UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

ANALYTICAL RESULTS FOR 78 GROUND-WATER SAMPLES FROM THE CASA GRANDE VICINITY, ARIZONA

by

Walter H. Ficklin, David J. Preston,

Eric P. Welsch, and Gary A. Nowlan

Open-File Report 81-960

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards.

CONTENTS

ILLUSTRATIONS

TABLES

ABSTRACT

Seventy-eight water samples were collected from deep wells in the Casa Grande vicinity, Arizona, as a part of a mineral resource study. The samples were analyzed for calcium, magnesium, sodium, potassium, strontium, bicarbonate, carbonate, sulfate, chloride, fluoride, nitrate, silica, iron, manganese, aluminum, silver, arsenic, barium, bismuth, cadmium, cobalt, chromium, cesium, copper, lithium, molybdenum, nickel, lead, rubidium, uranium, and zinc. Temperature, pH, dissolved oxygen, and specific conductance were also measured. The data is presented in the accompanying table. Also included are the sample locations from which the samples were collected.

INTRODUCTION

This report contains data pertaining to water samples collected during a study of the mineral resources in the Casa Grande area in Arizona. Samples were collected in the Stanfield, Double Peak, Chiuchu, Casa Grande West, and Sacaton Butte quadrangles. The samples were collected from the period of April 1977 to June 1980.

The waters were collected to study the ground water in an area where a known porphyry copper-molybdenum deposit is located. The deposit is located approximately at the location of sample 2233 shown in figure 1. The deposit is approximately 2 kilometers in circumference; it is beneath alluvium at a depth of about 300 to 700 meters. No visible indication of the deposit exists on the surface.

An index map of the area sampled is presented in figure 1. All of the analytical methods used are listed in table 1. The sample location, analytical results, date of collection, and quadrangle are presented in table 2.

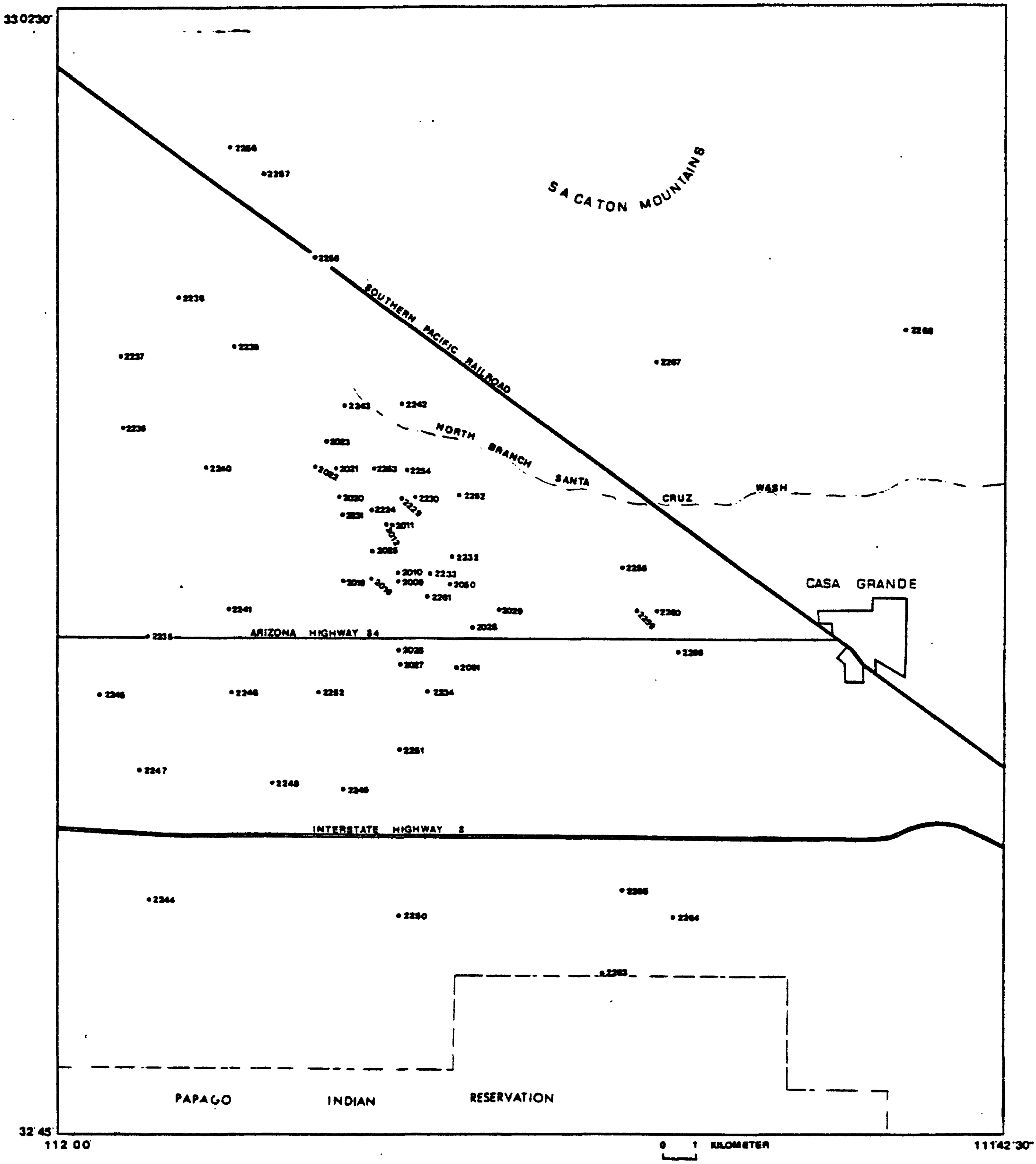

Fig. 1.--Sample locations for ground water samples.

