GENERAL SURFACE- AND GROUND-WATER QUALITY IN A COAL-RESOURCE AREA NEAR DURANGO, SOUTHWESTERN COLORADO

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METRIC CONVERSIONS

The following factors can be used to convert inch-pound units to the International System (SI) of units.

Multiply inch-pound units	*By*	*To obtain SI units*
cubic foot per second (ft^3/s)	0.02832	cubic meter per second
foot (ft)	0.3048	meter
inch (in.)	25.40	millimeter
mile (mi)	1.609	kilometer
ton	0.9072	metric ton

Temperature can be converted to degree Celsius (°C) or degree Fahrenheit (°F) by the following equations:

$$°C=5/9(°F-32)$$
$$°F=(9/5°C)+32$$

The following terms and abbreviations also are used in this report:

microsiemens per centimeter at 25 degrees Celsius (μS/cm at 25 °C)
milligram per liter (mg/L)
microgram per liter (μg/L).

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ABSTRACT

This report presents a general description of surface- and ground-water quality in a coal-resource area in southwestern Colorado. Dissolved-solids concentrations were less than 1,000 milligrams per liter in streams except in the Alkali Gulch, Basin Creek, and Carbon Junction Canyon drainage basins. Streams draining areas underlain primarily by sandstone and conglomerate had less dissolved solids (mean concentration 266 milligrams per liter) than streams draining areas underlain primarily by sandstone and shale (mean concentration 687 milligrams per liter). Median concentrations of dissolved boron, iron, manganese, and zinc in stream samples were less than 35 micrograms per liter; median concentrations of dissolved lead and selenium were less than 1 microgram per liter.

Water samples from the Mesaverde Group, undivided, had a mean dissolved-solids concentration of 976 milligrams per liter. Water samples from the Animas Formation had a mean dissolved-solids concentration of 378 milligrams per liter, and water samples from the Mancos Shale had a mean dissolved-solids concentration of 1,880 milligrams per liter. Median concentrations of trace elements of all ground-water samples were less than 50 micrograms per liter.

Major-ion and dissolved-solids concentrations in streams could be estimated from specific conductance and surficial geology using linear-regression relations. Stream samples were separated into two groups based on lithology for linear-regression analysis: samples collected from streams draining areas primarily underlain by sandstone and conglomerate and samples collected from streams draining areas primarily underlain by sandstone and shale. Linear regressions of dissolved-solids concentration to specific conductance were determined for ground-water samples separated into three geologic groups: the Animas Formation, the Fruitland Formation and the Mesaverde Group, undivided, and the Lewis Shale and the Mancos Shale.

INTRODUCTION

Coal has been mined in southwestern Colorado for more than 100 years. Part of the area, located in sections of Montezuma, La Plata, and Archuleta Counties (fig. 1), has been designated a Known Recoverable Coal Resource Area (KRCRA) by the U.S. Bureau of Land Management. Hydrologic information was needed for the KRCRA because some land may be leased for coal mining. Water-quality data for surface and ground water would aid the U.S. Bureau of Land Management in assessing the hydrology of potential coal-lease tracts and in evaluating their suitability for coal leasing.

This report presents a description of the general surface- and ground-water quality in the coal-resource area and documents how specific conductance can be used to estimate major-ion and dissolved-solids concentrations in surface and ground water in unsampled drainage basins. Several streams discussed in this report drain basins not located entirely within the coal-resource area. These streams are discussed because they drain land that

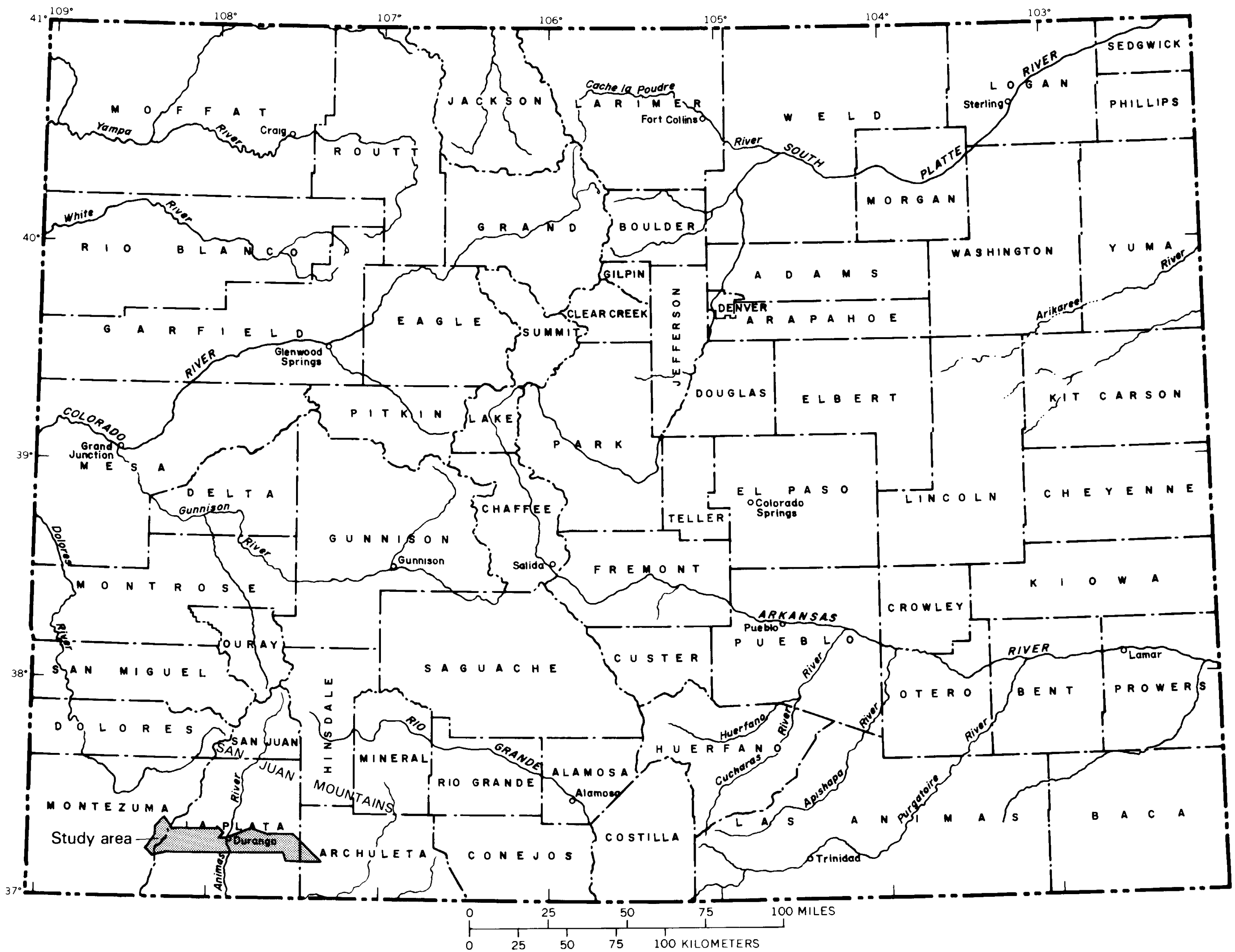

Figure 1.--Location of the Known Recoverable Coal Resource Area.

is of similar physiography and geology, and that is adjacent to the coal-resource area. Water quality of five rivers flowing through the coal-resource area is not discussed because large parts of their drainage basins are outside the KRCRA boundaries, and they drain areas of dissimilar geology, physiography, and land uses than that of the drainage basins in the KRCRA. Coal-lease tracts cannot be located in the alluvial valley floors of the major rivers; therefore, ground-water quality described in this report does not include water-quality data for the alluvial aquifers located in the major river valleys.

PHYSICAL SETTING

The coal-resource area is located along the southern slopes of the San Juan mountains in southwestern Colorado. Five major rivers, flowing southward, cross the study area: the La Plata, Animas, Florida, Los Pinos, and Piedra Rivers (pl. 1). The streams discussed in this report are tributary to these five rivers.

The coal-resource area is located in the extreme eastern part of the Colorado Plateau physiographic province (Hunt, 1974). In the western two-thirds of the study area, rolling hills and gently sloping valleys grade to steeper foothill slopes along the northern boundary of the study area. The eastern one-third of the study area is hill and canyon country. Altitude in the coal-resource area ranges from approximately 6,000 to 9,000 ft, generally decreasing from north to south. Many of the drainage basins studied have altitudes between 6,500 and 8,000 ft.

Geology

The coal-resource area is located in the northern part of the San Juan Structural Basin. Stratigraphic units dip southeast in the western part to southwest in the eastern part of the coal-resource area. The region has anticlines, synclines, and local faults and fractures. A lithologic description of the geologic units from Quaternary to Pennsylvanian age is shown in table 1.

Surficial deposits and rocks are of Quaternary, Tertiary, or Cretaceous age. The Quaternary deposits consist of unconsolidated alluvium and terrace gravels; Tertiary rocks consist of the San Jose Formation and the upper part (unnamed member) of the Animas Formation. The Cretaceous rocks consist of the lower part (McDermott Member) of the Animas Formation, Kirtland Shale, Fruitland Formation, Pictured Cliffs Sandstone, Lewis Shale, Cliff House Sandstone, Menefee Formation, Point Lookout Sandstone, Mancos Shale, and Dakota Sandstone. Coal-bearing units are the Fruitland and Menefee Formations. A map of the general surficial geology is shown in figure 2. Geologic maps at greater detail (1:31,680 scale) for the western two-thirds of the coal-resource area are found in Zapp (1949). Geologic maps at 1:250,000 scale for the entire coal-resource area are found in Haynes and others (1972) and Steven and others (1974).

Table 1.--*Generalized description of geologic units*

System	Series	Geologic unit	Lithology
Quaternary	Holocene and Pleistocene	Alluvial deposits	Present-day stream deposits of poorly sorted clay, sand, and gravel; includes landslide deposits.
		Terrace deposits	Remnants of alluvial-fan and older alluvial deposits consisting of poorly sorted clay, sand, and gravel.
Tertiary	Eocene	San Jose Formation	Sandstone and conglomerate with interbedded claystone.
	Paleocene	Animas Formation — Unnamed Member	Sandstone, shale, and conglomerate; contains volcanic debris.
Cretaceous	Upper Cretaceous	Animas Formation — McDermott Member	Sandstone, breccia, and conglomerate; contains volcanic debris.
		Kirtland Shale	Mostly shale interbedded with sandstone and siltstone.
		Fruitland Formation	Interbedded sandstone, shale, and coal.
		Pictured Cliffs Sandstone	Sandstone interbedded with some shale and siltstone.
		Lewis Shale	Marine shale with thin sandstone beds near top.
		Mesaverde Group — Cliff House Sandstone	Calcareous sandstone, mudstone, and silty shale.
		Mesaverde Group — Menefee Formation	Sandstone, shale, and siltstone interbedded with several coal seams.
		Mesaverde Group — Point Lookout Sandstone	Marine sandstone with interbedded siltstone and shale.
		Mancos Shale	Sandy marine shale and interbedded sandstone and limestone.
	Upper and lower Cretaceous	Dakota Sandstone	Sandstone with interbedded siltstone and carbonaceous shale.
		Burro Canyon Formation	Conglomerate interbedded with claystone and sandstone. Mapped with Dakota Sandstone.
Jurassic	Upper Jurassic	Morrison Formation	Interbedded mudstone, claystone, and sandstone.
Triassic	Upper Triassic	Dolores Formation	Non-marine siltstone, sandstone, and shale.
Permian and Pennsylvanian	Lower Permian	Cutler Formation	Red, non-marine shale, siltstone, and mudstone.
	Lower Permian and Pennsylvanian	Rico, Hermosa, and Molas Formations, undifferentiated	Sequence of marine and non-marine shale, siltstone, sandstone, and breccia.

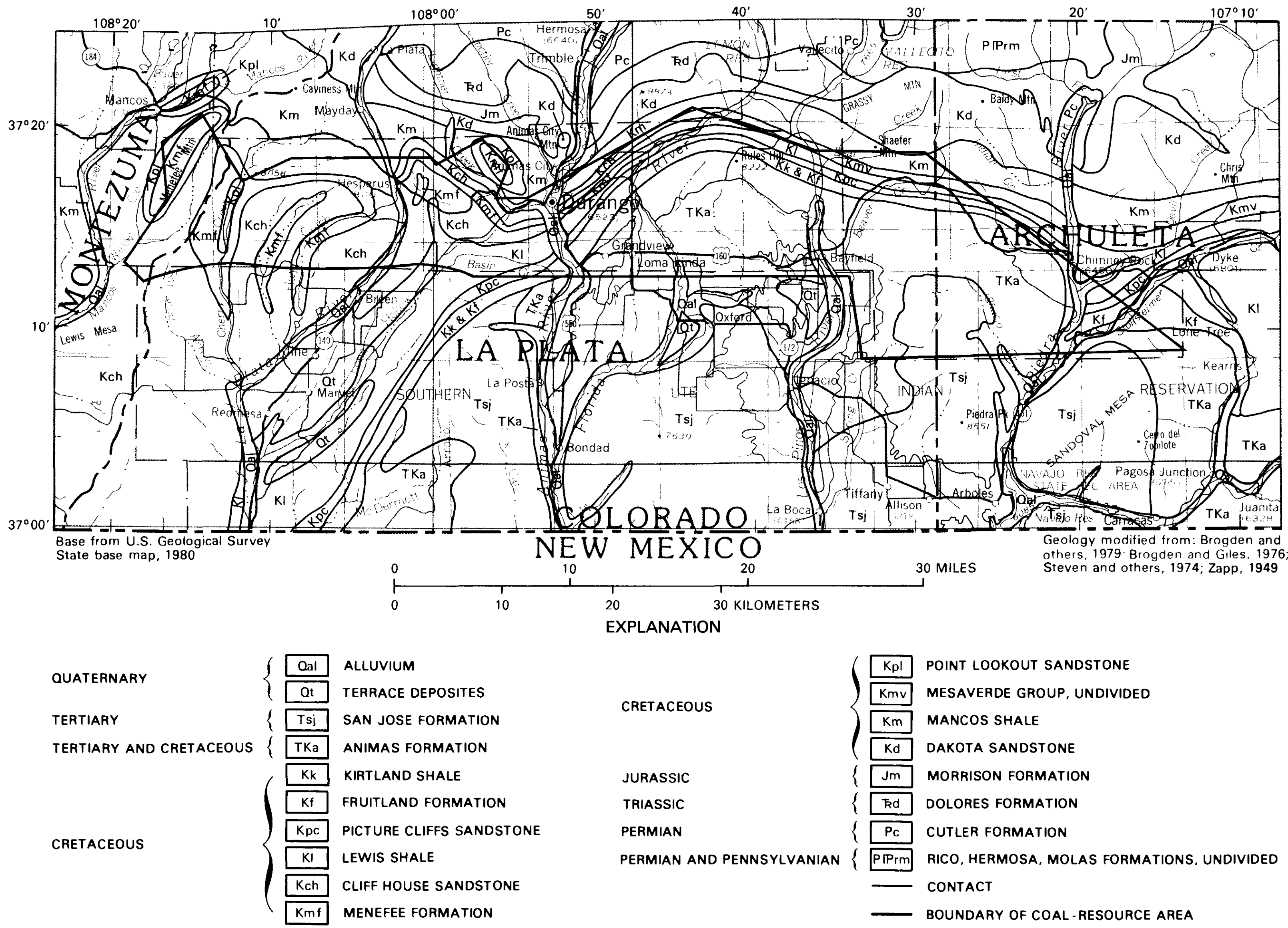

Figure 2.--Surficial geology of the coal-resource area and vicinity.

Vegetation and Land Use

Plant communities in the coal-resource area consist of pinyon pine, juniper, sagebrush, and bunch grass at lower altitudes or on drier slopes. These communities grade into mountain shrubs and woodlands of ponderosa pine, oak-brush, and mountain mahogany at higher altitudes.

The principal use of land in the coal-resource area is agriculture. Agricultural uses include irrigated and nonirrigated cropland and rangeland. Areas with considerable irrigated land are located in the Los Pinos River valley and Beaver Creek valley in the Bayfield area and the Florida River valley near Loma Linda. Urban development is concentrated in the Animas River valley at Durango. Suburban development has spread from Durango into the hills west of the city and into the Florida River valley area, east of the city.

Coal was mined west of Durango in upper Hay Gulch, Coal Gulch, Wildcat Canyon, and in lower Lightner Creek basin. There are numerous, small, abandoned mines in these areas. The only major, active coal mine west of Durango is located in Hay Gulch, about 3 mi southwest of site GW90 (pl. 1). This mine had a projected 1985 production of 210,000 tons (Kelso and others, 1981).

East of Durango, small-scale coal mining occurred in Horse Gulch, Carbon Junction Canyon, and along the northern boundary of the coal-resource area between the Florida River and Beaver Creek. The largest active mine in the coal-resource area is located in the lower Stollsteimer Creek basin near site GW11 (pl. 1). This mine had a projected 1985 production of 600,000 tons (Kelso and others, 1981).

Climate

The coal-resource area has a continental, semiarid climate. Mean-monthly-air temperature from 1951 to 1980 at Durango ranged from 25.7 °F during January to 68.3 °F during July (National Oceanic and Atmospheric Administration, 1984). Temperature decreases with increasing altitude. The mean-annual air temperature from 1951 to 1980 at Durango (altitude 6,600 ft) was 46.7 °F, and at Ft. Lewis (altitude 7,600 ft), it was 42.6 °F (National Oceanic and Atmospheric Administration, 1984).

Mean-annual precipitation in the coal-resource area ranges from 15 to 25 in. Much of the precipitation is the result of orographic lifting of moist air flowing north from Mexico. Areas with more than 20 in. precipitation are confined to areas higher than 8,000 ft that are located along the northern boundary of the coal-resource area and between the Los Pinos and Piedra Rivers. Monthly distribution of precipitation for Durango indicates a dry period from April through June and a wetter period from July through October. Thunderstorms are common from July through September.

