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GROUND-WATER CONDITIONS IN
TOOELE VALLEY, UTAH, 1976-78

Open-File Report 80-439



Prepared in cooperation with
The Utah Department of Natural Resources,
Division of Water Rights,

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> See Utah Division of Water Rights

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GEOLOGICAL SURVEY

GROUND-WATER CONDITIONS IN

TOOELE VALLEY, UTAH, 1976-78

by A. C. Razem and J. I. Steiger

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Prepared in cooperation with
The Utah Department of Natural Resources,
Division of Water Rights

Salt Lake City, Utah
1980

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CONVERSION FACTORS

Most values in this report are given in inch-pound units followed by metric units in parentheses. The conversion factors are shown to four significant figures. However, the metric equivalents are shown only to the number of significant figures consistent with the accuracy of the value in inch-pound units.

<u>Inch-pound</u>		<u>Metric</u>		
<u>Unit</u> (Multiply)	<u>Abbreviation</u>	(by)	<u>Unit</u> (to obtain)	<u>Abbreviation</u>
Acre		0.4047	Square hectometer	hm ²
		.004047	Square kilometer	km ²
Acre-foot	acre-ft	.001233	Cubic hectometer	hm ³
		1233	Cubic meter	m ³
Cubic foot per second	ft ³ /s	.02832	Cubic meter per second	m ³ /s
Foot	ft	.3048	Meter	m
Foot per mile	ft/mi	.1894	Meter per kilometer	m/km
Inch	in.	25.40	Millimeter	mm
		2.540	Centimeter	cm
Mile	mi	1.609	Kilometer	km
Square foot	ft ²	.0929	Square meter	m ²
Square mile	mi ²	2.590	Square kilometer	km ²

Chemical concentration and water temperature are given only in metric units. Chemical concentration is given in milligrams per liter (mg/L) or micrograms per liter (g/L). Milligrams per liter is a unit expressing the concentration of chemical constituents in solution as weight (milligrams) of solute per unit volume (liter) of water. One thousand micrograms per liter is equivalent to one milligram per liter. For concentrations less than 7,000 mg/L, the numerical value is about the same as for concentrations in the inch-pound unit, parts per million.

Water temperature is given in degrees Celsius (°C), which can be converted to degrees Fahrenheit (°F) by the following equation: °F=1.8(°C)+32.

GROUND-WATER CONDITIONS IN TOOEELE VALLEY, UTAH, 1976-78

by

A. C. Razem and J. I. Steiger

ABSTRACT

Ground-water conditions in Tooele Valley, Utah, did not change significantly between 1963 and 1978. Water levels in the artesian aquifers declined 2-4 feet (0.6-1.2 meters) in the Grantsville area, rose 4-12 feet (1.2-3.7 meters) in the Erda area, and remained relatively stable in the north part of the valley. The rise of water levels in the Erda area may be related to above-average recharge and the discharge of mine drainage.

The average annual recharge to the artesian aquifers is estimated to be about 57,000 acre-feet (70 cubic hectometers). The maximum discharge from the artesian aquifers in 1977 was estimated to be 71,000 acre-feet (88 cubic hectometers), of which 23,000 acre-feet (28 cubic hectometers) was by evapotranspiration, 28,000 acre-feet (35 cubic hectometers) was from wells, 17,000 acre-feet (21 cubic hectometers) was from springs, and about 3,000 acre-feet (4 cubic hectometers) discharged to Great Salt Lake. The difference between recharge and discharge represents inherent errors in estimates, particularly for recharge from precipitation and discharge by evapotranspiration and from springs.

No large areas of significant change in water quality were observed between 1963 and 1978. In two newly developed areas northwest of the mouth of Pine Canyon and north of the city of Tooele, however, wells yielded water with relatively high sulfate and chloride concentrations, respectively.

A digital-computer model of the artesian aquifers was used to predict water-level changes for the period 1978-2008. The model indicates that water

levels will decline less than 5 feet (1.5 meters) in most of the valley if well discharge is equal to the 1973-77 average discharge, and water levels will decline less than 15 feet (4.6 meters) in most of the valley if well discharge is 1.5 times the 1973-77 average discharge.

INTRODUCTION

Purpose and scope

An evaluation of the ground-water resources of Tooele Valley, Utah, was made by the U.S. Geological Survey in 1976-78 in cooperation with the Utah Department of Natural Resources, Division of Water Rights. The purposes of the study were to determine changes in ground-water conditions since a previous investigation in 1958-63 by Gates (1965) and to predict the effects of future ground-water development on the hydrologic system by means of a digital-computer model.

The basic data and interpretations contained in earlier reports by Thomas (1946) and Gates (1965) were used freely during this study. The construction of wells and test drilling since 1963, however, have yielded new information concerning water levels, aquifer properties, chemical quality and temperature of ground water, and subsurface geophysical and geologic data. This new information helped in the updating and reanalysis of previous interpretations concerning the potentiometric surface and movement of ground water. This, together with more detailed phreatophyte mapping and a refinement of aquifer characteristics, helped in the construction of a digital-computer model that provided a better understanding of the recharge and discharge to the aquifers.

Previous studies and acknowledgments

Earlier reports that discussed the hydrology, geology, or related aspects of Tooele Valley and its drainage basin include those by Gilbert

(1890), Carpenter (1913), Kearney and others (1914), Gilluly (1932), unpublished reports of soil studies made by the U.S. Department of Agriculture in 1922 and the U.S. Soil Conservation Service in 1935, Rigby (1958), Johnson (1958), and Cook (1961). The first study of the ground-water resources of Tooele Valley and the most comprehensive study of ground-water geology was made by Thomas (1946). Gates (1962, 1963b, 1965) re-evaluated Thomas' work, reported on changes in ground-water conditions from 1941 to 1963, and began quantitative studies in the valley.

Since Gates' studies, reports that have discussed ground water or related geology in Tooele Valley have been by Tooker and Roberts (1971a and b) and a series of annual reports entitled "Ground-water conditions in Utah, spring 19__", the latest of which is by Price (1979). Razem and Bartholoma (1980) describe the construction and calibration of the digital-computer model used in this study, and Ryan and others (in preparation) present the hydrologic data and results of a test-drilling program that were part of this study.

