

ARIZONA STATE DEPARTMENT OF HEALTH

ENVIRONMENTAL HEALTH SERVICES
DIVISION OF AIR POLLUTION CONTROL
1740 West Adams Street
Phoenix, Arizona 85007

AIR QUALITY MONITORING NETWORK DATA

1972

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FOREWORD

The air quality data reported herein was collected from the network of monitoring devices owned and operated by the Division of Air Pollution Control, Arizona State Department of Health. No data is presented for the Phoenix or Tucson metropolitan areas. The air quality monitoring instruments located in those areas are owned and operated by the local air pollution control agencies. For information concerning air pollution levels in the Phoenix area, contact:

Maricopa County Health Department
Bureau of Air Pollution Control
1825 East Roosevelt Street
Phoenix, Arizona 85006

For information concerning air pollution levels in the Tucson area, contact:

Pima County Health Department
Pima County Air Pollution Control District
151 West Congress Street
Tucson, Arizona 85701

It should be noted that additional air quality data is available for specific pollutants from:

Pinal-Gila Counties Air Quality Control District
P.O. Box 827
Florence, Arizona 85232

County of Greenlee
Air Pollution Control
Clifton, Arizona 85533

1. PARTICULATE MONITORING NETWORK DATA

1.1 INTRODUCTION

In 1969, the Division of Air Pollution Control (Air Quality Section) of the Arizona State Department of Health installed a network of high-volume samplers at various sites throughout the state to determine and identify particulate matter pollution in the Arizona atmosphere. Reports have been published of findings for the years 1969¹, 1970², and 1971³.

This report describes the results of continued operation and expansion of the network monitoring system for the calendar year 1972.

1.2 NETWORK DESCRIPTION

1.2.1 Equipment Used

General Metal Works Model GMWL2000 High-Volume Samplers and Shelters were used to measure the mass concentration of suspended particulates by capturing the particles on 8 x 10 inch, pre-weighed, glass-fiber filters. Sampling time and flow rate were 24 hours and 1.1 to 1.7 cubic meters per minute. The mass concentration was computed by measuring the weight of collected particles and dividing it by the volume of air sampled.

1.2.2 Sampling Sites

The sampling sites and their classification by groups were as follows:

A. Source-Oriented Ambient Surveillance

Ajo
Clarkdale
Claypool
Clifton
Davis Dam
Douglas
Florence

Joseph City
Paul Spur
Superior

B. Population-Oriented Surveillance

Flagstaff
Yuma

C. Background Surveillance

Holbrook
Lechee
Montezuma Castle National Monument
Organ Pipe Cactus National Monument
Page
Tuba City
Winslow

These locations of the sampling sites are noted on the map presented in Figure A.

1.2.3 Sampling Frequency

Samples were collected every 6 or 7 days.

1.3 MONITORING RESULTS

1.3.1 Total Suspended Particulates

The results for 1972 are summarized in Table 1.

