1984
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

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HONORABLE BRUCE BABBITT
Governor
State of Arizona

ARIZONA DEPARTMENT OF HEALTH SERVICES
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Prepared by The Division of Environmental Health Services
Office of Emergency Response and Environmental Analysis

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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 Office of Air Quality Management 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. Permits and Compliance Section

   a. Permits Unit

      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.

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.

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 noncomplying 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.

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.

Misdeameanor 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, high volume particulate samplers, and data recording devices.

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.

A new responsibility for the Instrumentation Section is the set-up, check-out, calibration and deployment of eleven PM_{10} size-selective high volume sampler (SSHVL) units to be provided by the EPA in early 1985. Additional units (10) have also been requested through the State's budgetary process. Preliminary studies and recommendations have been completed on the location and operation of the initial 11 units to be received.

3. Inspection and Maintenance Section

The Inspection and Maintenance Section of the Office of Air Quality Management conducts 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 are conducted each year at nine contractor-operated inspection stations. In addition, approximately 120,000 vehicles are inspected each year in self-inspection fleets. Section personnel assure the quality of emission measurements at both contractor-operated and fleet inspection facilities. In addition, they instruct and train automotive repair mechanics in proper tune-up procedures.

During the inspection, exhaust concentrations of carbon monoxide and hydrocarbons are 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 1984, repairs to those vehicles identified as not meeting the standards improved the average idle emissions of all vehicles in the program by 44% in carbon monoxide and 47% in hydrocarbons.

In support of the OAQM, the Office of Program Administration (OPA) and the Office of Emergency Response and Environmental Analysis (OEREA) within 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.

The Environmental Process Management Section provides assistance to the Office of Air Quality Management in the processing of regulations through the State regulatory 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 for forwarding of the regulations by the Governor as a formal SIP revision.

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 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.

Administration and management of the federal grant is an important task of this group. Closely associated with this activity is the administration of fiscal matters, such as budgets and contracts.

5. Air Data Analysis Section (in OEREA)

The processing and reporting of ambient air quality data from the State monitoring network is the chief 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 demonstrate compliance.

Another function of modeling is the projection of 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.

2. Summary of 1984 Activities

Summary of 1984 Activities

Regulation of industrial facilities under state jurisdiction in 1984 resulted in the following activities:

Operating Source Inspections	548
Visible Emissions Tests	193
Mass Emissions Tests	177
Emissions Monitor Tests	31
Source Ambient Monitor Audits	43
Agency Ambient Monitor Audits	12
Asbestos Renovation Projects	11
Asbestos Renovation Inspection	122
Complaint Investigations	125
Notices of Violation Served	17
Orders of Abatement Served	1
Operating Permits Issued	111
Installation Permits Issued	23
New Source Installation Inspections	39

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

Pollutant	Number of Sites
Carbon Monoxide	4
Lead	10
Ozone	4
Particulates	26
Sulfur Dioxide	10

Data summaries for these sites, plus all county and industrial sites operated in 1984 are included in Appendix A. Long-term trends in air quality are included in Appendix B.

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 progrqm. In February, 1984, 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 departments and council of government.

The following technical reports were prepared in 1984, and copies can be obtained by contacting the author:

"Sources of Visibility Impairment in Phoenix", James L. Guyton, October 23, 1984

"Phoenix CO Hotspot Analysis", Peter G. Hyde, September 28, 1984

"Phoenix Ozone Analysis", Gary R. Neuroth and Peter G. Hyde, January 30, 1985

"1984 Arizona State Fair Air Quality Study", Robert D. Alley, December 31, 1984

APPENDIX A: 1984 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.

1984 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.
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
NPS	National Park Service
Noranda	Noranda Lakeshore Mines, Incorporated
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
Particulates	
Hi-Vol	High volume air sampler
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

1984 Counties and Towns Monitored

COUNTY AND TOWN	CARBON MONOXIDE	LEAD	NITROGEN DIOXIDE	OZONE	PARTICULATES	SULFUR DIOXIDE
APACHE:						
St. Johns			X	X	X	X
Springerville			X		X	X
COCHISE:						
Bisbee					X	
Douglas		X			X	X
Dragoon			X		X	X
Kansas Settlement				X	X	X
McNeal						X
Sierra Vista	X			X	X	
COCONINO:						
Flagstaff	X			X	X	
Grand Canyon				X	X	
Page			X	X	X	X
GILA:						
Hayden		X			X	X
Miami		X			X	X
Payson					X	
Roosevelt					X	
Winkelman						X

Table 1 (Cont'd)

Counties and Towns Monitored

COUNTY AND TOWN	CARBON MONOXIDE	LEAD	NITROGEN DIOXIDE	OZONE	PARTICULATES	SULFUR DIOXIDE
GRAHAM:						
Safford					X	
GREENLEE:						
Morenci		x			x	x
MARICOPA:						
Glendale	X	X		X	X	
Mesa	X	X		X	X	
Phoenix	X	X	X	X	X	X
Scottsdale	X	X	X	X	X	
MOHAVE:						
Bullhead City			X		X	X
Davis Dam					X	X
Riviera					X	X
NAVAJO:						
Joseph City					X	
Show Low					X	
PIMA:						
Ajo		X			X	X
Corona de Tucson					X	

Table 1 (Cont'd)

Counties and Towns Monitored

COUNTY AND TOWN	CARBON MONOXIDE	LEAD	NITROGEN DIOXIDE	OZONE	PARTICULATES	SULFUR DIOXIDE
PIMA (Cont'd):						
Green Valley		X			X	X
Organ Pipe (N.M.)		X			X	
Redington						X
Rillito					X	
Tucson	X	X	X	X	X	X
PINAL:						
Apache Junction					X	
Kearney						X
Mammoth						X
Marana					X	
Oracle						X
San Manuel		X			X	X
Stanfield					X	
SANTA CRUZ:						
Nogales		X			X	
YAVAPAI:						
Clarkdale					X	
Montezuma Castle (N.M.)		X			X	
Nelson					X	
Prescott	X			X	X	
YUMA:						
Yuma	X			X	X	

Figure 1

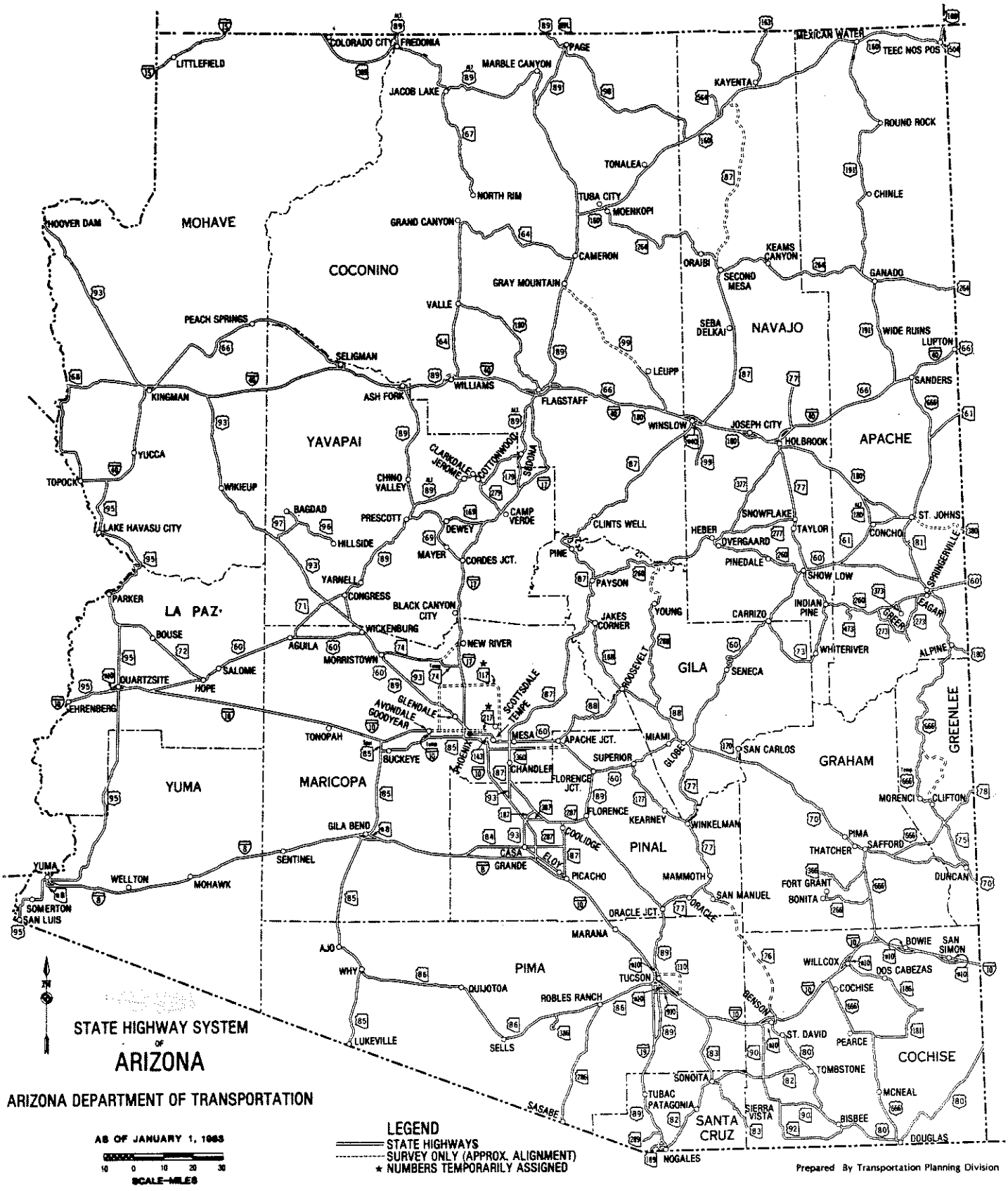

STATE HIGHWAY SYSTEM
OF
ARIZONA
ARIZONA DEPARTMENT OF TRANSPORTATION
AS OF JANUARY 1, 1983
SCALE-MILES
LEGEND
STATE HIGHWAYS
SURVEY ONLY (APPROX. ALIGNMENT)
★ NUMBERS TEMPORARILY ASSIGNED
Prepared By Transportation Planning Division
MOHAVE
COCONINO
NAVAJO
APACHE
YAVAPAI
LA PAZ
YUMA
MARICOPA
PINAL
GILA
GRAHAM
GREENLEE
PIMA
COCHISE
SANTA CRUZ
LITTLEFIELD
COLORADO CITY
FREDONIA
PAGE
MEXICAN WATER
TEEC NOS POS
MARBLE CANYON
JACOB LAKE
KAYENTA
ROUND ROCK
TONALEA
NORTH RIM
TUBA CITY
MOENKOPI
CHINLE
HOOVER DAM
GRAND CANYON
CAMERON
KEAMS CANYON
ORAIBI
SECOND MESA
GANADO
GRAY MOUNTAIN
VALLE
PEACH SPRINGS
SEBA DELKAI
WIDE RUINS
LUPTON
SELIGMAN
LEUPP
KINGMAN
ASH FORK
WILLIAMS
FLAGSTAFF
SANDERS
WINSLOW
JOSEPH CITY
HOLBROOK
YUCCA
CLARKDALE
JEROME
COTTONWOOD
SEDONA
TOPOCK
CHINO VALLEY
WIKIEUP
BAGDAD
PRESCOTT
CAMP VERDE
CLINTS WELL
HEBER
SNOWFLAKE
TAYLOR
ST. JOHNS
CONCHO
LAKE HAVASU CITY
HILLSIDE
DEWEY
MAYER
CORDES JCT.
PINE
OVERGAARD
PINEDALE
SHOW LOW
SPRINGERVILLE
YARNELL
PAYSON
PARKER
CONGRESS
BLACK CANYON CITY
JAKES CORNER
YOUNG
CARRIZO
INDIAN PINE
CONCHO
CEDAR
BOUSE
WICKENBURG
AGUILA
NEW RIVER
WHITERIVER
ALPINE
MORRISTOWN
ROOSEVELT
SENECA
QUARTZSITE
SALOME
HOPE
EHRENBERG
GLENDALE
AVONDALE
GOODYEAR
SCOTTSDALE
TEMPE
TONOPAH
MESA
APACHE JCT.
MIAMI
SAN CARLOS
BUCKEYE
PHOENIX
CHANDLER
SUPERIOR
GLOBE
FLORENCE JCT.
MORENCI
CLIFTON
FLORENCE
KEARNEY
WINKELMAN
GILA BEND
COOLIDGE
CASA GRANDE
ELOY
PICACHO
PIMA
THATCHER
SAFFORD
DUNCAN
YUMA
SENTINEL
MAMMOTH
SAN MANUEL
FORT GRANT
BONITA
WELLTON
MOHAWK
SOMERTON
SAN LUIS
ORACLE JCT.
ORACLE
MARANA
BOWIE
SAN SIMON
AJO
WHY
TUCSON
WILLCOX
DOS CABEZAS
COCHISE
DUILOTOA
ROBLES RANCH
BENSON
LUKEVILLE
SELLS
ST. DAVID
PEARCE
TOMBSTONE
SONOITA
MCNEAL
TUBAC
PATAGONIA
SIERRA VISTA
BISBEE
DOUGLAS
SASABE
NOGALES