SAMPLING TECHNIQUES

All of the samples were collected from wells. In most instances the well had been pumped for at least some length of time before sampling. Because the water is used for irrigation, it is assumed that these wells had been pumped for one or more days. A few domestic wells also were sampled; the water from these wells was allowed to run for at least five minutes before the sample was collected. At the sample site, a portion of the water was filtered through a 0.45-micron membrane filter and then acidified with 0.5 ml of concentrated nitric acid for each 100 ml of sample. For some samples, another portion was filtered through an 0.1-micron membrane and acidified in the same fashion. This portion of the sample was used to study the particulate nature of some elements that may exist as colloidal particles that will pass a 0.45-micron membrane filter. A larger portion of water was also collected that was neither acidified nor filtered.

ANALYTICAL TECHNIQUES

Water temperature, colorimetric iron, and dissolved oxygen were measured at the sample site. Alkalinity of a majority of the samples was measured both at the sample site and later in the laboratory. Specific conductance and pH usually were measured at the sample site, but a few measurements were made within one or two days of sample collection. Alkalinity, sulfate, fluoride, chloride, nitrate, and silica were determined using the untreated portion of the sample. Most sulfate, chloride, fluoride, and nitrate concentrations were measured by ion chromatography. However, determinations of these constituents from a few samples collected early in the study were done using ion-selective electrodes and turbidimetric procedures. The filtered, acidified samples were used for the determination of the remaining constituents. Table 1 is a list of analytical techniques employed for the analysis of each constituent with references to reports that describe the analytical methods used.

Some constituents were not determined for all of the samples because a satisfactory technique for the analysis was not available at the time (for example nitrate on several early samples). The elements lithium, rubidium, cesium, strontium, silver, bismuth, and molybdenum were determined by flameless atomic absorption although it had no published analytical method; however, the technique is so well established that the results are considered to be reliable. Recent work in the laboratory indicates that precision for some of the higher values listed for arsenic may be less than desirable. There are indications that this precision is not better than about 30 percent relative standard deviation for samples with more than 50 μg/L arsenic.

Table 1.--Analytical methods used for water analyses, Casa Grande, Arizona

Alkalinity	Gran's plot titration with sulfuric acid	Orion Research, Inc. (1975)
Fluoride	Gran's plot addition	Do.
Chloride	Gran's plot titration with silver nitrate	Do.
Sulfate	Barium-sulfate turbidimetric	Tabatabai (1974)
Fluoride	Ion chromatography	Fishman and Pyen (1979)
Chloride	Do.	Do.
Phosphate	Do.	Do.
Bromide	Do.	Do.
Nitrate	Do.	Do.
Sulfate	Do.	Do.
Sodium	Flame atomic absorption	Fishman and Downs (1966)
Potassium	Do.	Do.
Magnesium	Do.	Do.
Calcium	Do.	Do.
Aluminum	Flameless atomic absorption	Perkin-Elmer Corp. (1977) EN 4
Arsenic	Do.	Do.
Cadmium	Do.	Do.
Chromium	Do.	Do.
Copper	Do.	Do.
Iron	Do.	Do.
Manganese	Do.	Do.
Nickel	Do.	Do.
Lead	Do.	Do.
Zinc	Do.	Do.
Lithium	Do.	----
Rubidium	Do.	----
Cesium	Do.	----
Strontium	Do.	----
Silver	Do.	----
Bismuth	Do.	----
Molybdenum	Do.	----
Barium	Do.	Perkin-Elmer Corp. (1977) FS-1
Cobalt	Do.	----
Field alkalinity	Electrometer titration of pH 8.3 and 4.5	Brown, Skougstad, and Fishman (1970) p. 41
Iron	Colorimetric	Do. p. 105
Dissolved oxygen	Instrumental polarographic probe	Do. p. 129
Uranium	Fluorimetric	Ward and Bondar (1977)
Silica	Molybdate blue	Brown, Skougstad, and Fishman (1970) p. 138

RESULTS

Analytical results are presented in table 2. The samples collected in June 1980 were also analyzed for bromine and phosphate; these constituents were not detected at 0.1 mg/L in any of the samples.

The concentrations of the constituents calcium, magnesium, sodium, potassium, sulfate, chloride, fluoride, and silica are well above the minimum amount detectable (0.1 mg/L). The minimum amount detectable for minor and trace constituents is 1.0 (μg/L). Values less than this amount listed in table 2 are results that were obtained when analyzed and may reflect the concentration of that constituent, but relative standard deviation for precision may be as high as 100 percent.

Alkalinity is a term used to indicate the total acid-neutralizable constituents in water. Generally the alkalinity is due to carbonate and bicarbonate ions. The field determination of carbonate and bicarbonate is done with the assumption that total alkalinity is due entirely to the concentration of carbonate and bicarbonate.

EXPLANATION OF SYMBOLS IN TABLE 2

mg/L	represents milligrams per liter
μg/L	represents micrograms per liter
hCO_3	represents laboratory determination of alkalinity
HCO_3	represents field determination of bicarbonate
CO_3	represents field determination of carbonate
Fe	represents laboratory determination of iron from samples filtered through a 0.45-micron membrane filter
Fe 1	represents laboratory determination of iron from sample filtered through a 0.1-micron membrane filter
Fec	represents colorimetric field determination of iron
Mn	represents laboratory determination of manganese from sample filtered through a 0.45-micron membrane filter
Mn 1	represents laboratory determination of manganese from sample filtered through a 0.1-micron membrane filter
Cond lab	represents specific conductance measured in the laboratory
Cond fld	represents specific conductance measured in the field
--	indicates no results or not determined
Lat	North latitude in degrees, minutes, and seconds
Long	West longitude in degrees, minutes, and seconds