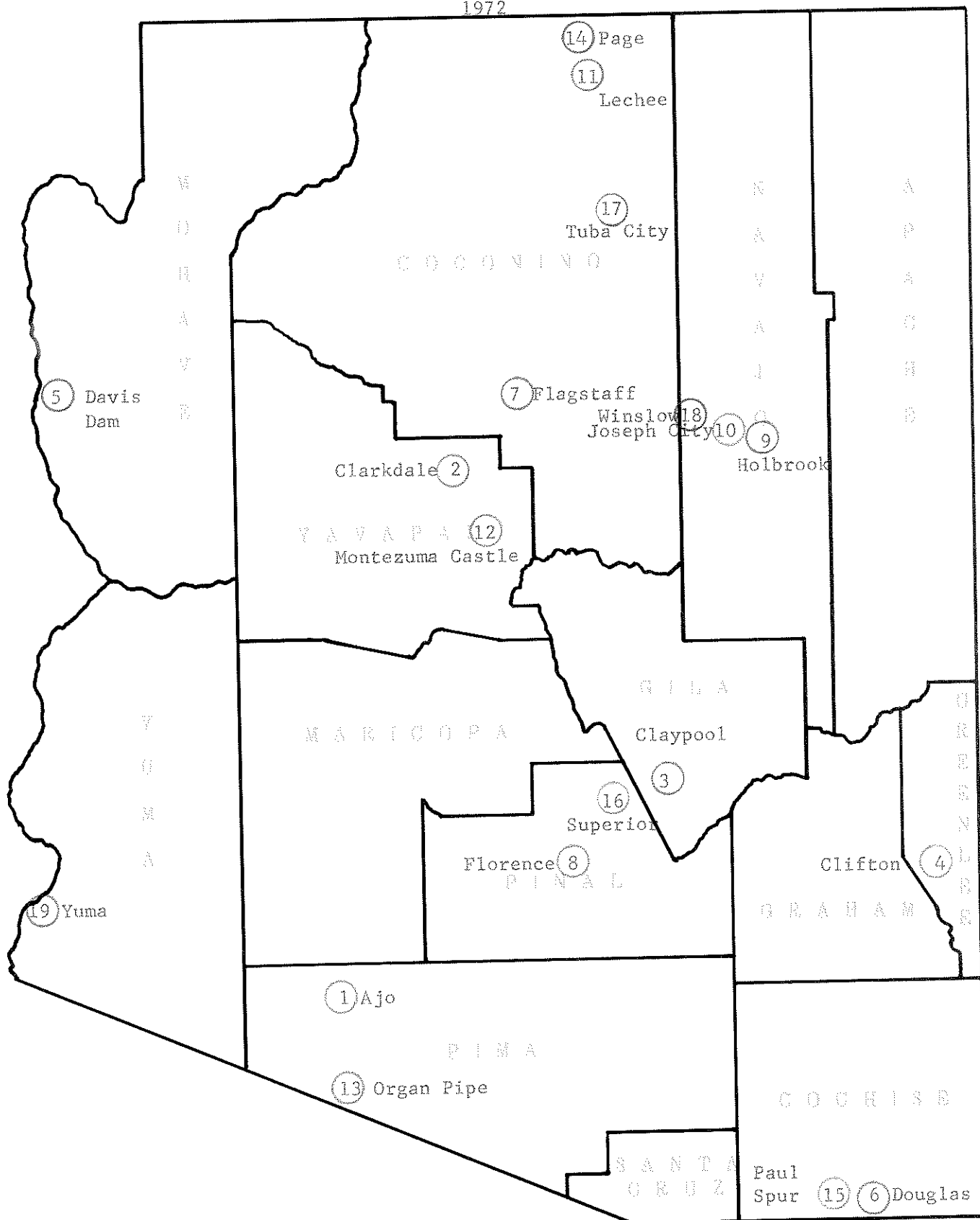
A comparison of data for 1969 through 1972 is illustrated in Table 2. In years when a site was initiated or terminated, the annual mean was based on less than 12 months of sampling data.

1.3.2 Specific Constituents of Particulates

A summary of the data is shown in Table 3. Analyses for benzene soluble organics, nitrates and sulfates were run on every sample. Analyses for the elements were usually run on every fourth sample.

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PARTICULATES MONITORING NETWORK
1972



Arizona State Department of Health
Division of Air Pollution Control

Table 1

1972 TOTAL SUSPENDED PARTICULATES DATA
(in micrograms per cubic meter)

<u>Location</u>	<u>Annual Geometric Mean</u>	<u>Max. 24-Hr. Avg.</u>	<u>Min. 24-Hr. Avg.</u>	<u>Number of Samples</u>	<u>Standard Geometric Deviation</u>
Ajo	70	251	30	38	1.58
Clarkdale	55	140	27	15	1.47
Claypool	170	774	48	30	1.64
Clifton	69	372	18	43	1.71
Davis Dam	36	148	11	57	1.93
Douglas NE1	242	721	95	22	1.70
Flagstaff	42	86	17	35	1.55
Florence	124	258	22	28	1.72
Holbrook	122	415	25	15	1.89
Joseph City	61	96	29	21	1.39
Lechee	35	73	15	24	1.57
Montezuma Castle	26	111	5	62	1.88
Organ Pipe	29	95	14	44	1.65
Page	31	145	11	25	1.80
Paul Spur	74	454	26	24	1.92
Superior	99	275	28	35	1.76
Tuba City	58	137	26	27	1.55
Winslow	45	104	10	28	1.79
Yuma	97	447	42	57	1.73

STATE AIR QUALITY STANDARDS FOR PARTICULATES:

Annual geometric mean - limit of 60 micrograms per cubic meter
24-hour average - limit of 100 micrograms per cubic meter