Table 2

1984 Carbon Monoxide Data (in mg/m^3)

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	23	19	6	5	0	0	4263
COCONINO:										
Flagstaff[d]	2501 N. 4th St.	State	NDIR	19	17	7	7	0	0	4184
MARICOPA:										
Glendale	6000 W. Olive	Maricopa	NDIR	11[c]	10	8	7	0	0	744
Mesa	Broadway & Brooks	Maricopa	NDIR	13	11	9	7	0	0	7405
Phoenix	4732 S. Central	Maricopa	NDIR	15	14	9	9	0	0	7996
Phoenix	8531 N. 6th St.	Maricopa	NDIR	21	19	10	8	0	0	6714
Phoenix	1845 E. Roosevelt	Maricopa	NDIR	19	19	16	15	14	15	8563
Phoenix	3315 W. Ind.Sch.	Maricopa	NDIR	46	44	20	19	86	120	7582
Phoenix[a]	3847 W. Earll	Maricopa	NDIR	25	24	16	15	15	17	7443
Scottsdale	2857 N. Miller	Maricopa	NDIR	19	19	13	12	2	2	7698
Scottsdale	13665 N.Scotsdl.	Maricopa	NDIR	16	11	6	5	0	0	6530

Table 2 (Cont'd)

1984 Carbon Monoxide Data (in mg/m^3)

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	7	0	0	8311
Tucson	22nd & Craycroft	Pima	NDIR	14	14	9	5	0	0	6477
Tucson	22nd & Alvernon	Pima	NDIR	24	20	12	12	5	5	8372
YAVAPAI:										
Prescott[d]	Co. Maint. Yard	State	NDIR	13	13	8	7	0	0	3827
YUMA:										
Yuma[d]	1485 Second Ave.	State	NDIR	11	10	6	5	0	0	3872

STATE AND FEDERAL STANDARD (mg/m^3): 1-Hour Average 40; 8-Hour Average 10

Table 3

1984 Lead Data
High Volume Sampler (in ug/m^3)

CITY AND COUNTY	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	.11	.17[C]	.10	.16	16	7	12	14
Douglas	City Park	State	.31[C]	.20[C]	.17[C]	.28[C]	8	6	5	6
GILA:										
Hayden	164 4th Ave.	JCC	.19	.12	.16	.11	11	14	13	11
Hayden	Jail	State	.22	.12	.20	.16	16	13	15	14
Miami	Fire Station	State	.23	.32	.36	.39	16	14	15	15
GREENLEE:										
Morenci	Stargo	State	.05	.04	.06	.06	16	15	13	11
MARICOPA:										
Glendale	6000 W. Olive	Maricopa	.50[C]	.20	.20	.30	11	15	15	12
Mesa	Broadway & Brooks	Maricopa	.30	.20	.20	.30[C]	16	15	14	11
Phoenix	1845 E. Roosevelt	Maricopa	.80	.30	.30	.60	14	13	13	15
Phoenix	8531 N. 6th Street	Maricopa	.60	.30	.20	.50	15	15	15	15
Phoenix	4732 S. Central	Maricopa	.50	.20	.20	.40	16	14	15	14

Table 3 (Cont'd)

1984 Lead Data
High Volume Sampler (in ug/m^3)

CITY AND COUNTY	SITE LOCATION	OPERATOR	QUARTERLY AVERAGE 1	2	3	4	NO. OF SAMPLES 1	2	3	4
MARICOPA (Cont'd):										
Phoenix	1826 W. McDowell	Maricopa	1.30	.80	.50[c]	1.0[c]	16	14	11	5
Phoenix[a]	3847 W. Earll	Maricopa	--	--	-	.80[c]	--	--	--	8
Scottsdale	13665 N. Scottsdale Rd.	Maricopa	NR	NR	NR	.30[c]	NR	NR	NR	6
Scottsdale	2857 N. Miller Rd.	Maricopa	.50	.30	.20	.40	15	15	15	13
PIMA:										
Ajo	Well Road	State	.09	.04	.05	.08	15	11	15	15
Organ Pipe (N.M.)	Visitors' Center	State	.01	.01	.02	.01	15	15	15	14
Tucson	1016 W. Prince Road	Pima	.60	.35	.33	.58	16	15	15	14
Tucson	Broadway & Swan	Pima	.37	.27	.22	.37	16	14	14	14
PINAL:										
San Manuel	L.D.S. Church	State	.04	.03	.04	.08	16	15	15	15
SANTA CRUZ:										
Nogales	U.S. Post Office	State	.45	.26	.30	.64	13	15	13	14
YAVAPAI:										
Montezuma Castle (N.M.)	Maint. Building	State	.02	.03	.03	.05	16	15	13	12

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

Table 4

1984 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.	<4	29	NA	6762
Springerville	Airport	TEP	Chem.	3	33	11	7890
Springerville	4 mi. N.E. of Town	TEP	Chem.	3	150	40	7960
COCONINO:							
Page	Water Tower	SRP	Chem.	15[c]	74	26	980
MARICOPA:							
Phoenix	1845 E. Roosevelt	Maricopa	Chem.	46	339	164	7438
Scottsdale	2857 N. Miller Rd.	Maricopa	Chem.	29[c]	132	53	4521
MOHAVE:							
Bullhead City	224 N. Main St.	SCE	Chem.	31	141	63	8328
PIMA:							
Tucson	22nd & Craycroft	Pima	Chem.	35	244	134	7514
Tucson	151 W. Congress	Pima	Chem.	48[d]	226	90	4520

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

Table 5

1984 Ozone Data (in ppm)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	1-HOUR AVERAGE MAX.	1-HOUR AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF STD.	COMPLIANCE STATUS EXCEEDANCES	NO. OF SAMPLES
APACHE:								
St. Johns	Mesa Parada	SRP	U.V.	.09	.09	0	0	7512
COCHISE:								
Kansas Settlement	1 mi. W. of Cotton Gin	AEPCO	U.V.	.05	.05	0	0	6395
Sierra Vista[d]	Fry Boulevard	State	U.V.	.09	.09	0	0	2896
COCONINO:								
Flagstaff[d]	2501 N. 4th St.	State	U.V.	.08	.08	0	0	3965
Grand Canyon	Clinic Bldg.	NPS	U.V.	.04	.04	0	0	4248
Page	Water Tower	SRP	U.V.	.08	.08	0	0	7608
MARICOPA:								
Glendale	6000 W. Olive	Maricopa	U.V.	.14	.14	1	1	7813
Mesa	Broadway & Brooks	Maricopa	U.V.	.10	.09	0	0.3	7711
Phoenix	3315 W. Indian School Rd.	Maricopa	U.V.	.14	.12	1	1.3	5276
Phoenix	1845 E. Roosevelt	Maricopa	U.V.	.16	.15	6	4.0	8471
Phoenix	8531 N. 6th St.	Maricopa	U.V.	.16	.14	2	1.0	6978

Table 5 (Cont'd)

1984 Ozone Data (in ppm)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	1-HOUR AVERAGE MAX.	1-HOUR AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF STD.	COMPLIANCE STATUS EXCEEDANCES	NO. OF SAMPLES
MARICOPA (Cont'd):								
Phoenix[a]	3847 W. Earll	Maricopa	U.V.	.12	.12	0	0	3640
Phoenix	4732 S. Central	Maricopa	U.V.	.11	.11	0	0.7	8076
Scottsdale	2857 N. Miller	Maricopa	U.V.	.13	.12	1	1	7914
Scottsdale	13665 N. Sctsd. Road	Maricopa	U.V.	.09	.09	0	0	6071
PIMA:								
Saguaro Nat. Monument E.	Visitors' Center	Pima	U.V.	.11	.10	0	0	8059
Tucson	151 W. Congress	Pima	U.V.	.10	.10	0	0	8327
Tucson	22nd & Craycroft	Pima	U.V.	.11	.11	0	0	8123
Tucson	9101 N. Thornydale	Pima	U.V.	.07	.07	0	0	1579
Tucson	4591 N. Pomona	Pima	U.V.	.11	.10	0	0.3	7763

Table 5 (Cont'd)

1984 Ozone Data (in ppm)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	1-HOUR AVERAGE MAX.	1-HOUR AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF STD.	COMPLIANCE STATUS EXCEEDANCES	NO. OF SAMPLES
YAVAPAI:								
Prescott[d]	County Maint. Yard	State	U.V.	.08	.08	0	0	4272
YUMA:								
Yuma[d]	1485 2nd Avenue	State	U.V.	.11	.11	0	0	3819

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

1984 Particulates Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL GEOMETRIC MEAN	24-HOUR AVERAGE MAX.	24-HOUR 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	22	43	43	0	0	57
St. Johns	Mesa Parada	SRP	12	38	35	0	0	59
St. Johns	Patterson Well-field	SRP	13	40	28	0	0	60
Springerville	#1, Airport	TEP	18	105	82	0	0	337
Springerville	4 mi. N.E.	TEP	15	87	66	0	0	210
COCHISE:								
Bisbee[a]	Dr. Abbott's Office	State	37[c]	110	23	0	0	3
Douglas	1.2 mi. N. of Smelter	State	54	391	203	1	2	49
Douglas	0.75 mi. N. of Smelter	PD	55	209	164	0	2	51
Douglas	F Avenue & 9th Street	PD	60	230	161	0	5	52

Table 6 (Cont'd)

1984 Particulates Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL GEOMETRIC MEAN	24-HOUR AVERAGE MAX.	24-HOUR 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
COCHISE (Cont'd):								
Douglas	Pirtleville	PD	72	533	199	1	5	49
Douglas	City Park	State	88	268	264	2	7	50
Dragoon	N. Dragoon Mts.	AEPCO	29	110	97	0	0	209
Kansas Settlement	1 mi.W. of Cotton Gin	AEPCO	44	139	135	0	0	214
Sierra Vista	Bartow Drive	State	52	116	99	0	0	49
COCONINO:								
Flagstaff E.	2500 Ft. Valley Road	State	33[c]	38	29	0	0	2
Flagstaff	218 N.Leroux St.	State	62	323	158	1	2	59
Flagstaff W.	5400 N.Dodge Av.	State	22[c]	37	25	0	0	3

Table 6 (Cont'd)