SURFACE-WATER QUALITY

Few water-quality samples had been collected from streams in the coal-resource area prior to this study. A reconnaissance of streams was done during 1984 to provide data to describe water quality of streams in the coal-resource area. Two samples were to be collected at each site: one during spring runoff (March and April) and one during summer base flow (July and August). Eight sites did not have flowing water during the summer visit. A compilation of water-quality data for streams is given in table 9 in the "Water-Quality Data" section at the end of this report. The site numbers listed in table 9 are shown on plate 1.

Streams west of the Animas River generally had larger dissolved-solids, magnesium, and sulfate concentrations than streams east of the Animas River. Stream samples with dissolved-solids concentrations larger than 1,000 mg/L were collected only in the Alkali Gulch, Basin Creek, and Carbon Junction Canyon basins.

The primary difference between spring-runoff samples and summer-baseflow samples collected during 1984 was smaller concentrations of major ions and dissolved solids in the runoff samples. If major-ion concentrations are converted to equivalent weights, ionic ratios and ion percentages can be determined for water-quality analyses. These ratios and percentages were used to determine if significant changes occurred in major-ion composition between runoff and baseflow stream samples. Significant changes in major-ion composition did not occur in most of the sampled streams based on the data collected during 1984.

Part of the areal variation of major-ion and dissolved-solids concentrations among streams could be explained by surface geology in the coal-resource area. The stream-sampling sites were separated into two groups, "A" or "S," according to the areal extent of the principal lithology of the various geologic units in the drainage basin upstream from the site. The "A" group consists of the Animas and San Jose Formations, and are composed primarily of sandstone and conglomerate. The "S" group includes all geologic units shown in table 1 older than the Animas Formation, and are composed primarily of sandstone and shale with lesser siltstone, mudstone, and coal. All sites east of the Animas River were in the "A" group except SW16 (Yellowjacket Creek) and SW17 (Carbon Junction Canyon). All sites west of the Animas River were in the "S" group. A statistical summary for specific conductance, major ions, alkalinity and dissolved solids separated into the lithologic groups is given in table 2. Mean concentrations of sodium, chloride, alkalinity, fluoride, and silica were the same at 0.05 probability between the two groups.

Separating the "S" group into more specific lithologic groups was not practical because many of the geologic units consist of mixed lithology. Shale units did not have as significant an effect on surface-water quality as expected because the moderate precipitation in the coal-resource area may have leached salts from the shallow layers in the units.

Water quality was classified according to the dominant cations and anions in solution after concentrations were converted to chemical equivalents. Diagrams showing major-ion composition of stream samples are shown in figure 3 for the "A" group and in figure 4 for the "S" group. Samples representing the "A" group were predominantly calcium bicarbonate water, and the ionic ratios of calcium to magnesium and bicarbonate to sulfate were greater than 2. Samples representing the "S" group were mixed water types. Ionic ratios of calcium to magnesium and bicarbonate to sulfate were less than 2 for samples in the "S" group.

Trace elements often have nonnormal, positively skewed frequency distributions of concentration which infers that most values occurred at small concentrations with a marked decrease in frequency with increasing concentration. A few large concentrations would produce an arithmetic-mean value

Table 2.--*Statistical summary for specific conductance, major ions, alkalinity, and dissolved solids in stream samples by lithologic group*

[Lithologic group: A, samples collected in basins draining primarily sandstone and conglomerate units, and S, samples collected in basins draining primarily sandstone and shale units; N, number of samples; SD, standard deviation; MAX, maximum value or concentration; MIN, minimum value or concentration; CV, coefficient of variation, in percent; specific conductance in microsiemens per centimeter at 25 degrees Celsius; major ion, alkalinity, and dissolved-solids concentrations in milligrams per liter]

Property or constituent	Lithologic group	N	MEAN	SD	MAX	MIN	CV
Specific conductance	A	18	446	142	645	205	32
Specific conductance	S	28	964	620	2,200	280	64
Calcium	A	18	55	17	77	27	31
Calcium	S	28	85	43	160	28	51
Magnesium	A	18	11	4.2	18	5	38
Magnesium	S	28	65	60	216	9.4	92
Sodium	A	18	30	15	60	10	50
Sodium	S	28	46	48	160	5	104
Potassium	A	18	1.5	0.7	3.5	0.5	47
Potassium	S	28	3.1	1.4	6.9	1.4	45
Chloride	A	18	4.3	3.7	16	1.5	86
Chloride	S	28	7.2	7.1	32	0.8	99
Sulfate	A	18	43	21	85	15	49
Sulfate	S	28	350	313	1,100	44	89
Alkalinity	A	18	187	53	270	91	28
Alkalinity	S	28	199	96	376	57	48
Fluoride	A	18	0.3	0.2	0.6	0.1	67
Fluoride	S	28	0.3	0.2	0.7	0.1	67
Silica	A	18	8.9	2.1	12	3.9	24
Silica	S	27	8.9	2.4	14	1.7	27
Dissolved solids	A	18	266	78	370	130	29
Dissolved solids	S	28	687	508	1,800	170	74

not representative of most of the sample concentrations. Another difficulty with calculating arithmetic means using trace-element data was that some concentrations were reported as less than some lower limit. Because of numerous "less than" values and non-normal distributions of concentration, median concentration was used to approximate central tendency for trace-element concentrations listed in table 3. If more than 50 percent of the concentrations for a trace element were "less than" values, the lower limit was used for the median concentration. Median concentrations of dissolved boron, iron, manganese, and zinc were less than 35 μg/L; median concentrations of dissolved lead and selenium were less than 1 μg/L.

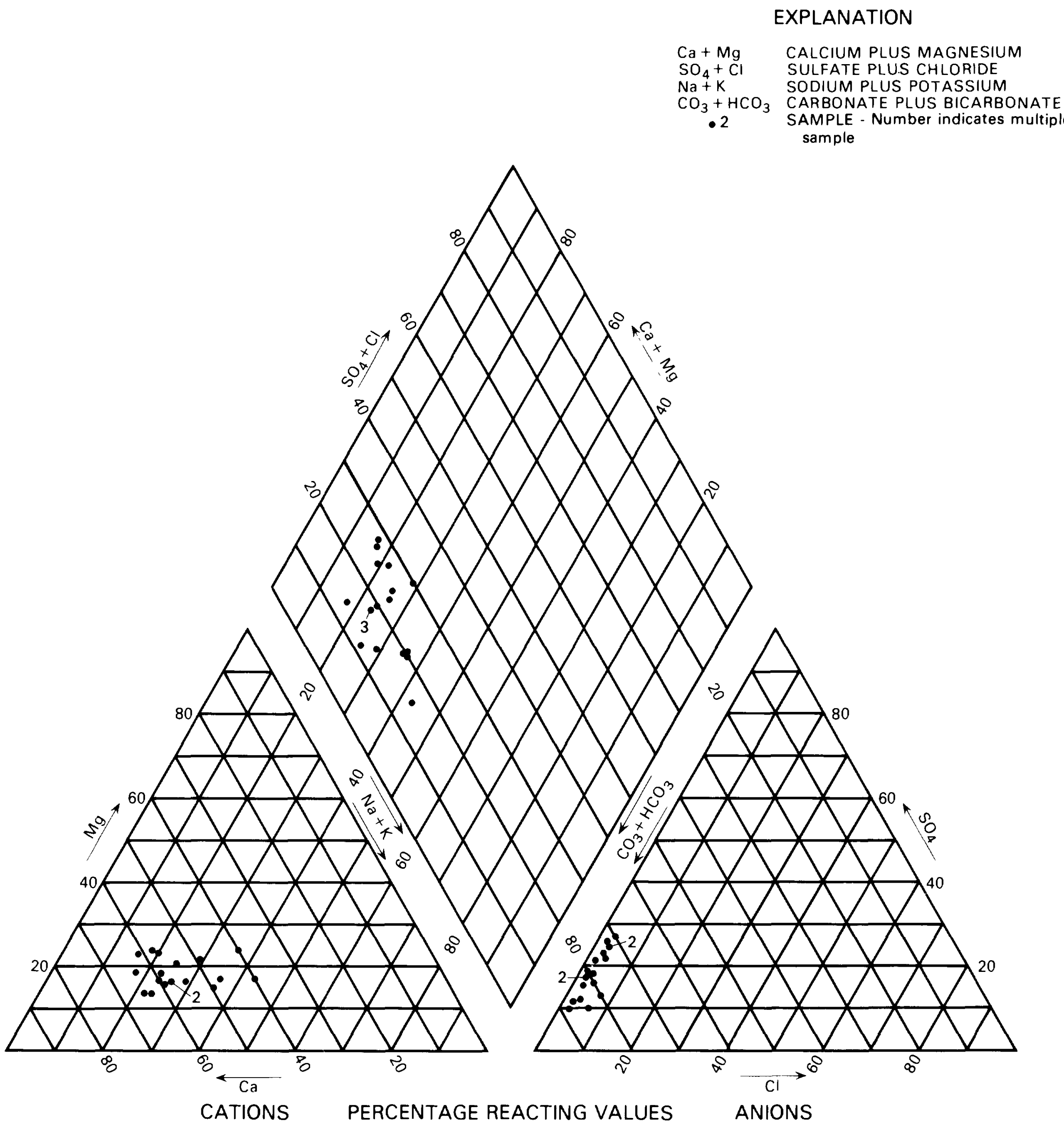

Figure 3.--Major-ion composition of 18 stream samples collected in basins where the lithology of surficial geologic units primarily is sandstone and conglomerate.

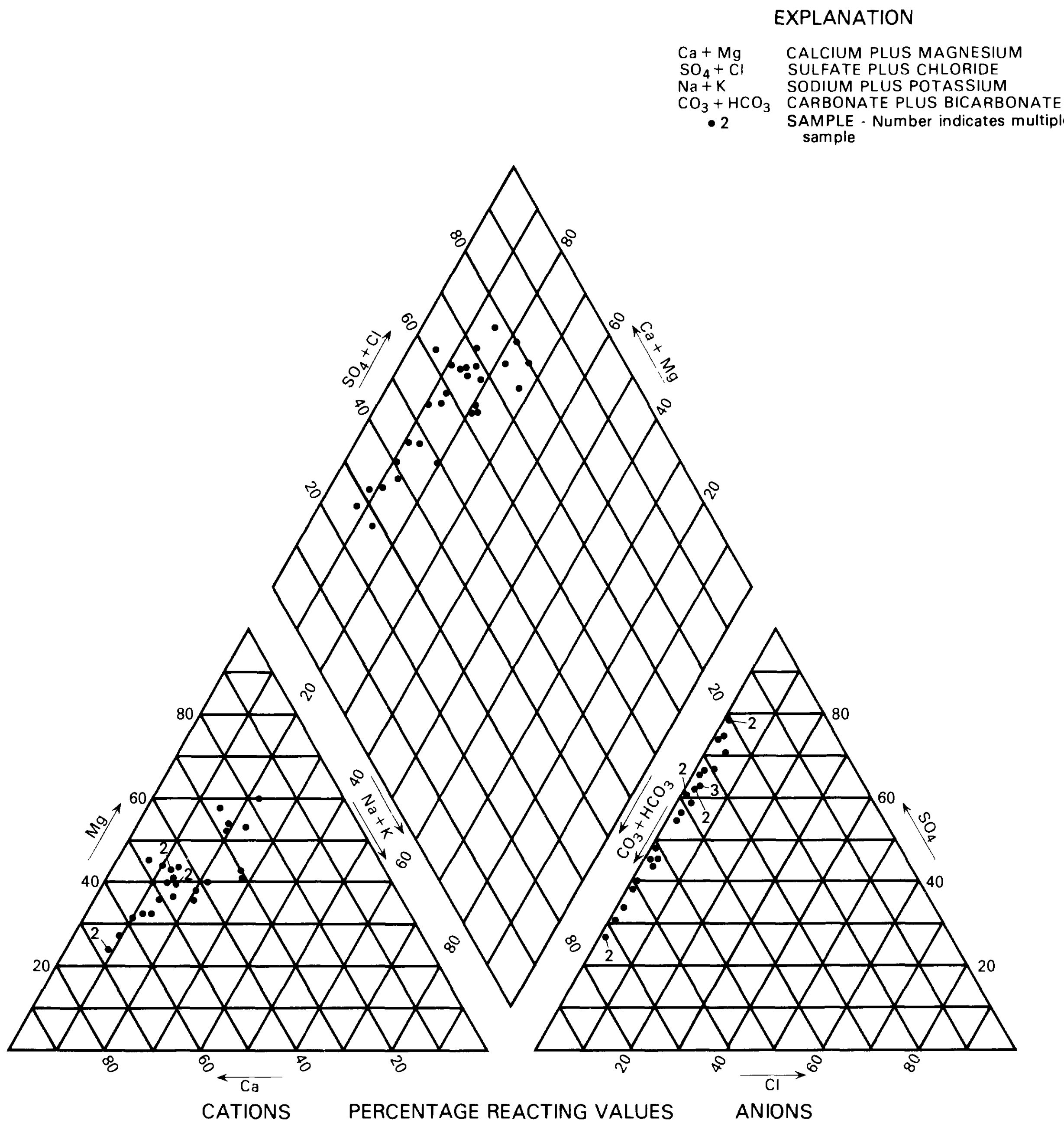

Figure 4.--Major-ion composition of 28 stream samples collected in basins where the lithology of surficial geologic units primarily is sandstone and shale.

Table 3.--*Median, maximum, and minimum concentrations of selected dissolved trace elements in stream samples*

[All concentrations in micrograms per liter; <, less than]

Element	Number of samples	Median concentration	Maximum concentration	Minimum concentration
Arsenic	4	1	2	<1
Boron	43	20	160	<10
Iron	46	31	170	<3
Lead	45	<1	52	<1
Manganese	45	16	180	<1
Selenium	46	<1	6	<1
Zinc	45	12	32	4

Median concentrations of dissolved boron, iron, lead, manganese, selenium, and zinc were not different between the "A" and "S" groups. No areal or seasonal differences in concentrations of these elements were noted. Because some trace elements, such as iron, lead, and zinc, may be transported by fine sediment particles in streams, analysis of unfiltered water samples collected during spring runoff may be needed to determine if trace elements were flushed into streams in the coal-resource area by overland runoff.

GROUND-WATER QUALITY

Three springs and 17 wells were sampled during 1984 to supplement ground-water data collected in the coal-resource area by three previous studies (Brogden and Giles, 1976; Hutchinson and Brogden, 1976; and Brooks, in press). Location information, geologic formation, and water-quality data for the ground-water sites are listed in table 10 in the "Water-Quality Data" section at the end of this report. Site locations are shown on plate 1. The system for describing the location of ground-water sites is shown in figure 5.

The largest number of ground-water samples listed in table 10 were collected from the Animas Formation because of the unit's importance as a water source rather than because of its importance to coal hydrology. More wells were drilled into the Animas Formation than into other rock units in the coal-resource area. Data were few for some units; no water samples were collected from the Pictured Cliffs Sandstone; only one sample was collected from the Kirtland Shale. The coal-bearing units, the Menefee Formation west of Durango and the Fruitland Formation east of Durango, were sampled in areas where they outcrop or were mined.

Statistical data for major-ion and dissolved-solids concentrations for the Animas Formation, Fruitland Formation, Lewis Shale, Mesaverde Group, undivided, and Mancos Shale are given in table 4. Only units with five or more samples are listed in table 4. Because potassium, fluoride, and silica did not have large differences in concentration among geologic units, they were not summarized. Mean concentrations of these ions were: potassium, 2.5 mg/L; fluoride, 1.2 mg/L; and silica, 11 mg/L.

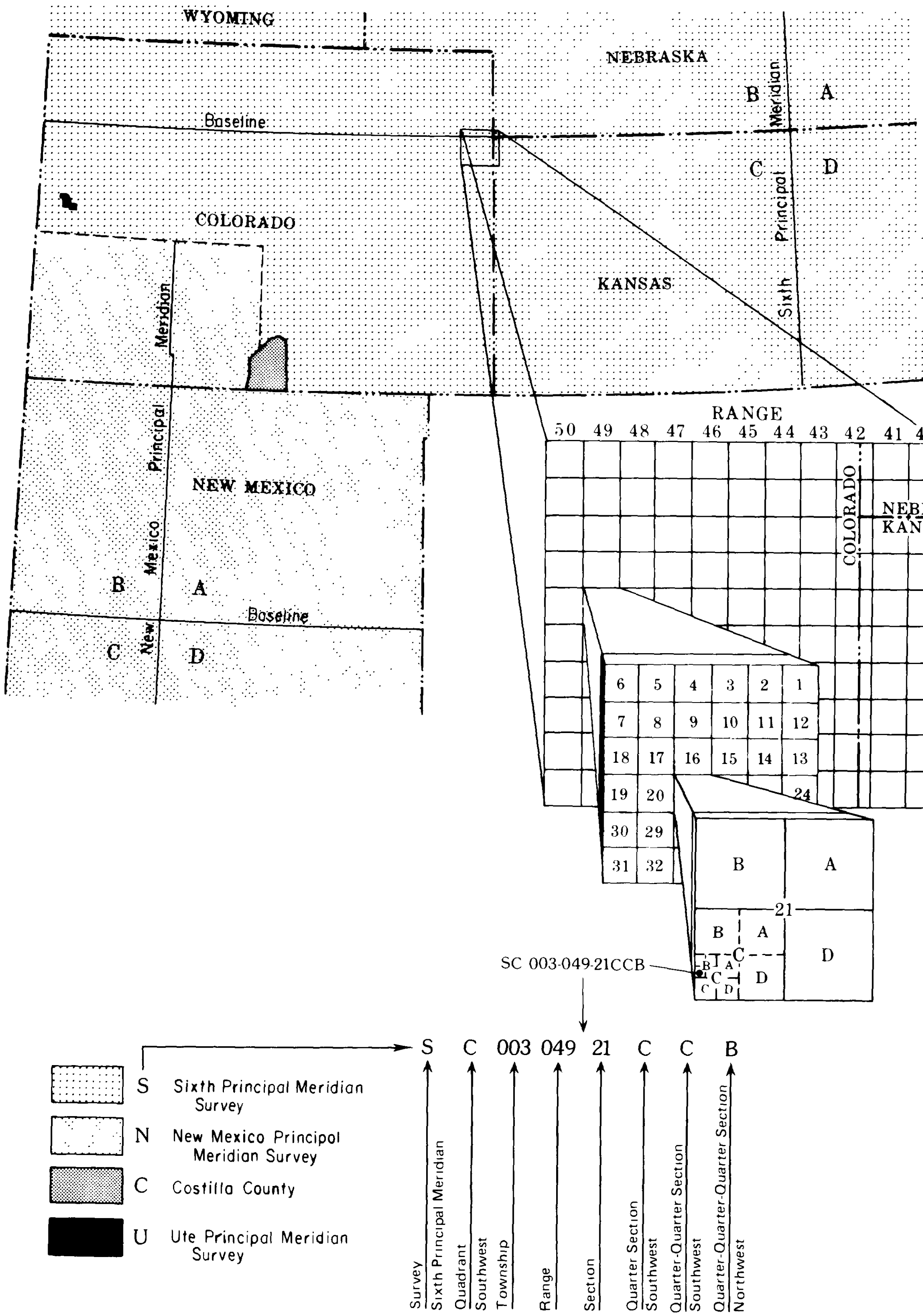

Figure 5.--System of numbering wells and springs using township, range, and section.