Table 2

COMPARISON OF TOTAL SUSPENDED PARTICULATES DATA (1969-1972)
 (annual geometric means in micrograms per cubic meter)

<u>Location</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>
Ajo	87	83	75	70
Clarkdale	--	64	63	55
Claypool	117	165	144	170
Clifton	51	51	43	69
Davis Dam	29	31	33	36
Douglas ESE3	240	264	303	--
Douglas NE1	--	--	118	242
Flagstaff	--	74	50	42
Florence	149	153	124	124
Joseph City	--	70	67	61
Lechee	--	--	31	35
Montezuma Castle	--	--	21	26
Organ Pipe	26	37	34	29
Page	17	9	--	31
Superior	139	204	213 ^a 96 ^b	99
Tuba City	--	--	46	58
Winslow	--	--	--	45
Yuma	--	98	94	97

a - 1st six months - with smelter

b - 2nd six months - no smelter

Table 3

1972 SPECIFIC CONSTITUENTS OF PARTICULATES DATA
(averages in micrograms per cubic meter)

	Benzene Soluble Organics	Nitrates	Sulfates	Arsenic	Bismuth	Cadmium	Chromium	Cobalt	Copper	Iron	Lead	Manganese	Mercury	Nickel	Tin	Titanium	Vanadium	Zinc
Ajo	1.6	1.1	5.3	.259	.007	.002	.003	.004	.28	1.1	.5	.02	.0002	.002	.00	.00	.000	.18
Clarkdale	.5	.8	1.8	.001	.002	.001	.010	.019	.21	1.4	.2	.03	.0002	.003	.00	.00	.000	.21
Claypool	3.6	1.1	8.2	.014	.019	.009	.011	.015	1.60	2.3	1.0	.13	.0001	.014	.01	.00	.001	.85
Clifton	1.1	1.0	5.8	.002	.008	.004	.001	.013	.19	1.7	.2	.03	.0004	.010	.00	.00	.001	.70
Davis Dam	1.1	1.7	2.7	.003	.004	.001	.001	.013	.12	.5	.1	.01	.0002	.008	.00	.00	.001	.15
Douglas	2.7	.9	8.1	.016	.007	.012	.001	.028	1.77	3.4	1.1	.08	.0008	.052	.01	.00	.001	.49
Flagstaff	2.5	.5	2.1	.000	.004	.000	.000	.013	.06	.8	.4	.03	.0002	.010	.00	.00	.001	.08
Florence	1.7	1.9	5.5	.010	.003	.005	.002	.030	.53	3.4	.4	.15	.0003	.020	.00	.00	.000	1.03
Holbrook	3.2	.6	3.2	.001	.001	.001	.020	.041	.10	1.6	.3	.32	.0001	.026	.01	.00	.001	.09
Joseph City	1.2	.7	2.7	.000	.012	.001	.001	.025	.07	1.8	.1	.04	.0002	.015	.00	.00	.000	.11
Lechee	1.1	.6	1.7	.001	.000	.001	.003	.007	.07	.7	.0	.01	.0000	.024	.00	.00	.003	.12
Montezuma																		
Castle	.8	.9	2.6	.000	.004	.001	.002	.013	.07	.7	.1	.02	.0001	.012	.00	.00	.001	.14
Organ Pipe	.7	1.0	3.1	.008	.007	.001	.001	.020	.18	.8	.1	.02	.0002	.016	.00	.00	.001	.71
Page	.7	.6	2.1	.000	.005	.000	.000	.000	.10	.3	.1	.01	.0000	.000	.01	.00	.000	.11
Paul Spur	1.2	.8	4.5	.007	.007	.002	.001	.009	.06	1.2	.3	.02	.0001	.014	.00	.00	.001	.11
Superior	1.5	1.0	4.0	.004	.008	.002	.002	.007	.16	3.0	.5	.06	.0001	.009	.01	.00	.000	.15
Tuba City	1.3	1.2	2.4	.001	.000	.000	.001	.006	.20	.8	.1	.02	.0001	.020	.00	.00	.002	.13
Winslow	1.3	.8	2.9	.000	.001	.001	.003	.000	.09	.5	.1	.02	.0001	.000	.00	.00	.000	.23
Yuma	1.9	1.4	2.3	.000	.001	.000	.004	.016	.04	1.5	.2	.04	.0001	.017	.00	.00	.000	.10

Note: Analyses for the elements were usually run on every fourth sample.