1984 Particulates Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL GEOMETRIC MEAN	24-HOUR AVERAGE MAX.	24-HOUR 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 (Cont'd):								
Grand Canyon	Hopi Point	State	11	172	49	0	1	50
Page	Airport	SRP	43	155	145	0	1	60
Page	Airport	State	38	106	90	0	0	57
Sedona	Post Office	State	28[c]	71	46	0	0	17
GILA:								
Hayden	164 4th Ave.	JCC	99	799	356	3	8	49
Hayden	Jail	State	122	514	301	4	18	58
Miami	Fire Station	State	81	201	156	0	4	60
Payson	County Courthouse	P-G	115	356	314	9	12	59
Roosevelt	Ranger Station	P-G	28	110	80	0	0	61

Table 6 (Cont'd)

1984 Particulates Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL GEOMETRIC MEAN	24-HOUR AVERAGE MAX.	24-HOUR AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF 24-HR. STANDARDS STATE AND PRIMARY	NO. OF EXCEEDANCES OF 24-HR. STANDARDS FEDERAL SECONDARY	NO. OF SAMPLES
GRAHAM:								
Safford	523 10th Ave.	State	96[c]	251	226	0	7	42
GREENLEE:								
Morenci	Cadillac Point	PD	54	173	115	0	1	48
Morenci	Fina Station	PD	53	156	130	0	1	48
Morenci	Fairbanks	PD	51	526	350	2	5	49
Morenci	Stargo	PD	68	191	177	0	2	50
Morenci	Standpipe	PD	24	181	63	0	1	52
Morenci	Stargo	State	78	203	171	0	3	55
MARICOPA:								
Glendale	6000 W.Olive Ave.	Maricopa	100	244	242	0	9	53
Mesa	Broadway & Brooks	Maricopa	82	257	144	0	1	58
Phoenix	1845 E.Roosevelt	Maricopa	120	284	263	2	12	57
Phoenix	1826 W.McDowell	Maricopa	168	363	338	3	28	46

Table 6 (Cont'd)

1984 Particulates Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL GEOMETRIC MEAN	24-HOUR AVERAGE MAX.	24-HOUR 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
MARICOPA (Cont'd):								
Phoenix	8531 N.6th St.	Maricopa	100	351	277	1	12	59
Phoenix	4732 S.Central	Maricopa	115	262	233	1	15	60
Scottsdale	2857 N.Miller Rd.	Maricopa	96	213	147	0	1	59
Scottsdale	13665 N.Scottsdale	Maricopa	126[c]	266	195	1	2	7
Phoenix[a]	3847 W. Earll	Maricopa	110[c]	199	163	0	2	8
MOHAVE:								
Bullhead City	224 N.Main St.	SCE	93	215	164	0	3	60
Davis Dam	Katherine Landing	SCE	25	80	78	0	0	61
Riviera	Ft. Mohave	SCE	42	154	111	0	1	61
NAVAJO:								
Joseph City	3.25 Mi.S.E.of Town	State	34	315	186	1	4	51
Joseph City	6 North Randall	APS	28	313	250	1	4	243
Joseph City	Met Tower	APS	15	116	105	0	0	243
Show Low	Deuce of Clubs Ave.	State	43	228	176	0	4	51

Table 6 (Cont'd)

1984 Particulates Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL GEOMETRIC MEAN	24-HOUR AVERAGE MAX.	24-HOUR AVERAGE 2ND HIGH	NO. OF EXCEEDANCES OF 24-HR. STANDARD STATE AND FEDERAL PRIMARY	NO. OF EXCEEDANCES OF 24-HR. STANDARD STATE AND FEDERAL SECONDARY	NO. OF SAMPLES
PIMA:								
Ajo	Well Road	State	77	273	246	1	10	56
Ajo	Camelback Mountain	PD	20	121	48	0	0	53
Ajo	Oxidation Pond	PD	52	528	194	1	5	55
Ajo	South Tailings Dam	PD	51	371	164	1	2	50
Ajo	Town Square	PD	71	272	236	1	3	49
Corona de Tucson	22000 S. Houghton Rd.	Pima	25	117	75	0	0	60
Green Valley	245 W. Esperanza	Pima	39	427	98	1	1	58
Organ Pipe (N.M.)	Visitors' Center	State	19	47	45	0	0	59
Rillito	Gremmler Residence	State	101[c]	328	252	1	9	36
Tucson	3915 E.Ft. Lowell Rd.	Pima	73	143	135	0	0	60
Tucson	7920 E.Tanque Verde Rd.	Pima	54	124	99	0	0	59
Tucson	2181 S.Harrison Rd.	Pima	55	200	125	0	1	61
Tucson	8100 S.Nogales Hwy.	Pima	48	157	115	0	1	60

Table 6 (Cont'd)

1984 Particulates 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	32 N. Stone[b]	PD	39[c]	92	69	0	0	29
Tucson	3401 W.Orange Grove Rd.	Pima	92	197	193	0	6	61
Tucson	1016 W.Prince Rd.	Pima	91	165	158	0	2	60
Tucson	1810 S.6th Avenue	Pima	91	179	175	0	5	59
Tucson	2nd St. & Palm Ave.	Pima	70	197	143	0	1	55
Tucson	Broadway & Swan	Pima	65	232	114	0	1	58
Tucson	½ mi.E.of Irvington & Alvernon	TEP	74	494	322	3	12	121
Tucson	1970 W. Ajo Way[b]	Pima	69[c]	120	96	0	0	15
Tucson	151 W. Congress	Pima	63	118	110	0	0	58
PINAL:								
Apache Junction	County Yard	P-G	61	231	181	0	5	61
Casa Grande	Indian Hwy 6	Noranda	26[c]	151	114	0	1	31

Table 6 (Cont'd)

1984 Particulates Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL GEOMETRIC MEAN	24-HOUR AVERAGE MAX.	24-HOUR 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
PINAL (Cont'd):								
Mammoth	County Courthouse	P-G	41	85	76	0	0	61
Marana	Pinal Air Park	P-G	29	222	103	0	1	60
San Manuel	Dormsite	Magma	29	52	50	0	0	56
San Manuel	Peppersauce Wash	Magma	28	94	70	0	0	53
San Manuel	Golf Course	Magma	26	57	49	0	0	54
San Manuel	L.D.S. Church	State	39	125	76	0	0	61
San Manuel	Townsite	Magma	35	62	61	0	0	53
Stanfield	County Courthouse	P-G	115	239	237	0	11	59
SANTA CRUZ:								
Nogales	U.S. Post Office	State	100	279	219	1	14	55
YAVAPAI:								
Clarkdale	Fire Station	State	59	148	111	0	0	55
Montezuma Castle (N.M.)	Maint. Bldg.	State	33	146	80	0	0	56

Table 6 (Cont'd)

1984 Particulates Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL GEOMETRIC MEAN	24-HOUR AVERAGE MAX.	24-HOUR 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:								
Nelson	.3 mi.W.of Lime Plant	State	75[c]	242	230	0	8	44
Prescott	Co. Maint. Yard	State	71	181	166	0	2	52
YUMA:								
Yuma	201 S. 2nd Avenue	State	100	571	195	1	9	55

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

Table 7

1984 Sulfur Dioxide Data (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	ANNUAL AVERAGE	MAX. AVERAGE 3-HR.	MAX. AVERAGE 24-HR.	3-HR. DAYS	3-HR. TIMES	24-HR. TIMES	NO. OF 1-HR. SAMPLES
APACHE:										
St. Johns	Mesa Parada	SRP	Flour.	<5	7	<5	0	0	0	8027
Springerville	4 mi.N.E.of Town	TEP	Flame	5	175	58	0	0	0	8235
Springerville	Airport	TEP	Flame	5	35	13	0	0	0	8230
COCHISE:										
Douglas	0.75 mi.N. of Smelter	PD	Coul	57	1527	307	1	1	0	8709
Douglas	Curtis	PD	Coul	37	1546	197	1	1	0	8577
Douglas	Fir	PD	Coul	31	1022	328	0	0	0	8708
Douglas	F Ave. & 9th St.	PD	Coul	38	1755	307	2	2	0	8702
Douglas	Queen	PD	Coul	47	1486	296	2	2	0	8676
Douglas	Mobile IV	PD	Coul	45	2751	438	1	2	1	8695
Douglas	Northwest	PD	Coul	65	2044	506	3	3	1	8700
Douglas	Pirtleville	PD	Coul	45	1247	278	0	0	0	8705

Table 7 (Cont'd)

1984 Sulfur Dioxide Data (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	METHOD	ANNUAL AVERAGE	MAX. 3-HR.	AVERAGE 24-HR.	3-HR. DAYS	3-HR. TIMES	24-HR. TIMES	NO. OF 1-HR. SAMPLES
COCHISE (Cont'd):										
Douglas	1.2 mi.N.of Smelter	State	Fluor.	65	1646	335	7	7	0	7830
Dragoon	N.Dragoon Mts.	AEPCO	Flame	0[c]	39	10	0	0	0	4086
Kansas Setlmt.	1 mi.W.of Cotton Gin	AEPCO	Flame	8[c]	81	39	0	0	0	2556
McNeal	Pinedo Farm	PD	Coul	9[c]	466	81	0	0	0	5169
McNeal	2.6 mi.WSW of Town	State	Fluor.	13	627	166	0	0	0	7317
COCONINO:										
Page	Water Tower	SRP	Fluor.	6	124	34	0	0	0	6528
GILA:										
Hayden	Town Hall	JCC	Coul	11	682	168	0	0	0	8520
Hayden	Jail	JCC	Coul	10	620	127	0	0	0	8688
Hayden	Hayden Jnct.	JCC	Coul	5	492	70	0	0	0	8424

Table 7 (Cont'd)

1984 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-HOUR SAMPLES
GILA (Cont't):										
Hayden	Montgomery Ranch	JCC	Fluor.	21	688	245	0	0	0	8640
Hayden	Montgomery[b] Ranch	State	Fluor.	20[c]	303	113	0	0	0	2147
Hayden	Jail	State	Fluor.	22	693	177	0	0	0	8132
Miami	Cities Serv. Bldg.	State	Fluor.	39	3209	517	1	2	1	8155
Miami	Jones Ranch	State	Fluor.	51	4670	697	9	12	5	8239
Miami	Jones Ranch	ICCC	Fluor.	42	4637	688	9	12	4	8784
Miami	S.E. of Smelter	State	Fluor.	16	1968	378	1	1	1	8246
Miami	Burch Pump St.	ICCC	Fluor.	12	1463	225	2	2	0	8784
Miami	Town Site	ICCC	Fluor.	29	2083	360	1	1	0	8784
Winkelman	School	JCC	Coul	5	330	57	0	0	0	8736
Winkelman	1 mi.North Jct. 77 & 177	JCC	Fluor.	20	537	152	0	0	0	8730

Table 7 (Cont'd)

1984 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	NO. OF 1-HOUR SAMPLES
GREENLEE:										
Morenci	Cadillac Point	PD	Coul	56	2130	472	6	6	1	8742
Morenci	Fina Station	PD	Coul	42	1276	299	0	0	0	8761
Morenci	Mobile-Lower Stargo	PD	Coul	61	1755	330	3	3	0	8195
Morenci	Mobile-Buena Vista	PD	Coul	58	2070	377	2	2	1	8577
Morenci	Metcalf	PD	Coul	40	1292	262	0	0	0	8730
Morenci	Standpipe	PD	Coul	33	1328	309	1	1	0	8740
Morenci	Stargo	PD	Coul	69	2036	325	5	5	0	8665
Morenci	Fairbanks	PD	Coul	13	655	136	0	0	0	8770
Morenci	Stargo	State	Fluor.	101	2565	550	15	16	5	8460
Morenci	Cadillac Point	State	Fluor.	67	2481	410	5	6	2	8560
MARICOPA:										
Phoenix	1845 East Roosevelt	Maricopa	Coul	11[c]	NR	102	NR	NR	0	1884

Table 7 (Cont'd)