Table 4.--*Statistical summary for specific conductance, selected major ions, alkalinity, and dissolved solids in water samples from the Animas Formation, Fruitland Formation, Lewis Shale, Mesaverde Group, and Mancos Shale*

[N, number of samples; SD, standard deviation; MAX, maximum value or concentration; MIN, minimum value or concentration; CV, coefficient of variation, in percent; specific conductance in microsiemens per centimeter at 25 degrees Celsius, major ion, alkalinity, and dissolved solids in milligrams per liter]

Geologic unit	N	MEAN	SD	MAX	MIN	CV
			SPECIFIC CONDUCTANCE			
Animas Formation	33	643	213	1,110	201	33
Fruitland Formation	6	834	300	1,410	535	36
Lewis Shale	5	1,590	949	2,950	490	60
Mesaverde Group	35	1,400	765	3,440	239	55
Mancos Shale	9	2,480	2,170	6,400	460	88
			CALCIUM			
Animas Formation	32	40	37	140	4.3	93
Fruitland Formation	7	100	52	200	50	52
Lewis Shale	6	93	95	243	3.5	102
Mesaverde Group	35	63	84	340	0.6	133
Mancos Shale	9	118	193	600	3.3	164
			MAGNESIUM			
Animas Formation	32	7.4	11	54	0.1	149
Fruitland Formation	7	19	15	49	7.8	79
Lewis Shale	6	42	43	108	1.6	102
Mesaverde Group	35	37	58	280	0.1	157
Mancos Shale	9	43	70	220	1.0	163
			SODIUM			
Animas Formation	32	94	59	240	4.0	63
Fruitland Formation	7	43	26	95	14	60
Lewis Shale	6	208	302	810	48	145
Mesaverde Group	35	238	193	670	8.1	81
Mancos Shale	8	525	545	1,600	8.9	104
			CHLORIDE			
Animas Formation	32	20	23	93	1.3	115
Fruitland Formation	7	3.0	1.5	5.8	1.3	50
Lewis Shale	6	69	108	275	2.9	157
Mesaverde Group	35	15	17	93	1.2	113
Mancos Shale	9	383	668	1,700	0.7	174

Table 4.--*Statistical summary for specific conductance, selected major ions, alkalinity, and dissolved solids in water samples from the Animas Formation, Fruitland Formation, Lewis Shale, Mesaverde Group, and Mancos Shale*--Continued

Geologic unit	N	MEAN	SD	MAX	MIN	CV
			SULFATE			
Animas Formation	32	45	44	210	2.9	98
Fruitland Formation	7	150	181	550	34	121
Lewis Shale	6	169	221	590	0.8	131
Mesaverde Group	35	293	456	2,000	0.5	156
Mancos Shale	9	331	454	1,400	34	137
			ALKALINITY			
Animas Formation	32	262	76	459	92	29
Fruitland Formation	7	276	51	350	192	18
Lewis Shale	6	539	564	1,670	214	105
Mesaverde Group	35	515	288	1,010	102	56
Mancos Shale	9	640	461	1,510	144	72
			DISSOLVED SOLIDS			
Animas Formation	32	378	129	710	110	34
Fruitland Formation	7	494	232	1,000	310	47
Lewis Shale	6	1,020	573	1,900	300	56
Mesaverde Group	33	976	675	3,300	130	69
Mancos Shale	9	1,880	1,640	4,700	200	87

Some wells, drilled through stream alluvium into consolidated geologic units, may have been open to water from alluvial aquifers. Ground water from alluvial aquifers may explain the small dissolved-solids concentrations in some water samples collected from wells located in river valleys. Mixing of alluvial ground water may have occurred in samples from sites GW87, GW88, and GW89 (Cliff House Sandstone); sites GW85 and GW86 (Menefee Formation); and sites GW92 and GW93 (Mancos Shale).

Major-ion composition is illustrated in figures 6 through 10: trilinear plots of ion percentages for water samples collected from the Animas Formation (fig. 6); Fruitland Formation (fig. 7); Cliff House Sandstone (fig. 8); Menefee Formation (fig. 9); and Mancos Shale (fig. 10). Water samples from the Animas Formation were of two distinct water types: sodium bicarbonate and calcium bicarbonate. Major-ion composition of water from other geologic units was difficult to classify from the water-quality data. Six samples from the Menefee Formation and six samples from the Cliff House Sandstone were dominated by sodium and bicarbonate ions. Other water samples from these units had other water types.

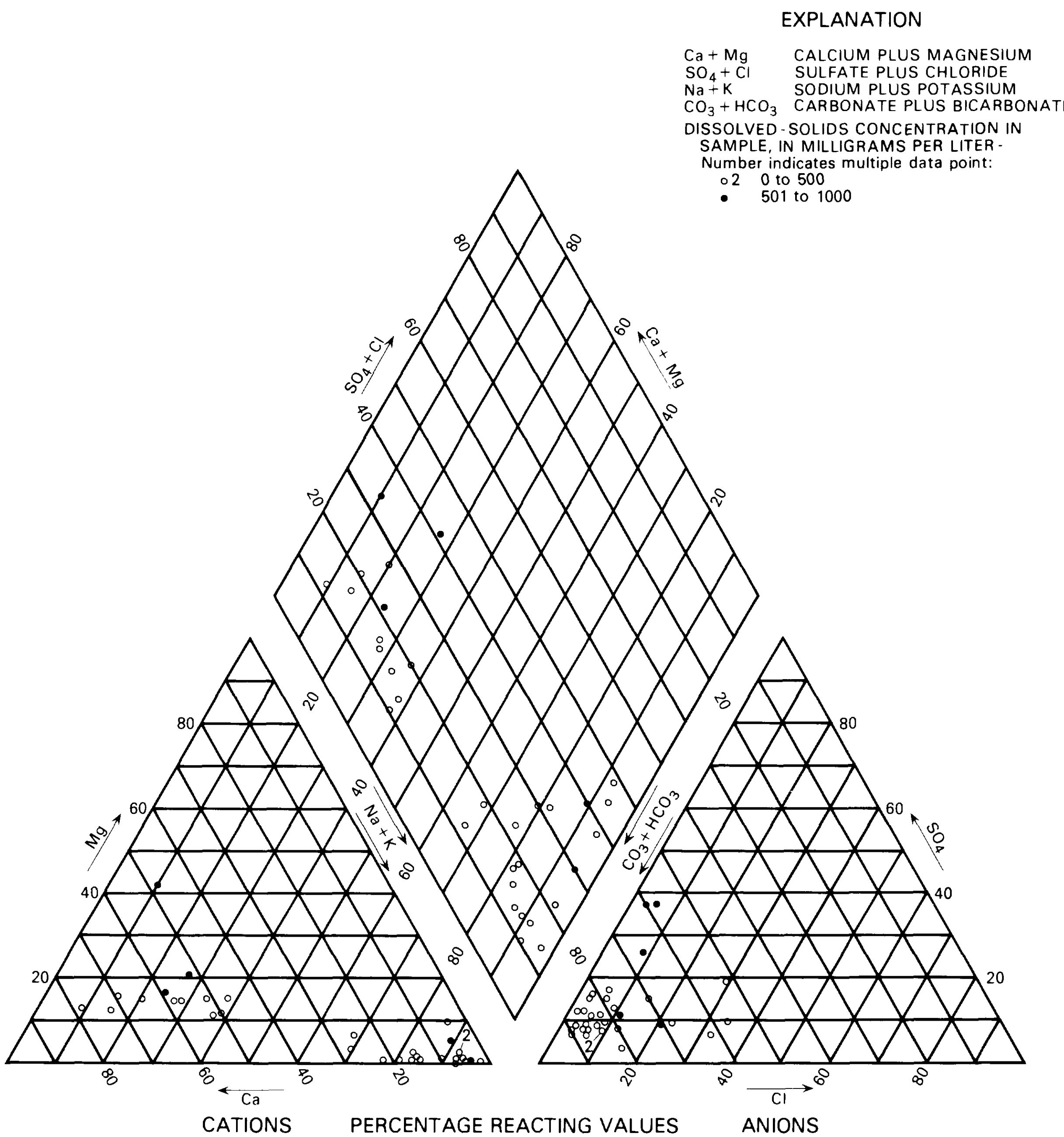

Figure 6.--Major-ion composition of 32 water samples collected from the Animas Formation.

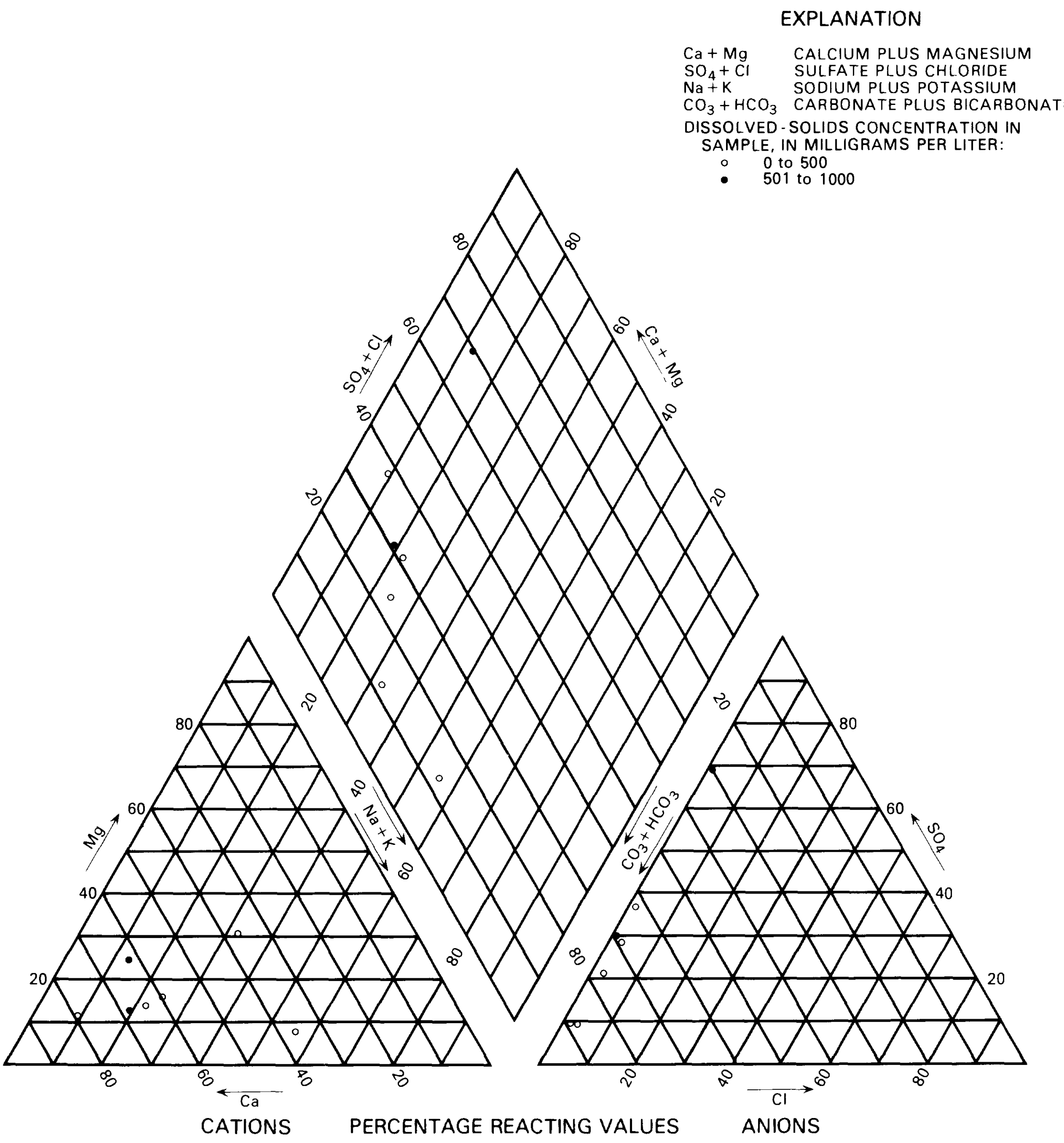

Figure 7.--Major-ion composition of seven water samples collected from the Fruitland Formation.

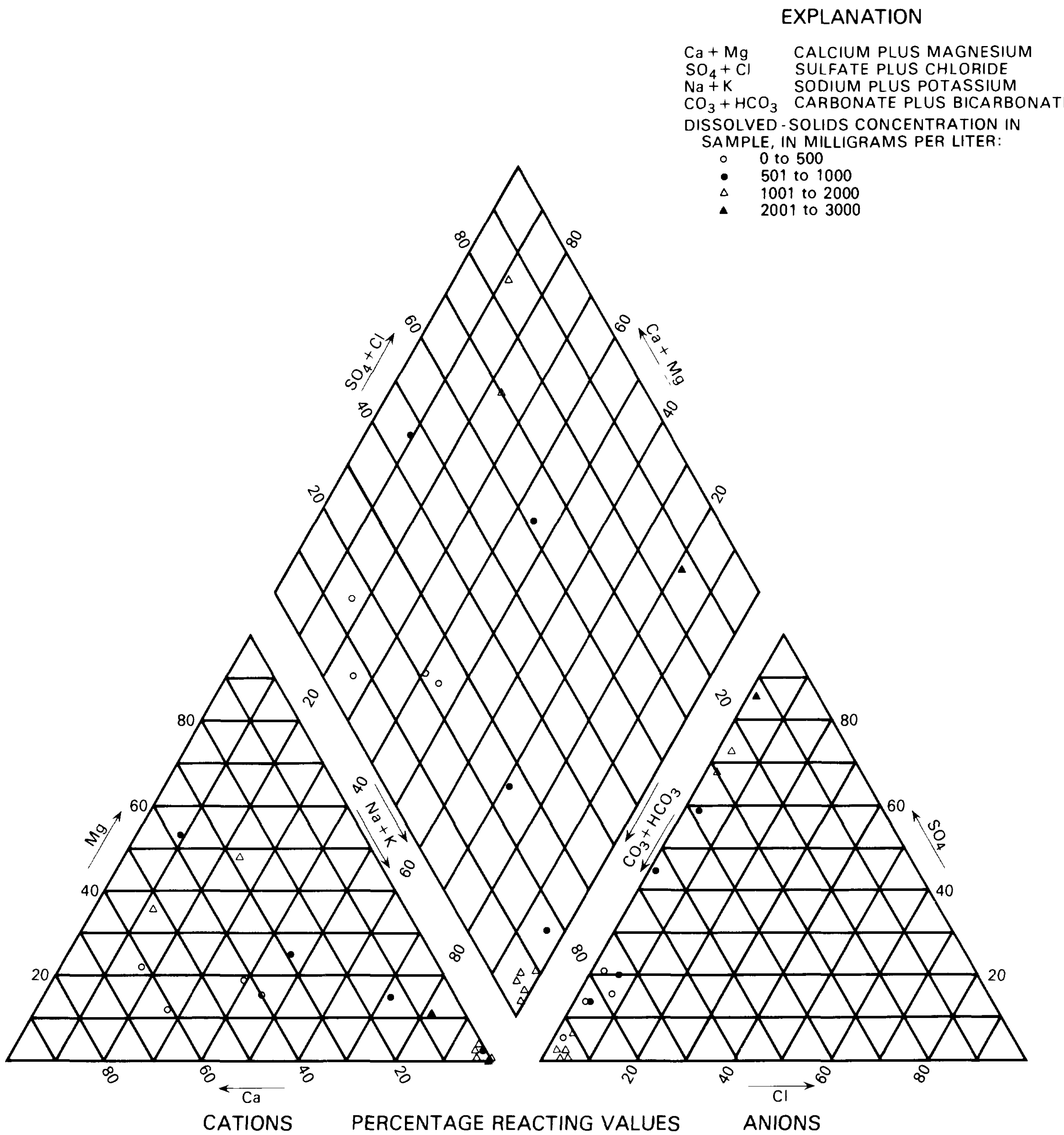

Figure 8.--Major-ion composition of 16 water samples collected from the Cliff House Sandstone.