2. SULFUR DIOXIDE MONITORING NETWORK DATA

2.1 INTRODUCTION

During 1972, the Division of Air Pollution Control (Air Quality Section) of the Arizona State Department of Health continued statewide surveillance of sulfur dioxide (SO₂) concentrations in ambient air.

This surveillance began in 1969. Reports describing the 1969⁴, 1970⁵ and 1971⁶ network studies have been published.

Beckman Instrument Model 906A SO₂ Analyzers and Bristol Model 760 Dynamaster Strip Chart Recorders were used to continuously measure and record SO₂ concentrations at all locations except Davis Dam and Page.

At Davis Dam and Page, a Research Appliance Company Model 2333-A Gas Bubbler Sampler was used to collect 24-hour samples which were analyzed at the Arizona State Department of Health Laboratory in Phoenix. The West & Gaeke method was employed for sampling and analysis. The sampling frequency was every 6 days.

Figure B illustrates SO₂ monitoring network instrument locations. It should be noted that these locations are not to be interpreted as sites of maximum concentrations of SO₂. The locations were chosen for accessibility, economy and convenience.

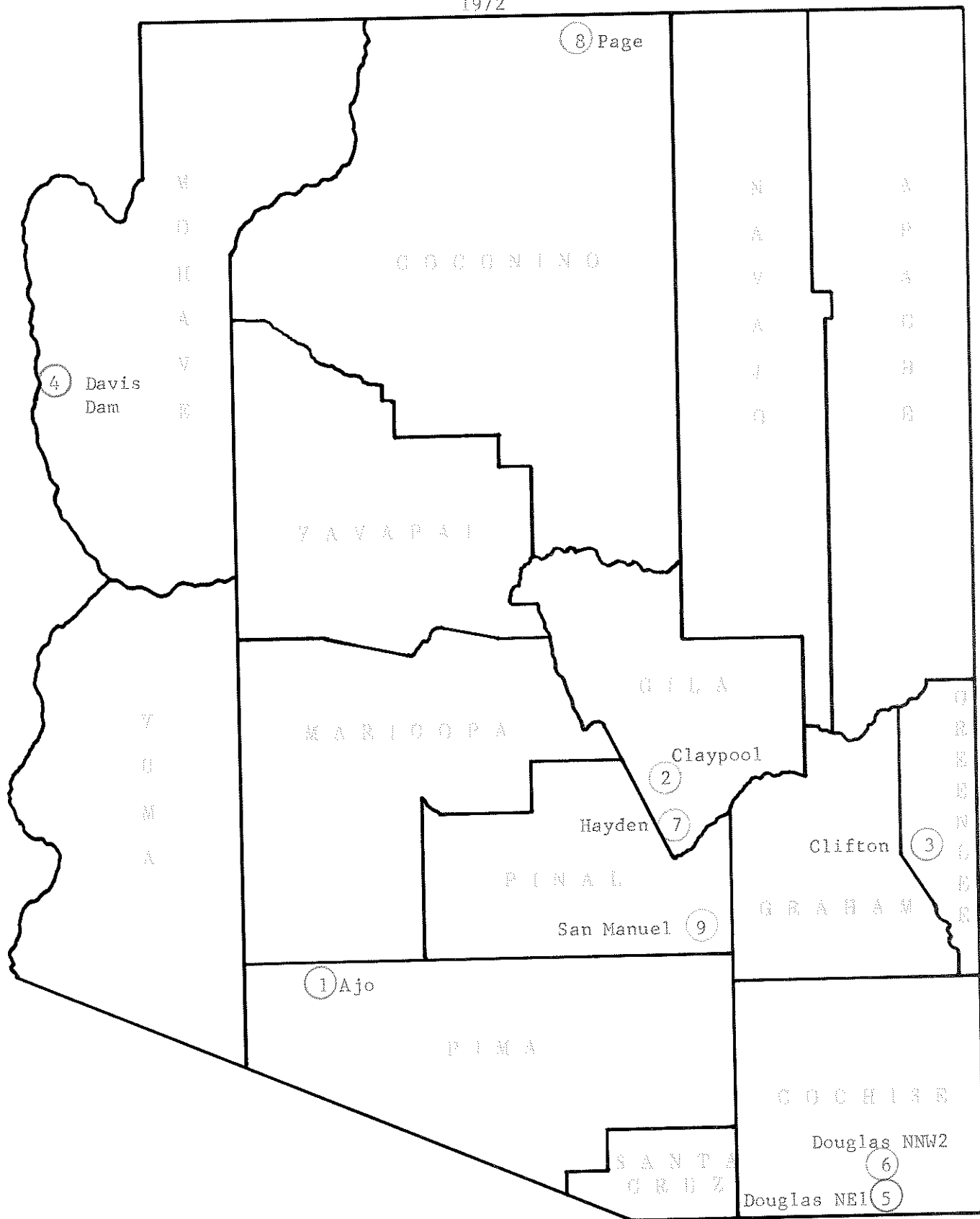
2.2 MONITORING RESULTS

Table 4 summarizes the 1972 data by annual average, maximum 3- and 24-hour averages, and percent data recovery. For comparison purposes, the State and Federal ambient air quality standards for SO₂ are noted.

Long-range trends are illustrated in Table 5, a list of annual average concentrations for 1969 through 1972. It should be noted that in some cases the annual averages are based on less than 12 months of monitoring data.

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SULFUR DIOXIDE MONITORING NETWORK
1972



Arizona State Department of Health
Division of Air Pollution Control

Table 4

1972 SO₂ MONITORING NETWORK DATA
(Concentrations in Micrograms Per Cubic Meter)

<u>Location</u>	<u>Annual Average Concentration</u>	<u>Maximum Concentrations:</u>		<u>Data Recovery, %</u>
		<u>3-Hr. Avg.</u>	<u>24-Hr. Avg.</u>	
Ajo	43	2314	630	65.5
Claypool	79	2910	708	96.3
Clifton	128	8996	4649	40.3
Davis Dam	0 ^(a)	--	4	95.0
Douglas-NE1	89	6974	1046	69.6