The cooperation of the many well owners and landowners who permitted the collection of hydrologic and chemical data and provided data for wells and springs is gratefully acknowledged. Also providing data and cooperation were the cities of Tooele and Grantsville, Tooele County, Tooele Army Depot, North Willow Irrigation Co., Kennecott Copper Corp., Anaconda Co., Blackhawk Resin and Chemical Co., American Salt Co., Hardy Salt Co., Flintkote Co., Terracor, and Jelco Inc.

Utah Power and Light Co. supplied power-consumption data for pumped wells. Stoddard Water Well Drilling Co., Gardner Drilling Co., and Hale Drilling supplied data for wells.

Well- and spring-numbering system

The system of numbering wells and springs in Utah is based on the cadastral land-survey system of the U.S. Government. The number, in addition to designating the well or spring, describes its position in the land net. By the land-survey system, the State is divided into four quadrants by the Salt Lake base line and meridian, and these quadrants are designated by the uppercase letters A, B, C, and D, indicating the northeast, northwest, southwest, and southeast quadrants, respectively. Numbers designating the township and range (in that order) follow the quadrant letter, and all three are enclosed in parentheses. The number after the parentheses indicates the section, and is followed by three letters indicating the quarter section, the quarter-quarter section, and the quarter-quarter-quarter section--generally 10 acres (4 hm^2);¹ the letters a, b, c, and d indicate, respectively, the northeast, northwest, southwest, and southeast quarters of each subdivision. The number after the letters is the serial number of the well or spring within a 10-acre (4-hm^2) tract; the letter "S" preceding the serial number denotes a spring. If a well or spring cannot be located within a 10-acre (4-hm^2) tract, one or two location letters are used and the serial number is omitted. Thus (C-2-4)31dad-2 designates the second well constructed or visited in the SE1/4NE1/4SE1/4 sec. 31, T. 2 S., R. 4 W. Other sites where hydrologic data were collected are numbered in the same manner, but three letters are used after the section number and no serial number is used. The numbering system is illustrated in figure 1.

¹Although the basic land unit, the section, is theoretically 1 mi^2 (2.6 km^2), many sections are irregular. Such sections are sub-divided into 10-acre (4-hm^2) tracts, generally beginning at the south-east corner, and the surplus or shortage is taken up in the tracts along the north and west sides of the section.

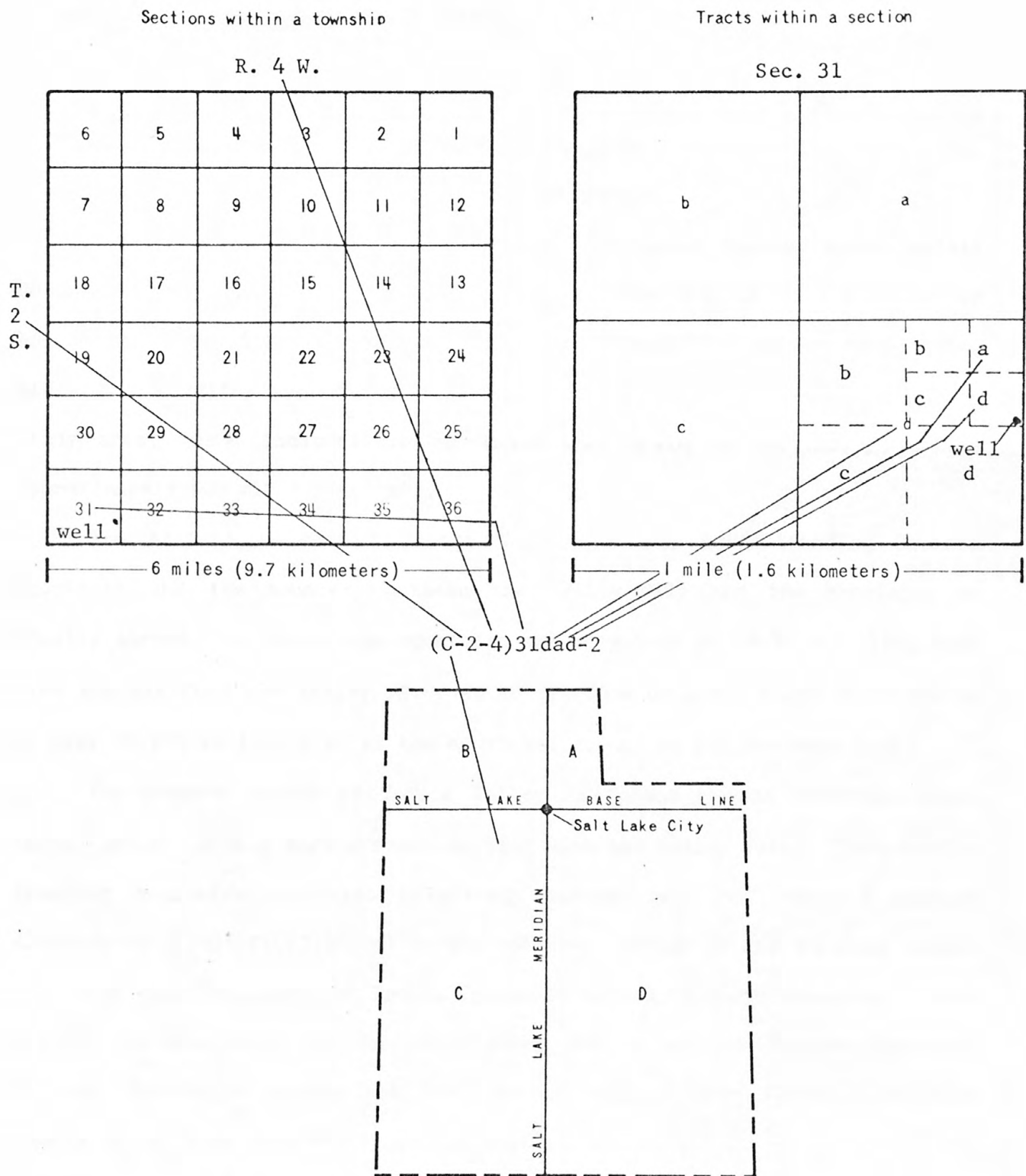


Figure 1.--Well- and spring-numbering system used in Utah.

Description of the area

Location and physiography

Tooele Valley is in the northeast part of Tooele County, approximately 30 mi (48 km) southwest of Salt Lake City. (See fig. 2.) The valley is bounded by Great Salt Lake on the north and by mountains on the three other sides. The valley includes approximately 250 mi² (650 km²); but the entire study area, which includes the mountains that drain to the valley, totals approximately 400 mi² (1,040 km²).