Sample location, results of analyses and date of collection

Sample	Lat	Long	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Sr mg/L	hco3mg/L	HCO3mg/L	CO3 mg/L	SO4 mg/L
W2009A	32 53 39	111 53 41	250.0	35.0	200	6.5	--	110.0	--	--	350
W2010A	32 53 46	111 53 40	240.0	36.0	240	5.5	--	230.0	--	--	350
W2010C	32 53 46	111 53 40	230.0	50.0	250	4.4	--	54.5	--	--	570
W2010E	32 53 46	111 53 40	210.0	45.0	250	4.0	3.10	133.0	124	--	430
W2011A	32 54 32	111 53 48	270.0	39.0	250	6.0	--	150.0	--	--	420
W2012A	32 54 32	111 53 52	280.0	63.0	250	6.3	--	120.0	--	--	470
W2012C	32 54 32	111 53 52	260.0	48.0	230	4.2	3.30	161.0	145	--	510
W2018A	32 53 41	111 54 11	120.0	23.0	110	3.4	--	130.0	--	--	180
W2019A	32 53 39	111 54 42	65.0	12.0	80	2.7	--	170.0	--	--	73
W2020A	32 54 56	111 54 48	150.0	27.0	150	4.3	--	150.0	--	--	260
W2021A	32 55 24	111 54 51	230.0	34.0	190	5.0	--	160.0	--	--	410
W2021C	32 55 24	111 54 51	140.0	39.0	160	3.4	--	62.3	--	--	280
W2021E	32 55 24	111 54 51	170.0	33.0	200	3.6	2.50	127.0	129	--	350
W2022A	32 55 24	111 55 13	130.0	23.0	120	3.6	--	160.0	--	--	160
W2022C	32 55 24	111 55 13	130.0	23.0	130	3.3	--	130.0	--	--	210
W2023A	32 55 49	111 55 1	160.0	28.0	170	4.5	--	150.0	--	--	200
W2023C	32 55 49	111 55 1	160.0	30.0	210	3.7	2.50	127.0	121	--	210
W2024A	32 54 43	111 54 11	150.0	25.0	180	4.2	--	160.0	--	--	220
W2024C	32 54 43	111 54 11	170.0	33.0	220	3.6	2.40	137.0	125	--	280
W2025A	32 54 7	111 54 11	190.0	29.0	160	4.6	--	200.0	--	--	280
W2025C	32 54 7	111 54 11	210.0	43.0	230	4.1	3.10	136.0	124	--	360
W2026A	32 52 34	111 53 40	85.0	15.0	90	3.2	--	160.0	--	--	110
W2027A	32 52 21	111 53 42	75.0	14.0	88	3.1	--	160.0	--	--	80
W2027C	32 52 21	111 53 42	63.0	13.0	110	3.2	1.00	127.0	119	--	100
W2028A	32 52 57	111 52 13	10.0	3.0	86	1.4	--	120.0	--	--	60
W2028C	32 52 57	111 52 13	12.0	2.0	77	1.2	--	100.0	--	--	70
W2028E	32 52 57	111 52 13	11.0	8.8	86	1.3	--	49.5	--	--	82
W2028G	32 52 57	111 52 13	13.0	2.5	100	1.4	.10	100.0	92	6.5	58
W2029A	32 53 13	111 51 51	35.0	8.0	110	2.0	--	120.0	--	--	110
W2029C	32 53 13	111 51 51	14.0	2.5	82	1.3	--	100.0	--	--	76
W2029E	32 53 13	111 51 51	12.0	9.3	88	1.3	--	49.9	--	--	76
W2029G	32 53 13	111 51 51	140.0	28.0	230	4.0	2.10	119.0	112	--	250
W2050A	32 53 35	111 52 45	140.0	49.0	200	4.7	--	150.0	--	--	560
W2050B	32 53 35	111 52 45	180.0	40.0	220	4.2	2.80	144.0	137	--	340
W2091A	32 52 19	111 52 38	5.0	.2	84	.8	--	93.0	--	--	62
W2229A	32 54 57	111 53 38	250.0	52.0	230	5.4	--	53.9	--	--	500
W2229C	32 54 57	111 53 38	160.0	30.0	210	4.9	2.20	155.0	139	--	360
W2230A	32 54 57	111 53 23	68.0	29.0	150	3.9	--	73.9	--	--	180
W2230C	32 54 57	111 53 23	60.0	10.0	160	3.8	.75	152.0	151	--	130
W2231A	32 54 41	111 54 42	110.0	23.0	140	3.1	1.60	143.0	131	--	200
W2232A	32 54 2	111 52 42	210.0	40.0	320	4.8	3.10	141.0	155	--	540
W2233A	32 53 44	111 53 7	240.0	48.0	280	4.8	3.30	195.0	177	--	540
W2234A	32 51 54	111 53 9	20.0	2.5	90	1.7	.30	134.0	134	3.7	66
W2234D	32 51 54	111 53 9	25.0	5.0	93	1.8	.30	146.0	131	4.7	76
W2235A	32 52 46	111 58 19	23.0	5.0	65	2.1	.20	157.0	157	--	33

