated in the federal court by ADHS, the Environmental Protection Agency (EPA), or jointly under the provisions of an Arizona-EPA Cooperative Air Enforcement Agreement.

2. Instrumentation Section

The operation of the State air quality monitoring network is the basic task of the Instrumentation Section. Included in this task are the procurement, installation, calibration and servicing of monitoring instruments, plus auxiliary equipment and housing. The monitoring instruments include anemometers, wind vanes, temperature differential sensors, continuous gas analyzers, particulate samplers, and data recording devices.

The Environmental Process Management Section assists the Office of Air Quality Management in processing regulations through the State procedure. Once the regulations have been certified by the Attorney General's Office and filed with The Secretary of State, the Environmental Process Management Section prepares the SIP revision request to send to EPA.

The other major component of the SIP is the nonattainment area plans (NAPs). Nonattainment areas are areas that exceed the ambient air quality standards. The NAPs contain control strategies and implementation schedules that will result in the area attaining and maintaining the air quality standards. The plans are developed in coordination with counties, councils of government, local officials and the Environmental Protection Agency (EPA).

Reasonable Further Progress (RFP) reports are prepared annually for those areas that have NAPs to determine the effectiveness of the control strategies. The Environmental Process Management Section reviews the RFP reports prepared by the Maricopa and Pima County Health Departments.

Other functions of the Section include liaison with EPA, councils of government, and local health departments, and the coordination of the federal grant applications.

5. Air Data Analysis Section (in OEREA)

The processing and reporting of ambient air quality data from the State monitoring network is a major function of the Air Data Analysis Section. Based on these data, the compliance status of each source with respect to air quality standards is determined. Control strategies for noncompliant sources are then developed and evaluated by continued monitoring.

The Air Data Analysis Section conducts modeling studies of air pollutant dispersion, from both point and area sources. This activity is a vital part of the review of permit applications submitted by proposed industrial plants. If modeled projections indicate that the source will not meet applicable standards, the plant design or operating procedures must be modified to ensure compliance.

Modeling is also performed to project vehicular-related air quality trends in urban areas to evaluate the effectiveness of current and proposed control strategies. Modeling is also performed to delineate the spatial variation in pollutant concentrations in point and urban source areas to determine monitoring site locations and assess population exposure.

The Section also manages activities within the agency associated with air toxics, visibility, acid rain and other special issues.

The management and coordination of emergency episode prevention activities is the responsibility of this Section. This entails close observation of air quality and meteorological conditions, forecasting air quality, issuing air pollution alerts, and determining necessary control measures.

Data quality assurance is an important part of the monitoring network operation. In meeting this need, technicians of the Section perform quarterly multi-point calibrations on each of the analyzers in the network, and semiannual calibrations of the high volume samplers. Biweekly precision, span and operational checks are also performed on the analyzers. At this time, the recorded data charts and magnetic tapes are brought in for analysis and report preparation.

In support of field calibration and quality assurance activities, Instrumentation maintains a laboratory which provides standards for flow, temperature, mass, pressure, voltage, and pollutant concentrations. These standards are traceable to the National Bureau of Standards or other recognized agencies.

Instrumentation is also responsible for the support engineering associated with the Office's automated data acquisition systems, including systems design, equipment procurement, and programming.

3. Inspection and Maintenance Section

The Inspection and Maintenance Section of the Office of Air Quality Management conducted an annual emissions inspection of all gasoline-fueled vehicles under 14 years of age registered in the urban nonattainment areas (carbon monoxide and ozone) of Pima and Maricopa Counties. About 1.2 million initial inspections were conducted at nine contractor-operated inspection stations. In addition, approximately 120,000 vehicles are inspected in self-inspection fleets. Section personnel assured the quality of emission measurements at both contractor-operated and fleet inspection facilities. In addition, they instructed and trained automotive repair mechanics in proper tune-up procedures.

During the inspection, exhaust concentrations of carbon monoxide and hydrocarbons were measured and compared to standards established by the Department of Health Services. These standards vary in stringency with emission control technologies mandated by the federal government. Vehicles identified as high and gross polluters are required to be repaired and reinspected. In 1985, repairs to those vehicles identified as not meeting the standards improved the average idle emissions of all vehicles in the program by 49% in carbon monoxide and 48% in hydrocarbons.

In support of the OAQM, the Office of Program Administration (OPA) and the Office of Emergency Response and Environmental Analysis (OEREA) within the DEHS perform two vital functions--air quality planning and data analysis. These activities are discussed below.

4. Environmental Process Management Section (in OPA)

The Environmental Process Management Section of OPA has the responsibility for the management of the State Implementation Plan (SIP). The SIP, which is required by federal law, is composed of state and county rules and regulations and nonattainment area plans that control air pollution.

As a part of the permitting activity, the Permits Unit maintains the master file for all sources under State permit. Also, the Unit keeps abreast of the state of the art in air pollution control equipment by inspection of newly-constructed facilities and by literature surveys.

Tax relief certification is another responsibility which involves certification of equipment as air pollution control devices for the purpose of special amortization.

The Permits Unit develops and maintains a statewide emissions inventory of all criteria pollutants; that is, pollutants for which there are ambient air quality standards.

Environmental impact statements for federally-funded construction projects, such as sewage treatment plants, airports, and highways are reviewed to assure that applicable regulations will be met.

Special projects and consulting activities concerning sources, both prospective and existing, are carried out routinely. Finally, the unit works with other government agencies such as EPA, county health departments, and the Chamber of Commerce in providing information.

b. Compliance Unit

Determining the capability of sources to comply with rules and regulations is a major responsibility of the Compliance Unit. This is done by conducting or evaluating mass emissions tests or observing visible emissions for each source. Compliance with applicable regulations must be demonstrated in these tests before a source can obtain an operating permit. Conditions deemed necessary to assure continuing compliance may be included in the operating permit.

In addition to checking emissions, the Compliance Unit must evaluate each source's impact on air quality to verify compliance. This entails the review of air quality data obtained by State and industrial monitoring stations. Also, the Unit performs quality assurance checks on the monitors to validate the data.

If a source is found to be violating regulations, the Compliance Unit initiates enforcement action by the issuance of a Notice of Violation (NOV) to the source operator. An effort is made to obtain voluntary action by the operator to correct the non-complying conditions.

Beyond this a number of forms of enforcement action appropriate to the case may be taken such as:

1. Referral of the NOV to the responsible officer of the source with a written request for corrective action and response.

2. Administrative conferences designed to obtain voluntary corrective action commitments from the source.

3. Permit denial.

4. Modification of permit conditions to require additional pollution controls or improved work practices.

2. Summary of 1985 Activities

Summary of 1985 Activities

Regulation of industrial facilities under state jurisdiction in 1985 resulted in the following activities:

Operating Source Inspections	626
Visible Emissions Tests	235
Mass Emissions Tests	92
Emissions Monitor Tests	16
Source Ambient Monitor Audits	32
Agency Ambient Monitor Audits	12
Asbestos Renovation Projects	19
Asbestos Renovation Inspection	40
Complaint Investigations	144
Notices of Violation Served	27
Orders of Abatement Served	2
Operating Permits Issued	68
Installation Permits Issued	13
New Source Installation Inspections	0

The State's monitoring network consisted of the following number of sites:

Pollutant	Number of Sites
Carbon Monoxide	4
Lead	10
Ozone	5
PM_{10}	11
TSP	29
Sulfur Dioxide	13

Data summaries for these sites, plus all county and industrial sites operated in 1985 are included in Appendix A. Long-term trends in air quality are included in Appendix B.

A new activity for the Instrumentation Section was the set-up, check-out, calibration and deployment of 11 PM_{10} size-selective high volume sampler (SSHVL) units provided by the EPA in early 1985. Additional units (5) have also been procured through the State's budgetary process and will be deployed in 1986.

In regard to carbon monoxide in Phoenix, historical trends and projections of future levels were the subject of several analyses. Modeling techniques were used in these analyses to assess the effectiveness of various control strategies.

During the past year, the Environmental Process Management Section has expanded considerable effort on the planning and development of portions of the nonattainment area program. In February, 1985, EPA indicated that the ozone nonattainment area plan for urban Maricopa County needed to be revised. A joint effort involving the Maricopa Association of Governments, the Maricopa County Health Department and this agency was designed and implemented to complete the project. In a similar manner, a

state-wide plan for the development of PM_{10} (particulate matter less than 10 microns) nonattainment area plans has been completed in response to EPA's proposed change in the particulate standard. The State will be responsible for developing the NAPs in the rural areas. The preparation of the Maricopa County and Pima County PM_{10} nonattainment area plans will be done in conjunction with the respective health department and council of government.

In reauthorizing the Inspection and Maintenance Program in 1985, the Legislature strengthened the program by adding certain requirements. An important one is the requirement that all 1972 and newer vehicles be inspected each year. This means that in 1986 vehicles 14 years and older will remain in the inspection fleet. Another significant improvement in the program is the requirement that all vehicles failing the first emissions test must be inspected for tampering and misfueling. If any tampering or misfueling is observed, the vehicle owner must replace the tampered or missing air pollution control device.

APPENDIX A

1985 Air Quality Data

Air Quality Data

Table 1 lists the counties and towns monitored in the state, including the pollutants monitored. For reference purposes a map of Arizona is shown in Figure 1.

1985 data summaries which are tabulated in Tables 2 through 9 consist of annual mean and maximum and second highest short-term average concentrations, numbers of exceedances of short-term air quality standards, and numbers of samples collected or hours monitored. The following abbreviations and footnotes were used in these data summaries:

GENERAL

NA	Not Applicable
NR	Not Reported

OPERATORS

AEPCO	Arizona Electric Power Cooperative, Inc.
Alam	Alamito Corporation
APS	Arizona Public Service Company
ICCC	Inspiration Consolidated Copper Company
JCC	Joint Control Center - A jointly owned system operated by ASARCO, Incorporated and Kennecott Minerals Company
Magma	Magma Copper Company
Maricopa	Maricopa County Department of Health Services, Bureau of Air Pollution Control
PD	Phelps Dodge Corporation
Pima	Pima County Health Department, Air Quality Control District
P-G	Pinal-Gila counties Air Quality Control District
SRP	Salt River Project
SCE	Southern California Edison Company
State	Arizona Department of Health Services
TEP	Tucson Electric Power Company

EQUIPMENT

Carbon Monoxide	
NDIR	Non-dispersive infrared
Nitrogen Dioxode	
Chem	Chemiluminescent

EQUIPMENT (Cont'd)

Ozone	
Chem	Chemiluminescent
UV	Ultraviolet absorption
TSP	
Hi-Vol	High volume air sampler
PM_{10}	
SA	Sierra Anderson type hi-vol
Wed	Wedding type hi-vol
Sulfur Dioxide	
Coul	Coulometric
Flame	Flame photometric
Fluor	Fluorescent

Footnotes:

a. New site.
b. Site terminated or method discontinued.
c. Mean value based on a limited number of samples.
d. Site operated on a seasonal schedule.

Table 1

1985 Counties and Towns Monitored

COUNTY AND TOWN	CARBON MONOXIDE	LEAD	NITROGEN DIOXIDE	OZONE	PM_{10}	TSP	SULFUR DIOXIDE
APACHE:							
St. Johns			X	X		X	X
Springerville		X	X			X	X
COCHISE:							
Bisbee							X
Douglas		X	X		X	X	X
Dragoon						X	X
Kansas Settlement				X		X	X
McNeal							X
Naco							X
Paul Spur			X		X	X	
Sierra Vista	X		X	X		X	X
COCONINO:							
Flagstaff	X		X	X	X	X	
Grand Canyon						X	
Page			X	X		X	X

Table 1 (Cont'd)

1985 Counties and Towns Monitored

COUNTY AND TOWN	CARBON MONOXIDE	LEAD	NITROGEN DIOXIDE	OZONE	PM_{10}	TSP	SULFUR DIOXIDE
GILA:							
Hayden		X	X		X	X	X
Miami		X	X			X	X
Miami (Jones Ranch)							X
Payson						X	
Roosevelt						X	
Wheatfield							X
Winkelman							X
GRAHAM:							
Safford			X		X	X	
GREENLEE:							
Morenci		X	X			X	X
MARICOPA:							
Glendale	X	X		X		X	
Mesa	X	X		X		X	
Phoenix	X	X	X	X	X	X	X
Scottsdale	X	X	X	X		X	

Table 1 (Cont'd)

1985 Counties and Towns Monitored

COUNTY AND TOWN	CARBON MONOXIDE	LEAD	NITROGEN DIOXIDE	OZONE	PM_{10}	TSP	SULFUR DIOXIDE
MOHAVE:							
Bullhead City			X			X	X
Davis Dam						X	X
Riviera						X	X
NAVAJO:							
Joseph City			X			X	
Show Low			X			X	
PIMA:							
Ajo		X	X		X	X	X
Corona de Tucson						X	
Green Valley						X	
Organ Pipe (NM)		X	X		X		
Redington							X
Rillito			X		X	X	
Tucson	X	X	X	X	X	X	X
PINAL:							
Apache Junction						X	

Table 1 (Cont'd)

1985 Counties and Towns Monitored

COUNTY AND TOWN	CARBON MONOXIDE	LEAD	NITROGEN DIOXIDE	OZONE	PM_{10}	TSP	SULFUR DIOXIDE
PINAL (Cont'd):							
Kearney							
Mammoth						X	X
Marana						X	
Oracle							X
San Manuel		X	X		X	X	X
Stanfield						X	
SANTA CRUZ:							
Nogales		X	X		X	X	
YAVAPAI:							
Clarkdale			X			X	
Montezuma Castle (NM)		X	X			X	
Nelson			X			X	
Prescott	X		X	X		X	
YUMA:							
Yuma	X		X	X	X	X	