The eastern border of Tooele Valley is the north-trending Oquirrh Mountains and the boundary between the valley fill and the mountains is usually abrupt. Although the mountains are only 5-12 mi (8-19 km) wide, they rise sharply from the valley floor at an altitude of about 5,200 ft (1,590 m) to over 10,000 ft (3,050 m) at the southeast corner of the drainage basin.

The western border of Tooele Valley is formed by the Stansbury Mountains, which have a more gradual contact with the valley fill. These north-trending mountains are also relatively narrow, and they reach a maximum altitude of 11,031 ft (3,362 m) in the southwest corner of the drainage basin.

The southern border of Tooele Valley is marked by South Mountain, a relatively low transverse divide, and Stockton Bar, a bar-like feature deposited by Lake Bonneville during the Pleistocene Epoch. These features separate Tooele Valley from Rush Valley to the south.

Ephemeral and perennial streams discharge approximately 17,000 acre-ft (21 hm³) per year from the mountains bordering Tooele Valley (table 1). The perennial streams are in Settlement Canyon in the Oquirrh Mountains and in Davenport, North and South Willow, and Box Elder Canyons in the Stansbury Mountains (fig. 3). The stream in Middle Canyon was perennial at one time;

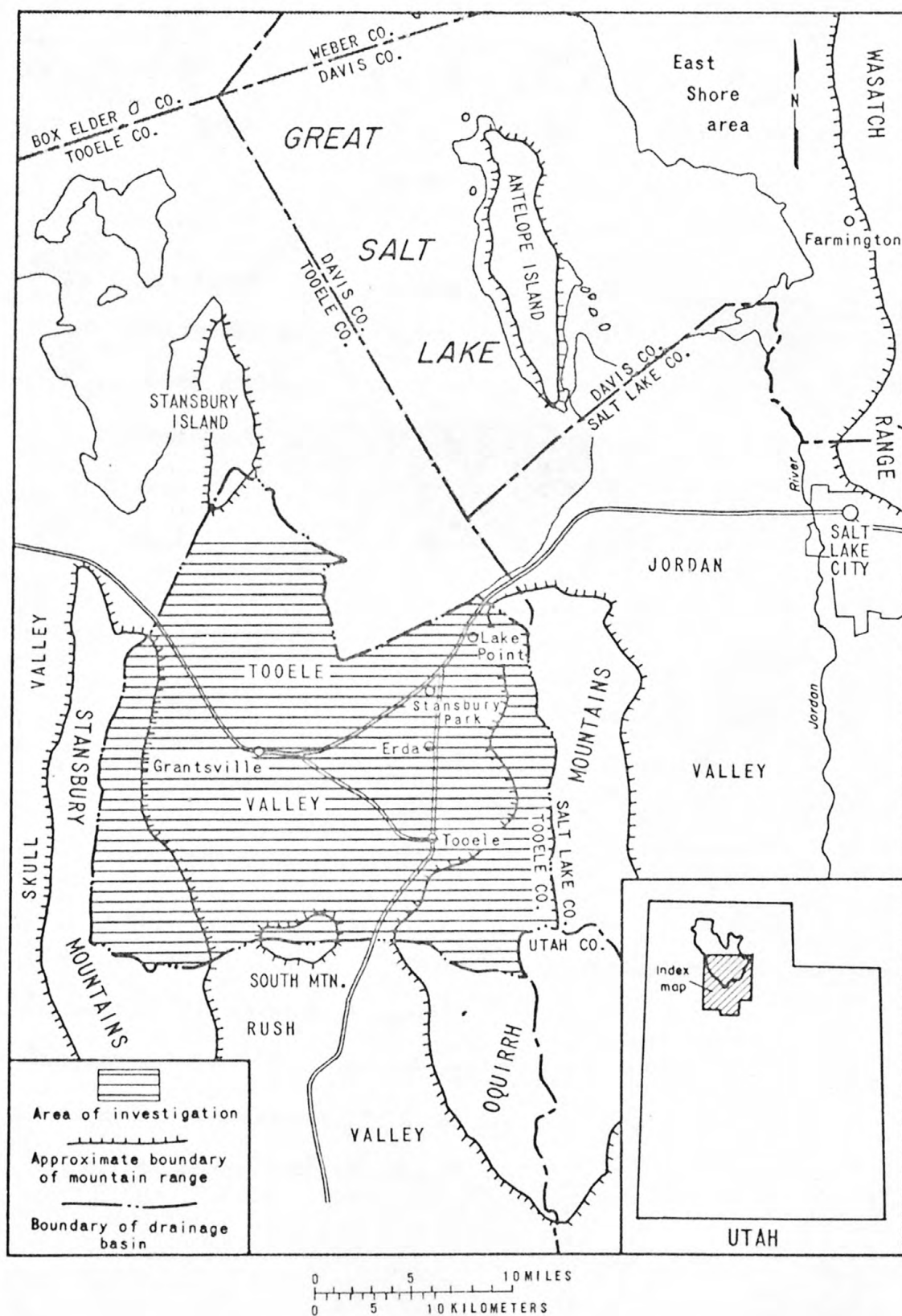


Figure 2.--Location of Tooele Valley.

Table 1.--Streamflow in ephemeral and perennial streams in Tooele Valley

Canyon	Drainage area (acres)	Average annual flow	
		Ephemeral (acre-feet per year)	Perennial
Box Elder	8,280		900 ¹
South Willow	5,630		4,830 ²
North Willow			
Davenport	6,820		3,100 ¹
Mack			
West	6,580	900 ³	
Dry			
Settlement	11,530		4,000 ⁴
Middle	9,540		1,100 ⁴
Pole			
Bates	7,800	1,600 ³	
Swenson	740	<u>600³</u>	<u> </u>
		3,100	13,930

¹Estimates based on spot measurements and channel-geometry measurements.

²Value from gaging-station records.

³Estimates based on channel-geometry measurements and equations from Region A in Hedman and Kastner (1977, p. 296).

⁴Value from Gates (1965, p. 58).

however, the water in the upper reaches of the canyon is now diverted. Except during periods of extremely high runoff, the streams are diverted for irrigation before or shortly after the stream course leaves the canyons.