1984 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	NO. OF 1-HR. SAMPLES
MOHAVE:										
Bullhead City	224 N. Main St.	SCE	Flame	27	115	39	0	0	0	8353
Davis Dam	Katherine Landing	SCE	Flame	28	149	44	0	0	0	8298
Riviera	Ft. Mohave	SCE	Flame	28	157	57	0	0	0	8166
PIMA:										
Ajo	Town Square	PD	Coul	20[c]	1293	351	0	0	0	5935
Ajo	Oxidation Pond	PD	Coul	41[c]	1022	305	0	0	0	5835
Ajo	S. Tailings Dam	PD	Coul	30[c]	4218	593	8	9	4	5836
Ajo	Camelback Mountain	PD	Coul	9[c]	472	119	0	0	0	5183
Ajo	Gibson	PD	Coul	6[c]	1249	176	0	0	0	5830
Ajo	Shelton	PD	Coul	8[c]	515	100	0	0	0	5843
Ajo	Miller	PD	Coul	5[c]	192	37	0	0	0	5804
Ajo	Hotshot	PD	Coul	5[c]	140	34	0	0	0	5823
Ajo	Well Road	State	Fluor.	23	927	227	0	0	0	8643

Table 7 (Cont'd)

1984 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
PIMA (Cont'd):										
Redington	E.of Main Ranch	Magma	Fluor.	6	319	55	0	0	0	8762
Tucson	32 N. Stone	PD	Coul	1[c]	31	5	0	0	0	4171
Tucson	1721 N.Tanque Verde	Pima	Fluor.	1[c]	60	20	0	0	0	5356
Tucson	22nd & Craycroft	Pima	Fluor.	8	157	40	0	0	0	7482
PINAL:										
Kearny	202 Hammond Dr.	JCC	Coul	14[c]	168	40	0	0	0	1416
Mammoth	Courthouse	Magma	Fluor.	7	452	142	0	0	0	8731
Oracle	Courthouse	Magma	Fluor.	12	1107	193	0	0	0	8720
San Manuel	Townsite	Magma	Fluor.	50	1224	337	0	0	0	8712
San Manuel	Golf Course	Magma	Fluor.	44	1260	313	0	0	0	8737
San Manuel	Dormsite	Magma	Fluor.	58	1353	332	1	1	0	8745
San Manuel	Minesite	Magma	Fluor.	38	1145	212	0	0	0	8732

Table 7 (Cont'd)

1984 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	NO. OF 1-HR. SAMPLES
PINAL:										
San Manuel	L.D.S. Church	State	Fluor.	41	1185	236	0	0	0	8704
Winkelman	1 mi.S.Jct. 77 & 177	JCC	Coul	4	252	35	0	0	0	8736

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

Table 8

1984 Nitrates Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	MAXIMUM 24-HOUR AVERAGE	NO. OF SAMPLES
APACHE:					
Springerville	Airport	TEP	0.3	2.0	156
Springerville	4 mi. N.E. of Town	TEP	0.2	1.9	108
COCHISE:					
Bisbee	Dr. Abbott's Office	State	0.9[c]	1.2	3
Douglas	City Park	State	1.7[c]	3.1	25
Douglas	1.2 mi.N. of Smelter	State	1.2	2.6	49
Sierra Vista	Bartow Drive	State	1.5	2.6	49
COCONINO:					
Flagstaff	218 N. Leroux Street	State	1.6	3.9	59
Grand Canyon	Hopi Point	State	1.5[c]	2.7	25
Page	Airport	State	2.2	10.6	57
GILA:					
Hayden	Jail	State	1.7	3.1	58
Miami	Fire Station	State	2.1	3.9	60

Table 8 (Cont'd)

1984 Nitrates Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	MAXIMUM 24-HOUR AVERAGE	NO. OF SAMPLES
GRAHAM:					
Safford	523 10th Avenue	State	1.9[C]	4.5	42
GREENLEE:					
Morenci	Stargo	State	1.6	3.2	55
NAVAJO:					
Joseph City	3.25 mi. S.E. of Town	State	1.4	5.3	51
Show Low	Deuce of Clubs Avenue	State	1.4	7.4	51
PIMA:					
Ajo	Well Road	State	1.8	3.1	56
Organ Pipe (N.M.)	Visitors' Center	State	1.6	3.6	59
Rillito	Gremmler Residence	State	2.5[C]	6.2	36
Tucson	½ Mi.E. of Irvington & Alvernon	TEP	1.5	6.9	128
PINAL:					
San Manuel	L.D.S. Church	State	1.6	3.4	61

Table 8 (Cont'd)

1984 Nitrates Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	MAXIMUM 24-HOUR AVERAGE	NO. OF SAMPLES
SANTA CRUZ:					
Nogales	U.S. Post Office	State	1.9	6.5	55
YAVAPAI:					
Clarkdale	Fire Station	State	1.8	5.6	55
Montezuma Castle (N.M.)	Maint. Building	State	1.7	5.4	56
Nelson	1. mi. N. of Lime Plant	State	1.3[c]	3.9	44
Prescott	County Maint. Yard	State	2.2	6.8	52
YUMA:					
Yuma	201 S. 2nd Avenue	State	3.3	8.9	55

Table 9

1984 Sulfates Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	MAXIMUM 24-HOUR AVERAGE	SAMPLES
APACHE:					
Springerville	Airport	TEP	1.6	7.1	336
Springerville	4 mi. N.E. of Town	TEP	1.6	4.9	210
COCHISE:					
Bisbee	Dr. Abbott's Office	State	10.8[c]	15.4	3
Douglas	1.2 mi. N. of Smelter	State	8.3	16.8	49
Douglas	City Park	State	7.9[c]	12.8	25
Sierra Vista	Bartow Drive	State	4.7	11.6	49
COCONINO:					
Flagstaff	218 N. Leroux Street	State	2.6	6.9	59
Grand Canyon	Hopi Point	State	2.2[c]	4.7	25
Page	Airport	State	3.3	6.6	57
GILA:					
Hayden	Jail	State	7.2	12.7	58
Miami	Fire Station	State	9.1	19.6	60

Table 9 (Cont'd)

1984 Sulfates Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	MAXIMUM 24-HOUR AVERAGE	NO. OF SAMPLES
GRAHAM:					
Safford	523 10th Avenue	State	4.9[C]	9.8	42
GREENLEE:					
Morenci	Stargo	State	9.3	20.0	55
MARICOPA:					
Glendale	6000 W. Olive Avenue	Maricopa	5.1	9.4	51
Mesa	Broadway & Brooks	Maricopa	4.0	11.0	56
Phoenix	1845 E. Roosevelt	Maricopa	5.0	14.0	53
Phoenix	4732 S. Central	Maricopa	4.2	11.0	57
Phoenix	8531 N. 6th Street	Maricopa	4.3	9.2	57
Phoenix	1826 W. McDowell	Maricopa	6.0[C]	14.7	44
Scottsdale	2857 N. Miller Road	Maricopa	4.7	11.1	57
Scottsdale	13665 N. Scottsdale Road	Maricopa	4.7[C]	6.4	7

Table 9 (Cont'd)

1984 Sulfates Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	MAXIMUM 24-HOUR AVERAVE	NO. OF SAMPLES
NAVAJO:					
Joseph City	3.25 Mi. S.E. of Town	State	4.8	10.8	51
Show Low	Deuce of Clubs Avenue	State	3.0	8.5	51
PIMA:					
Ajo	Well Road	State	6.5	18.1	56
Corona de Tucson	22000 S. Houghton	Pima	4.3[C]	8.0	18
Green Valley	245 W. Esperanza	Pima	5.3[C]	14.9	23
Organ Pipe (N.M.)	Visitors' Center	State	3.0	7.7	59
Rillito	Gremmler's Residence	State	6.3[C]	22.3	36
Tucson	3915 E. Ft. Lowell Road	Pima	4.3[C]	9.0	22
Tucson	151 W. Congress	Pima	4.9[C]	8.5	23
Tucson	1810 S. 6th Avenue	Pima	5.0[C]	7.7	23
Tucson	3401 W. Orange Grove Road	Pima	4.4[C]	7.6	24
Tucson	1016 W. Prince Road	Pima	4.9[C]	9.0	24
Tucson	½ mi. E. of Irvington & Alvernon	TEP	3.1	9.1	127

Table 9 (Cont'd)

1984 Sulfates Data
High Volume Sampler (in ug/m^3)

COUNTY AND CITY	SITE LOCATION	OPERATOR	ANNUAL AVERAGE	MAXIMUM 24-HOUR AVERAGE	NO. OF SAMPLES
PINAL:					
San Manuel	L.D.S. Church	State	8.5	18.8	61
SANTA CRUZ:					
Nogales	U.S. Post Office	State	4.7	9.6	55
YAVAPAI:					
Clarkdale	Fire Station	State	2.6	5.0	55
Montezuma Castle (N.M.)	Maint. Building	State	2.8	7.8	56
Nelson	1 mi. N. of Lime Plant	State	2.6[c]	5.6	44
Prescott	County Maint. Yard	State	2.8	6.7	52
YUMA:					
Yuma	201 S. 2nd Avenue	State	4.0	7.3	55

APPENDIX B: Air Quality Trends

Carbon Monoxide

In Phoenix very little change in the two highest 8-hour concentrations occurred in 1984 at the long-term trend site, 1845 East Roosevelt. In fact, referring to Figure 2, no substantial variation is apparent over the past three years at this site. A different trend, one of decreasing levels, is indicated in the number of exceedances of the 8-hour standard (Refer to Figure 4).

It should be noted that higher concentrations have been recorded at 3315 West Indian School Road since monitoring began in 1981 at this site. For example, the two highest 8-hour readings were 20 mg/m^3 and 19 mg/m^3 in 1984, compared with 16 mg/m^3 and 15 mg/m^3 at the Roosevelt site. A much greater difference between these two sites is evident in the highest 1-hour concentrations. The Indian School Road site recorded maximum and second highest 1-hour levels of 46 mg/m^3 and 44 mg/m^3; whereas the two highest measurements at the Roosevelt site were both only 19 mg/m^3. In fact, two violations of the 1-hour standard were monitored at the Indian School site, the first time this has occurred in Phoenix since 1972.

In Tucson very little change in the 8-hour carbon monoxide concentrations data was apparent in 1984. These data for the 22nd Street and Alvernon site are plotted in Figure 3. The two highest readings have tended to level out at 12-13 mg/m^3 over the last few years. During that same period, the number of exceedances of the 8-hour standard has increased and then decreased in 1984 as shown in Figure 4. In summary, it can be concluded that there is no obvious correlation between the trends in the highest concentrations and the trends in the number of exceedances.

In Flagstaff, Prescott, Sierra Vista and Yuma, carbon monoxide levels have not varied significantly during the past three years. At Flagstaff and Prescott the second highest 8-hour concentrations are running about 7 mg/m^3; whereas at Sierra Vista and Yuma, 5 mg/m^3 is the leveling point. Based on these data, which are plotted in Figure 5, no violations of the 8-hour carbon monoxide standard are likely in the near future in these cities.

Lead

After decreasing for a number of years, lead concentrations in Phoenix and Tucson seem to be leveling out (See Figure 6). This pattern appears to have developed first in Tucson in 1981, followed by Phoenix in 1982. Compliance with the quarterly standard, 1.5 ug/m^3, was achieved in 1981 in Phoenix; whereas, in Tucson, no violations of the standard have been measured.

It is noteworthy that in Phoenix and Tucson lead levels tended to converge in 1982 and 1983, but separated in 1984 when Phoenix levels increased and Tucson values declined. In addition, it should be noted that in Phoenix, higher concentrations are measured at 1826 West McDowell Road, a newer site near the six-way intersection of McDowell, Grand Avenue and 19th Avenue. The maximum quarterly average concentration increased to 1.3 ug/m^3 at that site in 1984.

Nitrogen Dioxide

It is difficult to assess nitrogen dioxide trends in Phoenix due to the large increases and decreases in concentrations from year to year. (See Figure 7.) In Tucson, however, nitrogen dioxide concentrations appear to have declined substantially over the last three years, which is surprising. The most likely reason for the ambiguous data is low data recovery. At any rate, compliance with the annual standard, 100 ug/m^3, is clearly indicated in Phoenix and Tucson at these two sites referred to in Figure 7.