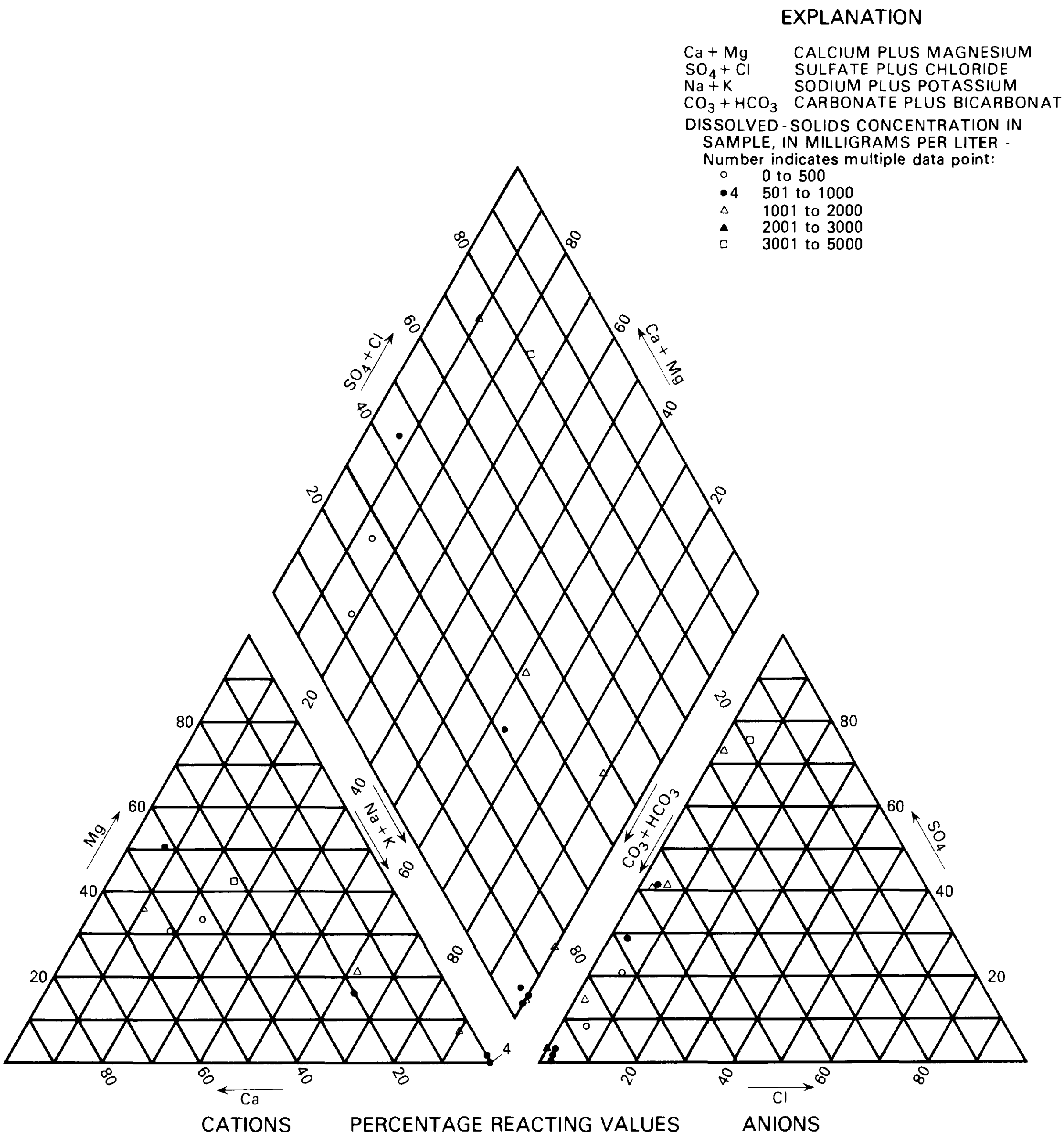

Figure 9.--Major-ion composition of 13 water samples collected from the Menefee Formation.

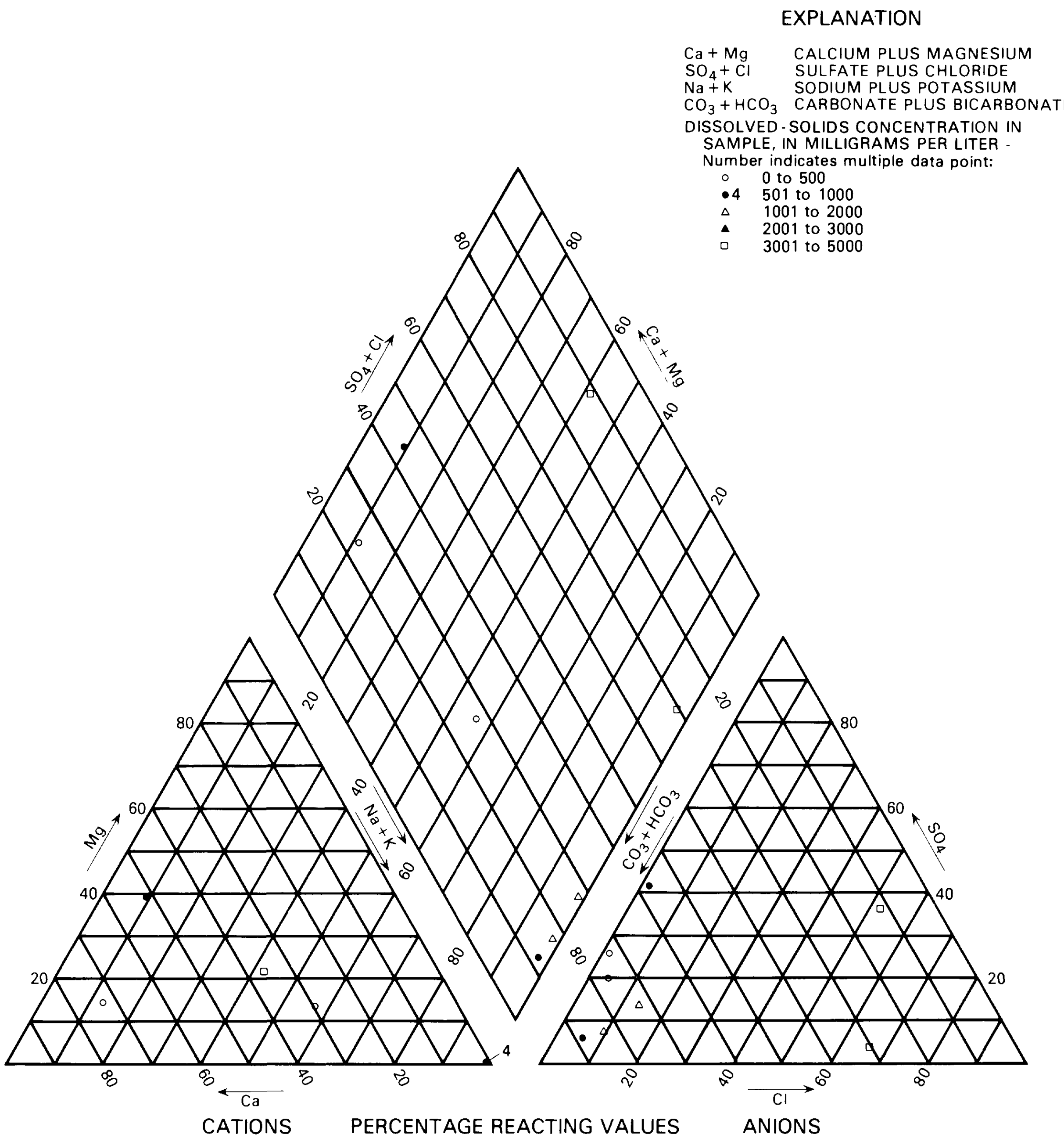

Figure 10.--Major-ion composition of eight water samples collected from the Mancos Shale.

Statistical testing of mean major-ion and dissolved-solids concentrations between geologic units was not done because of the small number of samples, large sample variances, and the uncertainty of the source water of some samples. A graphical comparison, shown in figure 11, was done for dissolved-solids concentrations for 87 water samples from 7 geologic units. The primary features noted in figure 11 are: (1) Smaller dissolved-solids concentrations and variation in water samples collected from the Animas Formation; (2) similarity of dissolved-solids concentrations in water samples from the Lewis Shale, Cliff House Sandstone, Menefee Formation, and Point Lookout Sandstone; and (3) large range of concentrations and greater mean concentration of dissolved solids in water samples from the Mancos Shale.

Median concentrations of dissolved nitrite plus nitrate (as nitrogen) and orthophosphate (as phosphorus) were near analytical detection limits. Median concentrations were used to approximate central tendency because of non-normal frequency distributions and of numerous concentrations reported as "less than" values for these constituents. Statistical data for nitrite plus nitrate and orthophosphate concentrations are shown in table 5. Only 8 of 80 water samples had nitrite plus nitrate concentrations greater than 1 mg/L; only 3 of 46 water samples had orthophosphate concentrations greater than 0.08 mg/L.

The maximum concentrations of nitrite plus nitrate (23 mg/L) and of orthophosphate (0.22 mg/L) were detected in the water sample collected at site GW70, a shallow well (75-ft sampling depth) drilled in the Mancos Shale. Water in shallow wells can be contaminated by runoff from the land surface flowing into the well. The potential for such contamination is increased near areas of heavy fertilizer use or near livestock feedlots; however, the reasons for the large concentration of nitrite plus nitrate in the sample from site GW70 were unknown.

Median concentrations of trace elements were less than 50 μg/L in ground-water samples collected in the coal-resource area. A summary of trace-element concentrations for all ground-water samples is given in table 6. Only boron, iron, manganese, and zinc had median concentrations greater than 10 μg/L.

A summary of trace-element data for specific geologic units was not presented, because few distinct differences of trace-element concentrations were noted among the units. Larger iron, lead, and zinc concentrations need to be interpreted with caution because of possible sample contamination from metal casing and pipes. Additional water samples from sites with large trace-element concentrations would be needed to verify initial results. Water samples from the coal units (Fruitland and Menefee Formations) generally did not contain larger concentrations of trace elements than water samples from other geologic units. A manganese concentration of 1,100 μg/L in a water sample collected at site GW48 (Menefee Formation) was about 3 times greater than the next largest manganese concentration in a ground-water sample. The manganese concentration in the sample from site GW48 did not appear to be typical of manganese in water of the Menefee Formation. Most water samples from the Animas Formation had smaller boron and manganese concentrations than did water samples from other rock units. The five water samples listed in table 10 with selenium concentrations greater than 10 μg/L were collected from the Animas Formation.

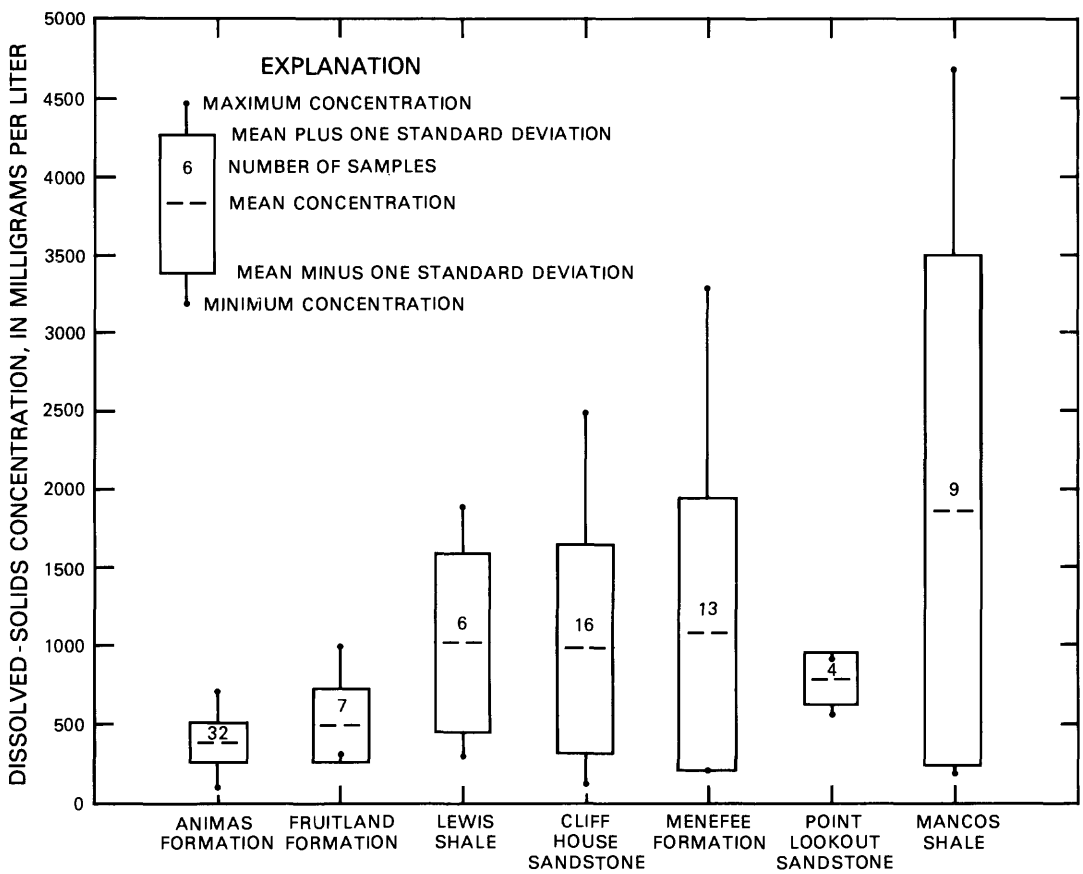

Figure 11.--Dissolved-solids concentrations in 87 water samples collected from 7 geologic units.

Table 5.--*Statistical summary of dissolved nitrite plus nitrate and orthophosphate in ground-water samples*

[N, number of samples; MAX, maximum concentration; MIN, minimum concentration; <, less than; all concentrations in milligrams per liter]

Constituent	N	MEDIAN	MAX	MIN
Nitrite plus nitrate, as nitrogen	80	0.10	23	0.01
Orthophosphate, as phosphorus	46	0.01	0.22	<0.01

Table 6.--*Statistical summary of trace elements in ground-water samples*

[N, number of samples; MAX, maximum concentration; MIN, minimum concentration; all concentrations in micrograms per liter; <, less than; trace elements are dissolved unless noted otherwise]

Element	N	MEDIAN	MAX	MIN
Aluminum	34	10	130	<10
Arsenic, total recoverable	15	1	8	<1
Arsenic	82	<1	14	<1
Boron	53	40	530	<20
Cadmium	35	2	11	<1
Copper	35	2	23	<1
Iron	98	32	20,000	<3
Lead	35	8	160	<1
Manganese	80	13.5	1,100	1
Mercury	35	<0.1	2.1	<0.1
Molybdenum	35	<1	80	<1
Nickel	35	1	25	<1
Selenium, total recoverable	15	2	23	<1
Selenium	81	<1	20	<1
Zinc	35	24	7,900	<3

Detailed interpretation of ground-water quality for specific geologic units was not possible from the data available. Some wells may have been open to more than one water-yielding zone; samples from such wells may not represent water quality of a single aquifer. Some aquifers may not represent one geologic formation; for example, the lower Menefee Formation may be hydraulically connected to the upper Point Lookout Sandstone. Mixed lithologies within units may produce variable water quality depending on which rock types the ground water contacted. Also, many of the aquifers sampled in the coal-resource area have shallow, short-flow paths (Brooks, in press) and are not part of larger, more homogeneous aquifers that may have less variable water quality.

LINEAR-REGRESSION ANALYSIS

Major-ion and dissolved-solids concentrations often can be estimated from specific conductance by using linear-regression relations. These relations are of the form:

$$C = X+Y(SC), \qquad (1)$$

where

C = constituent concentration, in mg/L;
X = regression intercept;
Y = regression slope; and
SC = specific conductance, in μS/cm at 25 °C.

Surface Water

Surface-water quality may be related to variables other than specific conductance, such as soil type, vegetation, precipitation, land use, mineralogy, and season of the year, and to basin characteristics such as drainage area and stream discharge. However, these variables could not be related to surface-water quality in the coal-resource area because the data required were not available. Soil type (as classes of soil salinity), vegetation, and precipitation were too similar in the coal-resource area and were determined at too large a scale to be used for defining water quality of the small basins studied. Season of the year and stream discharge were not significant variables for predicting major-ion and dissolved-solids concentrations. Additional samples, collected throughout the yearly range of stream discharge at each site, may be needed to describe seasonal variation and relate stream discharge to water quality.

Linear regressions were developed using the stream samples separated into the two groups, "A" and "S." Linear regressions explaining at least 50 percent of the sample variance were determined for most major ions and for dissolved solids. Fluoride and silica did not have significant relations to specific conductance. Linear-regression results are given in table 7.

The linear-regression results listed in table 7 could be used to estimate major-ion and dissolved-solids concentrations at a stream site in potential coal-lease tracts. General surface geology in the basin upstream of the site and specific conductance of the stream would need to be known. If the geologic units in the drainage basin upstream from the site were predominantly the Animas or San Jose Formations, the linear-regression relations for the "A" group apply; otherwise, the relations for the "S" group would be used.

Ground Water

Linear-regression relations were developed only for dissolved-solids concentrations for ground-water samples from the coal-resource area (table 8). Many major-ion concentrations did not have significant relations to specific conductance. Linear regressions for dissolved solids were developed by grouping water samples from geologic units of similar lithologic characteristics. Water samples from the Fruitland Formation, Cliff House Sandstone, Menefee Formation, and Point Lookout Sandstone were grouped together. Water samples from the Mancos Shale and Lewis Shale were combined. Water samples from the Animas Formation were not grouped with samples from other units for regression analysis.

SUMMARY

Streams sampled during 1984 in a coal-resource area in southwestern Colorado had dissolved-solids concentrations less than 1,000 mg/L except for samples collected from the Alkali Gulch, Basin Creek, and Carbon Junction Canyon basins. Samples with smaller dissolved-solids concentrations had calcium, sodium, and bicarbonate as the dominant ions in solution. Median concentrations of dissolved boron, iron, manganese, and zinc were less than 35 µg/L, and median concentrations of dissolved lead and selenium were less than 1 µg/L in streams in the coal-resource area.