Sample	Cl mg/L	F mg/L	NO3 mg/L	SiO2mg/L	O2 mg/L	Fe µg/L	Fe1 µg/L	Fec µg/L	Mn µg/L	Mn1 µg/L	Al µg/L
W2009A	480	.30	--	35	--	35.0	--	--	1.6	--	--
W2010A	420	2.60	--	31	--	12.0	--	--	1.7	--	--
W2010C	450	2.30	35.0	45	--	12.0	--	--	1.3	--	--
W2010E	430	2.90	31.0	34	5.8	26.0	22.0	20	2.1	2.0	57
W2011A	510	.80	--	38	--	13.0	--	--	1.4	--	--
W2012A	530	.80	--	35	--	23.0	--	--	1.3	--	--
W2012C	480	1.20	36.0	41	9.5	9.3	9.1	5	2.1	1.6	43
W2018A	160	.40	--	30	--	8.8	--	--	1.3	--	--
W2019A	66	.50	--	28	--	3.8	--	--	.9	--	--
W2020A	250	.70	--	30	--	6.5	--	--	1.1	--	--
W2021A	320	.70	--	32	--	16.0	--	--	1.5	--	--
W2021C	450	1.00	39.0	38	--	20.0	--	--	1.3	--	--
W2021E	380	.85	52.0	32	9.8	18.0	11.0	10	1.7	1.5	80
W2022A	160	.60	--	29	--	4.5	--	--	.9	--	--
W2022C	240	.40	--	32	--	12.0	--	--	.7	--	--
W2023A	320	1.10	--	29	--	4.5	--	--	1.0	--	--
W2023C	340	.82	48.0	31	7.4	6.3	5.7	<5	1.5	.8	49
W2024A	260	1.10	--	33	--	--	--	--	2.4	--	--
W2024C	350	.61	36.0	35	7.0	7.2	4.8	5	1.4	1.6	56
W2025A	250	.40	--	33	--	18.0	--	--	1.8	--	--
W2025C	400	.61	4.0	36	6.5	13.0	12.0	5	1.7	1.2	82
W2026A	74	.40	--	27	--	4.6	--	--	1.1	--	--
W2027A	74	.50	--	27	--	8.8	--	--	1.2	--	--
W2027C	120	.33	37.0	26	7.3	5.3	2.6	5	.8	.7	37
W2028A	41	2.10	--	26	--	--	--	--	2.4	--	--
W2028C	48	1.80	--	30	--	5.5	--	--	.4	--	--
W2028E	92	1.50	4.2	32	--	4.0	--	--	.6	--	--
W2028G	51	1.70	4.1	26	5.5	4.5	3.8	<5	.5	.4	68
W2029A	66	2.00	--	56	--	10.0	--	--	3.4	--	--
W2029C	54	1.80	--	28	--	6.2	--	--	.7	--	--
W2029E	120	1.30	4.6	34	--	5.9	--	--	.4	--	--
W2029G	340	.61	21.0	42	7.1	7.7	6.5	5	1.6	1.3	43
W2050A	460	.80	--	7	--	--	--	--	--	--	--
W2050B	370	.82	30.0	35	7.6	8.2	3.5	10	2.8	2.6	55
W2091A	32	.80	--	20	--	30.0	--	--	1.5	--	--
W2229A	900	.68	52.0	44	--	15.0	--	--	2.0	--	--
W2229C	310	.78	35.0	46	--	18.0	3.1	--	5.8	5.9	27
W2230A	340	.97	9.4	40	--	53.0	--	--	1.2	--	--
W2230C	140	1.20	6.2	43	--	19.0	3.8	--	3.4	3.5	29
W2231A	170	.61	45.0	34	7.7	9.7	5.7	5	1.1	.9	38
W2232A	640	.64	37.0	40	7.8	11.0	3.8	35	4.3	4.2	55
W2233A	480	.62	43.0	40	8.1	8.7	5.2	5	2.0	1.9	52
W2234A	37	.62	14.0	20	7.0	4.7	2.9	200	16.0	17.0	47
W2234D	41	.50	17.0	21	--	8.0	4.1	--	6.2	6.9	63
W2235A	21	.27	9.1	20	--	2.5	1.9	--	1.4	1.5	27

Table 2.--Sample location, results of analyses and date of collection--Continued

Sample	Ag µg/L	As µg/L	Ba µg/L	Bi µg/L	Cd µg/L	Co µg/L	Cr µg/L	Cs µg/L	Cu µg/L	Li µg/L	Mo µg/L	Ni µg/L
W2009A	--	5.8	--	--	--	--	--	--	3.2	--	6.3	--
W2010A	--	91.0	--	--	--	--	--	--	4.0	--	11.0	--
W2010C	--	120.0	--	--	--	--	--	--	4.6	220	9.4	--
W2010E	.9	86.0	80	.3	.4	7.8	15.0	2.5	3.9	260	6.0	8.6
W2011A	--	12.0	--	--	--	--	--	--	3.4	--	9.7	--
W2012A	--	15.0	--	--	--	--	--	--	2.5	--	9.2	--
W2012C	1.4	12.0	78	.2	.3	8.5	13.0	2.0	4.5	200	4.9	14.0
W2018A	--	8.3	--	--	--	--	--	--	1.5	--	4.9	--
W2019A	--	9.7	--	--	--	--	--	--	3.7	--	7.2	--
W2020A	--	19.0	--	--	--	--	--	--	2.3	--	7.8	--
W2021A	--	9.5	--	--	--	--	--	--	2.4	--	9.4	--
W2021C	--	58.0	--	--	--	--	--	--	2.9	110	7.5	--
W2021E	.6	19.0	78	.1	.3	5.5	11.0	2.3	2.6	130	6.0	13.0
W2022A	--	16.0	--	--	--	--	--	--	1.3	--	6.3	--
W2022C	--	11.0	--	--	--	--	--	--	5.6	--	5.1	--
W2023A	--	21.0	--	--	--	--	--	--	1.3	--	10.0	--
W2023C	.4	18.0	82	.1	.5	4.8	12.0	1.8	2.0	130	8.0	7.3
W2024A	--	24.0	--	--	--	--	--	--	2.0	--	12.0	--
W2024C	.5	14.0	110	.2	.3	5.3	12.0	1.7	2.5	190	6.9	11.0
W2025A	--	15.0	--	--	--	--	--	--	1.8	--	5.0	--
W2025C	.7	23.0	120	.2	.3	6.3	13.0	2.5	3.7	200	5.2	11.0
W2026A	--	12.0	--	--	--	--	--	--	1.4	--	5.5	--
W2027A	--	12.0	--	--	--	--	--	--	1.4	--	5.9	--
W2027C	.3	8.3	84	<.1	.2	2.1	15.0	1.7	2.1	70	3.3	4.5
W2028A	--	230.0	--	--	--	--	--	--	3.4	--	4.4	--
W2028C	--	191.0	--	--	--	--	--	--	2.0	--	3.9	--
W2028E	--	210.0	--	--	--	--	--	--	3.0	94	2.3	--
W2028G	.2	140.0	75	<.1	.2	4.8	45.0	2.4	3.6	110	2.8	7.8
W2029A	--	160.0	--	--	--	--	--	--	2.0	--	9.3	--
W2029C	--	170.0	--	--	--	--	--	--	1.5	--	4.1	--
W2029E	--	210.0	--	--	--	--	--	--	3.1	93	2.3	--
W2029G	.5	15.0	55	<.1	.2	5.4	24.0	3.2	3.0	260	8.9	6.3
W2050A	--	18.0	--	--	--	--	--	--	--	--	7.0	--
W2050B	1.0	23.0	84	.1	.3	6.4	21.0	2.5	3.6	230	4.0	8.5
W2091A	--	98.0	--	--	--	--	--	--	2.3	--	2.5	--
W2229A	--	16.0	--	--	--	--	--	--	4.0	180	10.0	--
W2229C	.6	10.0	74	<.1	.3	5.4	11.0	2.4	3.2	170	6.9	7.5
W2230A	--	23.0	--	--	--	--	--	--	4.5	130	6.1	--
W2230C	.6	15.0	51	.2	.2	4.3	16.0	2.0	4.2	150	7.2	6.7
W2231A	.4	14.0	74	.1	.4	4.0	9.8	2.2	3.7	90	6.1	13.0
W2232A	1.2	6.6	94	.1	.3	8.5	11.0	2.7	4.9	300	4.7	12.0
W2233A	1.0	21.0	96	.1	.2	9.0	14.0	3.3	8.6	250	3.9	11.0
W2234A	.4	13.0	35	.1	.2	3.7	12.0	3.1	3.1	50	3.2	4.7
W2234D	.3	13.0	45	.1	.3	4.0	15.0	2.7	3.5	50	3.0	4.8
W2235A	.2	8.3	13	.1	.3	2.3	16.0	2.4	1.9	40	2.2	2.3