Ozone

In Phoenix the second highest 1-hour concentration increased from .12 ppm in 1976 to .15 ppm in 1977, after which it has fluctuated between .14 and .16 ppm. (See Figure 8.) Thus, no significant trend is evident during the past seven years. In Tucson a different pattern has been followed, with the highest ozone levels increasing gradually from .10 ppm in 1976 to .12-.13 ppm in 1982. However, from 1982 to 1984, the two highest 1-hour readings decreased to .11 ppm (See Figure 9).

In general, the ozone exceedance data for Phoenix (See Figure 10) follow the concentration trends with one exception. In 1981 the highest concentrations increased; whereas, the number of exceedances diminished. Comparison of these two trend indicators is difficult because there is much greater variability in the number of exceedances.

In Flagstaff, Prescott and Sierra Vista the highest ozone concentrations have randomly declined and increased from year to year (See Figure 11). The 2nd highest 1-hour concentrations have been averaging about .08 ppm in these cities, well below the standard of .12 ppm. Yuma ozone levels in contrast exhibit a gradual upward trend, starting at .07 ppm in 1980 and reaching .11 ppm in 1983.

Particulates

In Phoenix and Tucson particulate concentrations were generally higher in 1984, reversing a downward trend observed from 1979 through 1983 (Refer to Tables 10 and 11). This increase in particulate concentrations is probably due to a state-wide change in weather conditions in 1984. The basis for this conclusion is the fact that particulate concentrations were higher not only in Phoenix and Tucson, but in other areas of the state. In Phoenix all six of the monitoring sites in Figure 12 exceeded the annual standard. In contrast, eight of the eleven Tucson sites were in compliance with the annual standard.

In other cities and towns particulate levels also increased in 1984, but some of these sites are located near industrial facilities (Refer to Table 12). Thus, factors other than meteorology may have affected the data. However, background sites including those at the Grand Canyon, Organ Pipe Cactus National Monument and Montezuma Castle National Monument recorded significantly higher concentrations in 1984.

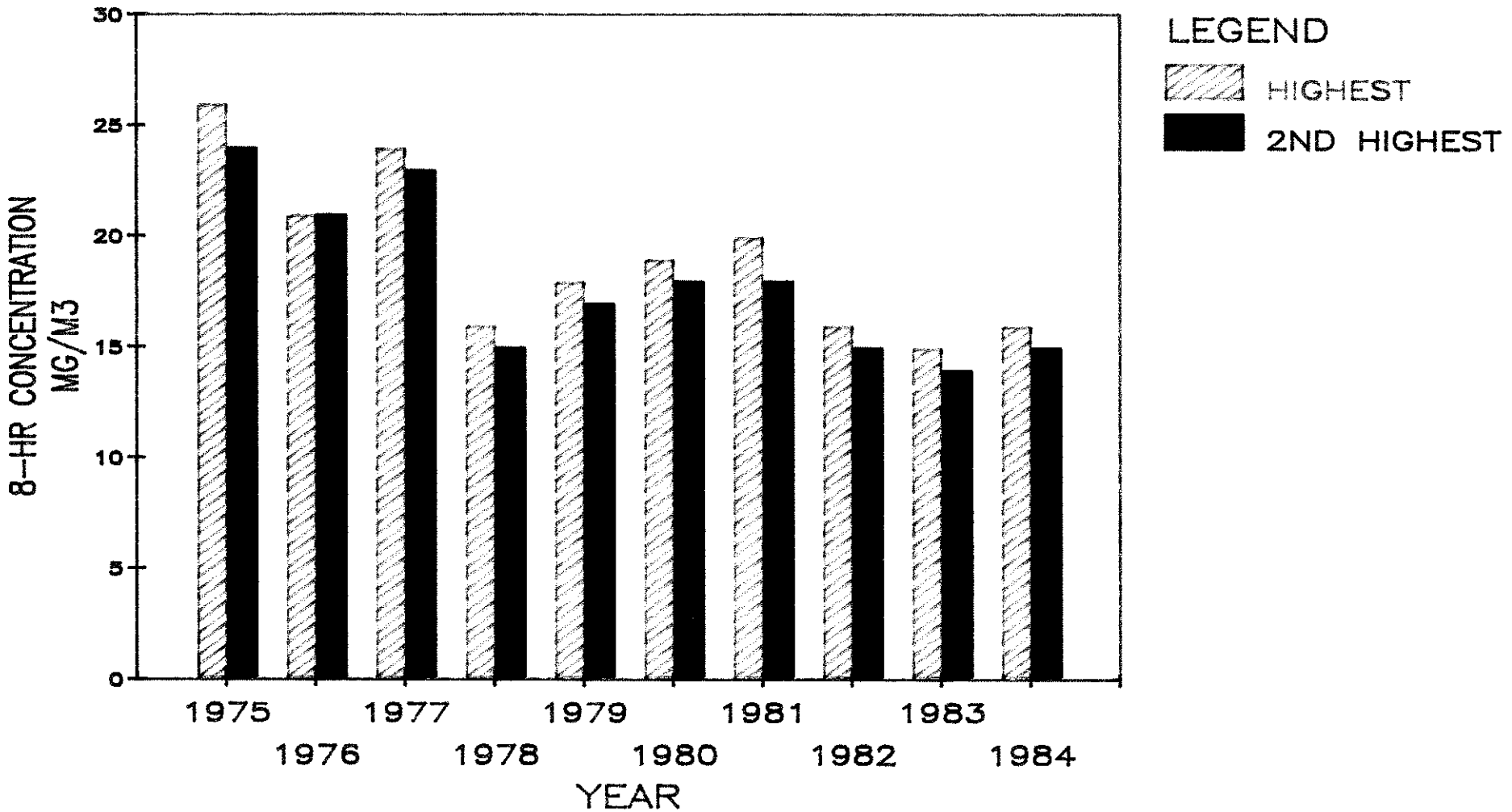
Industrial sites monitoring exceptionally large increases in particulate levels in 1984 include Ajo, Morenci and Nelson.

Sulfur Dioxide

Annual average concentrations in 1984 remained well below the annual standard in all smelter towns except Morenci (See Table 13). In that smelter town the annual average level declined from 118 ug/m^3 in 1983 to 101 ug/m^3 in 1984. The greatest reductions in annual average concentrations have been in Hayden, where the lowest value was monitored in 1984 for the sites referenced in Figure 14. In contrast, this same site measured the highest concentrations in 1979 and 1981.

Hayden and San Manuel had by far the fewest number of exceedances of the short-term sulfur dioxide standards in 1984, 0 and 1 respectively (See Table 14). The one exceedance which was measured in San Manuel was an exceedance of the 3-hour standard. No 24-hour exceedance was detected in either of these smelter towns. The greatest number of exceedances occurred in Morenci, but they were much fewer than in 1983. In Ajo, Douglas and Miami the exceedance frequencies increased substantially in 1984. For all the smelter towns, the 3-hour standard was exceeded much more frequently than the 24-hour standard during the 1978 - 1984 period.

FIGURE 2
CARBON MONOXIDE CONCENTRATIONS IN PHOENIX



1845 E ROOSEVELT

FIGURE 3
CARBON MONOXIDE CONCENTRATIONS IN TUCSON

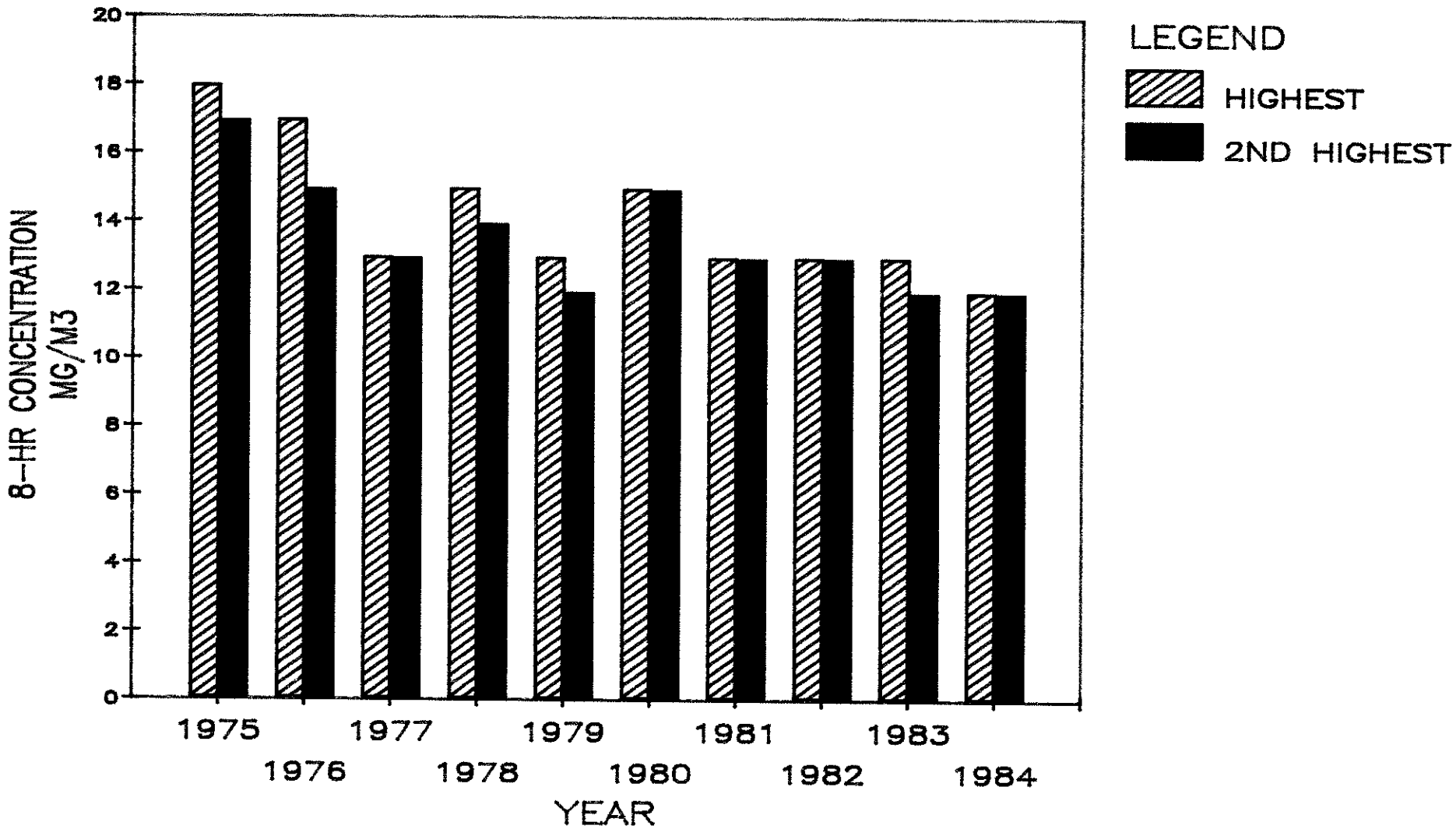
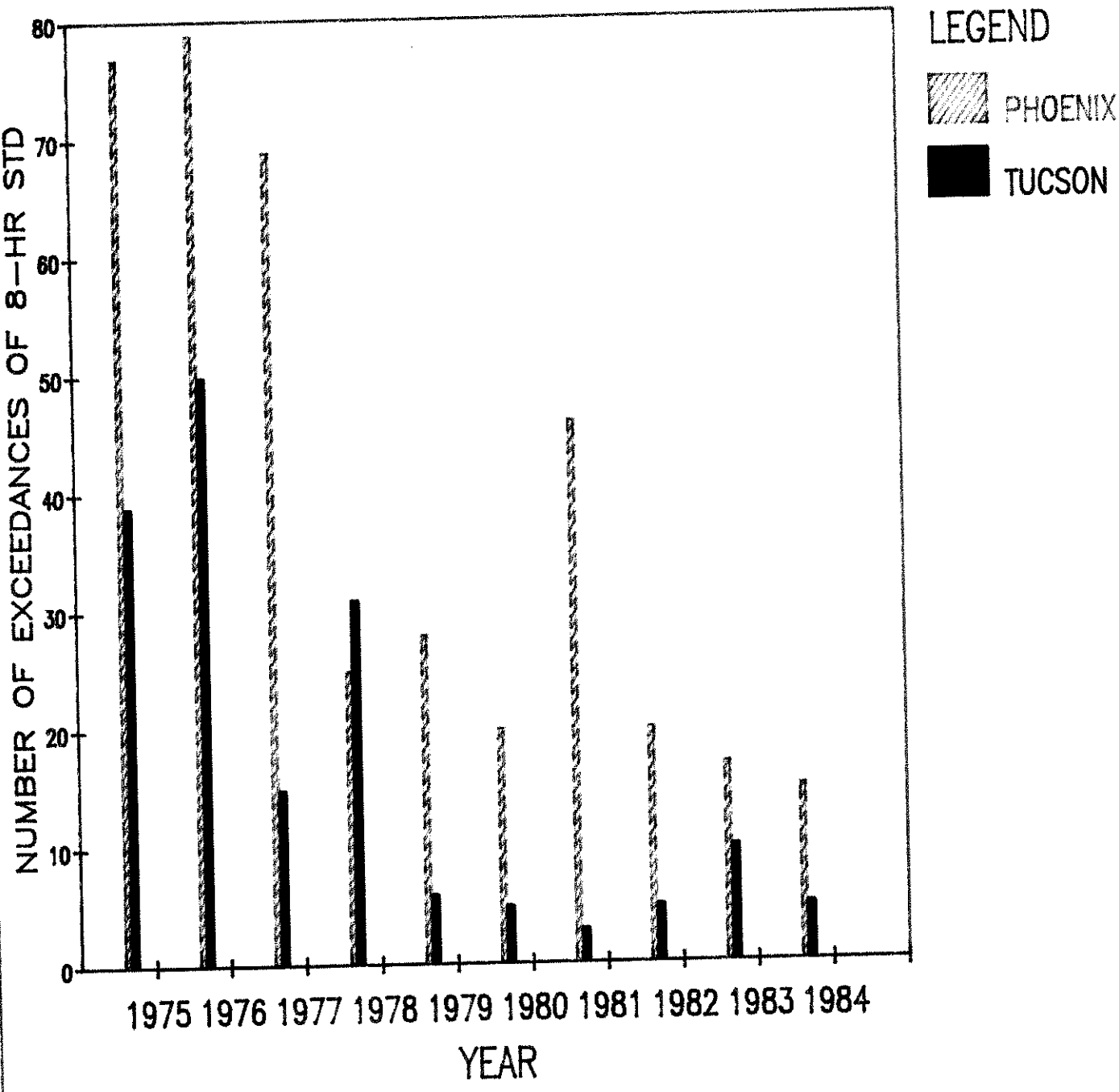