Douglas-NNW2	56 ^(b)	7435	3768	67.1
Hayden	274	9504	9504	85.6
Page	0 ^(c)	--	5	80.0
San Manuel	50 ^(d)	1893	357	90.7

(a) Zero is defined as less than 4 micrograms per cubic meter, the minimum detectable limit.

(b) Based on the monitoring period, 3-14 to 12-31-72. Sampling began on 3-14-72.

(c) Based on the monitoring period, 10-6 to 12-31-72. Sampling began on 10-6-72.

(d) Based on the monitoring period, 1-1 to 7-26-72. Sampling stopped on 7-26-72.

Note: For comparison purposes, State and Federal SO₂ standards are as follows:

<u>Standard</u>	<u>Annual Average</u>	<u>3-Hr. Average</u>	<u>24-Hr. Average</u>
State of Arizona	50	1300	260
Federal Primary	80	--	365
Federal Secondary	60*	1300	260

*Recently proposed to be dropped by EPA.

Table 5

COMPARISON OF ANNUAL AVERAGE SO₂ CONCENTRATIONS (1969-1972)
(concentrations in micrograms per cubic meter)

<u>Location</u>	<u>1969</u>	<u>1970</u>	<u>1971</u>	<u>1972</u>
Ajo	98	189	50	43
Claypool	147	48	46	79
Clifton	90	135	110	128
Davis Dam	--	--	0	0
Douglas ESE3	64	44	57	--
Douglas ENE4	109	51	--	--
Douglas NE1	--	--	55	89
Douglas NNW2	--	--	--	56
Hayden	377	481	336	274
Page	--	--	--	0
San Manuel	147	113	101	50

3. NITROGEN DIOXIDE MONITORING NETWORK DATA

3.1 INTRODUCTION

During 1972, the Division of Air Pollution Control (Air Quality Section) of the Arizona State Department of Health continued statewide surveillance of nitrogen dioxide (NO₂) concentrations in ambient air.

This surveillance began in 1971 at Davis Dam and in 1972 at Page. A Research Appliance Company Model 2333-A Gas Bubbler Sampler was used to collect 24-hour samples which were analyzed at the Arizona State Department of Health Laboratory in Phoenix. The Jacobs-Hochheiser method was employed for sampling and analysis. The sampling frequency was every 6 days.

In 1972 the Environmental Protection Agency reported an error in the Jacobs-Hochheiser method for NO₂ analysis which casts doubt about any NO₂ data based on this method. Until then this method was specified by EPA to be the reference method. In 1973 EPA reported that the Jacobs-Hochheiser method would be discontinued and other methods would be evaluated.