Sample	Pb µg/L	Rb µg/L	U µg/L	Zn µg/L	Cond lab	Cond fld	pH	T deg C	Date Collected	Quadrangle
W2009A	--	--	2.0	4.6	2,600	--	7.30	30.0	4-07-77	Stanfield
W2010A	--	--	3.8	3.9	2,700	--	7.30	29.0	4-07-77	Stanfield
W2010C	--	--	--	19.0	2,400	--	7.97	28.0	4-12-79	Stanfield
W2010E	.3	2.8	7.2	6.5	2,200	2,400	7.32	29.0	6-04-80	Stanfield
W2011A	--	--	3.7	1.9	3,200	--	7.20	28.0	4-07-77	Stanfield
W2012A	--	--	2.9	1.8	3,300	--	7.30	28.0	4-07-77	Stanfield
W2012C	.2	3.0	4.8	8.6	2,600	2,800	7.35	28.0	6-04-80	Stanfield
W2018A	--	--	3.1	5.3	1,300	--	7.30	28.0	4-11-77	Stanfield
W2019A	--	--	3.7	4.2	780	--	7.20	28.0	4-11-77	Stanfield
W2020A	--	--	3.3	4.7	1,800	--	7.30	28.0	4-11-77	Stanfield
W2021A	--	--	3.8	3.5	2,500	--	7.20	27.0	4-11-77	Stanfield
W2021C	--	--	--	32.0	1,500	--	7.95	27.0	4-12-79	Stanfield
W2021E	.8	1.4	4.8	4.5	1,600	2,100	7.50	28.0	6-04-80	Stanfield
W2022A	--	--	5.4	3.4	1,400	--	7.40	28.0	4-11-77	Stanfield
W2022C	--	--	--	2.0	--	1,500	7.60	26.0	3-30-78	Stanfield
W2023A	--	--	4.3	2.8	2,100	--	7.50	29.0	4-11-77	Stanfield
W2023C	.2	1.1	4.1	5.4	1,900	2,100	7.51	28.5	6-04-80	Stanfield
W2024A	--	--	5.2	3.3	1,800	--	7.30	29.0	4-11-77	Stanfield
W2024C	.3	1.6	3.7	4.1	1,900	2,300	7.47	29.0	6-04-80	Stanfield
W2025A	--	--	5.0	3.1	2,000	--	7.40	26.0	4-11-77	Stanfield
W2025C	.2	2.7	4.0	4.4	2,300	2,600	7.48	28.5	6-04-80	Stanfield
W2026A	--	--	3.8	2.4	980	--	7.60	28.0	4-11-77	Stanfield
W2027A	--	--	3.7	2.3	880	--	7.50	29.0	4-11-77	Double Peak
W2027C	.1	.4	3.6	3.4	880	1,000	7.81	28.5	6-05-80	Double Peak
W2028A	--	--	7.4	2.8	530	--	8.50	28.0	4-11-77	Casa Grande W
W2028C	--	--	--	.5	--	500	8.80	33.5	3-29-78	Casa Grande W
W2028E	--	--	--	5.3	490	--	7.91	34.0	4-12-79	Casa Grande W
W2028G	.1	.2	6.4	4.4	480	510	8.77	33.5	6-03-80	Casa Grande W
W2029A	--	--	7.2	2.1	810	--	7.90	25.0	4-11-77	Casa Grande W
W2029C	--	--	--	1.0	--	540	8.60	25.0	3-29-78	Casa Grande W
W2029E	--	--	--	3.5	500	--	8.06	24.0	4-12-79	Casa Grande W
W2029G	.3	2.0	4.4	4.0	1,800	2,000	7.70	29.0	6-24-80	Casa Grande W
W2050A	--	--	--	--	--	--	--	--	10-24-77	Stanfield
W2050B	.2	3.3	8.8	40.0	2,100	2,300	7.47	30.5	6-05-80	Stanfield
W2091A	--	--	--	.5	--	470	9.20	30.5	3-30-78	Double Peak
W2229A	--	--	--	18.0	2,500	--	7.80	--	4-12-79	Stanfield
W2229C	.6	2.2	5.2	3.9	1,900	--	7.48	30.0	6-09-80	Stanfield
W2230A	--	--	--	12.0	1,100	--	8.09	30.0	4-12-79	Stanfield
W2230C	.4	.6	5.0	2.3	1,100	--	7.73	30.0	6-09-80	Stanfield
W2231A	.1	1.3	4.4	3.8	1,400	1,500	7.61	28.0	6-04-80	Stanfield
W2232A	<.1	3.3	7.6	11.0	2,600	2,700	7.63	27.5	6-05-80	Stanfield
W2233A	.1	4.1	9.6	5.7	2,700	2,900	7.41	29.0	6-05-80	Stanfield
W2234A	.2	.2	4.4	4.7	510	650	8.57	29.5	6-05-80	Double Peak
W2234D	.2	.2	4.4	4.3	550	--	8.63	29.5	6-10-80	Double Peak
W2235A	.2	.2	4.6	2.3	410	--	8.05	27.0	6-06-80	Stanfield