Geology

Tooele Valley is underlain mostly by a thick sequence of unconsolidated sediments of Tertiary and Quaternary age. The bulk of this valley fill consists of interfingering clay, sand, and gravel, although some volcanic material is present in the southeastern part of the valley. The fill was emplaced in a complex sedimentation pattern of lake-bottom, lakeshore, stream, and alluvial-fan deposits, making it difficult to correlate beds from one part of the valley to another. An attempt at correlation was made using the geophysical logs from two oil-test wells and eight deep test holes. A general change was observed in most areas at a depth between 800 and 900 ft (244 and 274 m). The valley fill is much finer grained below that level than above it, and the change may mark the top of sediments of Tertiary age.

The thickness of the unconsolidated valley fill ranges from a feather edge at the margins of the valley to a possible maximum of about 7,100 ft (2,160 m) at oil-test well (C-2-5)14cab-1 in the northern part of the valley. None of eight test holes, which were drilled during 1977-78 to depths between 992 and 1,524 ft (302 and 465 m), reached bedrock (see fig. 3 for locations).

The Oquirrh Mountains and South Mountain are composed mainly of the Oquirrh Group (or Formation) of Late Mississippian, Pennsylvanian, and Early Permian age. This unit consists predominantly of alternating quartzite and limestone beds, with much of the limestone containing chert. Numerous formations crop out in the Stansbury Mountains, but the thickest are the Oquirrh Formation and the Tintic Quartzite of Cambrian age, which is exposed along most of the crest of the range. The rocks in all three of the mountain ranges bordering the valley have been extensively folded and faulted.

EXPLANATION FOR FIGURE 3

REPRODUCIBLE ENCLOSED (LARGER THAN PAGE SIZE)

EXPLANATION

- Well
- + Test hole
- q Spring
- ▲ Stream-gaging station
- ▽ Stream-sampling site
- ☆ Site of mine or tunnel discharge

Number by symbol indicates number
of wells represented

- C Chemical analysis in table 7
- H Hydrograph in figure 10
- W Water-level measurements in table 6

— • • — Boundary of drainage basin

Climate and vegetation

The climate of the study area ranges from semiarid in the salt flats near Great Salt Lake to humid in the higher mountains. The average precipitation at Tooele for the period 1897-1977 is 16.49 in. (418 mm) (fig. 4), whereas at Grantsville the average precipitation for the period 1957-77 is 11.00 in. (279 mm). The normal (1941-70) mean annual air temperature at Tooele is 51°F (10.6°C), and the annual freeze-free period at Tooele is 209 days (Criddle and others, 1962, p. 11).

The most common native plants in the lowland areas are greasewood (Sarcobatus vermiculatus), saltgrass (Distichlis stricta), pickleweed (Allenrolfea occidentalis), and rabbitbrush (Chrysothamnus nauseosus). Progressing upward toward the mountain slopes, sagebrush (Artemisia sp.), shadscale (Atriplex confertifolia), and juniper (Juniperus sp.) become increasingly more dominant. In the valley areas, the dominant type of vegetation is controlled largely by the depth to the water table, salinity of the soil and ground water, soil type, and soil moisture.

In the mountains, the common native plants are juniper on the foothills and lower slopes; scrub oak (Quercus gambelii) and brush species on slopes of southern exposure; pine (Pinus sp.), Douglas fir (Pseudotsuga mensiesii), spruce (Picea sp.), and quaking aspen (Populus tremuloides) on the north-facing slopes at high altitudes; and cottonwood (Populus), along streams and gullies.

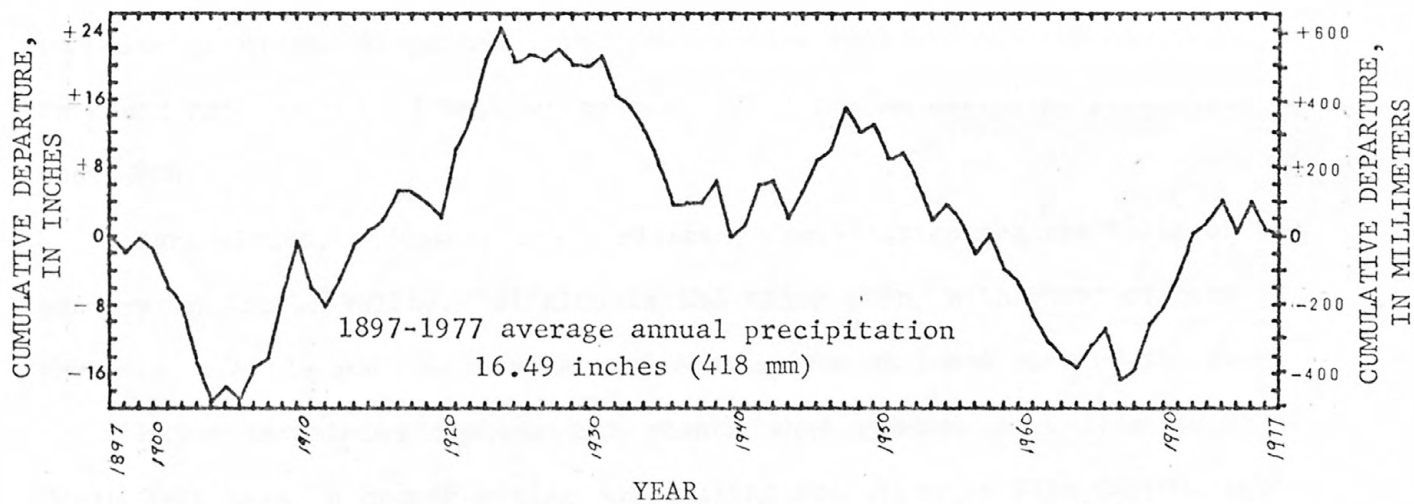


Figure 4.--Cumulative departure from average annual precipitation at Tooele, 1897-1977.

Population and economy

The population of Tooele Valley in 1975 was estimated to be almost 19,000 (U.S. Bureau of Census, 1977)--or an increase of about 46 percent since 1960. Most of the people reside in Tooele or Grantsville, which had estimated populations in 1975 of 12,905 and 3,657, respectively, representing an increase of 41 and 69 percent since 1960. The residential area of Stansbury Park did not exist in 1960, but it now (1978) has an estimated population of about 800.

Agriculture, industry, and a military installation are the basis of the economy in Tooele Valley. Alfalfa is the major crop, with wheat of next importance. Cattle and sheep are grazed locally for at least part of the year.