Figure 1

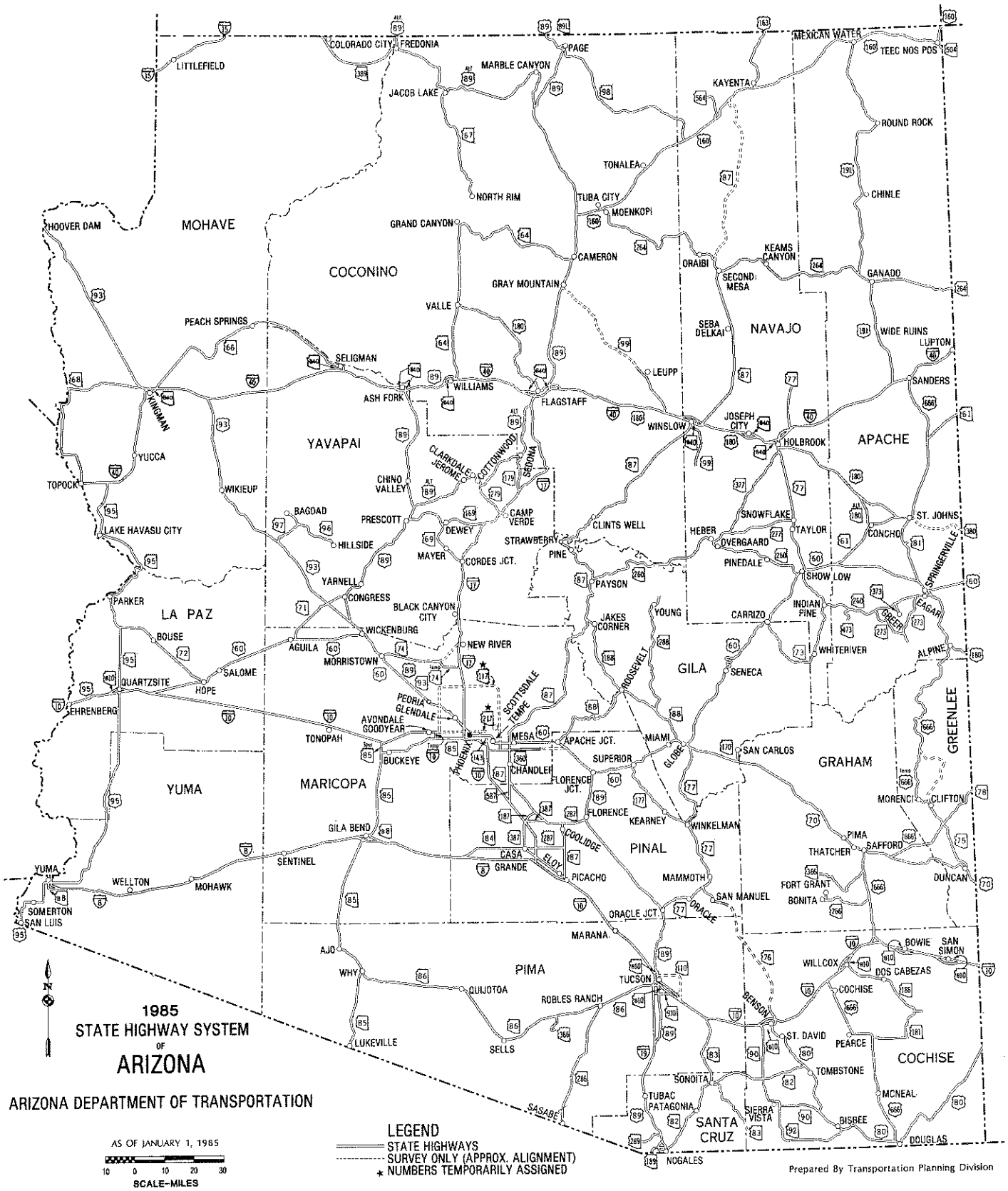

1985
STATE HIGHWAY SYSTEM
OF
ARIZONA
ARIZONA DEPARTMENT OF TRANSPORTATION
AS OF JANUARY 1, 1985
SCALE-MILES
LEGEND
STATE HIGHWAYS
SURVEY ONLY (APPROX. ALIGNMENT)
NUMBERS TEMPORARILY ASSIGNED
Prepared By Transportation Planning Division
MOHAVE
COCONINO
NAVAJO
YAVAPAI
APACHE
LA PAZ
YUMA
MARICOPA
GILA
PINAL
GRAHAM
GREENLEE
PIMA
SANTA CRUZ
COCHISE
LITTLEFIELD
COLORADO CITY
FREDONIA
PAGE
MARBLE CANYON
JACOB LAKE
KAYENTA
MEXICAN WATER
TEEC NOS POS
ROUND ROCK
CHINLE
TONALEA
NORTH RIM
TUBA CITY
MOENKOPI
HOOVER DAM
GRAND CANYON
CAMERON
ORAIBI
KEAMS CANYON
SECOND MESA
GANADO
GRAY MOUNTAIN
VALLE
PEACH SPRINGS
SEBA DELKAI
WIDE RUINS
LUPTON
SELIGMAN
LEUPP
SANDERS
WILLIAMS
ASH FORK
FLAGSTAFF
WINSLOW
JOSEPH CITY
HOLBROOK
KINGMAN
YUCCA
TOPOCK
WIKIEUP
CLARKDALE
JEROME
COTTONWOOD
SEDONA
CHINO VALLEY
BAGDAD
PRESCOTT
CAMP VERDE
SNOWFLAKE
ST. JOHNS
LAKE HAVASU CITY
DEWEY
CLINTS WELL
HEBER
OVERGAARD
TAYLOR
CONCHO
HILLSIDE
MAYER
STRAWBERRY
PINE
CORDES JCT.
PINEDALE
SHOW LOW
SPRINGERVILLE
YARNELL
PAYSON
PARKER
CONGRESS
BLACK CANYON CITY
JAKES CORNER
YOUNG
CARRIZO
INDIAN PINE
EAGAR
GREER
BOUSE
WICKENBURG
AGUILA
NEW RIVER
WHITERIVER
ALPINE
MORRISTOWN
SALOME
QUARTZSITE
HOPE
SCOTTSDALE
TEMPE
ROOSEVELT
SENECA
EHRENBERG
PEORIA
GLENDALE
AVONDALE
GOODYEAR
TONOPAH
MESA
APACHE JCT.
MIAMI
GLOBE
SAN CARLOS
BUCKEYE
PHOENIX
CHANDLER
SUPERIOR
FLORENCE JCT.
FLORENCE
KEARNEY
WINKELMAN
MORENCI
CLIFTON
GILA BEND
COOLIDGE
CASA GRANDE
ELOY
PICACHO
PIMA
SAFFORD
THATCHER
SENTINEL
YUMA
WELLTON
MOHAWK
MAMMOTH
SAN MANUEL
FORT GRANT
BONITA
DUNCAN
SOMERTON
SAN LUIS
ORACLE JCT.
ORACLE
MARANA
BOWIE
SAN SIMON
AJO
WHY
QUIJOTOA
TUCSON
WILLCOX
DOS CABEZAS
ROBLES RANCH
COCHISE
BENSON
LUKEVILLE
SELLS
ST. DAVID
PEARCE
TOMBSTONE
SONOITA
MCNEAL
TUBAC
PATAGONIA
SIERRA VISTA
BISBEE
SASABE
NOGALES
DOUGLAS

Table 2

1985 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 DAYS	NO. OF EXCEEDANCES OF 8-HR. STANDARD TIMES	NO. OF SAMPLES
COCHISE:										
Sierra Vista[d]	Fry Blvd.	State	NDIR	17	13	5	4	0	0	4323
COCONINO:										
Flagstaff[d]	2501 N. 4th St.	State	NDIR	16	14	5	5	0	0	4276
MARICOPA:										
Glendale	6000 W. Olive	Maricopa	NDIR	11	10	5	5	0	0	7079
Mesa	B'way & Brooks	Maricopa	NDIR	11	11	8	7	0	0	8661
Phoenix	4732 S. Central	Maricopa	NDIR	14	13	8	7	0	0	6974
Phoenix	8531 N. 6th St.	Maricopa	NDIR	13	12	7	7	0	0	8088
Phoenix	1845 E. Roosevelt	Maricopa	NDIR	17	17	13	12	18	23	8752
Phoenix	3315 W. Indian School Rd.	Maricopa	NDIR	36	34	18	18	66	97	7925
Phoenix[a]	3847 W. Earll	Maricopa	NDIR	17	16	12	11	13	16	8689
Scottsdale	2857 N. Miller	Maricopa	NDIR	15	14	8	7	0	0	8457
Scottsdale	13665 N.Scottsdale	Maricopa	NDIR	11	10	5	4	0	0	8298

Table 2 (Cont'd)

1985 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 DAYS	NO. OF EXCEEDANCES OF 8-HR. STANDARD TIMES	NO. OF SAMPLES
PIMA:										
Tucson	151 W. Congress	Pima	NDIR	12	11	7	5	0	0	8605
Tucson	22nd & Craycroft	Pima	NDIR	12	9	5	5	0	0	6819
Tucson	22nd & Alvernon	Pima	NDIR	19	19	10	9	1	1	8506
YAVAPAI:										
Prescott[d]	Co. Maint. Yard	State	NDIR	14	11	6	5	0	0	4179
YUMA:										
Yuma[d]	1485 Second Ave.	State	NDIR	10	9	5	4	0	0	3822

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

Table 3

1985 Lead Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	QUARTERLY AVERAGE 1	2	3	4	NO. OF SAMPLES 1	2	3	4
COCHISE:										
Douglas	1.2 mi.N. of Smelter	State	.12	.14	.16	.14	13	16	13	15
Douglas	City Park	State	.31[c]	.17[c]	.10[c]	.24[c]	6	6	3	4
GILA:										
Hayden	164 Fourth Ave.	JCC	.24	.23	.20	.17	12	15	15	13
Hayden	Jail	State	.23	.26	.27[c]	.22	14	11	5	15
Miami	Fire Station	State	.33	.15	.16	.11	15	16	12	15
GREENLEE:										
Morenci	Stargo	State	.01[c]	.00[c]	.03[c]	.01	6	1	7	15
MARICOPA:										
Glendale	6000 W. Olive	Maricopa	Not Reported							
Mesa	Broadway & Brooks	Maricopa	"							
Phoenix	1845 E. Roosevelt	Maricopa	"							
Phoenix	8531 N. 6th St.	Maricopa	"							
Phoenix	4732 S. Central	Maricopa	"							
Phoenix	1826 W. McDowell	Maricopa	"							
Phoenix[a]	3847 W. Earll	Maricopa	"							

Table 3 (Cont'd)

1985 Lead Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	QUARTERLY AVERAGE 1	2	3	4	NO. OF SAMPLES 1	2	3	4
MARICOPA (Cont'd):										
Scottsdale	13665 N.Scottsdale Rd.	Maricopa	"							
Scottsdale	2857 N. Miller Rd.	Maricopa	"							
PIMA:										
Ajo	Well Rd.	State	.07	.04[c]	.03[c]	.03	15	10	4	15
Organ Pipe (NM)	Visitors' Center	State	.02	site closed			11			
Tucson	1016 W. Prince Rd.	Pima	.58	.37	.20	.42	14	15	15	15
Tucson	Broadway & Swan	Pima	.50	.26	.15	.28	14	14	14	14
PINAL:										
San Manuel	L.D.S. Church	State	.08	.07	.05	.08	15	15	15	15
SANTA CRUZ:										
Nogales	U.S. Post Office	State	.48	.38[c]	.32[c]	.64	15	9	8	14
YAVAPAI:										
Montezuma Castle (NM)	Maint. Bldg.	State	.02	.02	.02	.02	14	13	15	15

STATE AND FEDERAL STANDARD (ug/m^3): Calendar Quarter Average
(Primary and Secondary) 1.5

Table 4

1985 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.	7	441	63	7544
Springerville	Airport	Alam	Chem.	1	50	12	8448
Springerville	4 mi. NE of Town	Alam	Chem.	1	23	13	8608
Springerville	1 mi. NNE of Unit 1 Stack	Alam	Chem.	1	51	10	8222
Springerville	1 mi. ESE of Unit 1 Stack	Alam	Chem.	1	63	10	8409
Springerville	1 mi. SSE of Unit 1 Stack	Alam	Chem.	1	65	13	8456
Springerville	12.2 mi.SE of Unit 1 Stack	Alam	Chem	1	64	14	8639
COCONINO:							
Page	Glen Canyon Dam	SRP	Chem.	5	61	19	8367
MARICOPA:							
Phoenix	1845 E. Roosevelt	Maricopa	Chem.	30	263	107	6993
Scottsdale	2847 N. Miller Rd.	Maricopa	Chem.	29	282	99	8415
MOHAVE:							
Bullhead City	224 N. Main St.	SCE	Chem.	34	123	61	7878
PIMA:							
Tucson	22nd & Craycroft	Pima	Chem.	30	188	66	8183
Tucson	151 W. Congress	Pima	Chem.	45[c]	188	83	4219

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

Table 5

1985 Ozone Data (in ppm)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	1-HR. AVERAGE MAX.	1-HR. AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF STD.	COMPLIANCE STATUS EXCEEDANCES	NO. OF SAMPLES
APACHE:								
St. Johns	Mesa Parada	SRP	U.V.	.09	.07	0	0	6792
COCHISE:								
Kansas Settlement	1 mi.W of Cotton Gin	AEPCO	U.V.	.06	.05	0	0	6932
Sierra Vista[d]	Fry Blvd.	State	U.V.	.07	.07	0	0	3467
COCONINO:								
Flagstaff[d]	2501 N. 4th St	State	U.V.	.08	.08	0	0	4253
Page	Glen Canyon Dam	SRP	U.V.	.08	.08	0	0	7712
MARICOPA:								
Glendale	6000 W. Olive	Maricopa	U.V.	.13	.13	3	1.7	8322
Mesa	Broadway & Brooks	Maricopa	U.V.	.11	.10	0	0.3	7740
Phoenix	3315 W. Indian School Rd.	Maricopa	U.V.	.13	.12	1	1.7	7993
Phoenix	1845 E. Roosevelt	Maricopa	U.V.	.14	.13	2	4.3	8595
Phoenix	8531 N 6th St.	Maricopa	U.V.	.14	.13	2	1.0	8407
Phoenix[a]	3847 W. Earll	Maricopa	U.V.	.13	.12	2	0.7	7644
Phoenix	4732 S. Central	Maricopa	U.V.	.11	.11	0	0.7	7379

Table 5 (Cont'd)

1985 Ozone Data (in ppm)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	1-HR. AVERAGE MAX.	1-HR. AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF STD.	COMPLIANCE STATUS EXCEEDANCES	NO. OF SAMPLES
MARICOPA (Cont'd):								
Scottsdale	2857 N. Miller Rd.	Maricopa	U.V.	.13	.10	1	1.3	6927
Scottsdale	13665 N. Scottsdale Rd.	Maricopa	U.V.	.15	.12	1	0.3	7956
PIMA:								
Saguaro NM E	Visitors' Center	Pima	U.V.	.11	.10	0	0	7441
Tucson	150 W. Congress	Pima	U.V.	.10	.09	0	0	8438
Tucson	22nd & Craycroft	Pima	U.V.	.11	.11	0	0	7434
Tucson	4591 N. Pomona	Pima	U.V.	.11	.10	0	0	8079
YAVAPAI:								
Prescott[d]	County Maint. Yard	State	U.V.	.08	.07	0	0	4055
YUMA:								
Yuma[d]	1485 2nd Ave.	State	U.V.	.11	.11	0	0	3473

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 been exceeded per year for the past three years. No more than 1.0 exceedances per year over the last three years is permitted.