Table 7.--*Results of linear regressions relating major ions, alkalinity, and dissolved solids to specific conductance for stream samples separated into two lithologic groups*

[Group codes are: A, samples collected in basins draining primarily sandstone and conglomerate units; S, samples collected in basins draining primarily sandstone and shale units; N, number of data pairs; X, intercept of the regression equation; Y, slope of the regression equation; SE, standard error of estimate, in milligrams per liter; r^2, coefficient of determination; P, significance probability of the regression; relations with r^2 less than 0.50 are designated "no significant relation"; predicted concentration in milligrams per liter if specific conductance is in microsiemens per centimeter at 25 degrees Celsius]

Group	N	X	Y	SE	r^2	P
			CALCIUM			
A	18	6.4	0.11	7.6	0.80	0.0001
S	28	23.8	.064	18.4	.83	.0001
			MAGNESIUM			
A	18	0.23	0.024	2.5	0.66	0.0001
S	28	-23.9	.092	17.6	.92	.0001
			SODIUM			
A	18	-8.8	0.085	9.6	0.63	0.0001
S	28	-25.1	.074	15.2	.90	.0001
			POTASSIUM			
A		no significant relation (r^2=0.25)				
S	28	1.47	0.002	0.95	0.56	0.0001
			CHLORIDE			
A		no significant relation (r^2=0.35)				
S	28	-1.24	0.009	4.6	0.59	0.0001
			SULFATE			
A	18	-6.4	0.11	14.3	0.55	0.0005
S	28	-127	.50	59.6	.97	.0001
			ALKALINITY			
A	18	24.3	0.36	15.9	0.91	0.0001
S	28	76.3	.13	55.0	.68	.0001
			DISSOLVED SOLIDS			
A	18	17.2	0.54	10.1	0.99	0.0001
S	28	-99.9	.82	42.8	.99	.0001

Table 8.--*Results of linear regressions relating dissolved solids to specific conductance for ground-water samples separated into three geologic groups*

[N, number of data pairs; X, intercept of regression equation; Y, slope of regression equation; SE, standard error of estimate, in milligrams per liter; r^2, coefficient of determination; P, significance probability of the regression; predicted concentrations in milligrams per liter if specific conductance is in microsiemens per centimeter at 25 degrees Celsius]

Geologic units grouped together	N	X	Y	SE	r^2	P
Animas Formation	32	-9.7	0.62	40	0.91	0.0001
Fruitland Formation, Cliff House Sandstone, Menefee Formation, and Point Lookout Sandstone	42	-169	.82	179	.92	.0001
Lewis Shale and Mancos Shale	14	24.0	.72	430	.91	.0001

Major-ion concentrations in streams in the coal-resource area were related to lithology of surficial geologic units in the drainage basins upstream from sampling sites. Streams draining basins underlain primarily by sandstone and conglomerate had significantly smaller mean dissolved-solids concentrations (266 mg/L) than streams draining basins underlain primarily by sandstone and shale units (687 mg/L). Streams draining the sandstone and conglomerate units had significantly less magnesium and sulfate concentrations than streams draining sandstone and shale units.

Ground-water samples had variable major-ion concentrations and compositions within geologic units in the coal-resource area. Water samples from the Animas Formation had a mean dissolved-solids concentration of 378 mg/L. Water samples from the Mesaverde Group had a mean dissolved-solids concentration of 976 mg/L, and water samples from the Mancos Shale had a mean dissolved-solids concentration of 1,880 mg/L. The median concentration of dissolved nitrite plus nitrate was 0.10 mg/L for all ground-water samples. Median trace-element concentrations were less than 50 μg/L; only boron, iron, manganese, and zinc had median concentrations greater than 10 μg/L.

Major-ion and dissolved-solids concentrations could be estimated using specific conductance at a stream site in a coal-lease tract by use of linear-regression relations. Stream samples from basins draining areas of sandstone and conglomerate were separated from samples collected in basins draining sandstone and shale for regression analysis.

Linear-regression relations of dissolved-solids concentration to specific conductance were developed for ground-water samples. Major-ion concentrations did not have significant relations to specific conductance. Ground-water samples were separated into three geologic groups for regression analysis: Animas Formation; Fruitland Formation and Mesaverde Group; and Lewis Shale and Mancos Shale.

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WATER-QUALITY DATA

Table 9.--*Water-quality data for stream samples*

[ft^3/s, cubic feet per second; μS/cm, microsiemens per centimeter at 25 degrees Celsius; mg/L, milligrams per liter; μg/L, micrograms per liter; -- indicates no data]

Site number on plate 1	Stream name	Latitude	Longitude	Date of sample	Time
SW1	Ignacio Creek at county road near mouth	37°06'58"	107°23'02"	04-03-84	1130
SW2	Turkey Creek at county road near mouth	37°08'01"	107°21'46"	04-03-84	1200
SW3	Spring Creek below Zabel Canyon	37°08'39"	107°32'09"	04-03-84	1430
SW4	Deep Canyon near Chimney Rock	37°09'06"	107°18'44"	08-17-83	1100
SW5	Cabezon Canyon one mile above mouth	37°09'38"	107°17'20"	11-07-83	1630
SW6	Cabezon Canyon at mouth	37°10'13"	107°17'47"	11-07-83	1400
SW6				04-03-84	1030
SW6				07-17-84	0815
SW7	Fossett Gulch below Peterson Gulch	37°10'49"	107°20'22"	04-03-84	1250
SW7				07-17-84	0920
SW8	Basin Creek at mouth	37°11'12"	107°52'46"	11-22-75	1200
SW8				04-02-84	1430
SW8				07-18-84	0740
SW9	East Alkali Gulch at county road	37°12'34"	108°10'33"	04-04-84	0930
SW9				07-18-84	1300
SW10	West Alkali Gulch at county road	37°12'36"	108°10'44"	04-04-84	0950
SW11	Beaver Creek near Bayfield	37°12'46"	107°34'00"	04-03-84	1540
SW11				07-17-84	1130
SW12	Basin Creek below Ridges Basin	37°13'07"	107°53'35"	08-14-84	1130
SW13	Wilson Gulch near Grandview	37°13'26"	107°50'39"	04-04-84	0745
SW13				07-18-84	0910
SW14	Dry Creek at U.S. Highway 160	37°13'33"	107°40'56"	04-02-84	1640
SW14				07-17-84	1330
SW15	Cherry Creek at county bridge, above Flat Canyon	37°13'39"	108°12'55"	04-19-84	0830
SW15				08-14-84	1400
SW16	Yellowjacket Creek at U.S. Highway 160	37°13'56"	107°23'47"	08-15-84	1530
SW17	Carbon Junction Canyon near Durango	37°14'09"	107°51'57"	03-21-84	1345
SW18	Wildcat Canyon at upper bridge	37°14'13"	107°58'23"	03-21-84	1610
SW18				07-18-84	1010
SW19	Unnamed tributary to Florida River near Loma Linda	37°15'02"	107°46'06"	04-02-84	1600

Table 9.--*Water-quality data for stream samples*--Continued

Site number on plate 1	Date of sample	Streamflow, instantaneous (ft^3/s)	Specific conductance (µS/cm)	Temperature (degrees Celsius)	pH (standard units)	Calcium dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Sodium adsorption ratio	Percent sodium	Potassium, dissolved (mg/L as K)
SW1	04-03-84	2.7	235	6.0	8.1	30	5.2	13	0.6	22	2.6
SW2	04-03-84	.85	355	9.0	8.3	46	8.4	22	.8	24	1.5
SW3	04-03-84	.31	205	10.0	8.1	27	5.0	10	.5	19	3.5
SW4	08-17-83	.04	449	17.5	8.3	50	9.2	30	1	29	.70
SW5	11-07-83	.14	540	10.0	8.3	72	9.7	29	.9	22	1.3
SW6	11-07-83	.18	512	10.5	8.2	62	10	29	.9	24	1.3
SW6	04-03-84	1.0	450	6.5	8.2	65	8.9	25	.8	21	1.1
SW6	07-17-84	.33	490	10.5	8.5	65	11	32	1	25	1.1
SW7	04-03-84	.30	570	10.5	7.9	76	17	22	.6	15	2.1
SW7	07-17-84	.21	505	16.0	8.5	63	16	21	.6	17	1.5
SW8	11-22-75	1.5	2,100	1.0	7.1	160	220	160	2	21	5.1
SW8	04-02-84	2.1	2,100	12.0	8.4	160	140	160	2	26	3.8
SW8	07-18-84	.59	1,880	14.0	8.3	140	110	140	2	27	6.9
SW9	04-04-84	.08	1,840	2.5	8.2	130	150	99	1	19	3.8
SW9	07-18-84	<.01	1,660	28.0	8.5	71	150	100	2	21	6.6
SW10	04-04-84	.01	2,200	.5	8.3	160	210	100	1	15	3.5
SW11	04-03-84	24	280	8.5	8.0	34	8.4	13	.5	19	1.7
SW11	07-17-84	13	245	19.5	8.2	36	6.4	10	.4	16	1.8
SW12	08-14-84	.78	1,240	21.5	8.5	82	100	62	1	18	3.6
SW13	04-04-84	1.1	645	4.0	7.9	71	13	60	2	36	.80
SW13	07-18-84	1.2	630	13.0	8.3	68	18	46	1	29	1.4
SW14	04-02-84	1.5	640	6.0	8.3	64	14	56	2	36	1.6
SW14	07-17-84	.23	450	25.5	8.5	40	10	49	2	43	1.4
SW15	04-19-84	66	330	5.0	8.2	39	14	7.9	.3	10	2.3
SW15	08-14-84	2.3	1,200	22.5	8.5	130	77	41	.7	12	4.6
SW16	08-15-84	1.2	630	20.5	8.3	78	29	20	.5	12	3.1
SW17	03-21-84	.02	1,600	11.5	8.2	160	98	95	1	20	3.0
SW18	03-21-84	9.5	305	11.5	8.0	28	14	13	.5	18	2.0
SW18	07-18-84	.01	880	16.0	8.1	85	45	31	.7	14	2.6
SW19	04-02-84	1.7	585	11.5	8.2	77	18	36	1	23	1.7

Table 9.--*Water-quality data for stream samples*--Continued

Site number on plate 1	Date of sample	Hardness (mg/L as $CaCO_3$)	Alkalinity (mg/L as $CaCO_3$)	Sulfate dissolved (mg/L as SO_4)	Chloride, dissolved (mg/L as Cl)	Fluoride, dissolved (mg/L as F)	Silica, dissolved (mg/L as SiO_2)	Solids, sum of constituents, dissolved (mg/L)	Nitrite plus nitrate, dissolved (mg/L as N)	Arsenic dissolved (µg/L as As)	Boron, dissolved (µg/L as B)
SW1	04-03-84	96	104	22	1.8	0.10	6.9	140	--	--	10
SW2	04-03-84	150	181	20	1.8	.20	7.9	220	--	--	20
SW3	04-03-84	88	91	18	2.0	.10	7.5	130	--	--	10
SW4	08-17-83	160	195	27	2.8	.40	11	250	<0.10	1	--
SW5	11-07-83	220	225	41	2.6	.60	11	300	<.10	1	--
SW6	11-07-83	200	203	54	2.9	.60	11	290	<.10	<1	--
SW6	04-03-84	200	176	59	2.1	.50	9.7	280	--	--	10
SW6	07-17-84	210	179	51	2.6	.60	11	280	<.10	--	20
SW7	04-03-84	260	236	82	2.7	.40	11	350	--	--	20
SW7	07-17-84	220	173	57	2.2	.40	12	280	<.10	--	20
SW8	11-22-75	1,300	320	850	32	.40	--	1,700	--	<1	<10
SW8	04-02-84	980	259	1,000	8.7	.40	8.5	1,600	--	--	50
SW8	07-18-84	800	277	790	10	.50	9.3	1,400	<.10	--	70
SW9	04-04-84	940	375	740	12	.70	6.7	1,400	--	--	110
SW9	07-18-84	790	188	750	14	.30	1.7	1,200	<.10	--	130
SW10	04-04-84	1,300	361	1,100	16	.10	6.1	1,800	--	--	160
SW11	04-03-84	120	114	33	2.0	.20	7.0	170	--	--	20
SW11	07-17-84	120	111	15	1.5	.20	9.7	150	<.10	--	10
SW12	08-14-84	620	376	350	1.9	.50	9.4	830	<.10	--	80
SW13	04-04-84	230	248	54	7.5	.20	7.6	360	--	--	<10
SW13	07-18-84	240	228	85	7.5	.20	9.1	370	<.10	--	10
SW14	04-02-84	220	270	41	16	.30	8.7	360	--	--	20
SW14	07-17-84	140	200	24	8.4	.40	6.4	260	<.10	--	20
SW15	04-19-84	160	99	77	2.0	<.10	7.3	210	--	--	20
SW15	08-14-84	640	252	450	4.6	.20	9.1	870	.12	--	80
SW16	08-15-84	310	238	81	2.5	.20	11	370	.69	--	30
SW17	03-21-84	800	369	610	20	.70	14	1,200	--	--	70
SW18	03-21-84	130	57	93	2.1	.10	10	200	--	--	20
SW18	07-18-84	400	175	310	5.6	.30	6.7	590	<.10	--	40
SW19	04-02-84	270	243	48	5.4	.30	8.9	340	--	--	10

Table 9.--*Water-quality data for stream samples*--Continued

Site number on plate 1	Date of sample	Iron, dissolved (µg/L as Fe)	Lead, dissolved (µg/L as Pb)	Manganese, dissolved (µg/L as Mn)	Selenium, dissolved (µg/L as Se)	Zinc, dissolved (µg/L as Zn)
SW1	04-03-84	55	<1	7	2	12
SW2	04-03-84	28	<1	4	2	28
SW3	04-03-84	51	<1	5	1	14
SW4	08-17-83	6	<1	1	1	13
SW5	11-07-83	7	35	2	1	4
SW6	11-07-83	5	<1	<1	1	4
SW6	04-03-84	34	<1	2	<1	13
SW6	07-17-84	5	4	2	<1	16
SW7	04-03-84	6	5	14	6	15
SW7	07-17-84	27	7	5	<1	12
SW8	11-22-75	50	--	--	5	--
SW8	04-02-84	90	1	20	4	10
SW8	07-18-84	110	4	8	<1	16
SW9	04-04-84	<3	<1	43	<1	25
SW9	07-18-84	10	<1	8	<1	9
SW10	04-04-84	30	<1	30	<1	10
SW11	04-03-84	48	<1	42	1	11
SW11	07-17-84	80	<1	77	<1	20
SW12	08-14-84	23	2	17	<1	20
SW13	04-04-84	<3	2	42	1	11
SW13	07-18-84	10	6	16	2	12
SW14	04-02-84	20	<1	180	1	17
SW14	07-17-84	110	4	61	<1	6
SW15	04-19-84	130	<1	21	<1	21
SW15	08-14-84	40	52	19	<1	11
SW16	08-15-84	25	<1	36	1	20
SW17	03-21-84	12	<1	97	<1	19
SW18	03-21-84	170	<1	19	<1	11
SW18	07-18-84	14	3	110	<1	14
SW19	04-02-84	49	<1	51	<1	16

Table 9.--*Water-quality data for stream samples*--Continued

Site number on plate 1	Stream name	Latitude	Longitude	Date of sample	Time
SW19	Unnamed tributary to Florida River near Loma Linda			07-17-84	1420
SW20	Roberts Canyon at mouth	37°15'35"	108°05'39"	04-04-84	0830
SW20				07-18-84	1200
SW21	Wildcat Canyon at mouth	37°15'56"	107°55'15"	03-21-84	1440
SW22	Unnamed creek above Sheep Springs Gulch	37°15'56"	107°57'42"	03-22-84	1150
SW22				07-19-84	0750
SW23	Sheep Springs Gulch at mouth	37°16'23"	107°57'34"	03-22-84	1050
SW23				07-19-84	0820
SW24	Cherry Gulch at mouth	37°16'33"	107°57'33"	03-22-84	1020
SW25	Coal Gulch at mouth	37°16'44"	107°56'23"	03-22-84	0930
SW26	Lightner Creek above Coal Canyon	37°17'00"	107°56'04"	03-22-84	0800
SW26				07-19-84	0920
SW27	Deadman Gulch at mouth	37°17'09"	108°11'50"	04-19-84	0910
SW27				08-14-84	1450
SW28	Cherry Creek below Cherry Creek campground	37°19'37"	108°07'21"	04-19-84	1000
SW28				08-14-84	1530

Table 9.--*Water-quality data for stream samples*--Continued

Site number on plate 1	Date of sample	Streamflow, instantaneous (ft^3/s)	Specific conductance (µS/cm)	Temperature (degrees Celsius)	pH (standard units)	Calcium dissolved (mg/L as Ca)	Magnesium, dissolved (mg/L as Mg)	Sodium, dissolved (mg/L as Na)	Sodium adsorption ratio	Percent sodium	Potassium, dissolved (mg/L as K)
SW19	07-17-84	0.35	440	24.5	8.6	41	15	41	1	35	0.50
SW20	04-04-84	.45	635	2.0	7.6	62	38	19	.5	12	2.9
SW20	07-18-84	.05	690	18.5	7.7	68	41	21	.5	12	3.2
SW21	03-21-84	5.6	525	8.0	8.4	46	25	24	.7	19	2.3
SW22	03-22-84	3.5	735	8.0	7.5	71	34	28	.7	16	2.1
SW22	07-19-84	.24	1,100	12.5	8.1	130	57	41	.8	14	2.8
SW23	03-22-84	4.6	430	4.5	8.1	39	21	11	.4	11	2.0
SW23	07-19-84	.05	810	11.0	8.0	83	47	26	.6	12	2.6
SW24	03-22-84	.33	660	6.0	7.8	61	36	14	.4	9	2.3
SW25	03-22-84	10	620	4.0	8.3	58	31	20	.5	14	2.1
SW26	03-22-84	64	315	3.0	8.2	43	9.8	5.3	.2	7	1.4
SW26	07-19-84	5.3	570	12.5	8.2	70	23	13	.4	9	1.8
SW27	04-19-84	1.8	495	5.0	8.4	50	29	7.1	.2	6	2.1
SW27	08-14-84	.02	875	22.5	8.6	99	49	20	.4	9	4.5
SW28	04-19-84	27	280	4.5	8.3	37	9.7	5.9	.2	9	1.7
SW28	08-14-84	3.6	280	19.0	8.5	42	9.4	5.0	.2	7	1.7