This error in NO₂ measurements nationwide has caused reevaluation of the following:

- a. Effects of NO₂ on human health
- b. Classification of Air Quality Control Regions according to priority for NO₂ emissions control
- c. Control strategies required for NO₂ emissions

3.2 MONITORING RESULTS

Table 6 summarizes the 1971 and 1972 data by annual averages, maximum 24-hour averages and data recovery.

Table 6

1971 AND 1972 NO₂ MONITORING NETWORK DATA
(concentrations in micrograms per cubic meter)

<u>Location</u>	<u>Year</u>	<u>Annual Average Concentration</u>	<u>Maximum 24-Hr. Concentrations</u>	<u>Data Recovery, %</u>
Davis Dam	1971	16	48	70
	1972	7	37	93.3
Page	1972	36 ^(a)	70	53.3

(a) Based on the monitoring period 10-6 to 12-31-72.

Arizona and Federal Air Quality Standards for NO₂:

Annual Average--100 micrograms per cubic meter.

4. ACKNOWLEDGEMENTS

James L. Guyton, Monitoring Network Operations Unit Leader, Air Quality Section, Division of Air Pollution Control, was responsible for the evaluation and summarization of the data reported herein and the preparation of this report.

Other Division of Air Pollution Control personnel who contributed to this report included: Alexander Bendyna, W. G. Holsinger and Howard B. Nicholas, who reduced the data; Mr. Nicholas, Matthew G. Cubitto and Mr. Bendyna, who serviced the instruments; and Robert P. Wright, who prepared and performed chemical analyses of the particulate and bubbler samples.

Mr. Lawrence McDonald, U.S. Bureau of Reclamation, supervised the operation of a gas bubbler sampler located at Davis Dam.

Mr. Gene C. Legate, U.S. Bureau of Reclamation, supervised the operation of a gas bubbler sampler located at Page.

The Arizona State Division of Air Pollution Control extends sincere appreciation to the hi-volume sampler operators named below for their voluntary services which included collection and mailing of samples at regular intervals from network stations.

<u>Name</u>	<u>Location of Hi-Volume Sampler</u>
Mr. William Harrison	Ajo
Mr. John C. Cooper, Jr. and Mr. L. Small	Clarkdale
Mr. Tom Teague	Claypool
Mr. Lawrence A. Dahners	Clifton
Mr. Lawrence McDonald and Associates	Davis Dam
Mr. Dan Spivey and Mr. Jim McLendon	Douglas
Mr. Donald Finical	Flagstaff
Mr. Jake Aguilar and Mr. Charles Bedford	Florence
Mr. Gavin E. Martinez	Holbrook
Mr. Dale Hodge	Joseph City
Mrs. Lu Snider, Mrs. Kathleen Reid and Associates	Montezuma Castle National Monument

<u>Name</u>	<u>Location of Hi-Volume Sampler</u>
Mr. Ken Patrick	Organ Pipe Cactus National Monument
Mr. Gene Legate and Associates	Page
Mr. George Shaw	Paul Spur
Mr. William J. Burneo and Mr. B. K. Bell	Superior
Mr. Keith R. Scherer and Associates	Tuba City and Lechee
Mr. Kenneth Kenney and Associates	Winslow
Mr. William Myers, Mr. Joseph Pozzi and Associates	Yuma

5. REFERENCES

- 1 -- Arizona State Department of Health, Division of Air Pollution Control, "Particulate Monitoring Network Data - 1969", September 1, 1970.
- 2 -- Arizona State Department of Health, Division of Air Pollution Control, "Particulate Monitoring Network Data - 1970", December 1971.
- 3 -- Arizona State Department of Health, Division of Air Pollution Control, "Particulate Monitoring Network Data - 1971", June 1972.
- 4 -- Sulfur Dioxide Monitoring Network Study - 1969. Arizona State Department of Health, Environmental Health Services, Division of Air Pollution Control.
- 5 -- Sulfur Dioxide Monitoring Network Study - 1970. Arizona State Department of Health, Environmental Health Services, Division of Air Pollution Control.
- 6 -- Sulfur Dioxide Monitoring Network Study - 1971. Arizona State Department of Health, Environmental Health Services, Division of Air Pollution Control.