Table 6

1985 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. STANDARDS STATE AND FEDERAL PRIMARY	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL SECONDARY	NO. OF SAMPLES
APACHE:								
St. Johns	Airport	SRP	24	73	36	0	0	54
St. Johns	Mesa Parada	SRP	13	42	24	0	0	59
St. Johns	Patterson Wellfield	SRP	14	61	24	0	0	59
Springerville	Airport	Alam	15	64	55	0	0	336
Springerville	4 mi. NE of Town	Alam	11	44	39	0	0	57
Springerville	1 mi. NE of Unit 1 Stack	Alam	18	142	115	0	0	55
Springerville	12.2 mi. SE of Unit 1 Stack	Alam	10	46	38	0	0	57
COCHISE:								
Douglas	1.2 mi. N of Smelter	State	48	307	140	1	1	57
Douglas	City Park	State	92	229	202	0	12	55
Dragoon	N. Dragoon Mtns.	AEPCO	33	111	99	0	0	263
Kansas Settlement	1 mi.W of Cotton Gin	AEPCO	35	119	115	0	0	274
Paul Spur	Housing Area	State	178[c]	698	474	14	28	40
Sierra Vista	Bartow Drive	State	53	108	99	0	0	52

Table 6 (Cont'd)

1985 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. STANDARDS STATE AND FEDERAL PRIMARY	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL SECONDARY	NO. OF SAMPLES
COCONINO:								
Flagstaff E	2500 Ft. Valley Rd.	State	231	848	644	28	38	54
Flagstaff	218 N. Leroux St.	State	78	334	272	2	8	53
Flagstaff W[b]	5400 N. Dodge Ave.	State	36[c]	69	58	0	0	39
Flagstaff W#2[a]	2501 N. Fourth St.	State	59[c]	133	129	0	0	16
Page	Glen Canyon Dam	SRP	14	59	42	0	0	60
Grand Canyon	Hopi Point	State	11	49	38	0	0	57
Page	Airport	SRP	44	260	139	0	1	55
Page	Airport	State	35	222	114	0	1	61
Sedona	Post Office	State	36	95	92	0	0	58
GILA:								
Hayden	164 Fourth Ave.	JCC	88	546	199	0	7	55
Hayden	Jail	State	123	378	271	6	22	58
Miami	Fire Station	State	80	215	188	0	4	59
Payson	County Courthouse	P-G	218	834	681	22	40	57
Roosevelt	Ranger Station	P-G	13	27	24	0	0	15

Table 6 (Cont'd)

1985 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. STANDARDS STATE AND FEDERAL PRIMARY	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL SECONDARY	NO. OF SAMPLES
GRAHAM:								
Safford	523 10th Ave.	State	93	412	269	2	8	47
GREENLEE:								
Morenci	Stargo	State	43[c]	104	97	0	0	29
MARICOPA:								
Glendale	6000 W. Olive Ave.	Maricopa	90	364	302	2	4	59
Mesa	Broadway & Brooks	Maricopa	92	463	236	1	7	56
Phoenix	1845 E. Roosevelt	Maricopa	114	456	330	3	9	58
Phoenix	1826 W. McDowell	Maricopa	174	524	415	10	33	58
Phoenix	8531 N. 6th St.	Maricopa	97	323	248	1	8	56
Phoenix	4732 S. Central	Maricopa	115	392	279	2	12	59
Phoenix[a]	3847 W. Earll	Maricopa	103	314	283	3	10	61
Scottsdale	2857 N. Miller Rd.	Maricopa	92	417	285	2	4	56
Scottsdale	13665 N. Scottsdale	Maricopa	95	289	241	1	9	56
MOHAVE:								
Bullhead City	224 N. Main St.	SCE	96	229	198	0	7	57
Davis Dam	Katherine Landing	SCE	21	69	62	0	0	60
Riviera	Ft. Mohave	SCE	37	112	93	0	0	61

Table 6 (Cont'd)

1985 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. STANDARDS STATE AND FEDERAL PRIMARY	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL SECONDARY	NO. OF SAMPLES
NAVAJO:								
Joseph City	3.25 mi. SE of Town	State	31	302	281	2	4	53
Joseph City	6 N. Randall	APS	24	165	137	0	1	251
Joseph City	Met Tower	APS	14	77	65	0	0	230
Show Low	Deuce of Clubs Ave.	State	55	453	282	3	5	50
PIMA:								
Ajo	Well Rd.	State	39	306	226	1	3	46
Corona de Tucson	22000 S. Houghton Rd.	Pima	20	93	70	0	0	57
Green Valley	245 W. Esperanza	Pima	37	167	138	0	1	55
Organ Pipe (NM)[b]	Visitors' Center	State	21[c]	88	34	0	0	11
Rillito	Gremmler Residence	State	84	476	275	2	8	56
Tucson	2181 S. Harrison Rd.	Pima	47	176	104	0	1	58
Tucson	8100 S. Nogales Hwy.	Pima	58	152	134	0	1	47
Tucson	3401 W.Orange Grove Rd.	Pima	87	436	213	1	2	56
Tucson	1016 W. Prince Rd.	Pima	102	302	232	1	5	60
Tucson	1810 S. 6th Ave.	Pima	99	503	283	2	5	60

Table 6 (Cont'd)

1985 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. STANDARDS STATE AND FEDERAL PRIMARY	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL SECONDARY	NO. OF SAMPLES
PIMA (Cont'd):								
Tucson	2nd St. & Palm Ave.	Pima	77	270	187	1	2	54
Tucson	Broadway & Swan	Pima	76	216	187	0	7	57
Tucson	½ mi.E of Irvington & Alvernon	TEP	61	191	170	0	3	121
PINAL:								
Apache Junction	County Yard	P-G	65	342	155	1	2	58
Mammoth	County Courthouse	P-G	41	99	95	0	0	59
Marana	Pinal Air Park	P-G	19	214	166	0	2	61
San Manuel	Dormsite	Magma	29	102	72	0	0	57
San Manuel	Peppersauce Wash	Magma	32	81	66	0	0	55
San Manuel	Golf Course	Magma	26	63	48	0	0	53
San Manuel	L.D.S. Church	State	32	77	69	0	0	60
San Manuel	Townsite	Magma	32	86	76	0	0	56
Stanfield	County Courthouse	P-G	92	251	177	0	5	61
SANTA CRUZ:								
Nogales	U.S. Post Office	State	89	317	228	1	9	49

Table 6 (Cont'd)

1985 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. STANDARDS STATE AND FEDERAL PRIMARY	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND FEDERAL SECONDARY	NO. OF SAMPLES
YAVAPAI:								
Clarkdale	Fire Station	State	50[c]	129	94	0	0	42
Montezuma Castle (NM)	Maintenance Bldg.	State	22	293	59	1	1	56
Nelson	.3 mi.W of Lime Plant	State	84	385	304	3	11	60
Prescott	County Maint. Yd.	State	81	296	228	1	5	55
YUMA:								
Yuma	201 S. 2nd Ave.	State	96	774	504	2	10	53

STATE AND FEDERAL STANDARDS (ug/m^3):	Annual Geometric Mean	24-Hr. Average
Primary	75	260
Secondary	60	150

Table 7

1985 PM_{10} Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL ARITHMETIC MEAN	24-HR. AVERAGE MAX.	24-HR. AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF: $250ug/m^3$	NO. OF EXCEEDANCES OF: $150ug/m^3$	NO. OF SAMPLES
COCHISE:								
Douglas	City Park	State	62[C]	148	138	0	0	23
Paul Spur	Housing Area	State	106[C]	270	206	1	10	42
COCONINO:								
Flagstaff	218 N. Leroux St.	State	39[C]	82	74	0	0	41
GILA:								
Hayden	Jail	State	68	157	146	0	1	51
GRAHAM:								
Safford	523 10th Ave.	State	49[C]	109	83	0	0	32
MARICOPA:								
Phoenix	4732 S. Central	Maricopa	80	214	196	0	4	181
PIMA:								
Ajo	Well Rd.	State	41[C]	148	138	0	0	23
Organ Pipe (NM)	Visitors Center	State	18[C]	46	35	0	0	37
Rillito	Gremmler Residence	State	66	225	130	0	1	47
Tucson	3401 W. Orange Grove	Pima	48	185	117	0	1	180
SANTA CRUZ:								
Nogales	U.S. Post Office	State	56[C]	110	88	0	0	19
YUMA:								
Yuma	201 S. 2nd Ave.	State	63[C]	281	172	1	2	32

Table 8

1985 Sulfur Dioxide Data (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	ANNUAL AVERAGE	MAX. 3-HR.	AVERAGE 24-HR.	NO. OF EXCEEDANCES OF STANDARDS 3-HR. DAYS	3-HR. TIMES	24-HR. TIMES	NO. OF 1-HR. SAMPLES
APACHE:										
St. Johns	Mesa Parada	SRP	Flour.	17	204	53	0	0	0	7429
Springerville	4 mi. NE of Town	Alam	Flour.	2	57	18	0	0	0	8608
Springerville	Airport	Alam	Flour.	2	26	19	0	0	0	8448
Springerville	1 mi. NNE of Unit 1 Stack	Alam	Flour.	2	116	20	0	0	0	8254
Springerville	1 mi. ESE of Unit 1 Stack	Alam	Flour.	2	95	17	0	0	0	8503
Springerville	1 mi. SSE of Unit 1 Stack	Alam	Flour.	2	142	34	0	0	0	8458
Springerville	12.2 mi. SE of Unit 1 Stack	Alam	Flour.	2	45	9	0	0	0	8639
COCHISE:										
Bisbee[a]	Tombstone Canyon	PD	Coul	4[c]	480	74	0	0	0	6223
Douglas	0.75mi.N of Smelter	PD	Coul	61	978	267	0	0	0	8675
Douglas	Curtis	PD	Coul	36	1240	248	0	0	0	8671
Douglas	Fir	PD	Coul	36	934	233	0	0	0	8653
Douglas	F. Ave. & 9th St.	PD	Coul	34	987	237	0	0	0	8689
Douglas	Queen	PD	Coul	42	1048	246	0	0	0	8593

Table 8 (Cont'd)

1985 Sulfur Dioxide Data (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	ANNUAL AVERAGE	MAX. 3-HR.	AVERAGE 24-HR.	NO. OF EXCEEDANCES OF STANDARDS 3-HR. DAYS	3-HR. TIMES	24-HR. TIMES	NO. OF 1-HR. SAMPLES
COCHISE (Cont'd):										
Douglas	Mobile IV	PD	Coul	35	1205	293	0	0	0	8673
Douglas	SEAMC Hospital	PD	Coul	65	1258	290	0	0	0	8679
Douglas	Pirtleville	PD	Coul	50	1039	281	0	0	0	8664
Douglas	1.2 mi.N of Smelter	State	Fluor.	62	1528	462	3	3	1	8580
Douglas[a]	SEAMC Hospital	State	Fluor.	63[c]	1315	247	1	1	0	5585
Douglas[a]	1.2 mi.N of Smelter	PD	Coul	57[c]	1162	300	0	0	0	3299
Dragoon	N. Dragoon Mtns.	AEPCO	Flame	0	79	18	0	0	0	7002
Kansas Settlement	1 mi.W of Cotton Gin	AEPCO	Flame	0[c]	52	10	0	0	0	5624
McNeal[d]	2 mi.W of Town	PD	Coul	10[c]	800	114	0	0	0	6616
McNeal	2.6 mi.WSW of Town	State	Fluor.	10	800	114	0	0	0	6594
Naco[a]	Customs House	State	Fluor.	9[c]	666	130	0	0	0	4635
Sierra Vista[a]	Fry Blvd.	State	Fluor.	13[c]	443	107	0	0	0	4414
COCONINO:										
Page	Glen Canyon Dam	SRP	Fluor.	14	143	54	0	0	0	8391
GILA:										
Hayden	Town Hall	JCC	Coul	13	534	84	0	0	0	8648
Hayden	Jail	JCC	Coul	9	346	58	0	0	0	8578

Table 8 (Cont'd)

1985 Sulfur Dioxide Data (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	ANNUAL AVERAGE	MAX. 3-HR.	AVERAGE 24-HR.	NO. OF EXCEEDANCES OF STANDARDS 3-HR. DAYS	3-HR. TIMES	24-HR. TIMES	NO. OF 1-HR. SAMPLES
GILA (Cont'd):										
Hayden	Hayden Junction	JCC	Coul	10	320	97	0	0	0	8487
Hayden	Montgomery Ranch	JCC	Fluor.	25	803	141	0	0	0	8564
Hayden	Jail	State	Fluor.	19	750	120	0	0	0	8494
Miami	Cities Serv. Bldg.	State	Fluor.	38	1168	228	0	0	0	8521
Miami	Jones Ranch	State	Fluor.	43	2258	386	8	8	2	8627
Miami	Jones Ranch	ICCC	Fluor.	36	2537	368	6	6	1	8760
Miami	SE of Smelter	State	Fluor.	19	373	151	0	0	0	8038
Miami	Burch Pump Station	ICCC	Fluor.	15	660	160	0	0	0	8760
Miami	Town Site	ICCC	Fluor.	20	1690	270	1	1	0	8760
Winkelman	School	JCC	Coul	3	516	72	0	0	0	8673
Winkelman	1 mi. N of Jct. 77 & 177	JCC	Fluor.	40	1556	283	1	1	0	8594
GREENLEE:										
Morenci[b]	Stargo	State	Fluor.	1[c]	36	15	0	0	0	872
Morenci[b]	Cadillac Point	State	Fluor.	0	42	18	0	0	0	875

Table 8 (Cont'd)