Table 9.--*Water-quality data for stream samples*--Continued

Site number on plate 1	Date of sample	Hardness (mg/L as $CaCO_3$)	Alkalinity (mg/L as $CaCO_3$)	Sulfate dissolved (mg/L as SO_4)	Chloride, dissolved (mg/L as Cl)	Fluoride, dissolved (mg/L as F)	Silica, dissolved (mg/L as SiO_2)	Solids, sum of constituents, dissolved (mg/L)	Nitrite plus nitrate, dissolved (mg/L as N)	Arsenic dissolved (µg/L as As)	Boron, dissolved (µg/L as B)
SW19	07-17-84	160	193	38	5.2	0.30	3.9	260	<0.10	--	10
SW20	04-04-84	310	185	160	4.9	.20	11	410	--	--	30
SW20	07-18-84	340	235	140	4.4	.20	13	430	<.10	--	50
SW21	03-21-84	220	114	180	4.2	.20	9.9	360	--	--	30
SW22	03-22-84	320	124	250	8.8	.20	9.2	480	--	--	40
SW22	07-19-84	560	195	430	16	.30	9.6	800	.78	--	70
SW23	03-22-84	180	89	120	3.2	.10	9.3	260	--	--	30
SW23	07-19-84	400	195	240	3.8	.20	9.7	530	<.10	--	40
SW24	03-22-84	300	165	180	2.7	.20	10	410	--	--	30
SW25	03-22-84	270	113	200	5.8	.10	9.0	390	--	--	30
SW26	03-22-84	150	127	45	1.1	.10	6.2	190	--	--	10
SW26	07-19-84	270	188	120	1.8	.20	6.1	350	<.10	--	20
SW27	04-19-84	240	106	160	3.7	.10	11	330	--	--	20
SW27	08-14-84	450	185	290	7.5	.20	11	590	<.10	--	30
SW28	04-19-84	130	97	49	1.2	.10	7.9	170	--	--	<10
SW28	08-14-84	140	100	44	.80	.20	8.0	170	<.10	--	20

Table 9.--*Water-quality data for stream samples*--Continued

Site number on plate 1	Date of Sample	Iron, dis-solved (µg/L as Fe)	Lead, dis-solved (µg/L as Pb)	Manga-nese, dis-solved (µg/L as Mn)	Sele-nium, dis-solved (µg/L as Se)	Zinc, dis-solved (µg/L as Zn)
SW19	07-17-84	71	<1	12	<1	6
SW20	04-04-84	5	3	48	<1	12
SW20	07-18-84	10	<1	110	<1	8
SW21	03-21-84	120	<1	9	<1	12
SW22	03-22-84	35	<1	69	3	13
SW22	07-19-84	18	2	65	<1	11
SW23	03-22-84	81	<1	6	<1	4
SW23	07-19-84	14	2	15	<1	5
SW24	03-22-84	25	<1	<1	<1	9
SW25	03-22-84	79	<1	18	1	15
SW26	03-22-84	73	<1	3	1	5
SW26	07-19-84	14	<1	16	<1	5
SW27	04-19-84	130	<1	25	<1	32
SW27	08-14-84	32	3	11	<1	20
SW28	04-19-84	57	4	9	1	27
SW28	08-14-84	41	7	9	<1	11

Table 10.--*Water-quality data for ground-water samples*

[μS/cm, microsiemens per centimeter at 25 degrees Celsius; mg/L, milligrams per liter; μg/L, micrograms per liter; ND, not detected; -- indicates no data]

Site number on plate 1	Location number	Latitude	Longitude	Geologic unit	Site type	Date of sample
GW1	NB03300701AAD	37°08'14"	107°33'03"	Animas Formation	well	08-08-73
GW1				Animas Formation	well	05-14-75
GW2	NB03400407UDAC	37°12'14"	107°19'06"	Lewis Shale	well	05-13-75
GW3	NB03400408UADB1	37°12'31"	107°18'05"	Mesaverde Group, undivided	spring	05-05-75
GW4	NB03400408UADB2	37°12'31"	107°18'07"	Mesaverde Group, undivided	spring	05-05-75
GW5	NB03400415UACA	37°11'44"	107°16'01"	Lewis Shale	well	05-06-75
GW6	NB03400428DCD1	37°09'24"	107°17'07"	Fruitland Formation	well	07-27-83
GW7	NB03400429CBB1	37°09'38"	107°18'54"	Fruitland Formation	well	07-15-83
GW8	NB03400429CBB3	37°09'41"	107°18'51"	Fruitland Formation	well	11-08-83
GW9	NB03400430ABB1	37°10'19"	107°19'31"	Fruitland Formation	well	11-08-83
GW10	NB03400430ACC1	37°09'47"	107°19'25"	Fruitland Formation	well	08-22-83
GW11	NB03400430DBB2	37°09'43"	107°19'26"	Fruitland Formation	well	07-22-83
GW12	NB03400520AAD1	37°10'55"	107°24'28"	San Jose Formation	spring	08-15-84
GW13	NB03400536CCB	37°08'35"	107°21'06"	Animas Formation	well	05-06-75
GW14	NB03400618BCC	37°13'05"	107°34'39"	Animas Formation	well	04-15-75
GW15	NB03400703DAA	37°14'33"	107°36'52"	Animas Formation	well	04-15-75
GW16	NB03400709DCB	37°13'32"	107°38'28"	Animas Formation	well	04-15-75
GW17	NB03400710UAAB	37°12'46"	107°35'20"	Animas Formation	well	05-21-74
GW18	NB03400710UBBB	37°12'43"	107°36'11"	Animas Formation	well	05-31-74
GW19	NB03400711CBD	37°13'27"	107°36'43"	Animas Formation	well	06-20-74
GW20	NB03400711UBBA	37°12'44"	107°34'59"	Animas Formation	well	05-10-74
GW21	NB03400711UCAB	37°12'16"	107°34'51"	Animas Formation	well	05-21-74
GW22	NB03400711UCBB	37°12'27"	107°35'05"	Animas Formation	well	05-25-74
GW23	NB03400711UCDC	37°12'00"	107°34'46"	Animas Formation	well	05-10-74
GW24	NB03400712UABA	37°12'42"	107°33'18"	Animas Formation	well	06-08-74
GW25	NB03400714UACC	37°11'31"	107°34'34"	Animas Formation	well	05-22-74
GW26	NB03400715UBBC	37°11'44"	107°36'13"	Animas Formation	well	05-31-74
GW27	NB03400736CDC	37°08'25"	107°33'48"	Animas Formation	well	05-01-75
GW28	NB03400802BAC	37°14'34"	107°43'02"	Animas Formation	well	12-11-74
GW29	NB03400802CAA1	37°14'33"	107°42'52"	Animas Formation	well	09-24-84

Table 10.--*Water-quality data for ground-water samples*--Continued

Site number on plate 1	Date of sample	Time	Sampling depth (feet)	Specific conductance (µS/cm)	Temperature (degrees Celsius)	pH (standard units)	Calcium dissolved (mg/L as Ca)	Magnesium dissolved (mg/L as Mg)	Sodium dissolved (mg/L as Na)	Sodium adsorption ratio	Percent sodium
GW1	08-08-73	1730	--	1,110	18.0	8.0	15	7.0	240	13	89
GW1	05-14-75	1100	75.0	1,100	13.0	--	--	--	--	--	--
GW2	05-13-75	1125	--	--	9.0	8.0	100	68	54	1	18
GW3	05-05-75	1135	--	760	6.5	7.9	110	26	34	.8	17
GW4	05-05-75	1220	--	1,000	9.0	7.7	150	38	39	.8	13
GW5	05-06-75	1435	--	1,540	.0	7.9	160	110	48	.7	11
GW6	07-27-83	1600	--	698	10.5	6.9	120	11	14	.3	8
GW7	07-15-83	1300	--	735	13.0	6.9	85	14	37	1	23
GW8	11-08-83	--	--	1,410	10.0	7.2	200	49	43	.7	12
GW9	11-08-83	1500	--	836	12.0	7.4	58	7.8	95	3	53
GW10	08-22-83	1330	--	790	13.5	6.6	120	14	37	.9	18
GW11	07-22-83	1400	--	--	--	--	68	9.1	25	.8	21
GW12	08-15-84	1140	--	840	11.0	7.9	19	4.6	180	10	85
GW13	05-06-75	1605	--	850	12.0	7.9	100	24	57	1	26
GW14	04-15-75	1100	125	680	9.0	--	93	15	46	1	25
GW15	04-15-75	1230	114	570	10.0	--	59	8.2	50	2	37
GW16	04-15-75	1000	200	740	11.5	--	9.3	.40	150	14	93
GW17	05-21-74	1300	175	576	11.0	8.5	5.2	.20	120	15	95
GW18	05-31-74	1440	--	495	--	8.1	19	1.0	92	6	79
GW19	06-20-74	1505	--	588	14.0	8.4	13	.60	130	10	89
GW20	05-10-74	1130	--	697	11.5	7.2	97	14	34	.9	20
GW21	05-21-74	1800	102	683	10.5	7.4	68	14	62	2	37
GW22	05-25-74	0810	--	201	11.0	7.7	32	3.3	4.0	.2	8
GW23	05-10-74	--	103	622	16.5	7.8	20	1.1	120	7	82
GW24	06-08-74	0930	107	932	12.0	8.4	8.1	.80	210	20	95
GW25	05-22-74	1045	--	446	13.0	7.7	48	8.9	35	1	32
GW26	05-31-74	1345	--	1,080	10.0	7.3	140	24	65	1	24
GW27	05-01-75	1715	--	735	11.5	7.8	40	7.3	130	5	67
GW28	12-11-74	1500	170	582	11.0	7.8	9.7	.50	140	12	92
GW29	09-24-84	1500	--	470	11.5	8.4	5.0	7.7	120	6	85

Table 10.--*Water-quality data for ground-water samples*--Continued

Site number on plate 1	Date of sample	Potassium dissolved (mg/L as K)	Hardness (mg/L as $CaCO_3$)	Alkalinity (mg/L as $CaCO_3$)	Bicarbonate (mg/L as HCO_3)	Carbonate (mg/L as CO_3)	Sulfate dissolved (mg/L as SO_4)	Chloride dissolved (mg/L as Cl)	Fluoride dissolved (mg/L as F)	Silica dissolved (mg/L as SiO_2)
GW1	08-08-73	0.70	66	360	440	0	210	10	1.7	7.7
GW1	05-14-75	--	--	--	--	--	--	--	--	--
GW2	05-13-75	9.0	540	231	210	36	390	23	.14	--
GW3	05-05-75	3.5	370	253	280	16	210	3.6	.20	--
GW4	05-05-75	23	530	291	310	20	270	19	.21	--
GW5	05-06-75	2.7	850	395	460	13	510	7.1	.23	--
GW6	07-27-83	1.9	340	245	--	--	140	1.7	.40	10
GW7	07-15-83	3.0	270	280	--	--	79	3.0	.40	9.3
GW8	11-08-83	6.0	700	252	--	--	550	3.5	.30	33
GW9	11-08-83	7.4	180	350	--	--	39	5.8	.50	9.8
GW10	08-22-83	2.2	360	312	--	--	130	2.4	.30	14
GW11	07-22-83	2.1	210	192	--	--	78	1.3	.30	10
GW12	08-15-84	1.0	66	350	--	--	95	4.0	.50	6.8
GW13	05-06-75	1.6	350	263	320	ND	160	16	.44	--
GW14	04-15-75	1.4	290	323	390	--	38	4.8	.30	15
GW15	04-15-75	1.2	180	253	310	--	35	1.4	.30	13
GW16	04-15-75	.70	25	204	250	--	9.3	93	7.8	8.6
GW17	05-21-74	.60	14	177	210	3	2.9	65	5.2	7.5
GW18	05-31-74	.60	52	180	220	0	39	25	.60	9.6
GW19	06-20-74	.40	35	278	340	0	26	9.0	1.7	5.9
GW20	05-10-74	.90	300	313	380	0	43	8.0	.90	21
GW21	05-21-74	1.7	230	344	420	0	30	3.3	.40	13
GW22	05-25-74	.80	94	92	110	0	10	1.3	.30	7.0
GW23	05-10-74	.80	54	270	330	0	49	3.3	1.5	8.1
GW24	06-08-74	.50	24	340	410	1	45	60	5.5	8.9
GW25	05-22-74	1.5	160	200	240	0	26	4.0	.40	11
GW26	05-31-74	1.4	450	459	560	0	61	40	.30	26
GW27	05-01-75	1.6	130	349	390	15	66	8.9	.39	--
GW28	12-11-74	.30	26	290	350	--	22	5.9	.80	8.1
GW29	09-24-84	.30	330	254	--	--	22	8.4	1.4	8.7

Table 10.--*Water-quality data for ground-water samples*--Continued

Site number on plate 1	Date of sample	Solids sum of constituents dissolved (mg/L)	Solids residue at 180 degrees Celsius dissolved (mg/L)	Nitrite plus nitrate, dissolved (mg/L as N)	Orthophosphate dissolved (mg/L as P)	Aluminum dissolved (µg/L as Al)	Arsenic total (µg/L as As)	Arsenic dissolved (µg/L as As)	Boron dissolved (µg/L as B)	Cadmium dissolved (µg/L as Cd)	Copper dissolved (µg/L as Cu)
GW1	08-08-73	710	--	0.970	0.010	--	<1	--	60	--	--
GW1	05-14-75	--	--	--	--	--	--	2	--	--	--
GW2	05-13-75	--	820	--	--	--	--	<1	ND	--	--
GW3	05-05-75	--	572	--	--	--	--	0	ND	--	--
GW4	05-05-75	--	716	--	--	--	--	0	ND	--	--
GW5	05-06-75	--	1,220	--	--	--	--	<1	ND	--	--
GW6	07-27-83	450	--	.380	--	10	--	<1	--	3	1
GW7	07-15-83	400	--	.100	--	<10	--	<1	--	3	3
GW8	11-08-83	1,000	--	<.100	--	20	--	2	--	5	19
GW9	11-08-83	430	--	.230	--	50	--	1	--	8	23
GW10	08-22-83	510	--	.270	--	<10	--	<1	--	2	7
GW11	07-22-83	310	--	.560	--	20	--	<1	--	<1	7
GW12	08-15-84	520	--	<.100	--	20	--	1	70	1	1
GW13	05-06-75	--	613	--	--	--	--	<1	ND	--	--
GW14	04-15-75	410	--	5.90	.040	--	--	1	--	--	--
GW15	04-15-75	320	--	.160	.030	--	--	1	--	--	--
GW16	04-15-75	400	--	.020	.030	--	--	1	--	--	--
GW17	05-21-74	320	--	.040	.030	--	2	--	40	--	--
GW18	05-31-74	300	--	.200	.010	--	8	--	<20	--	--
GW19	06-20-74	350	--	.110	.010	--	1	--	40	--	--
GW20	05-10-74	410	--	3.10	.140	--	<1	--	<20	--	--
GW21	05-21-74	400	--	.940	.010	--	5	--	30	--	--
GW22	05-25-74	110	--	.250	.070	--	<1	--	0	--	--
GW23	05-10-74	370	--	.140	.100	--	3	--	40	--	--
GW24	06-08-74	540	--	.080	.010	--	1	--	30	--	--
GW25	05-22-74	250	--	1.40	.010	--	<1	--	<20	--	--
GW26	05-31-74	630	--	2.10	.050	--	<1	--	<20	--	--
GW27	05-01-75	--	434	--	--	--	--	<1	ND	--	--
GW28	12-11-74	360	--	.010	<.010	--	--	1	--	--	--
GW29	09-24-84	330	--	<.100	--	10	--	1	20	<1	2

Table 10.--*Water-quality data for ground-water samples*--Continued

Site number on plate 1	Date of sample	Iron dis-solved (µg/L as Fe)	Lead dis-solved (µg/L as Pb)	Manga-nese dis-solved (µg/L as Mn)	Mercury dis-solved (µg/L as Hg)	Molyb-denum dis-solved (µg/L as Mo)	Nickel dis-solved (µg/L as Ni)	Sele-nium total (µg/L as Se)	Sele-nium dis-solved (µg/L as Se)	Zinc dis-solved (µg/L as Zn)
GW1	08-08-73	30	--	<10	--	--	--	21	--	--
GW1	05-14-75	--	--	--	--	--	--	--	20	--
GW2	05-13-75	ND	--	--	--	--	--	--	2	--
GW3	05-05-75	ND	--	--	--	--	--	--	2	--
GW4	05-05-75	ND	--	--	--	--	--	--	<1	--
GW5	05-06-75	<10	--	--	--	--	--	--	<1	--
GW6	07-27-83	13	8	26	<0.1	<1	<1	--	<1	11
GW7	07-15-83	1,100	17	260	<.1	<1	<1	--	2	30
GW8	11-08-83	150	45	380	<.1	<1	2	--	<1	16
GW9	11-08-83	29	120	260	.1	<1	7	--	2	7
GW10	08-22-83	20	2	17	<.1	<1	5	--	1	52
GW11	07-22-83	13	8	13	<.1	<1	4	--	1	44
GW12	08-15-84	18	2	18	<.1	8	<1	--	5	210
GW13	05-06-75	ND	--	--	--	--	--	--	2	--
GW14	04-15-75	<10	--	<10	--	--	--	--	2	--
GW15	04-15-75	40	--	20	--	--	--	--	3	--
GW16	04-15-75	<10	--	<10	--	--	--	--	<1	--
GW17	05-21-74	90	--	20	--	--	--	1	--	--
GW18	05-31-74	70	--	<10	--	--	--	10	--	--
GW19	06-20-74	30	--	30	--	--	--	2	--	--
GW20	05-10-74	90	--	20	--	--	--	3	--	--
GW21	05-21-74	<10	--	--	--	--	--	1	--	--
GW22	05-25-74	20	--	<10	--	--	--	<1	--	--
GW23	05-10-74	20	--	240	--	--	--	2	--	--
GW24	06-08-74	350	--	20	--	--	--	2	--	--
GW25	05-22-74	40	--	30	--	--	--	2	--	--
GW26	05-31-74	50	--	<10	--	--	--	23	--	--
GW27	05-01-75	ND	--	--	--	--	--	--	4	--
GW28	12-11-74	180	--	20	--	--	--	--	<1	--
GW29	09-24-84	6	37	4	<.1	2	<1	--	<1	8