Major industries include two plants that produce salt from water of Great Salt Lake, a copper mining and milling operation in Pine Canyon, and a limestone quarry northwest of Grantsville. The Tooele Army Depot, west of Tooele, is probably the major employer in the valley.

GROUND-WATER HYDROLOGY

Ground water occurs in the Tooele Valley study area in the consolidated rocks of the mountains and in the unconsolidated valley fill.

Consolidated rocks

Little is known about the water-bearing characteristics of the consolidated rocks because most ground water is withdrawn from the valley fill. The consolidated rocks are important to the valley's hydrologic system, however, in that they serve as a source of recharge to the fill. The consolidated rocks consist mostly of quartzite and limestone of low primary permeability. However, secondary permeability may be relatively high locally, owing to the presence of fractures and solution openings in the limestone.

Most information available for water-bearing properties of the consolidated rocks has been obtained from the Elton, Honerine, and Utah Metals tunnels and the Carr Fork Mine. Discharge from the Elton tunnel, east of Tooele, started in 1937. The tunnel had a sustained flow of about $5 \text{ ft}^3/\text{s}$ ($0.14 \text{ m}^3/\text{s}$) until it started to cave and finally ceased flowing in 1958 (Thomas, 1946, p. 158; Gates, 1965, p. 20). The Honerine tunnel, south of Tooele, was reported to have discharged about $1.7 \text{ ft}^3/\text{s}$ ($0.05 \text{ m}^3/\text{s}$) during 1941 (Thomas, 1946, p. 159). The flow had dropped to about $1.0 \text{ ft}^3/\text{s}$ ($0.03 \text{ m}^3/\text{s}$) in 1977 due to caving (Paul Dufendach, oral commun., 1977). In 1959 the Utah Metals tunnel, in the upper reaches of Middle Canyon, discharged approximately 0.2 to $0.9 \text{ ft}^3/\text{s}$ (0.006 to $0.03 \text{ m}^3/\text{s}$) (Gates, 1963a, p. K32). From 1975 to 1977, the Carr Fork Mine, in Pine Canyon, had an average annual discharge of about $5 \text{ ft}^3/\text{s}$ ($0.14 \text{ m}^3/\text{s}$) (J. F. Anderson, Carr Fork project manager, written commun., 1978).

Although no wells obtain water from bedrock, discharge of tunnels and a mine shows that water does exist in large quantities in the bedrock. Much of this water probably finds its way into the valley fill, either at the mountain-valley contact or by upward leakage in the valley.

Unconsolidated valley fill

Ground water occurs under unconfined and confined conditions in the unconsolidated valley fill. Unconfined conditions, or water-table conditions, exist where the ground water has free access to the atmosphere through open spaces in the sediments. Confined conditions, or artesian conditions, exist where relatively impermeable layers, usually consisting of fine material such as clay or silt, separate the aquifer from free access to the atmosphere.

Water-table aquifers

Ground water occurs under water-table conditions in the unconsolidated valley fill near the mountains and in the northern part of Tooele Valley. The water-table aquifers near the mountains are many hundreds of feet below the land surface, the depth to water is equally great, and the aquifers supply water to only a few wells. These deep aquifers merge downdip with artesian aquifers toward the center of the valley, and they are essentially a lateral extension of the artesian system. As such, they will be discussed in a later section of this report.

The water-table aquifer in the northern part of the valley consists of about the upper 50 ft (15 m) of sediment, and the water level ranges from land surface down to about 50 ft. No wells are known that presently obtain water from the shallow water-table aquifer in the northern part of the valley, though some water-table wells were reported in the Lake Point area in 1941 (U.S. Geol. Survey, 1942, p. 94-96).

The main source of recharge to the shallow water-table aquifer is upward leakage from the underlying artesian aquifers. Lesser sources are seepage of precipitation that falls directly on the shallow aquifer, seepage of water that discharges from springs, and seepage of excess irrigation water. Water levels obtained from shallow dug holes in the water-table aquifer indicate that the movement of water is in the same general direction as the slope of the land surface.

Discharge from the shallow water-table aquifer is mostly by evapotranspiration. (See pages 33-36 for a more detailed description of evapotranspiration.) Lesser amounts of discharge are from seeps, possibly springs, and a small amount of that moves in the subsurface to Great Salt Lake.