1985 Sulfur Dioxide Data (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	ANNUAL AVERAGE	MAX. 3-HR.	AVERAGE 24-HR.	NO. OF EXCEEDANCES OF STANDARDS 3-HR. DAYS	3-HR. TIMES	24-HR. TIMES	NO. OF 1-HR. SAMPLES
MARICOPA:										
Phoenix	1845 E. Roosevelt	Maricopa	Coul	8	NR	68	0	0	0	6261
MOHAVE:										
Bullhead City	224 N. Main St.	SCE	Flame	14	94	38	0	0	0	8272
Davis Dam	Katherine Landing	SCE	Flame	14	127	41	0	0	0	8494
Riviera	Ft. Mohave	SCE	Flame	14	232	73	0	0	0	8342
PIMA:										
Ajo	Town Square	PD	Coul	21[c]	847	200	0	0	0	2197
Ajo	Oxidation Pond	PD	Coul	39[c]	1022	305	0	0	0	2197
Ajo	S. Tailings Dam	PD	Coul	37[c]	1555	260	2	2	0	2196
Ajo	Camelback Mtn.	PD	Coul	24[c]	956	193	0	0	0	2143
Ajo	Gibson	PD	Coul	18[c]	2218	298	1	1	0	2196
Ajo	Shelton	PD	Coul	13[c]	751	148	0	0	0	2197
Ajo	Miller	PD	Coul	2[c]	166	38	0	0	0	2192
Ajo	Hotshot	PD	Coul	8[c]	297	22	0	0	0	2188
Ajo[b]	Well Rd.	State	Fluor.	40[c]	1042	359	0	0	0	2196
Redington	E of Main Ranch	Magma	Fluor.	10	714	107	0	0	0	8384
Tucson	1721 N Tanque Verde	Pima	Fluor.	3[c]	139	52	0	0	0	2148
Tucson	22nd & Craycroft	Pima	Fluor.	13	236	66	0	0	0	8503

Table 8 (Cont'd)

1985 Sulfur Dioxide Data (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	ANNUAL AVERAGE	MAX. 3-HR.	AVERAGE 24-HR.	NO. OF EXCEEDANCES OF STANDARDS 3-HR. DAYS	3-HR. TIMES	24-HR. TIMES	NO. OF 1-HR. SAMPLES
PINAL:										
Mammoth	Courthouse	Magma	Fluor.	10	812	188	0	0	0	8704
Oracle	Courthouse	Magma	Fluor.	16	1185	174	0	0	0	8662
San Manuel	Townsite	Magma	Fluor.	61	1514	311	2	2	0	8709
San Manuel	Golf Course	Magma	Fluor.	49	1044	294	0	0	0	8711
San Manuel	Dormsite	Magma	Fluor.	67	1280	265	0	0	0	8699
San Manuel	Minesite	Magma	Fluor.	58	1278	279	0	0	0	8717
San Manuel	L.D.S. Church	State	Fluor.	56	1601	388	3	3	1	8667
San Manuel[a]	L.D.S. Church	Magma	Fluor.	2[c]	1264	221	0	0	0	205
Winkelman	1 mi. S of Jct. 77 & 177	JCC	Coul	5	244	56	0	0	0	8460

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

Table 9

1985 Nitrates Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	24-HOUR AVERAGE MAX.	24-HOUR AVERAGE 2ND HIGH	NO. OF SAMPLES
APACHE:						
Springerville	Airport	Alam	0.3	0.8	0.7	336
Springerville	4 mi. NE of Town	Alam	0.2	0.8	0.6	57
Springerville	1 mi. NNE of Unit 1 Stack	Alam	0.2	1.2	1.1	55
Springerville	12.2 mi. SE of Unit 1 Stack	Alam	0.2	0.8	0.7	57
COCHISE:						
Douglas	City Park	State	1.5[c]	2.5	2.2	19
Douglas	1.2 mi. N of Smelter	State	1.1	3.3	2.0	57
Paul Spur	Housing Area	State	1.0[c]	1.8	1.8	27
Sierra Vista	Bartow Dr.	State	1.7	4.0	3.6	52
COCONINO:						
Flagstaff	218 N. Leroux St.	State	1.6[c]	3.0	2.9	42
Grand Canyon	Hopi Point	State	1.1[c]	2.1	2.0	26
Page	Airport	State	1.7	4.1	4.1	61
GILA:						
Hayden	Jail	State	1.4	3.6	2.8	46
Miami	Fire Station	State	2.0	5.0	4.9	59
GRAHAM:						
Safford	523 10th Ave.	State	1.6[c]	2.7	2.3	39

Table 9 (Cont'd)

1985 Nitrates Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	24-HOUR AVERAGE MAX.	24-HOUR AVERAGE 2ND HIGH	NO. OF SAMPLES
GREENLEE:						
Morenci	Stargo	State	1.6[c]	3.6	3.0	29
NAVAJO:						
Joseph City	3.25 mi. SE of Town	State	1.2	2.6	2.5	53
Show Low	Deuce of Clubs Ave.	State	1.5	7.2	3.8	49
PIMA:						
Ajo	Well Rd.	State	1.7[c]	3.8	3.8	44
Organ Pipe (NM)	Visitors' Center	State	1.3[b]	3.4	1.5	11
Rillito	Gremmler Residence	State	2.6[c]	6.0	5.6	41
Tucson	½ mi.E of Irvington & Alvernon	TEP	1.5	5.5	4.6	121
PINAL:						
San Manuel	L.D.S. Church	State	1.7	3.3	3.3	60
SANTA CRUZ:						
Nogales	U.S. Post Office	State	1.8[c]	3.1	2.7	38
YAVAPAI:						
Clarkdale	Fire Station	State	1.8[c]	4.4	3.7	42
Montezuma Castle (NM)	Maintenance Bldg.	State	1.5	4.9	3.7	56
Nelson	1 mi. N of Lime Plant	State	1.3	3.5	2.9	60
Prescott	County Maint. Yard	State	1.8	3.0	3.0	55
YUMA:						
Yuma	201 S. 2nd Ave.	State	3.5[c]	18.8	8.1	44

Table 10

1985 Sulfates Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	24-HOUR AVERAGE MAX.	24-HOUR AVERAGE 2ND HIGH	NO. OF SAMPLES
APACHE:						
Springerville	Airport	Alam	1.4	5.4	4.0	336
Springerville	4 mi. NE of Town	Alam	1.4	6.3	6.1	57
Springerville	1 mi. NNE of Unit 1 Stack	Alam	1.5	6.1	4.1	55
Springerville	12.2 mi. SE of Unit 1 Stack	Alam	1.5	5.2	5.0	57
COCHISE:						
Douglas	1.2 mi. N of Smelter	State	9.6	18.6	16.0	57
Douglas	City Park	State	8.1[c]	13.5	11.0	19
Paul Spur	Housing Area	State	7.6[c]	21.3	10.9	40
Sierra Vista	Bartow Dr.	State	6.2	13.8	13.6	52
COCONINO:						
Flagstaff	218 N. Leroux St.	State	3.3[c]	6.7	5.1	42
Grand Canyon	Hopi Point	State	1.7[c]	4.0	3.7	26
Page	Airport	State	3.4	6.1	5.9	61
GILA:						
Hayden	Jail	State	7.6	14.7	12.9	46
Miami	Fire Station	State	10.8	54.7	23.2	59
GRAHAM:						
Safford	523 10th Ave.	State	4.7[c]	9.0	8.2	39

Table 10 (Cont'd)

1985 Sulfates Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	24-HOUR AVERAGE MAX.	24-HOUR AVERAGE 2ND HIGH	NO. OF SAMPLES
GREENLEE:						
Morenci	Stargo	State	5.5[c]	10.4	8.2	29
MARICOPA:						
Glendale	6000 W. Olive Ave.	Maricopa	Not Reported			
Mesa	Broadway & Brooks	Maricopa	"			
Phoenix	1845 E. Roosevelt	Maricopa	"			
Phoenix	4732 S. Central	Maricopa	"			
Phoenix	8531 N. 6th St.	Maricopa	"			
Phoenix	1826 W. McDowell	Maricopa	"			
Scottsdale	2857 N. Miller Rd.	Maricopa	"			
Scottsdale	13665 N. Scottsdale Rd.	Maricopa	"			
NAVAJO:						
Joseph City	3.25 mi. SE of Town	State	4.7	7.3	7.2	53
Show Low	Deuce of Clubs Ave.	State	4.1	15.8	9.3	49
PIMA:						
Ajo	Well Rd.	State	4.1[c]	9.0	8.8	44
Corona de Tucson	22000 S. Houghton	Pima	3.2[c]	8.0	5.8	24
Green Valley	245 W. Esperanza	Pima	4.4[c]	11.1	7.6	22

Table 10 (Cont'd)

1985 Sulfates Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	24-HOUR AVERAGE MAX.	24-HOUR AVERAGE 2ND HIGH	NO. OF SAMPLES
PIMA (Cont'd):						
Organ Pipe (NM)	Visitors' Center	State	4.3[b]	6.9	6.1	11
Rillito	Gremmler Residence	State	6.3[c]	10.3	10.0	41
Tucson	1810 S. 6th Ave.	Pima	5.2[c]	11.0	8.0	24
Tucson	3401 W. Orange Grove Rd.	Pima	4.5[c]	9.9	6.6	23
Tucson	1016 W. Prince Rd.	Pima	5.2[c]	8.5	7.1	24
Tucson	½ mi.E of Irvington & Alvernon	TEP	2.8	7.8	7.7	121
PINAL:						
San Manuel	L.D.S. Church	State	9.9	28.6	23.3	60
SANTA CRUZ:						
Nogales	U.S. Post Office	State	5.7[c]	11.8	9.8	38
YAVAPAI:						
Clarkdale	Fire Station	State	2.2[c]	7.4	4.4	42
Montezuma Castle (NM)	Maintenance Bldg.	State	2.8	7.6	5.8	56
Nelson	1 mi. N of Lime Plant	State	2.1	6.5	4.0	60
Prescott	County Maint. Yard	State	3.3	6.5	5.0	55
YUMA:						
Yuma	201 S. 2nd Ave.	State	4.8[c]	18.8	8.1	44

APPENDIX B

Air Quality Trends

Carbon Monoxide

In Phoenix no significant changes in the second highest 8-hour concentration occurred over the past four years at the long-term trend site, 1845 E. Roosevelt. However, referring to Figure 2, it can be seen that concentrations did decrease over the years 1976 through 1982. In regard to the W. Indian School site, no definite trend is evident during the last five years except that concentrations are much higher at this site.

In Tucson the second highest 8-hour concentration has gradually declined from 13 ppm in 1976 to 9 ppm in 1985 (refer to Figure 3). Thus, no violation of the 8-hour standard was detected in 1985 in Tucson. This marks the first year in which no violation has been recorded at the 22nd and Alvernon site where monitoring began in 1975. The 8-hour exceedance data, plotted in Figure 4, appear to be consistent with the concentration trends noted for Phoenix and Tucson with one exception. In Phoenix at the E. Roosevelt site exceedances and concentrations decreased from 1976 through 1982 and then leveled out. In Tucson at the 22nd and Alvernon site a continuous declining pattern has been observed in exceedances and concentrations. However, at the W. Indian School Rd. site in Phoenix, no agreement between concentration and exceedance trends is indicated..

In Flagstaff carbon monoxide levels have declined from 7 ppm in 1980 to 5 ppm in 1985. In contrast, the second highest 8-hour concentrations in Prescott, Sierra Vista, and Yuma exhibit no significant change over this period (refer to Figure 5). The leveling points are 5 - 6 ppm for Prescott and 4 - 5 ppm for Sierra Vista and Yuma, well below 9 ppm, the 8-hour standard.

Lead

Concentrations have tended to level out in recent years after declining sharply from 1979 through 1981 in Tucson and from 1979 through 1982 in Phoenix (refer to Figure 6). Compliance with the standard, 1.5 ug/m^3, for any calendar quarter, was achieved in 1981 in Phoenix at the E. Roosevelt site, whereas, in Tucson, no violations have ever been monitored. However, it should be noted that higher concentrations were measured in 1984 in Phoenix at a new site near the six-way intersection of McDowell Rd., Grand Ave., and 19th Ave. A maximum quarterly average of 1.3 ug/m^3 was monitored at this site, whereas, at the E. Roosevelt site the maximum was 0.8 ug/m^3. Unfortunately, complete data for 1985 are not available at this time for the Phoenix sites.

Nitrogen Dioxide

Annual average data in Figure 7 suggest a downward trend over the past eight years in Phoenix and Tucson. However, this conclusion must be tempered somewhat in view of low data recovery obtained at these two trend sites. It is safe, however, to conclude that Phoenix and Tucson are in compliance with the annual standard.

Ozone

In Phoenix the second highest 1-hour ozone concentrations have randomly fluctuated between 0.14 ppm and 0.16 ppm since 1977 with no consistent change (See Figure 8). In contrast, ozone levels in Tucson gradually increased from 0.10 ppm in 1977 to 0.12 ppm in 1981, indicating that a violation of the 0.12 ppm standard was likely after 1981. However, second highest concentrations have remained at 0.11 - 0.12 ppm for the last four years in Tucson.

A comparison of Phoenix concentration data in Figure 8 with ozone exceedances in Figure 9 indicates there is no correlation between the two plots. The concentration plot suggests no significant variation whereas the number of exceedances increase and decrease sharply from year to year with no definite pattern.

In Flagstaff, Prescott and Sierra Vista the second highest 1-hr. ozone concentrations have tended to run between 0.07 and 0.08 ppm for the most part (Refer to Figure 10). Thus, no violation of the 0.12 ppm standard appears likely in the near future. In Yuma, however, a gradual, increasing trend from 0.08 ppm in 1980 to 0.11 ppm in 1983 through 1985 is exhibited. Accordingly, continued monitoring in Yuma is required.

Total Suspended Particulates (TSP)

TSP levels in Phoenix in 1985 were relatively unchanged from 1984 levels (Refer to Table 10). The two largest variations were a 10% decrease in Glendale and a 12% increase in Mesa. Over the past seven years no major changes in TSP levels are apparent with one exception. At the S. Central Ave. site a large reduction in TSP concentrations occurred in 1982. However, the annual mean has remained in the 105 - 115 ug/m^3 range during the last three years, well above the 75 ug/m^3 annual standard. All of the other sites are also exceeding the standard, especially the W. McDowell Rd. site. This monitoring site is located near the six-way intersection of McDowell Rd., 19th Ave., and Grand Ave. where traffic is very heavy. Unfortunately, concentrations at this site are likely to increase in 1986 due to construction work on the Black Canyon Freeway.

In Tucson concentrations increased at five of the trend sites listed in Table 11 whereas three sites exhibited reduced levels in 1985. The greatest variations were a 21% increase at the Nogales Hwy. site and a 20% decline at Corona de Tucson, a background site located southeast of Tucson. Since 1979 it appears that TSP levels are declining in Tucson at the Palm Ave., Prince Rd., Orange Grove, and Harrison Rd. sites. In contrast, limited data for the Broadway/Swan site suggest an increasing trend. Five of the seven trend sites located in the city exceeded the annual standard in 1985.

For other areas of the state TSP data are tabulated in Table 12. The most significant features of these data are summarized below:

Ajo - A large reduction in TSP due probably to the smelter shutdown in 1985.

Bullhead City - A slight increasing trend which could be related to increasing population .

Marana - Decreasing concentrations from 1982 through 1985.