FIGURE 4
CARBON MONOXIDE EXCEEDANCES IN PHOENIX AND TUCSON



PHX-ROOSEVELT TUC-22ND/ALV

FIGURE 5
CARBON MONOXIDE CONCENTRATIONS IN VARIOUS CITIES

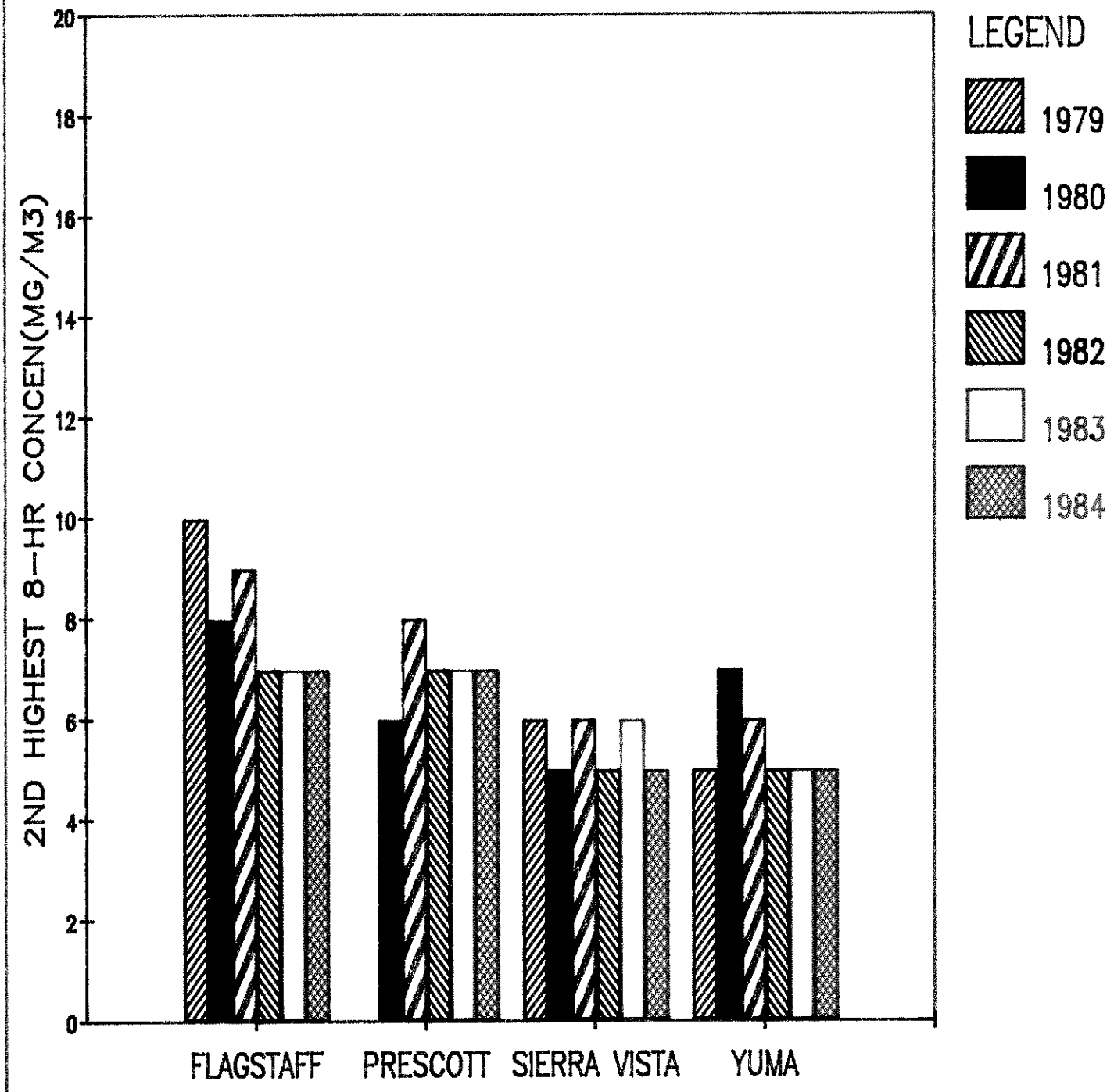


FIGURE 6
LEAD CONCENTRATIONS
IN PHOENIX AND TUCSON

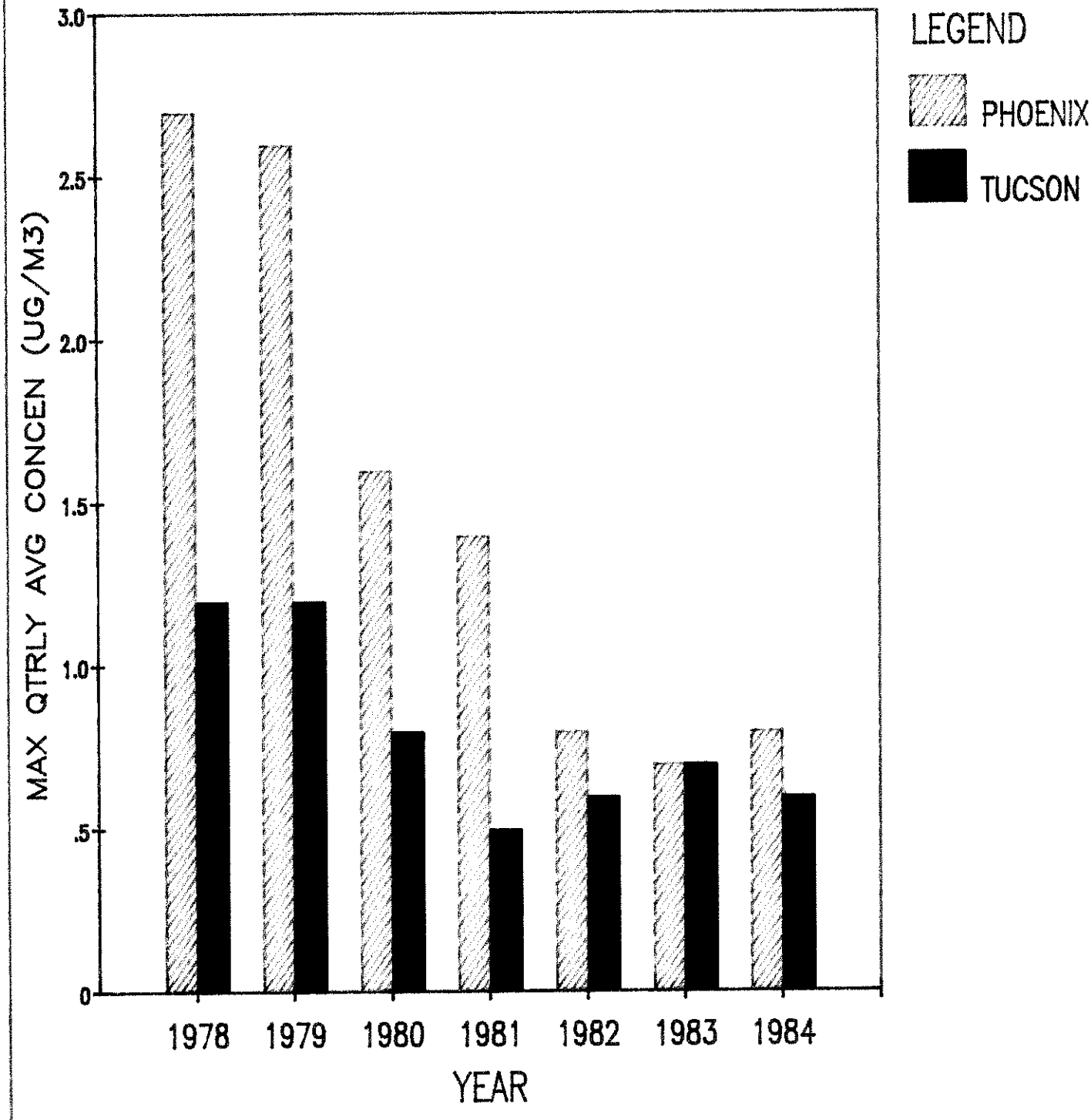
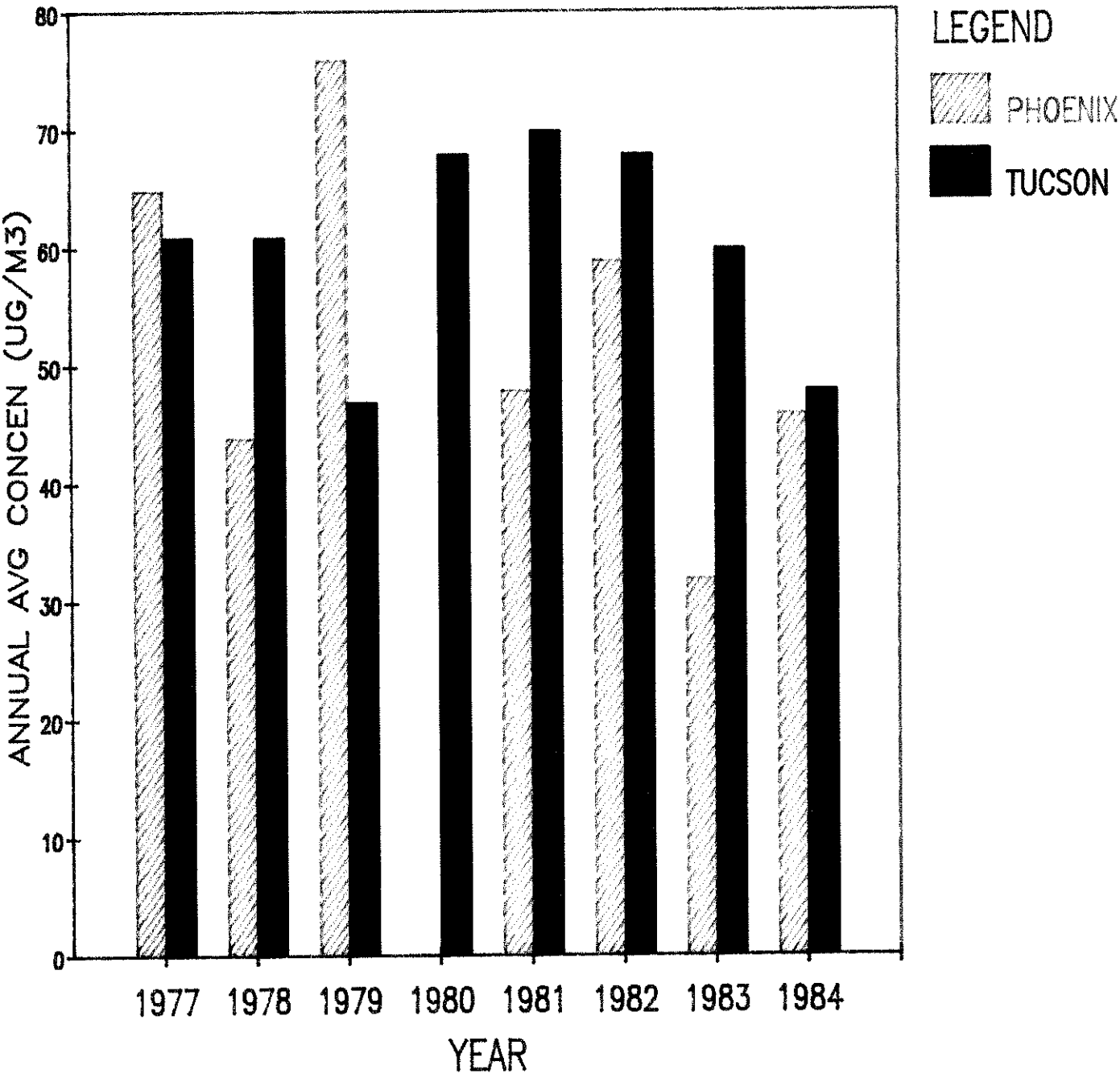