Artesian aquifers

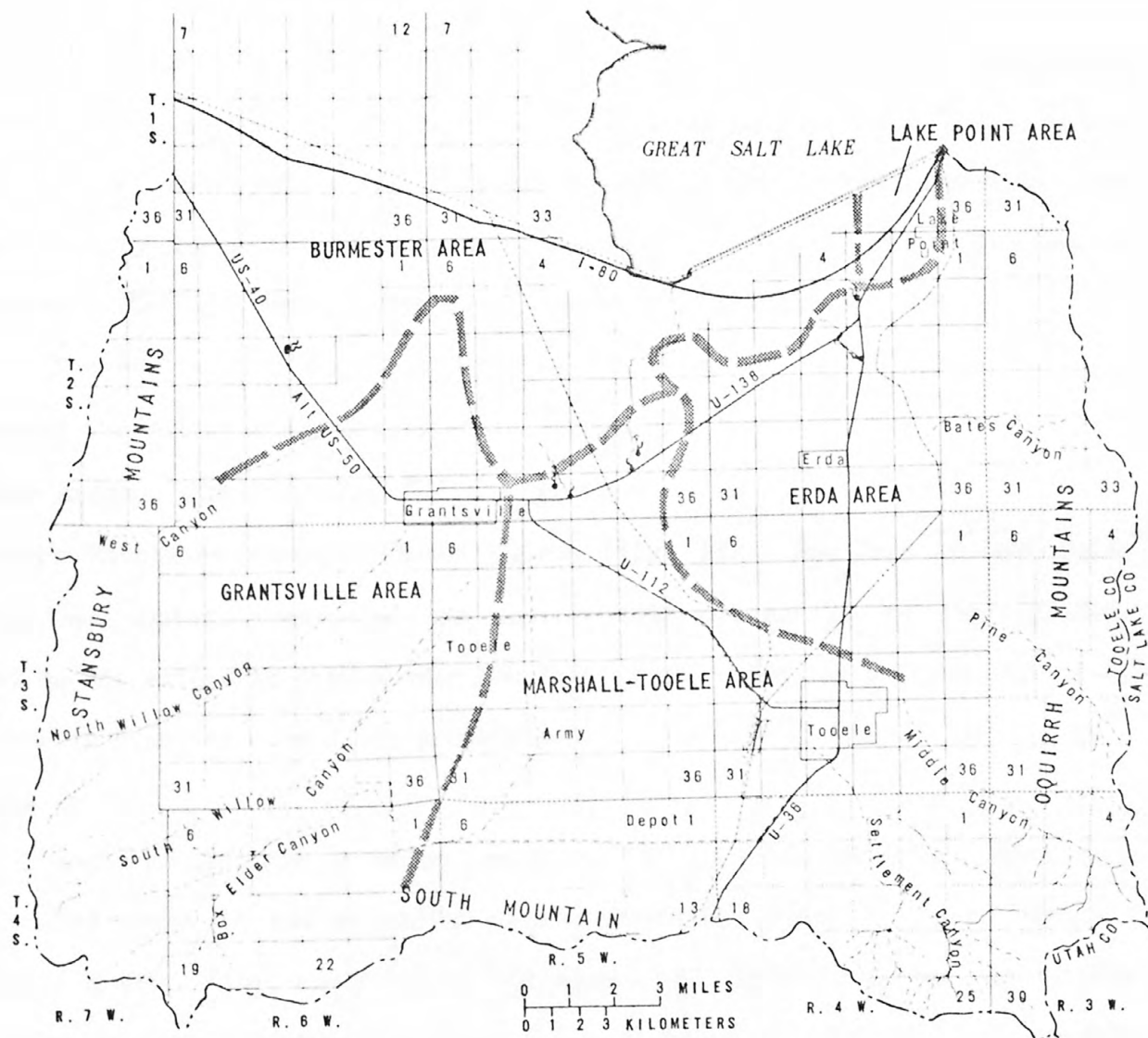
Ground-water areas

Thomas (1946, p. 161-162 and Gates (1965, p. 31-36) divided the artesian aquifers in Tooele Valley into districts based on various geohydrologic factors. Data obtained since 1963 indicate that the district boundaries are not barriers to ground-water movement. In this report, therefore, the artesian aquifers in the valley fill are treated as a single unit. The ground-water areas shown in figure 5 were chosen to show areas where ground-water conditions are generally similar or areas where ground-water conditions can conveniently be discussed together. The areas are not independent of adjacent areas, and the boundary lines that separate the areas are approximate.

The aquifers in the Erda area receive recharge from the Oquirrh Mountains. Many of the aquifers consist of coarse well-sorted gravels that may be several hundred feet thick. (See log for test hole (C-2-4)34cab-1 in Ryan and others, in preparation.)

Water from the Oquirrh Mountains serves as the main source of recharge to aquifers in the Marshall-Tooele area. Additional sources of recharge are Rush Valley and the Stansbury Mountains. Production from wells is highly variable in this area. The aquifers generally consist of clayey or sandy gravel separated by clay and gravelly or sandy clay. (See logs of test holes (C-2-5)35daa-1 and (C-3-5)22dab-1 in Ryan and others, in preparation.)

The Grantsville area is recharged from the Stansbury Mountains. The aquifers in the area consist mostly of sandy layers, usually about 20 ft (6 m) thick, separated by thin clayey layers. There may be some gravel aquifers, especially in the southern part of the area. (See logs for test holes (C-2-5)31bad-1 and (C-3-5)7ccd-1 in Ryan and others, in preparation.)



EXPLANATION

Approximate boundary of ground-water areas. Boundaries are not barriers to ground-water movement

Boundary of drainage basin

Figure 5.--Approximate boundaries of ground-water areas in Tooele Valley.

The aquifers in the Burmester area in the northern part of the valley receive water moving out of the Erda, Grantsville, and Marshall-Tooele areas. The aquifers in the Burmester area are typically thin beds of gravel or sand separated by large thicknesses of relatively impermeable clay. (See log of test hole (C-2-5)14cbb-1 in Ryan and others, in preparation.)

The aquifers in the Lake Point area are essentially separated from the rest of the valley and probably would be little affected by development in the other areas. The recharge for the aquifers in the Lake Point area is the Oquirrh Mountains north of Bates Canyon (fig. 13). Aquifers in Lake Point area that contain freshwater are usually thin and consist of sandy gravel. They do not extend to depths over 500 ft (152 m). (See log of test hole (C-2-4)2bda in Ryan and others, in preparation.)

Recharge

Recharge to the artesian aquifers is by subsurface flow from consolidated rocks in the adjoining mountains and by lateral movement from the adjoining water-table aquifer near the mountains. Recharge to the water-table aquifer is from precipitation that falls directly on that aquifer, seepage from stream channels that cross it, seepage of excess irrigation water, seepage of discharge from mines and tunnels, and subsurface flow from consolidated rocks. In the following discussion, the artesian aquifers and the adjoining water-table aquifer are treated as a hydrologic unit.

Subsurface flow from consolidated rocks along the mountain front into the valley fill probably accounts for a large percentage of the total recharge. Such flow from consolidated rocks has been shown to be the largest single source of recharge in the nearby East Shore area (Feth and others, 1966, p. 39) and the Jordan Valley (Hely and others, 1971, p. 119). Other possible ways by which water moves into the valley fill from consolidated

rocks are by upward leakage from bedrock along faults and by subsurface flow from Rush Valley.

The southeastern and southwestern parts of the study area appear to be the areas of greatest recharge because the precipitation is greatest there and stream-drainage areas are largest. These areas of greatest recharge extend from Swenson Canyon to Settlement Canyon in the southeast and from Davenport Canyon to Box Elder Canyon in the southwest. The streams in these two areas account for approximately 14,500 acre-ft (18 hm^3) of the total of 16,900 acre-ft (21 hm^3) of estimated streamflow (table 1). Part of this streamflow is diverted for irrigation, but some infiltrates the unconsolidated deposits near the mountain fronts and eventually recharges the aquifer system.

Thomas (1946, p. 195), Gates (1965, p. 22), and Hood (1969, p. 30-31) all indicated that water moves by subsurface flow from Rush Valley to Tooele Valley, but none of them were able to give a figure for the amount of flow. About 5,000 acre-ft (6 hm^3) per year of recharge along the southern margin of the valley gave the best results for calibration of the digital-computer model during this study (Razem and Bartholoma, in preparation), and this may be a reasonable estimate of underflow from Rush Valley.