Morenci - A sharp decline in concentrations in 1985 most likely due to the smelter closure.

Nelson - An appreciable increase in TSP in 1984 followed by a slight rise in 1985.

Organ Pipe - A gradual decreasing pattern which started in 1982 and continued through 1985.

Paul Spur - A large decrease in 1985 caused by relocation of the TSP sampler

Payson - In 1985 the annual mean increased by almost 100% over the 1984 value, making this the highest mean value in the state.

Rillito - Concentrations declined moderately in 1985.

Roosevelt - The annual mean decreased approximately 50% in 1985.

St. Johns - A 100% increase in the annual mean in 1985.

PM_{10} (Particulate Matter less than 10 microns in size)

Due to the proposed replacement of TSP with PM_{10} in the federal primary air quality standards, it became necessary to obtain data on PM_{10} concentrations in Arizona. Accordingly, the State and Maricopa and Pima Counties began monitoring for PM_{10} in 1985. A summary of these preliminary data is given below. A more detailed summary for each site is presented in Table 7 of Appendix A.

Sites Exceeding Proposed Standards*

	Annual		24-Hr.	
	50	65	150	250
Douglas	X			
Hayden	X	X	X	
Nogales	X			
Paul Spur	X	X	X	X
Phoenix	X	X	X	
Rillito	X	X	X	
Tucson			X	
Yuma	X	X	X	X

* EPA's proposed standards are 50-65 ug/m^3, annual average and 150-250 ug/m^3m 24-Hr. average.

Sites Not Exceeding Proposed Standards

Ajo
Flagstaff
Organ Pipe
Safford

It should be noted that these results are preliminary and do not reflect a complete year. In addition, sampling frequencies at the Phoenix and Tucson sites were greater than at the other sites.

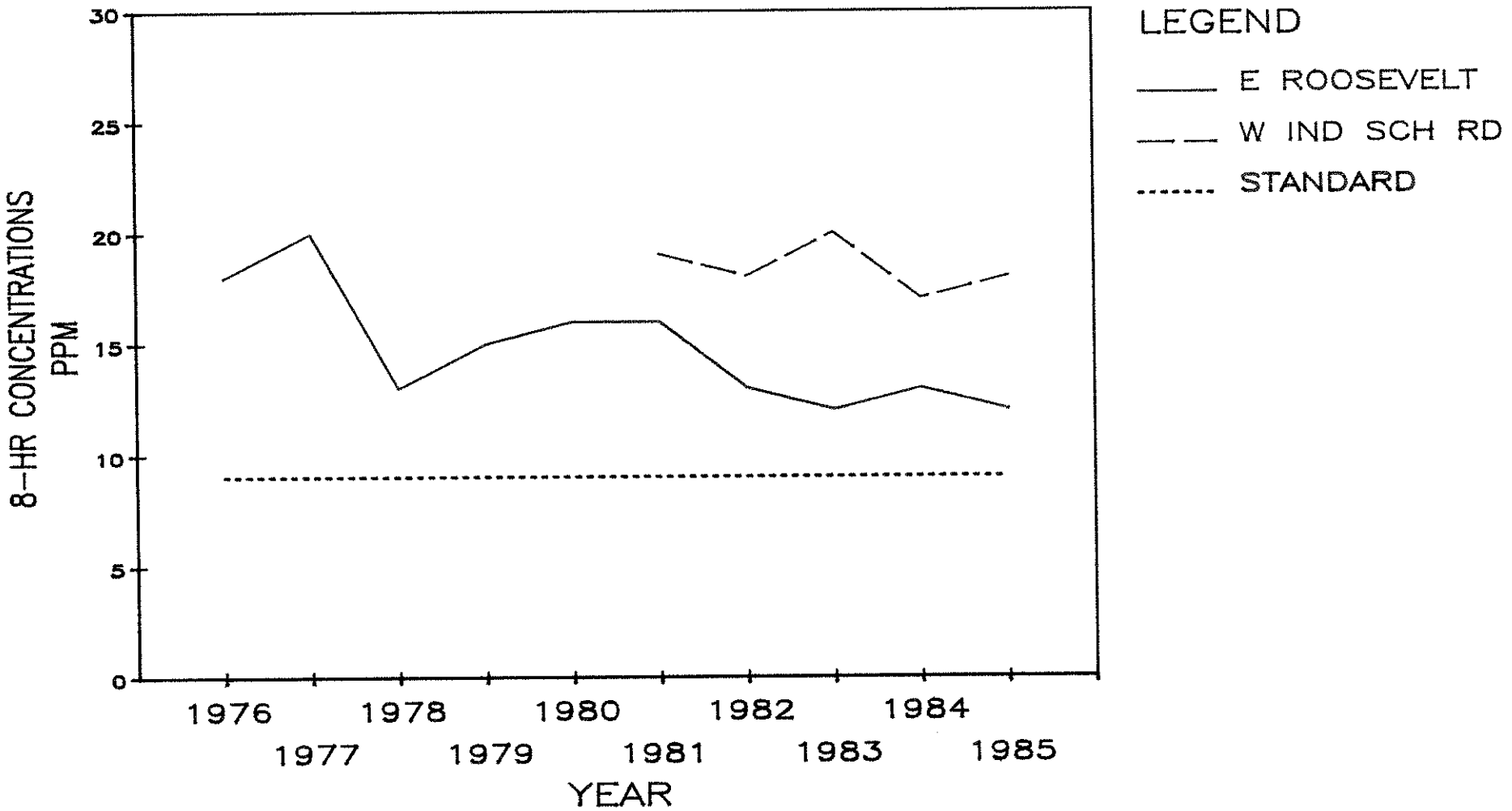
Sulfur Dioxide

In 1985 the number of exceedances of the 3-Hr. standard was reduced in Douglas and in Miami relative to the previous year. However, in Hayden and especially San Manuel, an increase in 3-Hr. exceedances was monitored as indicated in Figure 11. Ajo and Morenci data are not plotted because the smelters in these towns shut down in 1985.

With regard to 24-Hr. exceedances, none have been recorded in Hayden since 1982 and very few have occured in Douglas and in San Manuel during the past six years (Refer to Figure 12). In Miami the number of 24-Hr. exceedances was lower in 1985.

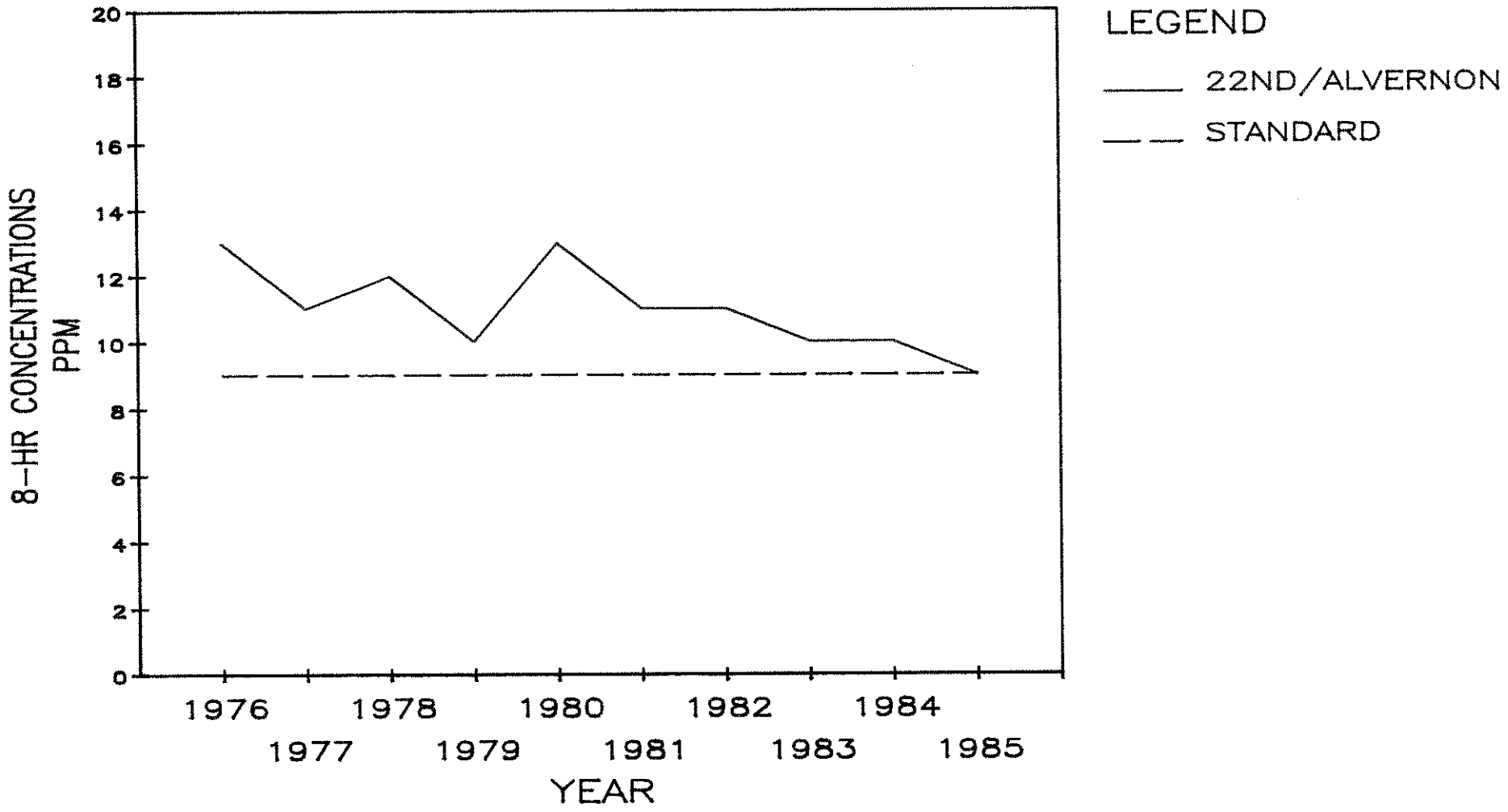
Annual average data were not plotted for 1985 and prior years because there were no violations of the annual standard (80 ug/m^3) in 1985.