Sample	Lat	Long	Ca mg/L	Mg mg/L	Na mg/L	K mg/L	Sr mg/L	hco3mg/L	HCO3mg/L	CO3 mg/L	SO4 mg/L
W2236A	32 56 2	111 58 48	10.0	<.1	78	2.3	.20	130.0	96	4.7	41
W2237A	32 57 9	111 58 52	88.0	15.0	100	3.5	1.40	164.0	152	--	110
W2238A	32 58 2	111 57 45	7.5	<.1	78	2.3	.10	102.0	95	3.7	51
W2239A	32 57 17	111 56 44	280.0	50.0	210	4.7	3.50	155.0	139	--	510
W2240A	32 55 24	111 57 16	18.0	2.5	95	2.3	.30	143.0	134	--	56
W2241A	32 53 12	111 56 48	25.0	5.0	78	2.6	.30	142.0	138	--	60
W2242A	32 56 24	111 53 38	66.0	10.0	200	2.9	1.00	154.0	151	--	150
W2243A	32 56 22	111 54 41	50.0	7.5	140	2.7	.60	200.0	174	--	100
W2244A	32 48 41	111 58 18	25.0	7.5	250	4.4	.60	230.0	212	--	150
W2245A	32 51 53	111 59 15	21.0	10.0	160	2.7	.30	216.0	204	--	89
W2246A	32 51 54	111 56 47	59.0	13.0	88	2.8	.90	164.0	150	--	69
W2247A	32 50 42	111 58 30	18.0	10.0	250	3.7	.30	283.0	266	--	120
W2248A	32 50 31	111 56 0	38.0	15.0	90	3.8	.30	188.0	147	--	49
W2249A	32 50 26	111 54 42	50.0	10.0	78	2.5	.60	149.0	140	--	53
W2250A	32 48 27	111 53 39	28.0	13.0	120	3.8	.35	193.0	178	--	73
W2251A	32 51 1	111 53 39	25.0	5.0	83	2.5	.40	151.0	146	--	55
W2252A	32 51 54	111 55 10	26.0	5.0	78	2.7	.40	122.0	137	--	69
W2253A	32 55 23	111 54 8	340.0	68.0	260	5.9	5.30	102.0	111	--	620
W2254A	32 55 21	111 53 33	70.0	7.5	210	5.9	1.30	91.0	89	--	190
W2255A	32 58 39	111 55 15	50.0	7.5	110	2.6	.70	145.0	138	--	110
W2256A	33 0 22	111 56 50	33.0	5.0	85	2.4	.50	163.0	147	--	76
W2257A	32 59 57	111 56 13	91.0	15.0	150	3.7	1.50	141.0	133	--	190
W2258A	32 53 51	111 49 32	98.0	23.0	380	2.6	1.30	368.0	322	--	350
W2259A	32 53 12	111 49 16	96.0	20.0	470	3.3	1.30	396.0	342	--	350
W2260A	32 53 11	111 48 56	100.0	25.0	450	3.0	1.30	371.0	345	--	310
W2261A	32 53 25	111 53 8	140.0	35.0	210	3.9	2.50	120.0	106	--	220
W2262A	32 54 58	111 52 36	170.0	33.0	270	4.6	2.70	184.0	159	--	430
W2263A	32 47 32	111 49 54	7.5	2.5	140	2.0	.10	237.0	215	4.7	48
W2264A	32 48 25	111 48 33	30.0	10.0	58	2.0	.20	155.0	149	--	53
W2265A	32 48 51	111 49 32	40.0	7.5	65	2.4	.40	156.0	150	--	96
W2266A	32 52 32	111 48 30	120.0	23.0	460	3.6	1.50	282.0	293	--	430
W2267A	32 57 3	111 48 56	7.5	<.1	210	1.8	.10	98.0	77	7.5	150
W2268A	32 57 34	111 44 20	15.0	<.1	190	4.8	.10	87.0	79	3.7	170