A computation of the recharge to the aquifer system from precipitation that falls directly on the study area was made using the precipitation contours and the recharge area shown by Gates (1965, p. 23 and fig. 2). At altitudes below the recharge area, precipitation probably does not infiltrate to the artesian aquifers. Gates (1965, p. 57) states that the average annual precipitation that falls on the recharge area and on the mountains tributary to Tooele Valley is about 200,000 acre-ft (247 hm^3). This would be the maximum available recharge to the artesian-aquifer system.

The amount of water from precipitation that actually recharges the aquifer system has been estimated using the method described by Hood and Waddell (1968, p. 22) who modified a method of Eakin and others (1951, p. 79-81). This method assumes that a fixed percentage of the average annual precipitation recharges the ground-water reservoir. The fixed percentage is determined on the basis of the following factors: altitude, geology, gradient of the land surface, and the amount of precipitation. The average annual recharge in Tooele Valley, using this method, was estimated to be about 51,000 acre-ft (63 hm^3), with about 31,500 acre-ft (39 hm^3) from the Oquirrh Mountains; 19,300 acre-ft (24 hm^3) from the Stansbury Mountains; and less than 500 acre-ft (0.6 hm^3) from South Mountain (table 2).

The digital-computer model was also used to determine recharge to the aquifer system. When calibrating the model to reflect water-level changes from 1941 to 1978, it was found that an average annual recharge from precipitation of about 52,500 acre-ft (65 hm^3) produced the best results. This consisted of about 39,800 acre-ft (49 hm^3) from the Oquirrh Mountains, 12,300 acre-ft (15 hm^3) from the Stansbury Mountains, and less than 500 acre-ft (0.6 hm^3) from South Mountain.

The two methods of estimating recharge indicate that the average annual recharge from precipitation is about 52,000 acre-ft (64 hm^3). Thus, with the inflow from Rush Valley, the total average annual recharge is about 57,000 acre-ft (70 hm^3). Considering the type of estimates involved in both methods of computing recharge, the total of 57,000 acre-ft (70 hm^3) is believed to have an accuracy of 10-20 percent.

Movement

Ground water in the valley fill in Tooele Valley generally moves at right angles to the potentiometric-surface contours shown in figure 6. Thomas

Table 2.—Estimated average annual precipitation and ground-water recharge in Tooele Valley

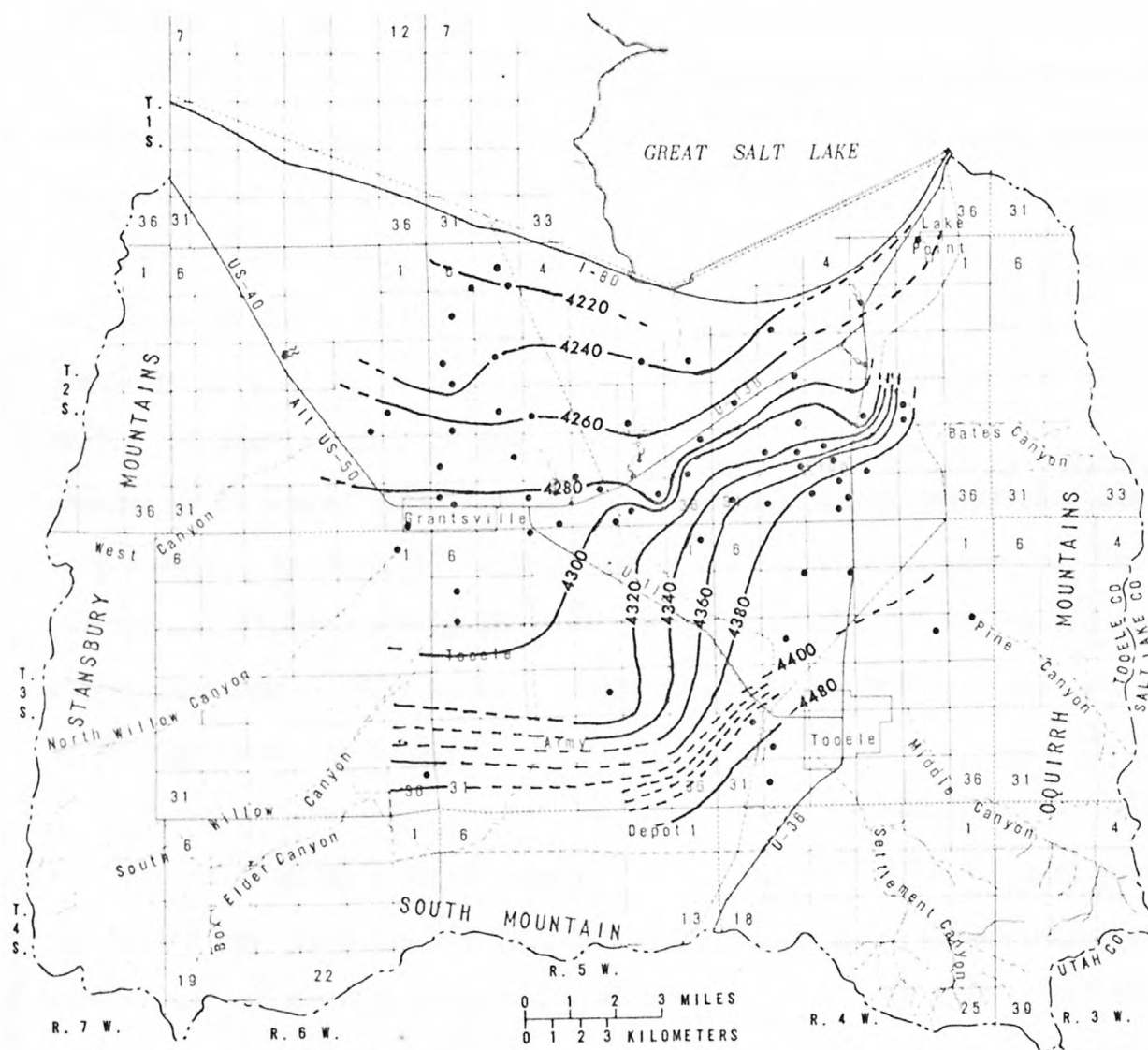
Precipitation zone (inches)	Area (acres)	Estimated annual precipitation		Estimated annual recharge	
		Inches	Acre-feet	Percentage of precipitation	Acre-feet
STANSBURY MOUNTAINS					
11-12	700	11.5	700	1	10
12-14	8,500	13	9,200	3	300
14-16	9,000	15	11,300	3	300
16-18	5,600	17	8,000	20	1,600
18-20	6,500	19	10,300	20	2,100
20-25	8,500	22.5	15,800	33	5,200
25-30	10,200	27.5	23,400	33	7,700
30-35	1,200	32.5	3,300	33	1,100
35-40	800	37.5	2,500	33	800
>40	200	42.5	700	33	200
Subtotal	51,200		85,200		19,300
OQUIRRH MOUNTAINS					
14-16	9,400	15	11,800	3	400
16-18	7,400	17	10,500	20	2,100
18-20	5,700	19	9,000	20	1,800
20-25	11,000	22.5	20,500	33	6,800
25-30	14,900	27.5	34,100	33	11,300
30-35	5,800	32.5	15,700	33	5,200
35-40	2,100	37.5	6,600	33	2,200
>40	1,400	42.5	5,000	33	1,700
Subtotal	57,700		113,200		31,500
SOUTH MOUNTAIN					
12-14	2,800	13	3,000	3	90
14-16	1,200	15	1,500	3	50
>16	30	17	40	20	10
Subtotal	4,030		4,540		150
Total (rounded)	113,000		203,000		51,000