FIGURE 2
CARBON MONOXIDE CONCENTRATIONS IN PHOENIX



2ND HIGHEST CONCENTRATIONS

FIGURE 3
CARBON MONOXIDE CONCENTRATIONS IN TUCSON



2ND HIGHEST CONCENTRATIONS

FIGURE 4
CARBON MONOXIDE EXCEEDANCES IN PHOENIX AND TUCSON

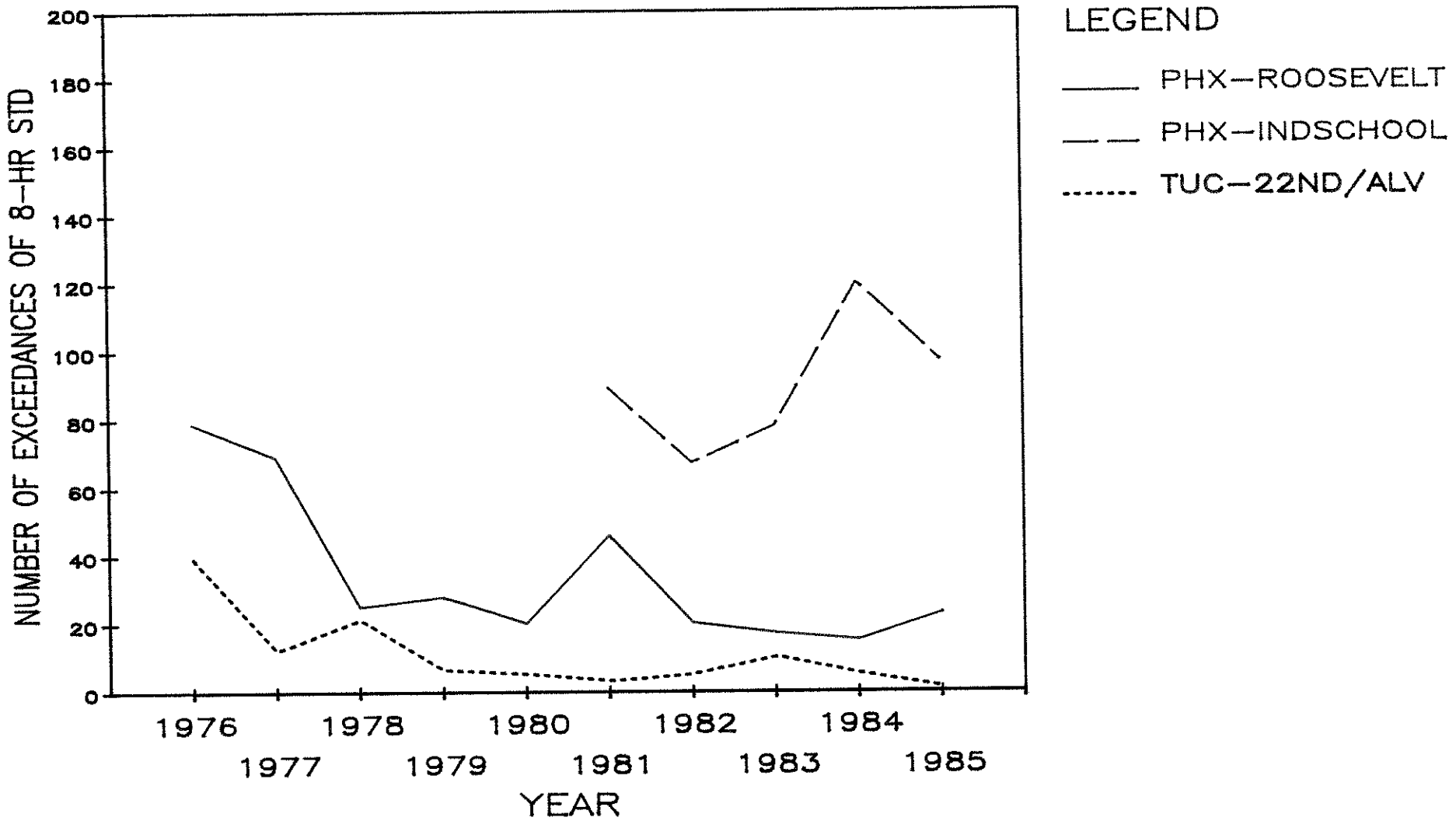
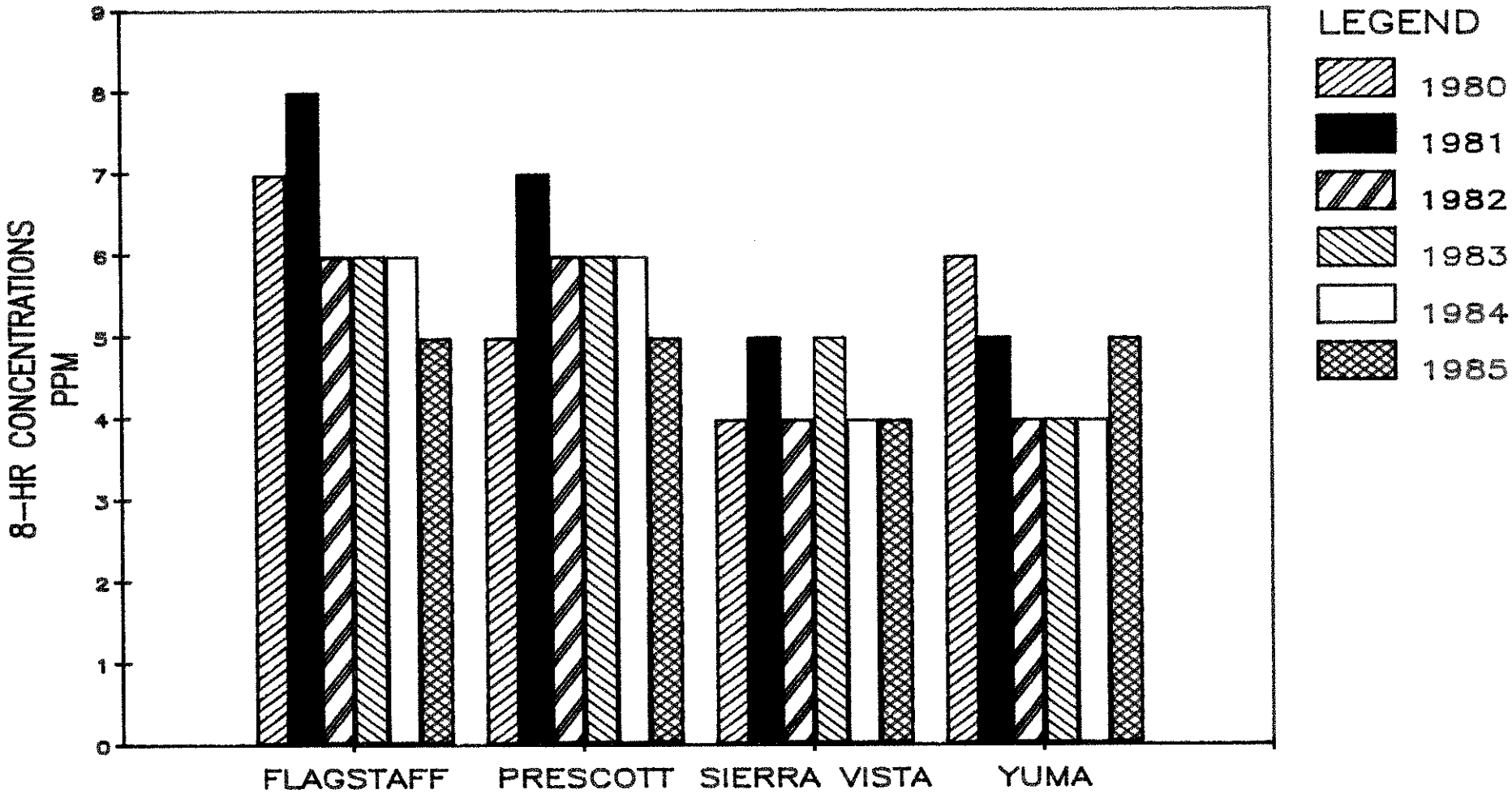
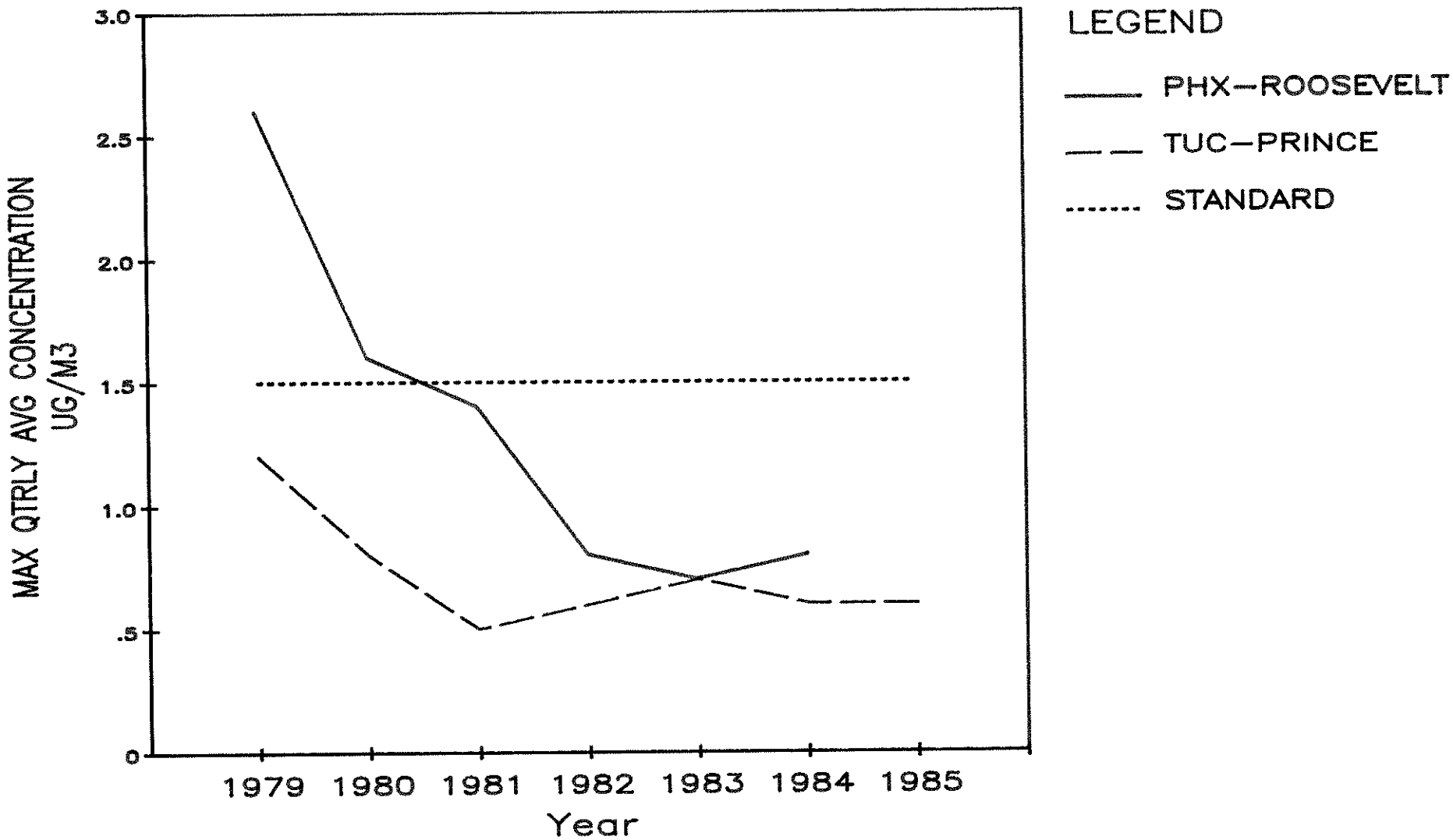


FIGURE 5
CARBON MONOXIDE CONCENTRATIONS IN VARIOUS CITIES



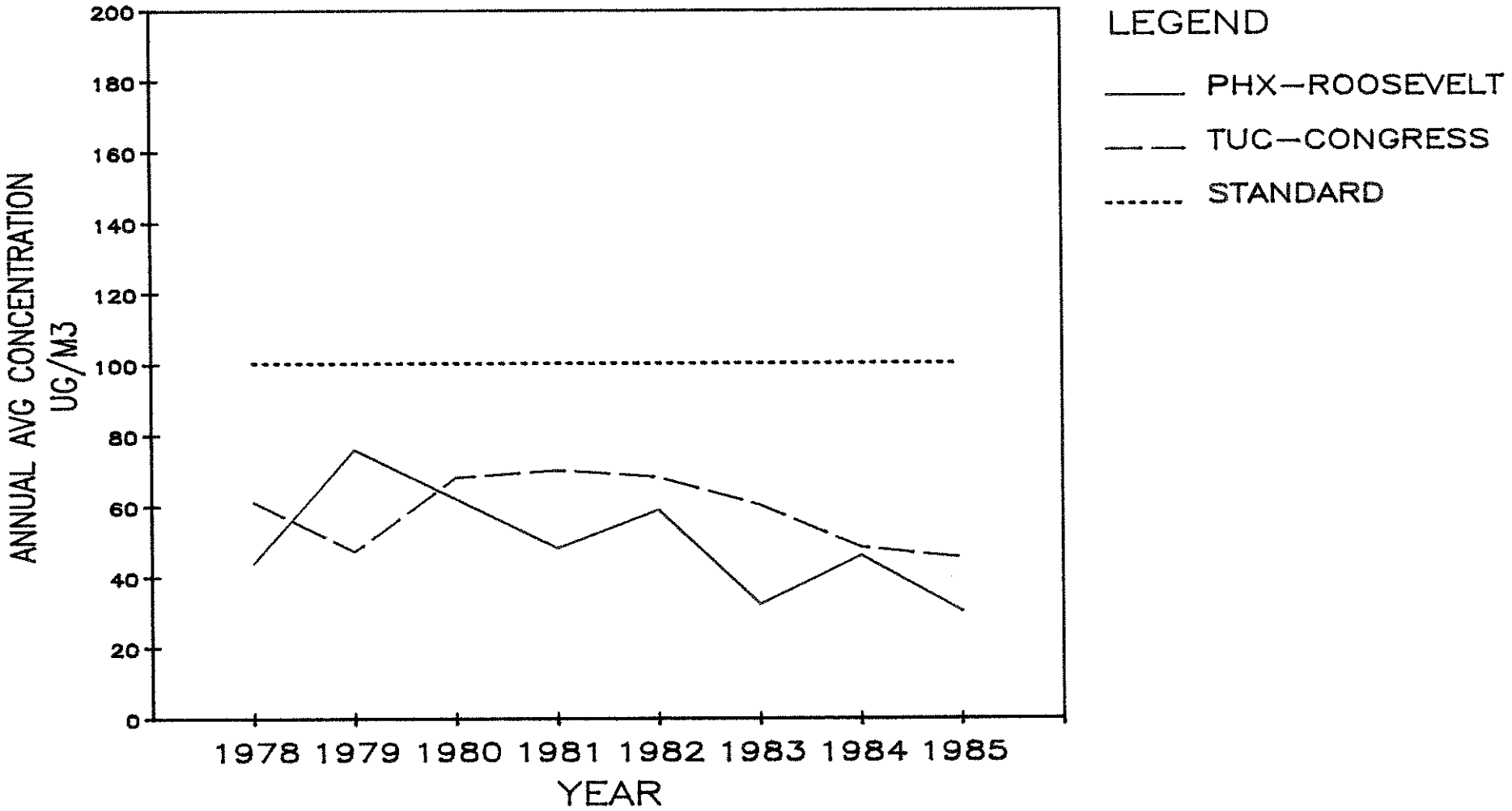
SECOND HIGHEST CONCENTRATIONS. STANDARD — 9 PPM