Sample	Cl mg/L	F mg/L	NO3 mg/L	SiO2mg/L	O2 mg/L	Fe µg/L	Fe1 µg/L	Fec µg/L	Mn µg/L	Mn1 µg/L	Al µg/L
W2236A	16	.81	6.6	14	--	4.6	4.1	--	.5	.5	49
W2237A	91	.74	120.0	34	--	2.6	5.3	--	1.2	1.1	38
W2238A	22	1.00	5.1	15	--	8.0	6.9	--	.8	.8	53
W2239A	410	.62	83.0	35	--	15.0	5.2	--	2.0	2.2	50
W2240A	28	1.00	11.0	18	--	7.7	2.4	--	.7	.5	44
W2241A	28	.41	12.0	23	--	3.8	2.6	--	.5	.5	36
W2242A	180	1.80	21.0	41	--	11.0	4.1	--	1.5	1.6	36
W2243A	90	1.40	14.0	36	--	18.0	3.0	--	1.2	1.2	54
W2244A	170	3.90	22.0	26	--	9.0	6.0	--	1.2	1.1	32
W2245A	70	1.30	40.0	37	--	5.3	2.7	--	.7	.5	51
W2246A	79	.36	88.0	28	--	4.3	7.2	--	.6	.7	30
W2247A	150	1.80	38.0	39	--	11.0	8.7	--	1.1	1.2	64
W2248A	97	.36	17.0	36	--	9.4	--	--	1.1	--	37
W2249A	55	.74	5.3	32	--	7.8	--	--	.3	--	56
W2250A	76	.90	11.0	36	--	14.0	23.0	--	.5	1.9	49
W2251A	33	.72	9.1	20	--	5.4	--	--	.4	--	49
W2252A	34	.50	20.0	22	--	2.7	--	--	1.0	--	42
W2253A	820	.40	96.0	41	--	27.0	15.0	--	3.7	4.3	81
W2254A	250	3.30	<.1	26	--	13.0	5.0	--	9.8	11.0	26
W2255A	91	1.80	12.0	29	--	17.0	--	--	1.5	--	55
W2256A	49	.72	10.0	22	--	3.5	--	--	.5	--	36
W2257A	170	.62	25.0	26	--	7.8	--	--	.8	--	37
W2258A	380	2.10	36.0	63	--	7.2	--	--	1.2	--	24
W2259A	420	2.00	45.0	59	--	11.0	--	--	1.6	--	40
W2260A	450	2.00	38.0	63	--	8.4	7.0	--	1.4	1.2	30
W2261A	420	.61	25.0	34	--	10.0	--	--	2.5	--	29
W2262A	380	1.20	19.0	37	--	69.0	65.0	--	110.0	140.0	29
W2263A	34	1.30	9.7	37	--	10.0	--	--	1.6	--	46
W2264A	19	.42	1.4	41	--	2.8	--	--	.9	--	35
W2265A	46	.54	14.0	37	--	4.0	--	--	.6	--	41
W2266A	380	1.80	48.0	47	--	7.8	--	--	1.1	--	51
W2267A	110	10.00	2.0	17	--	45.0	51.0	--	2.8	3.7	19
W2268A	75	6.60	4.0	30	--	11.0	--	--	1.2	--	29

Table 2.--Sample location, results of analyses and date of collection--Continued

Sample	Ag µg/L	As µg/L	Ba µg/L	Bi µg/L	Cd µg/L	Co µg/L	Cr µg/L	Cs µg/L	Cu µg/L	Li µg/L	Mo µg/L	Ni µg/L
W2236A	.4	7.5	21	<.1	.2	4.3	31.0	1.3	6.9	40	3.2	4.5
W2237A	.4	5.7	100	.1	.2	2.7	6.3	1.5	1.0	70	4.4	2.8
W2238A	.3	8.0	29	<.1	.2	4.5	19.0	1.0	2.9	30	5.0	5.1
W2239A	1.4	4.0	71	<.1	.3	9.0	5.7	2.1	4.2	100	4.3	11.0
W2240A	.3	13.0	41	.1	.2	4.0	14.0	1.9	3.3	40	2.6	5.2
W2241A	.2	8.4	40	.1	.2	2.1	16.0	.7	2.6	35	4.2	4.5
W2242A	.6	14.0	43	<.1	.3	5.4	20.0	2.0	3.1	140	4.4	6.9
W2243A	.4	17.0	33	<.1	.2	4.3	15.0	1.7	2.6	120	7.8	5.3
W2244A	.8	8.3	16	.1	.3	9.3	21.0	1.2	5.1	200	8.0	11.0
W2245A	.5	65.0	22	<.1	.2	6.4	19.0	1.5	4.0	120	2.7	11.0
W2246A	.2	5.2	55	.1	.3	2.0	7.6	1.7	3.5	50	5.1	2.4
W2247A	1.0	20.0	14	.1	.3	11.0	21.0	6.1	6.0	170	4.6	9.5
W2248A	.2	5.4	28	.2	.3	3.0	16.0	1.0	2.3	70	5.2	3.3
W2249A	.2	6.9	74	.4	.2	2.5	7.3	1.0	3.1	50	5.2	2.0
W2250A	.3	7.4	15	.3	.2	5.0	21.0	1.5	1.3	80	4.5	6.0
W2251A	.3	15.0	53	.3	.2	3.6	15.0	.9	1.5	40	3.5	4.2
W2252A	.3	8.4	32	.3	.2	3.8	13.0	1.0	2.4	40	7.0	4.1
W2253A	1.2	6.8	140	.6	.3	12.0	6.5	4.0	4.1	290	3.7	17.0
W2254A	.7	7.2	16	.4	.2	7.6	7.3	1.7	4.8	210	11.0	8.2
W2255A	.4	10.0	35	.3	.2	4.1	10.0	1.4	2.9	75	3.6	3.7
W2256A	.3	7.7	55	.1	.2	3.5	8.1	1.0	2.2	40	2.9	4.1
W2257A	.6	5.3	70	.1	.2	5.2	7.7	1.1	2.6	80	2.1	4.9
W2258A	1.0	7.6	26	.2	.2	9.8	56.0	1.8	4.9	200	9.7	21.0
W2259A	1.3	9.8	26	.1	.2	13.0	5.4	4.8	9.0	250	6.7	18.0
W2260A	1.2	12.0	29	.1	.2	13.0	5.0	2.7	7.9	280	7.4	13.0
W2261A	.3	18.0	90	<.1	.3	5.5	12.0	1.4	2.4	220	5.1	7.4
W2262A	1.1	7.9	77	.4	.2	11.0	1.7	2.5	5.8	200	6.9	10.0
W2263A	.4	52.0	12	.1	.2	4.9	18.0	2.0	5.8	80	5.5	5.4
W2264A	.2	6.9	34	.1	.2	3.8	14.0	2.2	3.0	60	3.5	4.1
W2265A	.3	6.5	72	.1	.2	4.2	14.0	1.5	3.9	60	3.4	4.1
W2266A	1.5	8.5	23	.1	.2	13.0	5.2	4.6	7.9	190	11.0	20.0
W2267A	1.1	72.0	31	.2	.2	14.0	1.6	6.1	12.0	140	9.6	18.0
W2268A	1.1	23.0	15	.2	.2	13.0	13.0	6.3	7.1	110	7.4	13.0