Table 10.--*Water-quality data for ground-water samples*--Continued

Site number on plate 1	Location number	Latitude	Longitude	Geologic unit	Site type	Date of sample
GW30	NB03400808ADD	37°13'58"	107°45'40"	Animas Formation	well	12-11-74
GW31	NB03400810CCC	37°13'22"	107°44'25"	Animas Formation	well	08-09-73
GW32	NB03400910UCBA	37°12'20"	107°49'04"	Animas Formation	well	06-12-75
GW33	NB03400910UCDC	37°12'01"	107°48'58"	Animas Formation	well	03-21-75
GW34	NB03400911BCA	37°13'32"	107°49'20"	Animas Formation	well	12-11-74
GW35	NB03400912DDD	37°12'58"	107°47'43"	Animas Formation	well	06-13-74
GW36	NB03400912UCCD	37°11'56"	107°46'57"	Animas Formation	well	06-10-74
GW37	NB03400912UCCD2	37°11'56"	107°46'57"	Animas Formation	well	07-23-75
GW38	NB03400912UDCC1	37°11'56"	107°46'30"	Animas Formation	well	06-13-74
GW39	NB03400916BBB	37°11'54"	107°50'20"	Animas Formation	well	03-25-75
GW40	NB03401001ABC1	37°14'13"	107°54'38"	Cliff House Sandstone	well	09-17-84
GW41	NB03401001CBB1	37°13'58"	107°55'08"	Cliff House Sandstone	well	09-18-84
GW42	NB03401001CCB	37°14'01"	107°55'06"	Cliff House Sandstone	well	12-12-74
GW43	NB03401001CDB1	37°13'42"	107°54'46"	Lewis Shale	spring	09-19-84
GW44	NB03401006AAD1	37°14'11"	107°59'35"	Menefee Formation	well	09-20-84
GW45	NB03401108UCDD	37°11'50"	108°03'56"	Cliff House Sandstone	well	11-14-75
GW46	NB03401110UDCD	37°11'51"	108°01'31"	Lewis Shale	well	02-02-76
GW47	NB03401203BAC1	37°14'11"	108°10'04"	Cliff House Sandstone	well	09-05-84
GW48	NB03401206CDA	37°13'42"	108°13'08"	Menefee Formation	well	04-10-75
GW49	NB03401207CDC1	37°12'59"	108°13'17"	Menefee Formation	well	08-17-84
GW50	NB03401208UCCB	37°12'07"	108°10'49"	Cliff House Sandstone	well	02-01-76
GW51	NB03401208UDCD	37°11'56"	108°10'12"	Cliff House Sandstone	well	01-31-76
GW52	NB03401210UCAC	37°12'11"	108°08'22"	Cliff House Sandstone	spring	01-30-76
GW53	NB03401214BBC	37°11'44"	108°07'39"	Menefee Formation	well	01-31-76
GW54	NB03401217AAA	37°11'53"	108°09'57"	Cliff House Sandstone	well	01-31-76
GW55	NB03401311UADC	37°12'23"	108°13'16"	Cliff House Sandstone	well	01-29-76
GW56	NB03500607DDD1	37°18'31"	107°33'39"	Lewis Shale	well	09-12-84
GW57	NB03500704CBA	37°19'46"	107°38'52"	Dakota Sandstone	well	05-11-75
GW58	NB03500803CAA1	37°19'46"	107°43'57"	Cliff House Sandstone	well	07-29-83
GW59	NB03500807CAD	37°18'48"	107°46'54"	Mancos Shale	well	12-12-74

Table 10.--*Water-quality data for ground-water samples*--Continued

Site number on plate 1	Date of sample	Time	Sampling depth (feet)	Specific conductance (μS/cm)	Temperature (degrees Celsius)	pH (standard units)	Calcium dissolved (mg/L as Ca)	Magnesium dissolved (mg/L as Mg)	Sodium dissolved (mg/L as Na)	Sodium adsorption ratio	Percent sodium
GW30	12-11-74	1045	--	470	6.0	7.7	19	0.70	120	8	84
GW31	08-09-73	1030	110	553	19.0	8.3	5.0	<.10	130	16	96
GW32	06-12-75	1435	--	650	14.5	8.5	20	2.4	130	8	82
GW33	03-21-75	1510	--	480	10.0	7.5	63	10	34	1	27
GW34	12-11-74	1300	140	667	5.5	8.0	4.3	.50	180	23	97
GW35	06-13-74	1800	--	618	13.0	7.1	91	10	22	.6	15
GW36	06-10-74	1800	--	313	12.0	8.8	9.7	1.0	61	5	82
GW37	07-23-75	1445	--	850	16.0	9.3	10	1.2	170	14	92
GW38	06-13-74	1720	--	535	14.0	7.8	59	7.8	46	2	36
GW39	03-25-75	1105	--	875	4.0	7.0	98	53	23	.5	10
GW40	09-17-84	1300	--	1,590	13.0	7.7	50	32	290	8	71
GW41	09-18-84	1300	--	1,770	14.0	8.1	1.3	.50	460	90	99
GW42	12-12-74	1430	--	1,600	8.0	8.2	5.8	.90	480	51	98
GW43	09-19-84	1500	--	2,950	17.0	7.4	3.5	1.6	810	93	99
GW44	09-20-84	0800	--	1,050	15.0	8.5	.70	.20	290	82	99
GW45	11-14-75	1230	225	2,250	10.0	6.6	320	140	80	1	11
GW46	02-02-76	1030	116	2,000	4.0	6.6	240	58	60	.9	13
GW47	09-05-84	1300	--	2,200	14.0	7.7	160	170	150	2	23
GW48	04-10-75	1100	72.0	3,440	12.0	6.8	340	280	300	3	25
GW49	08-17-84	1400	--	1,530	17.0	8.2	62	48	260	6	61
GW50	02-01-76	1630	--	1,680	13.0	7.6	4.0	8.5	390	26	94
GW51	01-31-76	1015	395	1,680	11.0	8.0	2.0	<.10	400	78	99
GW52	01-30-76	1530	--	1,120	3.0	7.4	110	97	30	.5	9
GW53	01-31-76	1630	122	2,700	7.0	7.3	20	24	580	21	89
GW54	01-31-76	1215	--	1,750	14.0	6.5	6.0	6.1	430	30	96
GW55	01-29-76	1600	85.0	1,600	7.5	7.6	6.0	7.3	420	27	95
GW56	09-12-84	1100	--	490	8.5	7.3	40	12	57	2	45
GW57	05-11-75	1545	2,880	660	14.0	--	63	28	43	1	25
GW58	07-29-83	1200	--	417	9.5	7.3	59	8.0	28	.9	25
GW59	12-12-74	0900	103	932	.0	9.1	3.3	1.0	250	32	98

Table 10.--*Water-quality data for ground-water samples*--Continued

Site number on plate 1	Date of sample	Potassium dissolved (mg/L as K)	Hardness (mg/L as $CaCO_3$)	Alkalinity (mg/L as $CaCO_3$)	Bicarbonate (mg/L as HCO_3)	Carbonate (mg/L as CO_3)	Sulfate dissolved (mg/L as SO_4)	Chloride dissolved (mg/L as Cl)	Fluoride dissolved (mg/L as F)	Silica dissolved (mg/L as SiO_2)
GW30	12-11-74	0.50	50	254	310	--	27	10	1.4	9.2
GW31	08-09-73	.30	12	232	280	0	39	12	2.2	7.3
GW32	06-12-75	.78	60	243	260	21	34	50	2.4	--
GW33	03-21-75	1.6	200	239	290	0	24	12	.70	16
GW34	12-11-74	.40	13	353	430	--	33	14	1.2	9.5
GW35	06-13-74	.80	270	273	330	0	22	16	.20	18
GW36	06-10-74	.50	28	133	150	4	5.9	15	1.6	2.8
GW37	07-23-75	.30	30	199	190	24	66	65	8.8	--
GW38	06-13-74	.80	180	227	280	0	22	21	.90	10
GW39	03-25-75	1.2	470	354	410	12	130	30	.13	--
GW40	09-17-84	3.6	260	654	--	--	170	35	1.1	9.6
GW41	09-18-84	2.2	5	1,010	--	--	.5	22	1.9	9.3
GW42	12-12-74	2.0	18	1,010	1,230	--	4.3	32	1.9	8.9
GW43	09-19-84	4.3	15	1,670	--	--	.8	100	1.8	11
GW44	09-20-84	1.2	3	633	--	--	4.9	2.5	3.1	10
GW45	11-14-75	3.1	1,400	397	410	5	1,100	16	.10	--
GW46	02-02-76	2.7	850	214	250	7	30	270	.31	--
GW47	09-05-84	4.8	1,100	445	--	--	960	13	.30	12
GW48	04-10-75	7.1	2,000	513	630	0	2,000	93	.50	17
GW49	08-17-84	3.8	350	527	--	--	370	9.8	.70	12
GW50	02-01-76	4.7	45	900	850	120	22	18	4.1	--
GW51	01-31-76	1.2	5	774	920	12	57	12	3.0	--
GW52	01-30-76	1.2	670	393	430	24	310	8.9	.30	--
GW53	01-31-76	7.4	150	790	740	110	600	44	.54	--
GW54	01-31-76	1.2	40	822	850	77	130	11	3.8	--
GW55	01-29-76	1.6	45	894	930	77	17	5.7	5.1	--
GW56	09-12-84	1.3	150	243	--	--	28	2.9	.20	11
GW57	05-11-75	2.2	270	194	240	--	160	3.3	.50	23
GW58	07-29-83	1.4	180	228	--	--	13	1.2	.20	7.2
GW59	12-12-74	.60	12	508	600	8	34	20	1.1	7.6

Table 10.--*Water-quality data for ground-water samples*--Continued

Site number on plate 1	Date of sample	Solids sum of constituents dissolved (mg/L)	Solids residue at 180 degrees Celsius dissolved (mg/L)	Nitrite plus nitrate dissolved (mg/L as N)	Orthophosphate dissolved (mg/L as P)	Aluminum dissolved (µg/L as Al)	Arsenic total (µg/L as As)	Arsenic dissolved (µg/L as As)	Boron dissolved (µg/L as B)	Cadmium dissolved (µg/L as Cd)	Copper dissolved (µg/L as Cu)
GW30	12-11-74	340	--	0.670	<0.010	--	--	2	--	--	--
GW31	08-09-73	340	--	.010	<.010	--	6	--	<20	--	--
GW32	06-12-75	--	356	--	--	--	--	4	400	--	--
GW33	03-21-75	300	--	.450	.020	--	--	--	--	--	--
GW34	12-11-74	450	--	.010	<.010	--	--	1	--	--	--
GW35	06-13-74	340	--	2.60	.060	--	1	--	30	--	--
GW36	06-10-74	180	--	.130	.010	--	1	--	0	--	--
GW37	07-23-75	--	406	--	--	--	--	8	<20	--	--
GW38	06-13-74	300	--	.790	.020	--	1	--	0	--	--
GW39	03-25-75	--	613	--	--	--	--	<1	ND	--	--
GW40	09-17-84	980	--	<.100	--	<10	--	<1	80	2	<1
GW41	09-18-84	1,100	--	<.100	--	<10	--	<1	90	4	1
GW42	12-12-74	1,100	--	.010	.060	--	--	2	--	--	--
GW43	09-19-84	1,900	--	--	--	<10	--	<1	170	5	5
GW44	09-20-84	690	--	<.100	--	20	--	<1	180	<1	4
GW45	11-14-75	--	1,950	--	--	--	--	<1	<20	--	--
GW46	02-02-76	--	1,310	--	--	--	--	<1	420	--	--
GW47	09-05-84	1,700	--	<.100	--	20	--	<1	130	5	1
GW48	04-10-75	3,300	--	.270	.040	--	--	<1	--	--	--
GW49	08-17-84	1,100	--	.260	--	<10	--	<1	130	4	2
GW50	02-01-76	--	1,080	--	--	--	--	<1	200	--	--
GW51	01-31-76	--	1,110	--	--	--	--	<1	340	--	--
GW52	01-30-76	--	810	--	--	--	--	<1	120	--	--
GW53	01-31-76	--	1,870	--	--	--	--	<1	340	--	--
GW54	01-31-76	--	616	--	--	--	--	<1	60	--	--
GW55	01-29-76	--	1,100	--	--	--	--	<1	420	--	--
GW56	09-12-84	300	--	<.100	--	<10	--	<1	50	9	<1
GW57	05-11-75	440	--	<.100	.040	--	--	1	--	--	--
GW58	07-29-83	250	--	.290	--	10	--	3	--	1	15
GW59	12-12-74	630	--	.010	.010	--	--	<1	--	--	--

Table 10.--*Water-quality data for ground-water samples*--Continued

Site number on plate 1	Date of sample	Iron dis-solved (µg/L as Fe)	Lead dis-solved (µg/L as Pb)	Manga-nese dis-solved (µg/L as Mn)	Mercury dis-solved (µg/L as Hg)	Molyb-denum dis-solved (µg/L as Mo)	Nickel dis-solved (µg/L as Ni)	Sele-nium total (µg/L as Se)	Sele-nium dis-solved (µg/L as Se)	Zinc dis-solved (µg/L as Zn)
GW30	12-11-74	40	--	<10	--	--	--	--	<1	--
GW31	08-09-73	60	--	20	--	--	--	2	--	--
GW32	06-12-75	ND	--	--	--	--	--	--	2	--
GW33	03-21-75	50	--	<10	--	--	--	--	--	--
GW34	12-11-74	20	--	<10	--	--	--	--	<1	--
GW35	06-13-74	20	--	<10	--	--	--	1	--	--
GW36	06-10-74	100	--	20	--	--	--	<1	--	--
GW37	07-23-75	<10	--	--	--	--	--	--	<1	--
GW38	06-13-74	30	--	30	--	--	--	3	--	--
GW39	03-25-75	ND	--	--	--	--	--	--	10	--
GW40	09-17-84	15	42	5	.1	<1	2	--	<1	10
GW41	09-18-84	75	78	3	.1	<1	<1	--	<1	52
GW42	12-12-74	70	--	<10	--	--	--	--	<1	--
GW43	09-19-84	150	54	<10	<.1	<1	1	--	<1	40
GW44	09-20-84	21	8	3	<.1	<1	1	--	<1	27
GW45	11-14-75	50	--	--	--	--	--	--	<1	--
GW46	02-02-76	140	--	--	--	--	--	--	3	--
GW47	09-05-84	80	84	60	<.1	60	4	--	<1	7,900
GW48	04-10-75	2,500	--	1,100	--	--	--	--	<1	--
GW49	08-17-84	32	46	52	2.1	<1	7	--	<1	35
GW50	02-01-76	<10	--	--	--	--	--	--	<1	--
GW51	01-31-76	480	--	--	--	--	--	--	<1	--
GW52	01-30-76	20	--	--	--	--	--	--	<1	--
GW53	01-31-76	230	--	--	--	--	--	--	<1	--
GW54	01-31-76	50	--	--	--	--	--	--	<1	--
GW55	01-29-76	110	--	--	--	--	--	--	<1	--
GW56	09-12-84	7	74	9	.2	<1	1	--	<1	16
GW57	05-11-75	640	--	270	--	--	--	--	<1	--
GW58	07-29-83	6	8	1	<.1	<1	<1	--	<1	220
GW59	12-12-74	160	--	20	--	--	--	--	<1	--

Table 10.--*Water-quality data for ground-water samples*--Continued

Site number on plate 1	Location number	Latitude	Longitude	Geologic unit	Site type	Date of sample
GW60	NB03500808CCB1	37°18'44"	107°46'32"	Point Lookout Sandstone	well	12-12-74
GW61	NB03500818CCC1	37°17'41"	107°47'39"	Lewis Shale	well	09-13-84
GW62	NB03500819BCD	37°17'18"	107°47'34"	Kirtland Shale	well	04-15-75
GW63	NB03500823CCC	37°17'02"	107°43'15"	Animas Formation	well	04-15-75
GW64	NB03500824DAB1	37°17'14"	107°50'27"	Animas Formation	well	09-25-84
GW65	NB03500827CAD1	37°16'12"	107°43'55"	Animas Formation	well	09-21-84
GW66	NB03500831AAC	37°15'49"	107°46'48"	Animas Formation	well	08-09-73
GW67	NB03500836CAB1	37°15'25"	107°41'53"	Cretaceous,undifferientated	well	09-25-84
GW68	NB03500905BCA	37°19'57"	107°52'55"	Morrison Formation	well	04-15-75
GW69	NB03500907BAC	37°19'08"	107°53'42"	Morrison Formation	well	04-11-75
GW70	NB03500912CAC	37°18'47"	107°48'28"	Mancos Shale	well	12-10-74
GW71	NB03500914ACD1	37°18'12"	107°49'03"	Mancos Shale	well	09-06-84
GW72	NB03500927DCA1	37°16'00"	107°50'05"	Fruitland Formation	spring	08-16-84
GW73	NB03501010CAB1	37°18'17"	107°56'53"	Point Lookout Sandstone	spring	07-28-83
GW74	NB03501015BAC1	37°17'43"	107°57'00"	Mancos Shale	well	09-07-84
GW75	NB03501015DBB	37°17'43"	107°57'02"	Mancos Shale	well	12-09-74
GW76	NB03501028CDA1	37°15'27"	107°57'54"	Menefee Formation	well	06-08-83
GW77	NB03501028CDA2	37°15'27"	107°57'54"	Menefee Formation	well	06-08-83
GW78	NB03501028DCC1	37°15'18"	107°57'48"	Menefee Formation	well	06-08-83
GW79	NB03501028DDB1	37°15'27"	107°57'31"	Menefee Formation	well	07-26-83
GW80	NB03501032CBC1	37°14'43"	107°59'23"	Menefee Formation	well	09-04-84
GW81	NB03501034BBC	37°15'07"	107°57'16"	Menefee Formation	well	04-08-75
GW82	NB03501034CBB	37°14'47"	107°57'40"	Cliff House Sandstone	well	04-09-75
GW83	NB03501034DBC1	37°14'40"	107°56'44"	Point Lookout Sandstone	well	07-26-83
GW84	NB03501034DCC1	37°14'26"	107°56'44"	Point Lookout Sandstone	well	07-28-83
GW85	NB03501114CAD1	37°17'19"	108°02'21"	Menefee Formation	well	08-16-84
GW86	NB03501114DDC	37°17'05"	108°02'16"	Menefee Formation	well	12-09-74
GW87	NB03501123ACC	37°16'36"	108°02'11"	Cliff House Sandstone	well	04-08-75
GW88	NB03501123DAC1	37°16'24"	108°01'52"	Cliff House Sandstone	well	07-29-83
GW89	NB03501126DCC1	37°15'17"	108°02'08"	Cliff House Sandstone	well	09-26-84