FIGURE 7
NITROGEN DIOXIDE CONCENTRATIONS IN PHOENIX AND TUCSON



PHX--ROOSEVELT TUC--CONGRESS

FIGURE 8
OZONE CONCENTRATIONS IN PHOENIX

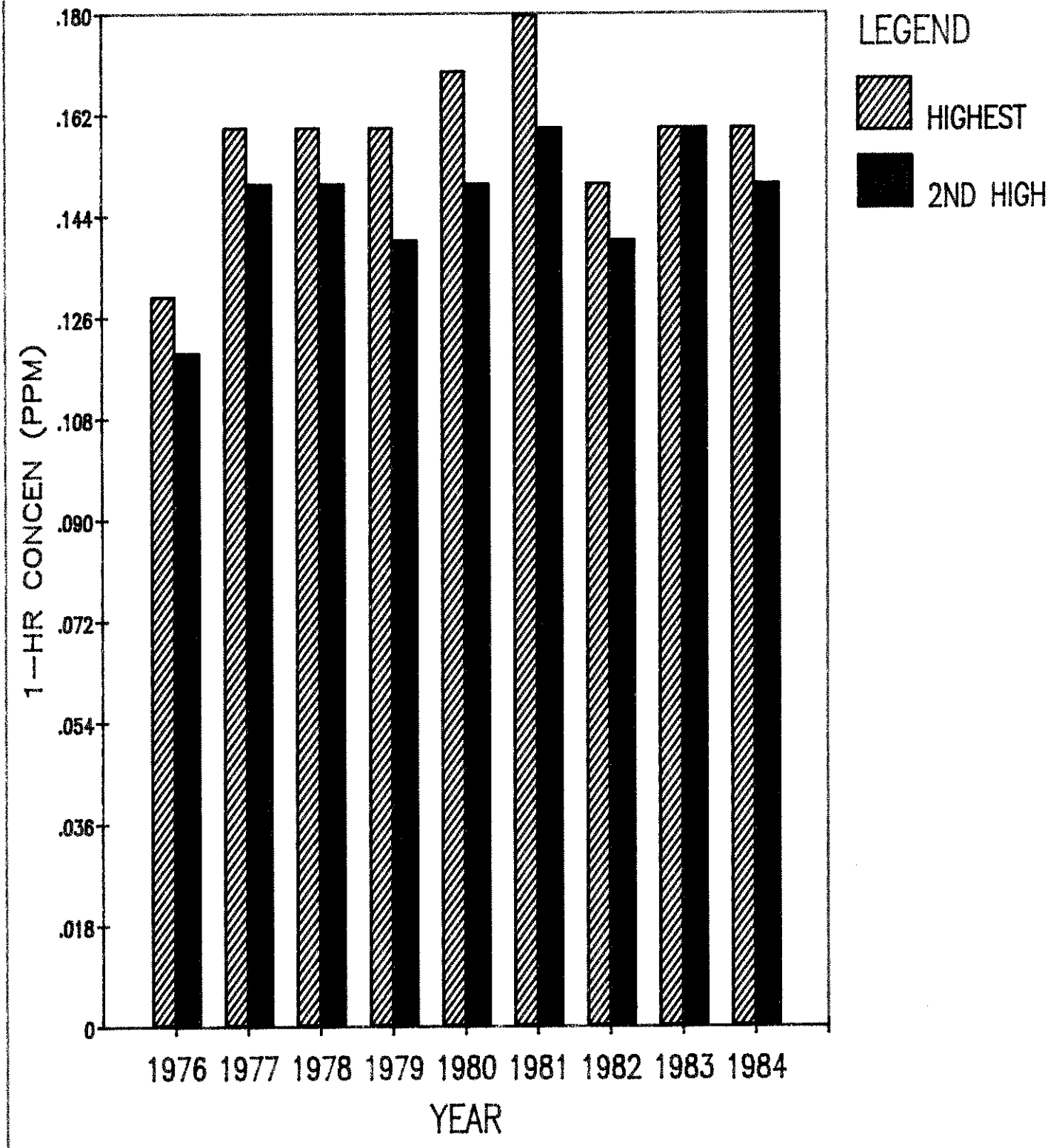


FIGURE 9
OZONE CONCENTRATIONS IN TUCSON

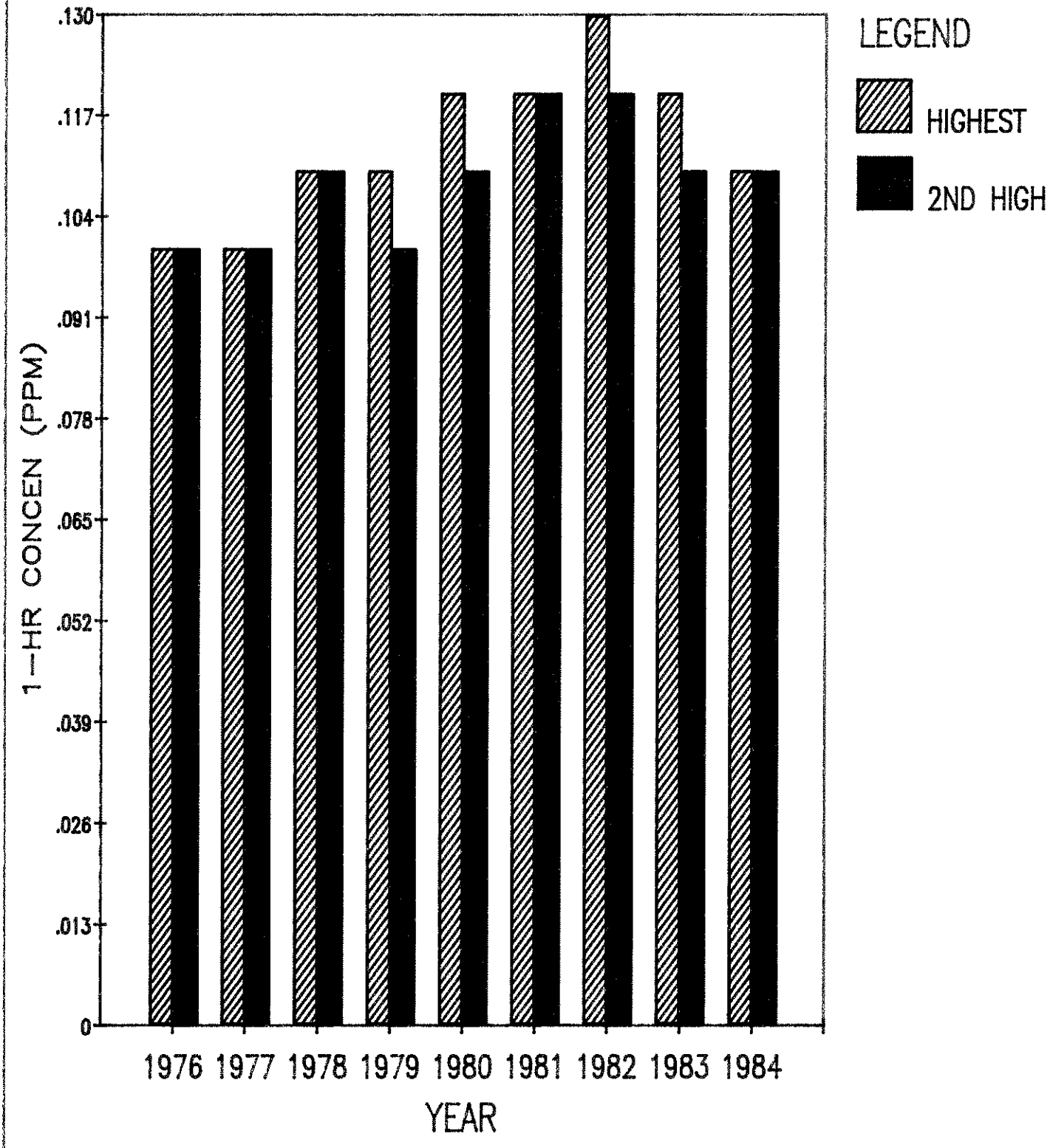


FIGURE 10
OZONE EXCEEDANCES IN PHOENIX

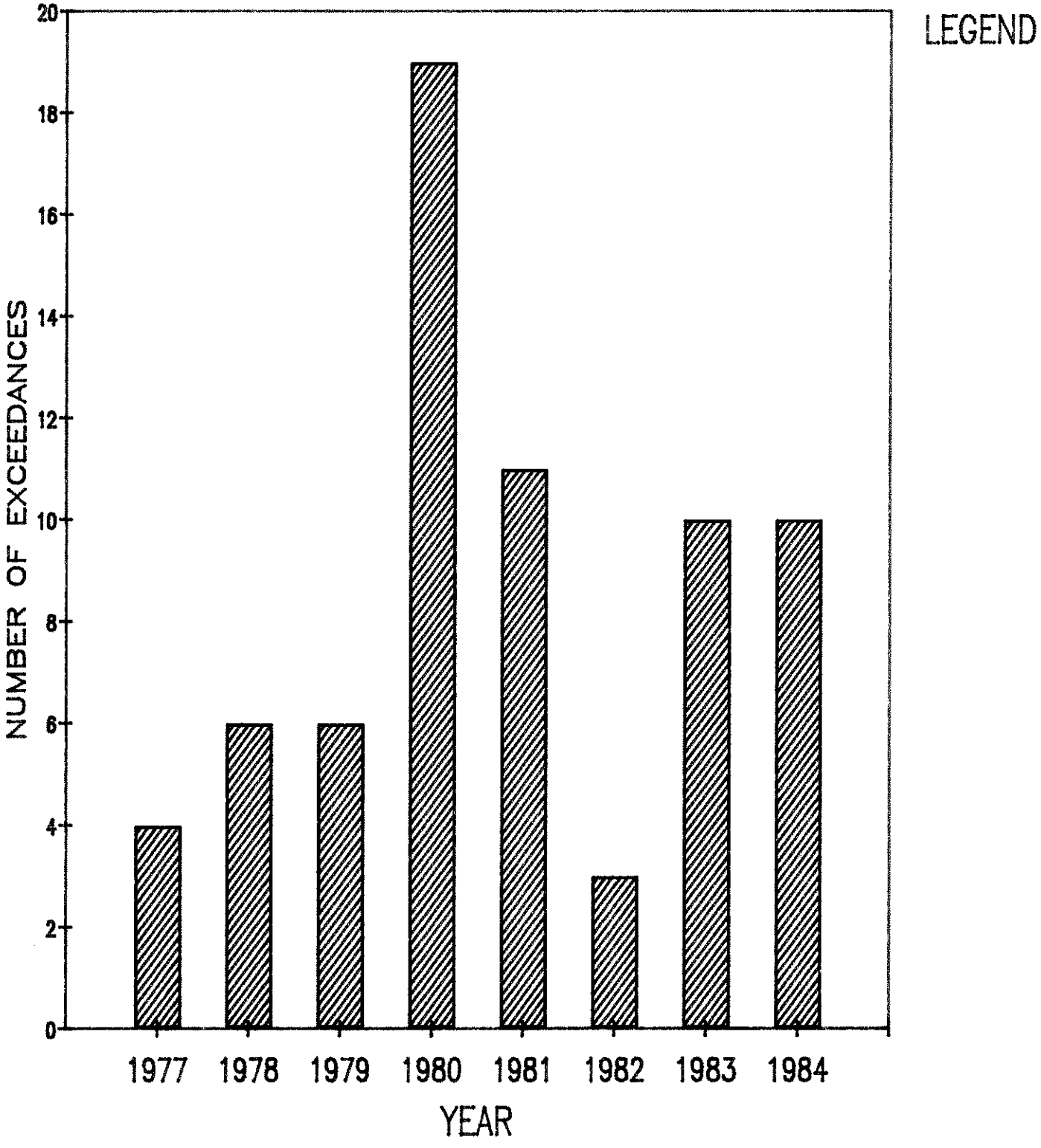


FIGURE 11
OZONE CONCENTRATIONS IN VARIOUS CITIES

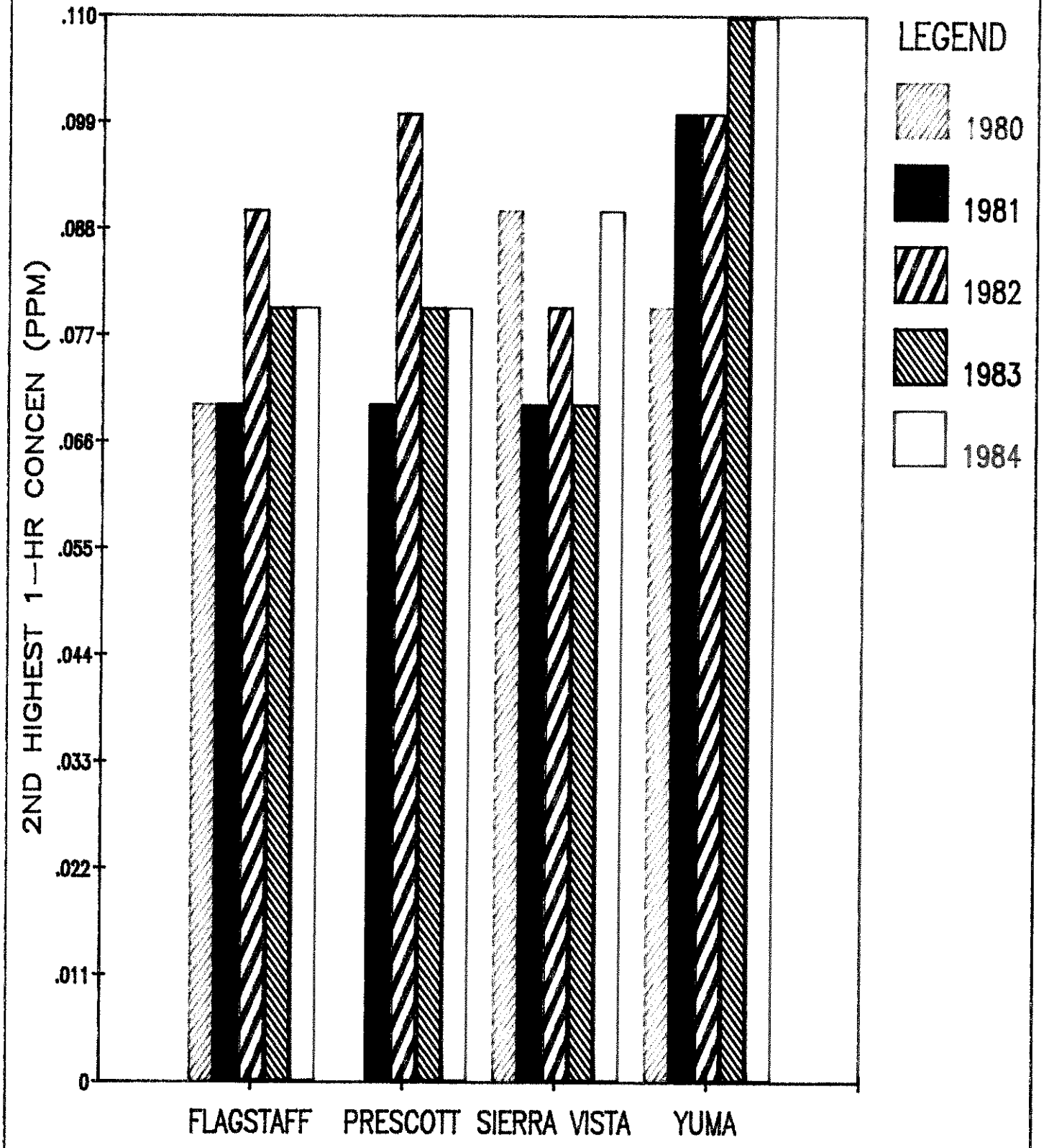


Table 10

PARTICULATE CONCENTRATIONS IN PHOENIX AREA

Annual Geometric Mean (ug/m^3)

Site	1978	1979	1980	1981	1982	1983	1984
Glendale	97	105	88	100	84	83	100
Mesa	86	87	86	93	74	73	82
Phoenix (Roosevelt)	120	121	120	113	90	93	120
Phoenix (S. Central)	218	171	182	176	121	105	115
Phoenix (N. 6th St.)	106	117	100	108	86	107	100
Scottsdale (N. Miller)	92	99	87	97	84	82	96

Table 11

PARTICULATE CONCENTRATIONS IN TUCSON

Annual Geometric Mean Concen. (ug/m^3)

Site	1978	1979	1980	1981	1982	1983	1984
Downtown	56	70	61	67	65	52	63
U. of Arizona	61	89	75	76	59	54	70
South Tucson	117	101	97	112	89	79	91
Prince Road	110	129	117	101	93	77	91
Magnetic Observatory	56	61	56	62	54	45	54
Hughes/Nogales	43	54	54	54	44	34	48
Orange Grove	87	109	108	108	86	78	92
Alvernon/Ft. Lowell	126	120	101	98	89	70	73
Golf Links/Harrison	55	65	59	67	59	48	55

Table 12

PARTICULATE CONCENTRATIONS IN VARIOUS CITIES

	Annual Geometric Mean Concentration (ug/m^3)						
Site	1978	1979	1980	1981	1982	1983	1984
Ajo	69	67[c]	85	86	68	56	80
Bullhead City	71	75	66	87	70	84	93
Douglas (U.S. 666)	20[c]	48	57	65[c]	54	46	56[c]
Dougals (City Park)	74	121	136	128[c]	90[c]	91[c]	96[c]
Flagstaff	104[c]	82	81[c]	81	77[c]	68	64
Grand Canyon-Hopi Pt.	--	22	11[c]	16	12	5	13
Green Valley	45	54	39	46	33	27	39
Hayden	134[c]	172	152[c]	287	132	98	124
Joseph City	35	40	37	34	30	27	34
Kansas Settlement	--	38	41	44	31	32	44
Miami	85	118	86	75	69	70	81
Morenci	37	55	50	55[c]	35	43	78
Organ Pipe (N.M.)	28[c]	31	36[c]	34	24	16	19