FIGURE 6
LEAD CONCENTRATIONS IN PHOENIX AND TUCSON



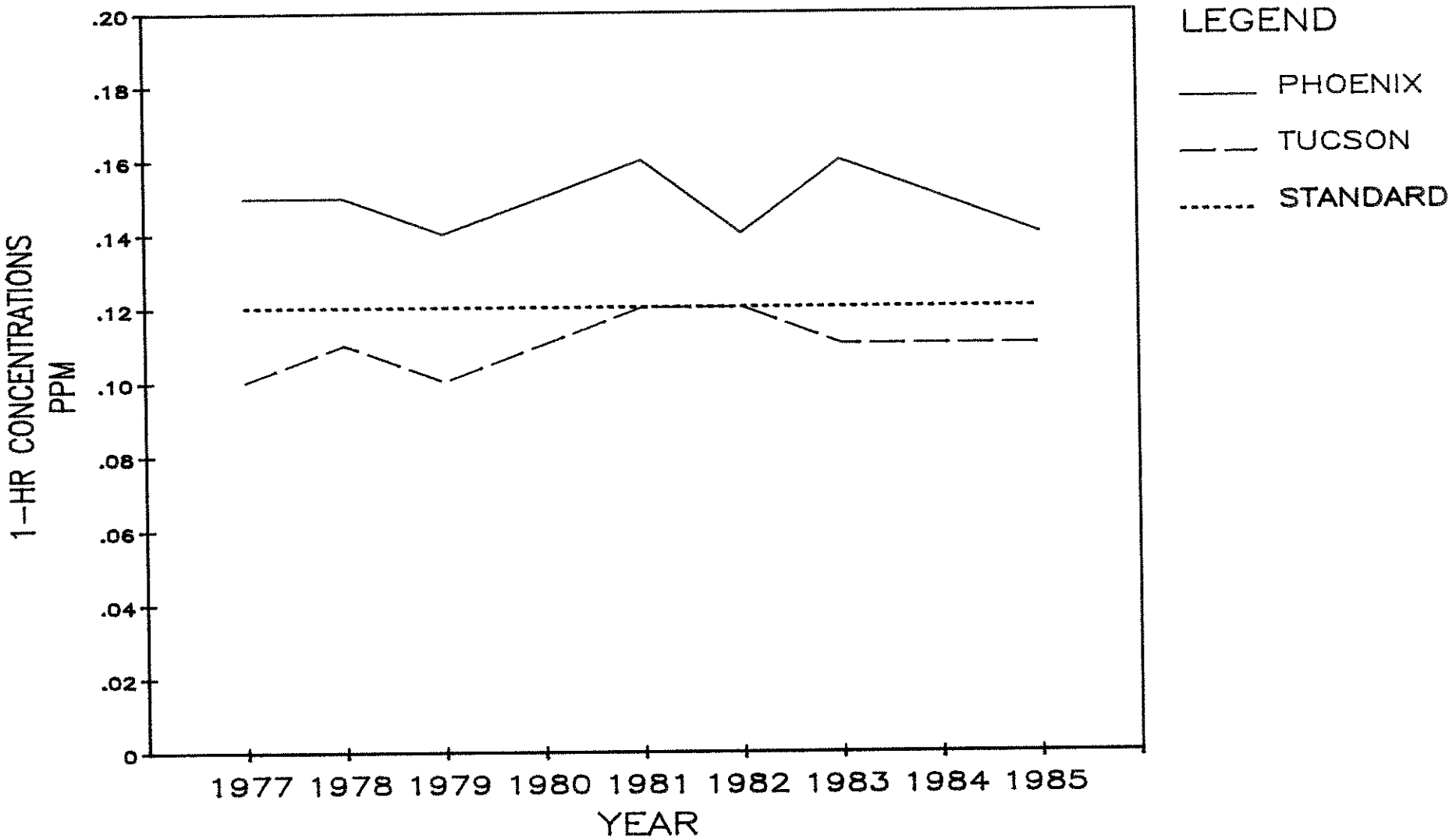
PHX 1985 NR

FIGURE 7
NITROGEN DIOXIDE CONCENTRATIONS IN PHOENIX AND TUCSON



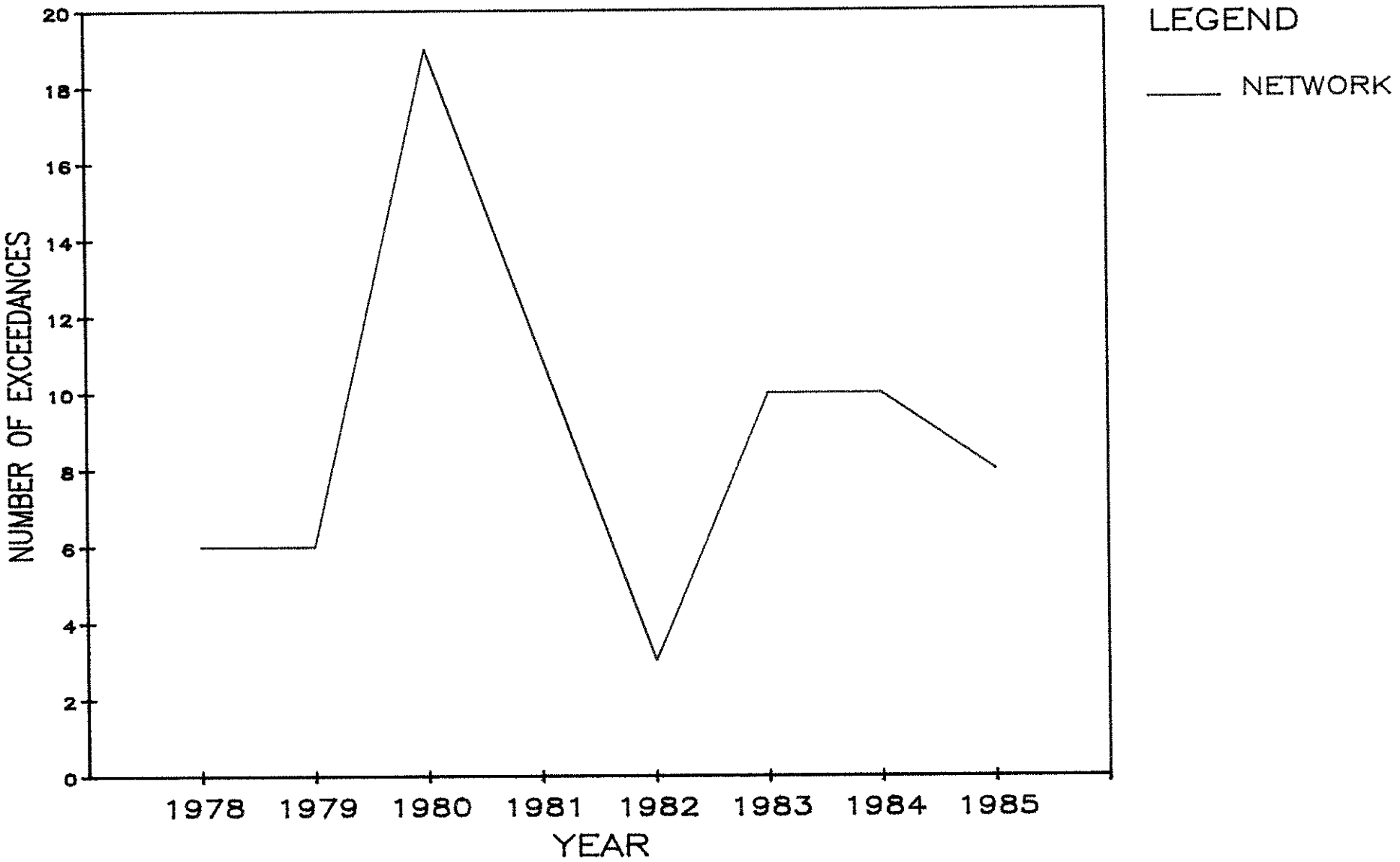
PHX 1980 NA

FIGURE 8
OZONE CONCENTRATIONS IN PHOENIX AND TUCSON



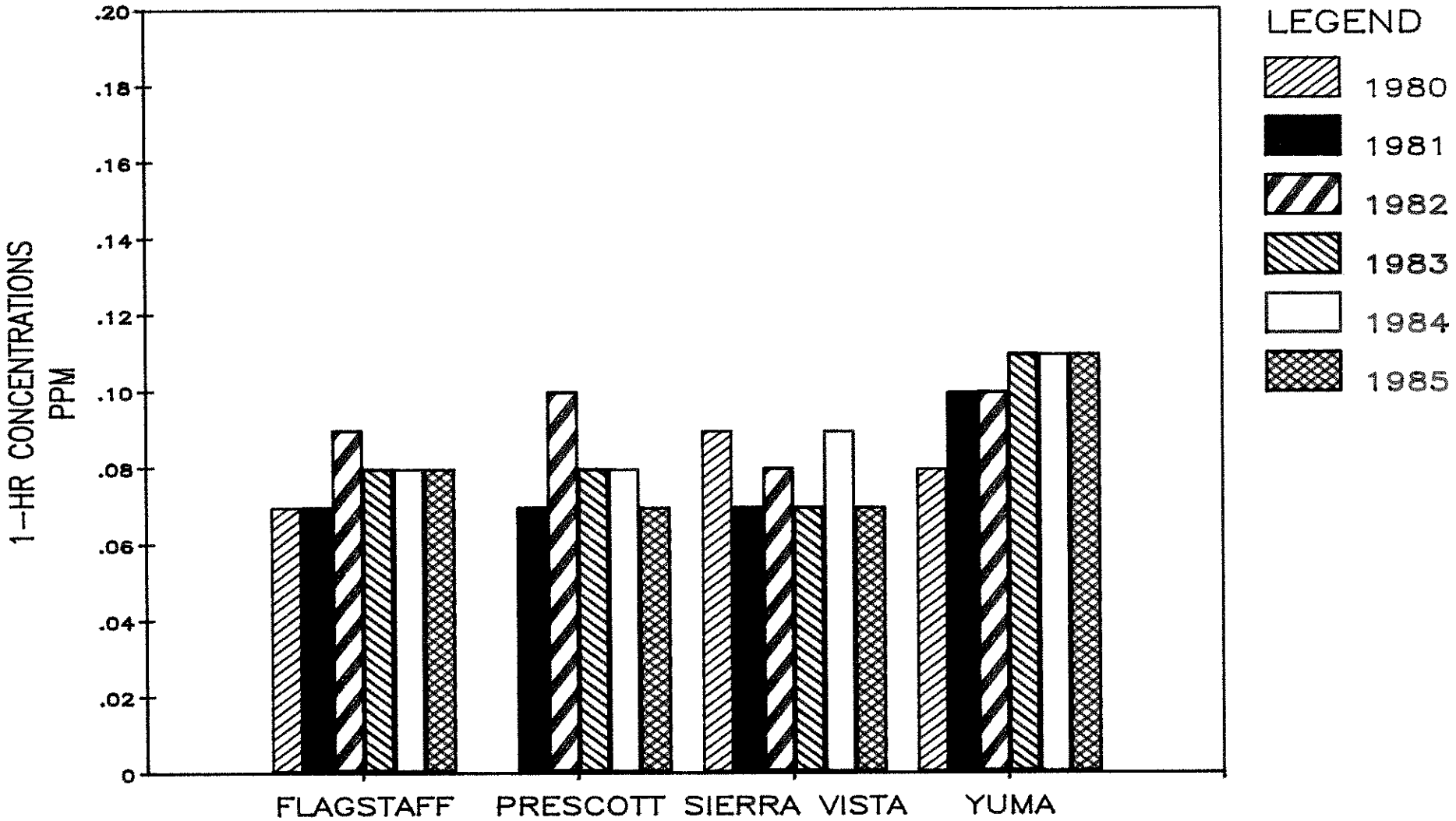
2ND HIGHEST IN NETWORK

FIGURE 9
OZONE EXCEEDANCES IN PHOENIX



5 TREND SITES

FIGURE 10
OZONE CONCENTRATIONS IN VARIOUS CITIES



2ND HIGHEST CONCENTRATIONS

Table 11

TSP CONCENTRATIONS IN PHOENIX AREA

Annual Geometric Mean (ug/m^3)

Site	1979	1980	1981	1982	1983	1984	1985
Glendale	105	88	100	84	83	100	90
Mesa	87	86	93	74	73	82	92
Phoenix (Roosevelt)	121	120	113	90	93	120	114
Phoenix (S. Central)	171	182	176	121	105	115	115
Phoenix (N. 6th St.)	117	100	108	86	107	100	97
Phoenix(W.McDowell Rd.)	--	--	--	140	125	168	174
Scottsdale (N. Miller)	99	87	97	84	82	96	92

Table 12

TSP CONCENTRATIONS IN TUCSON AREA

Annual Geometric Mean (ug/m^3)

Site	1979	1980	1981	1982	1983	1984	1985
Corona de Tucson (S. Houghton Rd.)	28	22	35	22	18	25	20
Tucson (Palm Ave.)	89	75	76	59	54	70	77
South Tucson(6th Ave.)	101	97	112	89	79	91	99
Tucson (Prince Rd.)	129	117	101	93	77	91	102
Tucson (Nogales Hwy.)	54	54	54	44	34	48	58
Tucson (Orange Grove)	109	108	108	86	78	92	87
Tucson (Harrison)	65	59	67	59	48	55	47
Tucson (Broadway)	--	--	--	--	59	65	76

Table 13

PARTICULATE CONCENTRATIONS IN VARIOUS CITIES

Annual Geometric Mean (ug/m^3)

Site	1979	1980	1981	1982	1983	1984	1985
Ajo	67[C]	85	86	68	56	77	39
Apache Junction	--	78[C]	65	57	51	61	65
Bullhead City	75	66	87	70	84	93	96
Clarkdale*	100[C]	71[C]	46[C]	--	52	59	50[C]
Douglas (U.S. 666)	48	57	65[C]	54	46	56[C]	48
Douglas (City Park)	121	136	128[C]	90[C]	91[C]	88[C]	92
Flagstaff	82	81[C]	81	77[C]	68	62	78
Grand Canyon	22	11[C]	16	12	5	11	11
Green Valley	54	39	46	33	27	39	37
Hayden	172	152[C]	287	132	98	122	123
Joseph City	40	37	34	30	27	34	31
Kansas Settlement	38	41	44	31	32	44	35
Mammoth	--	--	56	43	37	41	41
Marana	--	43[C]	45	35	28	29	19
Miami	85	86	75	69	70	81	80
Montezuma Castle	33	27[C]	31	24	24	33	22
Morenci	37	50	55[C]	35	43	78	43[C]
Nelson	--	37[C]	42	42[C]	42	75[C]	84
Organ Pipe (NM)	31	36[C]	34	24	16	19	15[C]
Page	31	36[C]	38	36	31	38	35
Paul Spur*	395	381	354[C]	303	284[C]	--	178[C]
Payson*	--	--	110	110	88	115	218
Prescott*	--	--	76	71	62	71	81
Rillito*	132	114	112	107[C]	--	101[C]	84
Roosevelt	--	36[C]	38	26	21	28	13
Safford	159	125	107	107	95	96[C]	93[C]
San Manuel	30	29	49	36	33	39	32
Show Low	93	62	66	47	49	43	55
Sierra Vista	65	52[C]	53	45	48	52	53
St. Johns	19	24	23	19	22	22	44
Stanfield	--	65[C]	103	74	92	115	92
Yuma	139	126	121	90	107	100	109

* Clarkdale relocated in 1982
Payson relocated in 1980
Paul Spur relocated in 1985
Prescott relocated in 1980
Rillito relocated in 1983