Table 2. Sample location, results of analyses and date of collection--continued

Sample	Pb μg/L	Ro μg/L	U μg/L	Zn μg/L	Cond lab	Cond fld	pH	T deg C	Date Collected	Quadrangle
W2236A	.2	.3	2.6	1.7	380	--	8.73	30.5	6-06-80	Stanfield
W2237A	.1	.2	5.2	3.3	1,100	--	7.50	26.0	6-06-80	Stanfield
W2238A	.1	.3	2.2	1.7	370	--	8.67	32.5	6-06-80	Stanfield
W2239A	.1	1.5	4.0	4.4	2,500	--	7.39	26.0	6-06-80	Stanfield
W2240A	.1	.4	4.0	1.9	470	--	8.24	31.0	6-06-80	Stanfield
W2241A	.1	.4	3.2	2.7	450	--	8.04	29.0	6-06-80	Stanfield
W2242A	.2	.8	5.4	5.7	1,200	--	8.00	29.5	6-06-80	Stanfield
W2243A	.1	.7	7.0	2.3	840	--	7.69	30.0	6-06-80	Stanfield
W2244A	.1	1.5	19.0	2.1	1,200	--	7.97	34.0	6-08-80	Double Peak
W2245A	.1	.7	4.6	2.3	790	--	8.28	28.5	6-08-80	Double Peak
W2246A	.4	.2	4.2	2.9	740	--	7.69	26.0	6-08-80	Double Peak
W2247A	.3	.8	8.2	2.9	1,200	--	8.00	29.5	6-06-80	Double Peak
W2248A	.3	.7	4.6	2.5	740	--	7.82	27.0	6-08-80	Double Peak
W2249A	.4	.2	3.6	3.5	680	--	7.80	27.0	6-08-80	Double Peak
W2250A	.1	.8	9.4	2.3	720	--	8.00	28.0	6-08-80	Double Peak
W2251A	.2	.2	4.1	2.5	490	--	8.08	29.0	6-08-80	Double Peak
W2252A	.1	.3	4.0	2.5	500	--	7.98	28.5	6-08-80	Double Peak
W2253A	.2	5.6	2.4	4.1	3,300	--	7.30	30.0	6-09-80	Stanfield
W2254A	.2	1.7	4.4	2.8	1,300	--	7.70	33.0	6-09-80	Stanfield
W2255A	.2	.4	5.4	5.2	800	--	7.86	32.5	6-09-80	Stanfield
W2256A	.1	.4	5.0	2.6	580	--	7.81	32.0	6-09-80	Sacaton Butte
W2257A	.1	.7	5.8	3.4	1,200	--	7.59	31.5	6-09-80	Stanfield
W2258A	.1	.1	17.0	3.0	2,400	--	7.39	23.0	6-09-80	Casa Grande W
W2259A	<.1	.1	15.0	4.2	2,600	--	7.42	23.0	6-09-80	Casa Grande W
W2260A	.3	.1	16.0	2.6	2,400	--	7.43	22.5	6-10-80	Casa Grande W
W2261A	.1	1.4	3.4	3.4	1,800	--	7.69	29.0	6-10-80	Stanfield
W2262A	.2	3.6	6.8	6.7	2,200	--	7.49	29.0	6-10-80	Stanfield
W2263A	.4	.8	7.4	2.1	610	--	8.58	32.0	6-10-80	Chiuchu
W2264A	.1	.4	3.9	2.6	490	--	7.89	28.5	6-10-80	Chiuchu
W2265A	<.1	.3	4.6	2.7	460	--	7.81	29.5	6-10-80	Chiuchu
W2266A	.2	.3	16.0	2.8	2,600	--	7.40	23.5	6-11-80	Casa Grande W
W2267A	.3	.3	2.0	4.2	940	--	8.92	39.0	6-11-80	Casa Grande W
W2268A	.2	.6	1.4	2.8	860	--	8.80	27.0	6-11-80	Casa Grande W

REFERENCES CITED

Brown, Eugene, Skougstad, M. W., and Fishman, M. J., 1970, Methods for collection and analysis of water samples for dissolved minerals and gases: U.S. Geological Survey Techniques of Water Resources Investigations, TWI 5-A1, 160 p.

Fishman, M. J., and Downs, S. C., 1966, Methods for analysis of selected metals in water by atomic absorption: Geological Survey Water Supply Paper 1540-C, U.S. Government Printing Office, Washington, D.C.

Fishman, M. J., and Pyen, Grace, 1979, Determination of selected anions in water by ion chromatography: U.S. Geological Survey Water Resources Investigations 70-101, 30 p.

Orion Research, Inc., 1975, Orion Research Analytical Methods Guide, 7th edition, Cambridge, Massachusetts, 33 p.

Perkin-Elmer Corp., 1977, The determination of heavy metals in water: Analytical methods using the HGA Graphite Furnace, p. EN-4.

Tabatabai, M. A., 1974, A rapid method for determination of sulfate in water samples: Environmental Letters, v. 7, no. 3, p. 237-243.

Ward, F. N., and Bandar, W. F., 1977, Analytical methodology in the search for metallic ores, in Programs and Abstracts, Exploration 77 Symposium [Abs.]: Ottawa, Canada, Canadian Geoscience Council, October 16-26, 1977, p. 37.