Page	25[c]	31	36[c]	38	36	31	38
Paul Spur	--	395	381	354[c]	303	284[c]	--
Rillito[b]	100	132	114	112	107[c]	105[c]	101[c]
Safford	123	159	125	107	107	95	96[c]
San Manuel	26	30	29	49	36	33	39
Show Low	70	93	62	66	47	49	43
Sierra Vista	53	65	52[c]	53	45	48	52
St. Johns	21[c]	19	24	23	19	22	22
Yuma	112[c]	139	126	121	90	107	103

Table 13

SULFUR DIOXIDE CONCENTRATIONS IN SMELTER TOWNS

Annual Avg. Concentrations (ug/m^3)

Site	1978	1979	1980	1981	1982	1983	1984
Ajo (Oxidation Pond) PD	43	51	42	65	39	No Data	41
Douglas (Northwest) PD	55	67	45	67	35	59	65
Hayden (Montgomery Ranch) JCC	133	158	93	139	84	44	21
Miami (Jones Ranch) State	64	79	30	76	76	31	51
Morenci (Stargo) State	78	75	98	138	42	118	101
San Manuel (Golf Course) Magma	62	65	36	75	71	49	44

Table 14

SULFUR DIOXIDE EXCEEDANCES IN SMELTER TOWNS

City	Year	Number of 3-Hour Exceedances	Number of 24-Hour Exceedances
Ajo	1978	5	2
	1979	0	2
	1980	8	2
	1981	5	1
	1982	1	1
	1983	0	0
	1984	9	3
Douglas	1978	7	0
	1979	12	6
	1980	8	0
	1981	20	1
	1982	3	1
	1983	3	0
	1984	17	2
Hayden	1978	13	9
	1979	40	21
	1980	13	6
	1981	17	12
	1982	7	4
	1983	2	0
	1984	0	0
Miami	1978	34	14
	1979	56	21
	1980	13	5
	1981	31	10
	1982	52	23
	1983	7	2
	1984	18	7
Morenci	1978	44	11
	1979	27	5
	1980	73	28
	1981	89	42
	1982	18	3
	1983	93	29
	1984	30	7
San Manuel	1978	24	3
	1979	19	6
	1980	7	0
	1981	9	1
	1982	7	2
	1983	5	1
	1984	1	0

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)	40 (35)
	8-hour	10 (9)	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 anemia 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.

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

Sulfir 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 Techniques

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 ultra violet (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.

Particulates

Particulate 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.

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.