FIGURE 11
SULFUR DIOXIDE 3-HR EXCEEDANCES IN SMELTER TOWNS

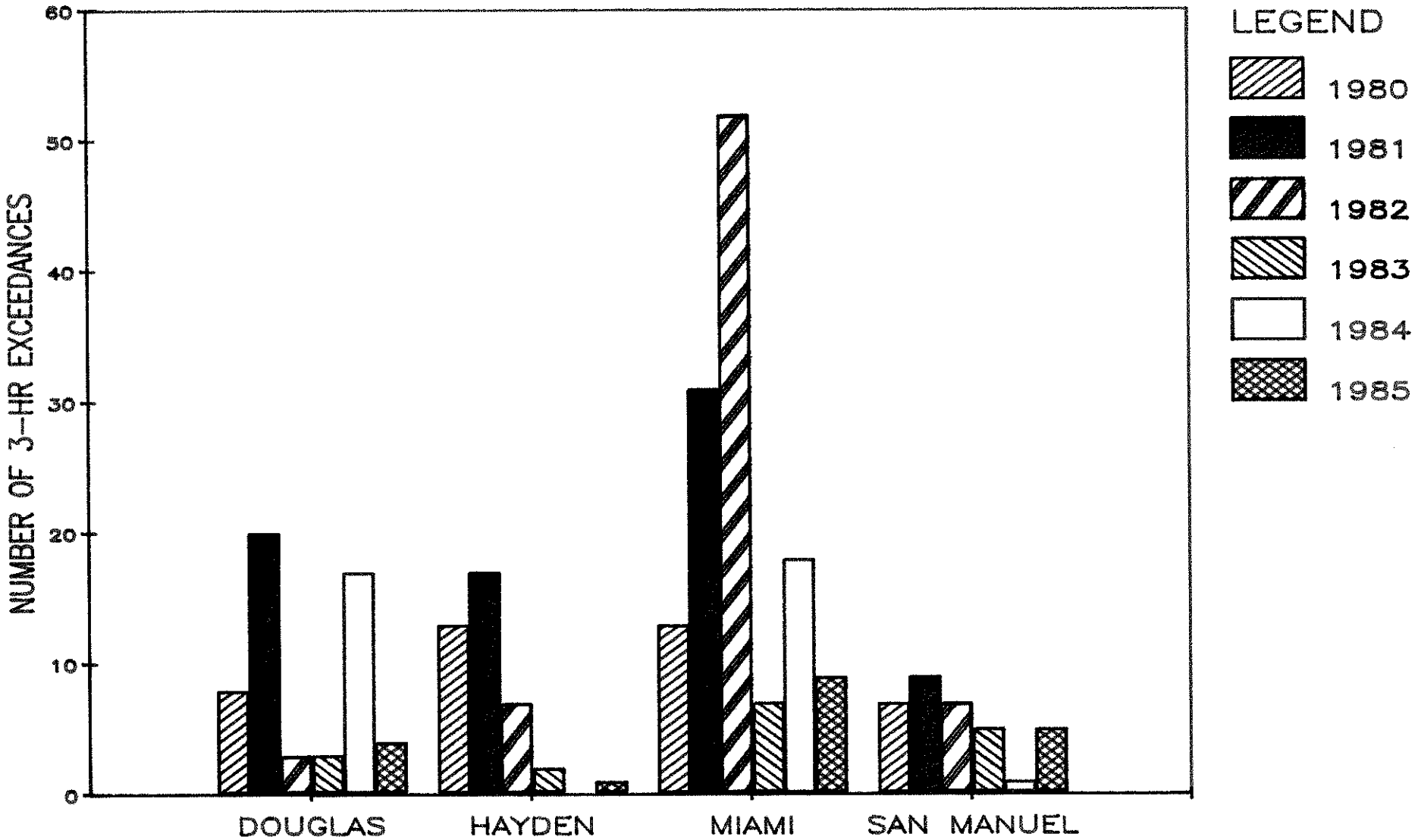
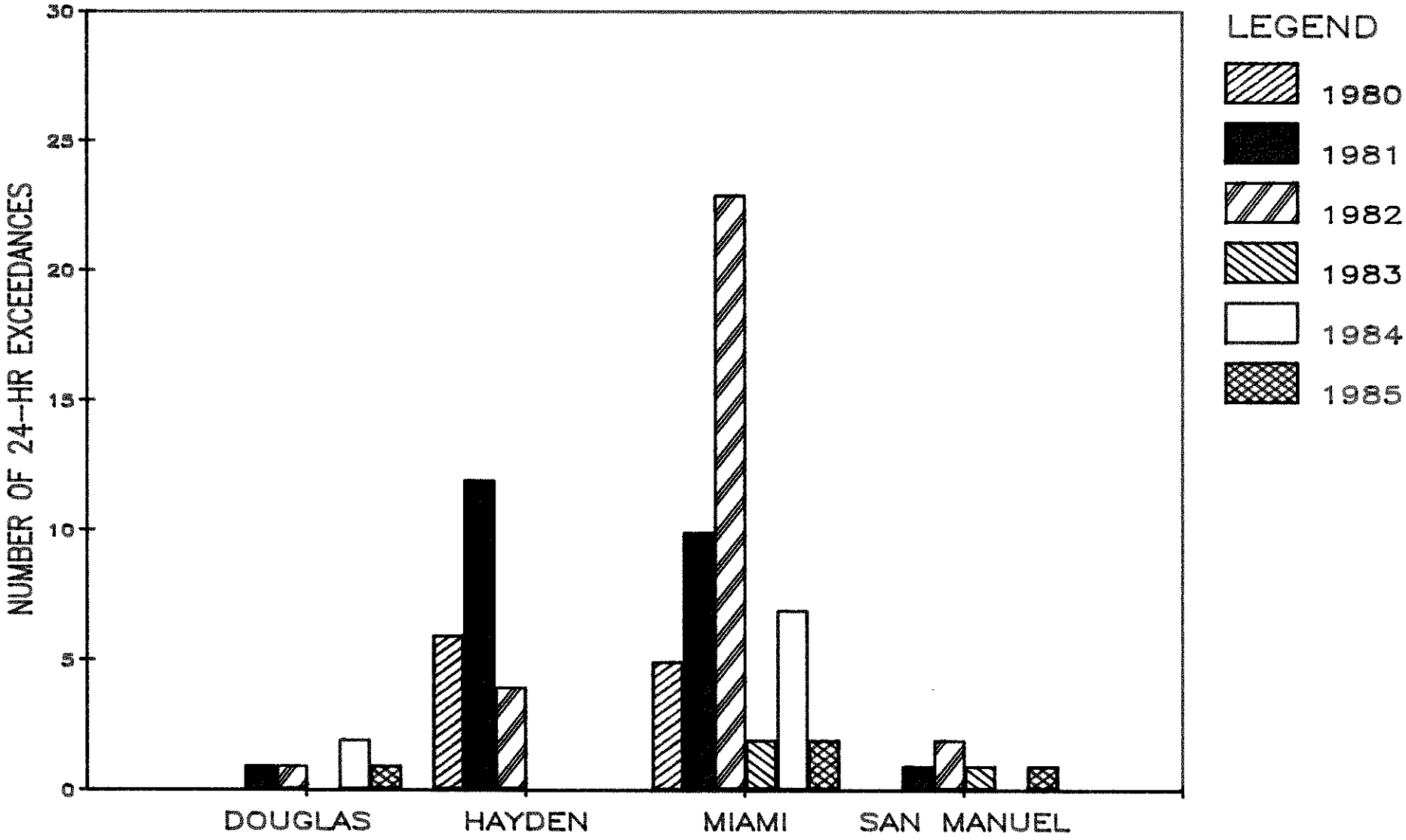


FIGURE 12
SULFUR DIOXIDE 24-HR EXCEEDANCES IN SMELTER TOWNS



APPENDIX C

Summary of Air Quality Standards and Emergency Episode Levels

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)	--
	8-hour	10 (9)	--
Nitrogen Dioxode	Annual	100 (.05)	100 (.05)
Ozone	1-hour	235 (.12)	235 (.12)
Particulates	24-hour	260 (-)	150 (-)
	Annual (Geom.Mean)	75 (-)	60 (-)
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(b)	1-hour	--	--	--	144 (125)
	4-hour	--	--	--	86.3 (75)
	8-hour	17 (15)	34 (30)	46 (40)	57.5 (50)
Nitrogen Dioxide	1-hour	1130 (.6)	2260 (1.2)	3000 (1.6)	3750 (2.0)
	24-hour	282 (.15)	565 (.3)	750 (.4)	938 (.5)
Ozone	1-hour State	400 (.2)	800 (.4)	1000 (.5)	1200 (.6)
	Federal	200 (.1)			
Particulates	24-hour	375 (-)	625 (-)	875 (-)	1000 (-)
Sulfur Dioxide	24-hour	800 (.3)	1600 (.6)	2100 (.8)	2620 (1.0)
Sulfur Dioxide(c) & Particulates combined	24-hour	65000 (-)	261000 (-)	393000 (-)	490000 (-)

(a) Standards are not to be exceeded more than once per year with one exception. In the case of ozone, compliance is determined by the number of days on which the ozone standard is exceeded. The number of ozone exceedance days per year, based on a 3-year running average, is not to exceed 1.0.

(b) In mg/m^3 (and ppm)

(c) In (ug/m^3)^2

APPENDIX D

Glossary of Pollutants in the Ambient Air

Glossary of Pollutants in the Ambient Air

Carbon Monoxide

Carbon monoxide is a colorless, odorless gas formed by incomplete combustion of fuels. The major source of carbon monoxide in the urban air is motor vehicle operation. Aggravation of angina pectoris and other cardiovascular diseases is its major effect on human health.

Hydrocarbons

Hydrocarbons, which are a group of compounds composed of carbon and hydrogen, are the constituents of gaseous and liquid fuels. As a result, motor vehicles, service stations and bulk fuel storage tanks are the chief origins of hydrocarbon emissions. At the concentrations found in ambient air, hydrocarbons are not harmful, but they react with nitrogen oxides to form ozone and other oxidants, substances known to be at deleterious levels in the atmosphere.

Lead

In Arizona lead originates primarily from motor vehicle operation due to the use of lead antiknock compounds in gasoline. Lead concentrations are expected to stay at acceptable levels in the Phoenix area due to increased usage of unleaded gasoline instead of leaded gasoline. The health effects of lead include damage to the blood, the kidneys, and the nervous and reproductive systems in humans, resulting in anemia, brain and kidney diseases, and infertility.

Nitrates

Nitrates is a term referring to nitric acid and salts of nitric acid which are formed in the atmosphere by various complex reactions of nitrogen oxides with other substances. Nitrates exist as finely divided particulates which inhibit visibility, damage the respiratory system, exacerbate respiratory diseases, and soil and damage materials.

Nitrogen Dioxide

Nitrogen dioxide is a reddish-brown corrosive gas produced during high temperature fuel combustion. Power plants and motor vehicles generate the bulk of nitrogen dioxide in the atmosphere. It causes pulmonary edema and bronchitis in children.

Nitrogen Oxides

In air pollution terminology, nitrogen oxides include nitrogen dioxide and nitric oxide only. Both of these gases are emitted by the same major sources, namely motor vehicles and power plants, as a result of high temperature fuel combustion. Nitrogen oxides react with hydrocarbons in the atmosphere to produce ozone and other oxidants.

Oxidants (Ozone)

Oxidants are oxygen-containing gases or vapors that are formed in the atmosphere by the reaction of hydrocarbons with nitrogen oxides. Since sunlight accelerates this reaction, it is referred to as the photochemical reaction and the products formed are sometimes referred to as photochemical oxidants. The principal oxidant is ozone, a pungent, bluish gas which is a triatomic form of oxygen. Oxidants irritate the eyes, nose, and throat, impair breathing, and limit physical exercise. These effects are more severe in persons with chronic lung and cardiovascular diseases.

Particulates

They are small, solid particles or liquid droplets which are suspended in the atmosphere. Examples of particulates include dust, smoke, mist and fog. Particulates reduce visibility in the atmosphere, damage the respiratory system, aggravate respiratory diseases, and soil and damage materials. Major sources of particulates in Arizona are motor vehicle traffic on paved and unpaved roads and streets, construction activity, agriculture, wood burning, industrial and power generating plants and windblown desert lands.

Total Suspended Particulates (TSP)

This term refers to both fine and coarse particulates up to 25-45 microns in diameter. Current air quality standards for particulates are based on TSP.

PM_{10}

PM_{10} is a symbol for particulate matter equal to or less than 10 microns in diameter. Because particles equal to or less than 10 microns pose a greater threat to public health, the U.S. Environmental Protection Agency has proposed changes to health standards by specifying PM_{10} rather than TSP as the pollutant.

Sulfates

Sulfates are a group of compounds including sulfuric acid and salts of sulfuric acid which are emitted by power plants and copper smelters. They are also produced in the atmosphere by the oxidation of sulfur dioxide. Sulfates exist as small particles which cause the same effects on visibility, human health, and materials as noted above for nitrates and particulates.

Sulfur Dioxide

Sulfur dioxide is a heavy, acrid, colorless gas generated by combustion of sulfur-containing fuels in power generating and industrial plants. Another important source in Arizona is the smelting of sulfide ore in the copper industry. Aggravation of respiratory diseases is the primary health effect of sulfur dioxide.

APPENDIX E

Air Sampling Techniques

Air Sampling Techinques

Carbon Monoxide

Carbon monoxide is monitored by non-dispersive infrared absorption, a method which is based on the fact that carbon monoxide absorbs infrared radiation at a wavelength at which other gases do not absorb infrared.

Lead

Concentrations of lead are determined by means of nitric acid extraction of particulate samples followed by atomic absorption analysis of the nitric acid extract.

Nitrates

Nitrates analysis is performed through water extraction of particulate samples and specific ion electrode analysis of the water extract.

Nitrogen Dioxide

The chemiluminescent technique is based on the catalytic conversion of nitrogen dioxide in the air sample to nitric oxide followed by chemiluminescent analysis of the effluent from the convertor for nitric oxide. This measurement represents the concentration of nitrogen dioxide plus nitric oxide in the sample. It is necessary to concurrently monitor the concentration of nitric oxide only by chemiluminescent analysis of that part of the air sample which bypasses the catalytic convertor. The nitric oxide concentration is subtracted from the concentration of nitrogen dioxide plus nitric oxide to give the nitrogen dioxide concentration.

Ozone

The two most widely used methods for ozone monitoring are ultraviolet (UV) and chemiluminescent. In the UV analyzer concentrations are determined by measuring the quantity of UV radiation absorbed by ozone in the air sample.

The chemiluminescent analyzer monitors ozone by detecting the amount of light emitted due to the reaction of ozone with ethylene.

TSP

TSP concentrations are measured by passing a metered flow of air for 24 hours through a pre-weighed 8 X 10 inch glass fiber filter. Particulates in the air sample are trapped on the filter which is delivered to the laboratory for reweighing. The gain in weight of the filter during sampling represents the quantity of particulates collected. The concentration is calculated by dividing the weight of particulates by the volume of air passed through the filter. The filter is then divided into sections for chemical analysis for sulfates, nitrates, lead and other metals.

PM_{10}

PM_{10} is measured essentially the same as TSP except for one major difference. An inlet chamber on the sampler removes particles greater than 10 microns in diameter from the air sample by inertial separation.

Air flow is regulated in PM_{10} samplers by two different methods. In the Sierra-Anderson type a thermal flowmeter is used to control flow whereas the Wedding type utilizes a critical orifice.

Sulfates

Concentrations of sulfates are determined by water extraction of particulate samples followed by turbidimetric analysis of the water extract.

Sulfur Dioxide

In Arizona three methods of sampling are used, including the coulometric, fluorescent and flame photometric methods. The coulometric method consists of scrubbing sample air in an aqueous solution of potassium bromide, bromine and sulfuric acid. Sulfur dioxide in the air sample reacts with bromine, causing a change in electrical potential at the anode. This voltage change is proportional to the amount of bromine which has reacted with sulfur dioxide. Thus, the voltage change is a direct indication of the sulfur dioxide concentration in the air sample.

In the fluorescent analyzer sample air is drawn into a chamber and irradiated with ultraviolet light. Any sulfur dioxide in the airstream is excited to a higher energy state. The excited sulfur dioxide then reverts to a lower energy state by emitting radiation which is measured by a photomultiplier tube.

The flame photometer technique is similar to the fluorescent in that emitted radiation is proportional to the sulfur dioxide concentration. In the flame photometer, however, the radiation is emitted by excited sulfur molecules rather than sulfur dioxide molecules. Sulfur molecules are produced by passing sample air into a hydrogen flame where sulfur dioxide is converted to elemental sulfur. Sulfides must be removed by a scrubber before the air sample is passed into the hydrogen flame because they will also convert to elemental sulfur.