Table 10.--*Water-quality data for ground-water samples*--Continued

Site number on plate 1	Date of sample	Time	Sampling depth (feet)	Specific conductance (µS/cm)	Temperature (degrees Celsius)	pH (standard units)	Calcium dissolved (mg/L as Ca)	Magnesium dissolved (mg/L as Mg)	Sodium dissolved (mg/L as Na)	Sodium adsorption ratio	Percent sodium
GW60	12-12-74	1100	102	1,060	6.0	7.1	62	23	200	6	63
GW61	09-13-84	1700	--	980	12.0	8.7	7.9	3.0	220	17	94
GW62	04-15-75	1530	100	710	8.5	--	110	8.9	44	1	23
GW63	04-15-75	1400	--	550	11.0	--	8.4	.10	110	11	91
GW64	09-25-84	1600	--	440	11.5	7.8	20	.50	81	5	77
GW65	09-21-84	1100	--	640	14.0	7.2	38	2.8	96	5.7	65
GW66	08-09-73	1630	108	436	17.0	7.4	64	9.1	16	.5	15
GW67	09-25-84	1400	--	1,280	38.0	8.2	2.7	.30	310	50	98
GW68	04-15-75	1830	152	550	8.5	--	50	18	30	1	24
GW69	04-11-75	1000	115	370	6.0	7.3	55	11	6.4	.2	7
GW70	12-10-74	1600	75.0	5,630	8.0	7.3	600	220	780	7	41
GW71	09-06-84	1600	--	3,000	--	7.6	8.5	4.3	820	59	98
GW72	08-16-84	1250	--	535	15.5	8.4	50	26	49	1	31
GW73	07-28-83	1600	--	842	9.0	7.2	70	57	25	.5	12
GW74	09-07-84	1000	--	1,960	11.0	6.9	210	67	--	--	--
GW75	12-09-74	1400	105	2,280	10.0	8.2	9.3	6.1	610	39	96
GW76	06-08-83	1500	--	1,860	9.0	7.0	200	82	43	.7	10
GW77	06-08-83	1600	--	1,030	12.0	7.8	44	22	160	5	63
GW78	06-08-83	1400	--	1,150	14.5	8.7	.60	.10	290	95	99
GW79	07-26-83	1600	--	1,340	15.0	8.2	3.1	1.4	350	43	98
GW80	09-04-84	1300	--	1,600	15.5	8.2	1.2	.50	460	92	99
GW81	04-08-75	1000	426	1,500	9.0	7.7	.80	.60	470	99	99
GW82	04-09-75	1900	138	1,410	5.0	6.3	96	51	170	4	45
GW83	07-26-83	1400	--	1,380	11.5	8.9	4.1	2.7	340	33	97
GW84	07-28-83	1400	--	1,650	15.5	8.4	6.3	2.3	360	32	97
GW85	08-16-84	1200	--	420	11.0	7.4	49	18	19	.6	17
GW86	12-09-74	1630	86.0	335	6.0	6.5	38	15	10	.4	12
GW87	04-08-75	1600	76.0	330	6.0	7.6	25	6.2	31	1	43
GW88	07-29-83	1330	--	239	12.5	6.8	29	6.5	8.1	.4	15
GW89	09-26-84	1800	--	370	11.0	7.1	32	8.9	35	1	39

Table 10.--*Water-quality data for ground-water samples*--Continued

Site number on plate 1	Date of sample	Potassium dissolved (mg/L as K)	Hardness (mg/L as $CaCO_3$)	Alkalinity (mg/L as $CaCO_3$)	Bicarbonate (mg/L as HCO_3)	Carbonate (mg/L as CO_3)	Sulfate dissolved (mg/L as SO_4)	Chloride dissolved (mg/L as Cl)	Fluoride dissolved (mg/L as F)	Silica dissolved (mg/L as SiO_2)
GW60	12-12-74	2.8	250	437	530	--	220	15	0.30	13
GW61	09-13-84	.90	32	482	--	--	57	4.5	1.1	8.8
GW62	04-15-75	.90	310	280	340	--	91	7.6	.40	13
GW63	04-15-75	.70	21	237	290	--	32	4.3	.50	9.8
GW64	09-25-84	.90	52	189	--	--	40	4.0	3.8	8.9
GW65	09-21-84	2.3	5	312	--	--	25	14	.40	9.3
GW66	08-09-73	.40	200	199	240	0	35	9.7	.20	10
GW67	09-25-84	2.8	8	724	--	--	.7	14	1.5	23
GW68	04-15-75	6.6	200	255	310	--	15	5.6	.60	15
GW69	04-11-75	.70	180	154	190	0	43	1.8	.20	5.3
GW70	12-10-74	11	2,400	477	580	--	1,400	1,400	.30	20
GW71	09-06-84	1.7	39	1,510	--	--	140	110	2.1	8.8
GW72	08-16-84	3.0	230	298	--	--	34	3.2	.20	11
GW73	07-28-83	5.2	410	213	--	--	250	3.3	.10	17
GW74	09-07-84	5.2	800	368	--	--	740	83	.20	--
GW75	12-09-74	2.0	48	1,030	1,250	--	190	130	2.8	7.3
GW76	06-08-83	--	840	236	--	--	680	5.7	.30	12
GW77	06-08-83	--	200	382	--	--	160	10	.90	10
GW78	06-08-83	1.1	2	608	--	--	23	4.3	1.6	8.8
GW79	07-26-83	1.4	14	757	--	--	18	3.2	4.3	10
GW80	09-04-84	2.0	5	884	--	--	150	9.8	3.0	9.5
GW81	04-08-75	2.4	4	951	1,160	0	2.9	28	1.7	9.7
GW82	04-09-75	2.3	450	317	390	0	480	15	.80	11
GW83	07-26-83	1.2	21	589	--	--	150	20	.60	7.9
GW84	07-28-83	1.7	25	829	--	--	17	7.6	1.7	9.4
GW85	08-16-84	1.1	200	206	--	--	21	7.0	.10	14
GW86	12-09-74	2.0	160	133	160	--	38	7.4	.10	19
GW87	04-08-75	.60	88	125	150	0	32	1.5	.40	9.3
GW88	07-29-83	.90	99	102	--	--	16	1.6	.30	11
GW89	09-26-84	1.1	120	160	--	--	32	6.4	.50	22

Table 10.--*Water-quality data for ground-water samples*--Continued

Site number on plate 1	Date of sample	Solids sum of constituents dissolved (mg/L)	Solids residue at 180 degrees Celsius dissolved (mg/L)	Nitrite plus nitrate dissolved (mg/L as N)	Orthophosphate dissolved (mg/L as P)	Aluminum dissolved (µg/L as Al)	Arsenic total (µg/L as As)	Arsenic dissolved (µg/L as As)	Boron dissolved (µg/L as B)	Cadmium dissolved (µg/L as Cd)	Copper dissolved (µg/L as Cu)
GW60	12-12-74	800	--	0.270	0.010	--	--	<1	--	--	--
GW61	09-13-84	590	--	<.100	--	<10	--	<1	170	11	1
GW62	04-15-75	440	--	1.10	.040	--	--	1	--	--	--
GW63	04-15-75	310	--	.050	.030	--	--	<1	--	--	--
GW64	09-25-84	270	--	<.100	--	10	--	<1	20	<1	5
GW65	09-21-84	377	--	.400	--	10	--	<1	10	3	5
GW66	08-09-73	260	--	.260	<.010	--	--	--	<20	--	--
GW67	09-25-84	790	--	<.100	--	10	--	<1	190	2	9
GW68	04-15-75	300	--	.020	.050	--	--	14	--	--	--
GW69	04-11-75	220	--	.140	.010	--	--	<1	--	--	--
GW70	12-10-74	4,700	--	23.0	.220	--	--	3	--	--	--
GW71	09-06-84	2,000	--	<.100	--	10	--	<1	530	11	<1
GW72	08-16-84	360	--	<.100	--	20	--	<1	30	<1	2
GW73	07-28-83	560	--	.940	--	<10	--	<1	--	2	<1
GW74	09-07-84	--	2,600	<.100	--	20	--	<1	80	<1	3
GW75	12-09-74	1,600	--	.010	.040	--	--	<1	--	--	--
GW76	06-08-83	--	--	.130	--	--	--	<1	--	<1	3
GW77	06-08-83	--	--	<.100	--	20	--	1	--	8	1
GW78	06-08-83	690	--	<.100	--	10	--	1	--	<1	<1
GW79	07-26-83	850	--	<.100	--	20	--	1	--	2	17
GW80	09-04-84	1,200	--	<.100	--	<10	--	<1	220	<1	1
GW81	04-08-75	1,100	--	.010	.070	--	--	<1	--	--	--
GW82	04-09-75	1,000	--	<.100	.010	--	--	<1	--	--	--
GW83	07-26-83	920	--	<.100	--	10	--	<1	--	<1	<1
GW84	07-28-83	900	--	<.100	--	130	--	1	--	<1	<1
GW85	08-16-84	250	--	<.100	--	10	--	<1	20	<1	<1
GW86	12-09-74	210	--	.020	<.010	--	--	1	--	--	--
GW87	04-08-75	180	--	.070	.010	--	--	1	--	--	--
GW88	07-29-83	130	--	<.100	--	10	--	<1	--	1	1
GW89	09-26-84	240	--	<.100	--	<10	--	<1	60	7	1

Table 10.--*Water-quality data for ground-water samples*--Continued

Site number on plate 1	Date of sample	Iron dis- solved (µg/L as Fe)	Lead dis- solved (µg/L as Pb)	Manga- nese dis- solved (µg/L as Mn)	Mercury dis- solved (µg/L as Hg)	Molyb- denum dis- solved (µg/L as Mo)	Nickel dis- solved (µg/L as Ni)	Sele- nium total (µg/L as Se)	Sele- nium dis- solved (µg/L as Se)	Zinc dis- solved (µg/L as Zn)
GW60	12-12-74	1,500	--	100	--	--	--	--	1	--
GW61	09-13-84	32	46	6	0.2	<1	1	--	<1	12
GW62	04-15-75	20	--	<10	--	--	--	--	1	--
GW63	04-15-75	<10	--	<10	--	--	--	--	<1	--
GW64	09-25-84	14	3	3	<.1	<1	3	--	<1	15
GW65	09-21-84	<3	2	3	.1	<1	<1	--	<1	<3
GW66	08-09-73	30	--	20	--	--	--	--	--	--
GW67	09-25-84	67	32	3	<.1	<1	4	--	<1	10
GW68	04-15-75	1,800	--	110	--	--	--	--	<1	--
GW69	04-11-75	<10	--	<10	--	--	--	--	<1	--
GW70	12-10-74	60	--	30	--	--	--	--	8	--
GW71	09-06-84	80	120	10	.4	80	2	--	<1	40
GW72	08-16-84	34	3	93	<.1	<1	<1	--	<1	10
GW73	07-28-83	5	4	2	<.1	<1	<1	--	4	6
GW74	09-07-84	3,200	<1	220	<.1	<1	<1	--	<1	60
GW75	12-09-74	40	--	<10	--	--	--	--	<1	--
GW76	06-08-83	90	2	19	<.1	<2	17	--	3	140
GW77	06-08-83	30	160	12	<.1	<2	25	--	<1	8
GW78	06-08-83	9	1	3	.1	<2	15	--	<1	21
GW79	07-26-83	680	18	5	<.1	<1	<1	--	<1	51
GW80	09-04-84	21	7	5	<.1	60	1	--	<1	12
GW81	04-08-75	30	--	<10	--	--	--	--	<1	--
GW82	04-09-75	20,000	--	200	--	--	--	--	<1	--
GW83	07-26-83	14	3	3	<.1	<1	<1	--	<1	6
GW84	07-28-83	88	6	11	<.1	<1	<1	--	<1	66
GW85	08-16-84	62	3	33	<.1	<1	<1	--	<1	24
GW86	12-09-74	40	--	70	--	--	--	--	<1	--
GW87	04-08-75	<10	--	<10	--	--	--	--	--	--
GW88	07-29-83	220	5	14	<.1	<1	<1	--	<1	9
GW89	09-26-84	890	120	320	<.1	<1	1	--	<1	50

Table 10.--*Water-quality data for ground-water samples*--Continued

Site number on plate 1	Location number	Latitude	Longitude	Geologic unit	Site type	Date of sample
GW90	NB03501129DBC1	37°15'42"	108°04'09"	Menefee Formation	well	04-13-75
GW91	NB03501202CDC1	37°19'06"	108°08'52"	Mancos Shale	well	04-09-75
GW92	NB03501203ADD	37°19'15"	108°09'21"	Mancos Shale	well	04-09-75
GW93	NB03501217ABD	37°17'46"	108°11'50"	Mancos Shale	spring	04-13-75
GW94	NB03501234ACD1	37°14'50"	108°09'34"	Cliff House Sandstone	well	09-05-84
GW95	NB03600728CBB	37°21'34"	107°39'01"	Dakota Sandstone	well	05-11-75
GW96	NB03600729DCB	37°21'23"	107°39'30"	Mancos Shale	well	04-14-75
GW97	NB03600733DBB	37°20'38"	107°38'30"	Dakota Sandstone	well	05-15-75
GW98	NB03600733DCC	37°20'16"	107°38'26"	Dakota Sandstone	well	05-15-75

Site number on plate 1	Date of sample	Time	Sampling depth (feet)	Specific conductance (µS/cm)	Temperature (degrees Celsius)	pH (standard units)	Calcium dissolved (mg/L as Ca)	Magnesium dissolved (mg/L as Mg)	Sodium dissolved (mg/L as Na)	Sodium adsorption ratio	Percent sodium
GW90	04-13-75	1530	57.0	950	10.0	6.7	99	72	17	0.3	6
GW91	04-09-75	1130	216	6,400	9.0	8.1	18	16	1,600	68	97
GW92	04-09-75	0930	108	460	10.0	7.9	53	6.8	8.9	.3	11
GW93	04-13-75	1030	--	890	4.0	7.0	110	50	22	.4	9
GW94	09-05-84	1000	--	3,300	11.0	7.2	48	51	670	16	81
GW95	05-11-75	1245	73.0	855	12.0	--	110	57	3.9	.0	2
GW96	04-14-75	1630	180	780	3.5	--	51	14	110	4	56
GW97	05-15-75	0935	469	530	15.0	--	32	19	59	2	44
GW98	05-15-75	1630	1,180	460	13.0	--	39	17	37	1	32

Table 10.--*Water-quality data for ground-water samples*--Continued

Site number on plate 1	Date of sample	Potassium dissolved (mg/L as K)	Hardness (mg/L as $CaCO_3$)	Alkalinity (mg/L as $CaCO_3$)	Bicarbonate (mg/L as HCO_3)	Carbonate (mg/L as CO_3)	Sulfate dissolved (mg/L as SO_4)	Chloride dissolved (mg/L as Cl)	Fluoride dissolved (mg/L as F)	Silica dissolved (mg/L as SiO_2)
GW90	04-13-75	4.3	540	314	380	0	230	5.5	0.50	11
GW91	04-09-75	5.0	110	1,100	1,340	0	110	1,700	1.2	3.3
GW92	04-09-75	1.5	160	144	180	0	36	2.2	.20	7.7
GW93	04-13-75	2.4	480	299	370	0	220	1.9	.40	10
GW94	09-05-84	6.7	330	250	--	--	1,500	12	.10	12
GW95	05-11-75	2.2	510	231	280	--	240	2.7	.10	--
GW96	04-14-75	2.0	190	323	390	--	110	.70	.70	6.8
GW97	05-15-75	3.0	160	272	330	--	14	1.7	.20	8.4
GW98	05-15-75	3.4	170	234	290	--	24	1.3	.30	10

Site number on plate 1	Date of sample	Solids sum of constituents dissolved (mg/L)	Solids residue at 180 degrees Celsius dissolved (mg/L)	Nitrite plus nitrate dissolved (mg/L as N)	Orthophosphate dissolved (mg/L as P)	Aluminum dissolved (μg/L as Al)	Arsenic total (μg/L as As)	Arsenic dissolved (μg/L as As)	Boron dissolved (μg/L as B)	Cadmium dissolved (μg/L as Cd)	Copper dissolved (μg/L as Cu)
GW90	04-13-75	630	--	1.60	<0.010	--	--	<1	--	--	--
GW91	04-09-75	4,100	--	.010	.040	--	--	<1	--	--	--
GW92	04-09-75	200	--	.910	.010	--	--	<1	--	--	--
GW93	04-13-75	600	--	.290	.020	--	--	<1	--	--	--
GW94	09-05-84	2,500	--	<.100	--	10	--	<1	150	<1	4
GW95	05-11-75	--	--	<.100	<.010	--	--	<1	--	--	--
GW96	04-14-75	490	--	.020	<.010	--	--	<1	--	--	--
GW97	05-15-75	300	--	.050	.010	--	--	<1	--	--	--
GW98	05-15-75	270	--	.040	.010	--	--	<1	--	--	--

Table 10.--*Water-quality data for ground-water samples*--Continued

Site number on plate 1	Date of sample	Iron dis-solved (µg/L as Fe)	Lead dis-solved (µg/L as Pb)	Manga-nese dis-solved (µg/L as Mn)	Mercury dis-solved (µg/L as Hg)	Molyb-denum dis-solved (µg/L as Mo)	Nickel dis-solved (µg/L as Ni)	Sele-nium total (µg/L as Se)	Sele-nium dis-solved (µg/L as Se)	Zinc dis-solved (µg/L as Zn)
GW90	04-13-75	<10	--	<10	--	--	--	--	1	--
GW91	04-09-75	20	--	<10	--	--	--	--	<1	--
GW92	04-09-75	310	--	<10	--	--	--	--	3	--
GW93	04-13-75	20	--	30	--	--	--	--	1	--
GW94	09-05-84	1,700	<1	60	<.1	60	9	--	<1	40
GW95	05-11-75	500	--	100	--	--	--	--	<1	--
GW96	04-14-75	120	--	230	--	--	--	--	<1	--
GW97	05-15-75	120	--	70	--	--	--	--	<1	--
GW98	05-15-75	20	--	50	--	--	--	--	<1	--