(1946, fig.10) and Gates (1965, fig. 6) showed similar contour maps for 1941 and 1962, and comparison with the map for 1978 indicates little change in the pattern of movement. The general direction of movement is from the recharge areas--east, south, and west of the valley--northward toward Great Salt Lake.

In addition to the direction of movement indicated in figure 6, the ground water in the artesian aquifers in Tooele Valley also moves vertically upward. Such upward movement results in discharge to the water-table aquifer in the northern part of the valley.

Gates (1965, p. 24) stated that the only known barrier to ground-water movement in the valley fill was the Occidental(?) fault. Gates (1962, p. D79) inferred this barrier primarily because his data showed differences in the potentiometric surface and chemical quality of the water from one side of the suspected fault to the other. However, data from new wells that have been drilled in the vicinity of the fault show that it is not a barrier to ground-water movement. This is indicated by the map showing the potentiometric surface in 1978 (fig. 6) and also by the chemical data which indicate that differences in chemical quality do not seem to be related to the fault but rather appear to be a function of depth. For example, wells (C-2-4)27bba-1 and (C-2-4)27bac-1, which are both on the northeast side of the fault, yield water with specific conductances of 1,900 and 650 micromhos per centimeter at 25°C, respectively, but the former well is 105 ft (32 m) deep and the latter is 500 ft (152.4 m) deep.

Although the fault is not a barrier to ground-water movement, it probably exists and may be influencing ground-water movement. Figure 6 shows that a steep hydraulic gradient occurs in the area, and although the reason for this is not known, the fault may be partly responsible.



Base from U.S. Geological Survey
topographic maps

EXPLANATION

• Observation well

♣ Spring

— 4320 — — — —

Potentiometric contour, dashed where inferred;
contour interval 20 ft (6.1 m); datum is mean
sea level

— — — — — Boundary of drainage basin

Figure 6.--Potentiometric surface of the artesian aquifers in Tooele Valley, March-April 1978.

Discharge

Ground water in the valley fill in Tooele Valley is discharged by wells, springs, evapotranspiration, and subsurface outflow. The total discharge in 1977 was about 71,000 acre-ft (88 hm^3).

Wells.--Discharge of ground water from wells in Tooele Valley in 1977 was about 28,000 acre-ft (35 hm^3). Gates (1965, table 1) reported that the discharge from wells in the valley fill in 1962 was about 21,000 acre-ft (26 hm^3). Of that amount, he estimated that 10,500 acre-ft (13 hm^3) was discharged by 55 pumped wells for irrigation and municipal, industrial, and military supply. By 1977, 63 wells supplied water for those uses, and the total pumpage was 17,800 acre-ft (22 hm^3). The method used for estimating the discharge from pumped wells by using power consumption records is the same as described by Gates (1965, p. 25).

Time constraints did not allow discharge measurements at all the hundreds of flowing wells in Tooele Valley, so an estimate was made following the method used by Gates (1965, p. 24). It was assumed that approximately the same number of flowing wells existed in Tooele Valley in 1977 as in 1962, new wells having replaced ones abandoned. Discharge measurements were made at 63 wells; a ratio of 1.2 was computed showing the average discharge of these wells as compared to their discharge in 1962; and this ratio then was applied to the discharge of 8,200 acre-ft (10 hm^3) for all flowing wells in 1962, giving about 10,000 acre-ft (12 hm^3) as the discharge from flowing wells in 1977. An estimate of 150 acre-ft (0.2 hm^3) of water from flowing wells was made for industrial and domestic use during 1977, giving a total of approximately 28,000 acre-ft (35 hm^3) discharged by wells in 1977.

Springs.--Discharge of ground water from springs in Tooele Valley in 1977 was about 17,000 acre-ft (21 hm^3). Most of the spring discharge is from

the artesian system, but some possibly comes from the shallow water-table aquifer. Thomas (1946, p. 234) estimated that about 19,500 acre-ft (25 hm^3) was discharged by springs in 1938-40, and Gates (1965, p. 26) stated that about 15,000 acre-ft (19 hm^3) was discharged in 1962. The increase since 1962 is probably due to the rise in water levels in the Erda area, which is close to the two largest springs.

Almost all the spring discharge is from four large springs, with minor additions from a few seeps. The large springs are Dunne's Pond Springs, (C-2-4)10bca-S1, Mill Pond Spring, (C-2-4)15cac-S1, and the sources of Sixmile Creek, (C-2-5)26cdc-S2, and Fishing Creek, (C-2-5)33add-S1.

Measurement devices on all but Fishing Creek are usually read on a weekly basis by Kennecott Copper Corp., and spot measurements were made over a period of a year at Fishing Creek. The measurements indicate the following discharges for 1977: Dunne's Pond Springs, 6,360 acre-ft (7.8 hm^3); Mill Pond Spring, 5,340 acre-ft (6.6 hm^3); Sixmile Creek, 2,780 acre-ft (3.4 hm^3); and Fishing Creek, 2,470 acre-ft (3.0 hm^3).

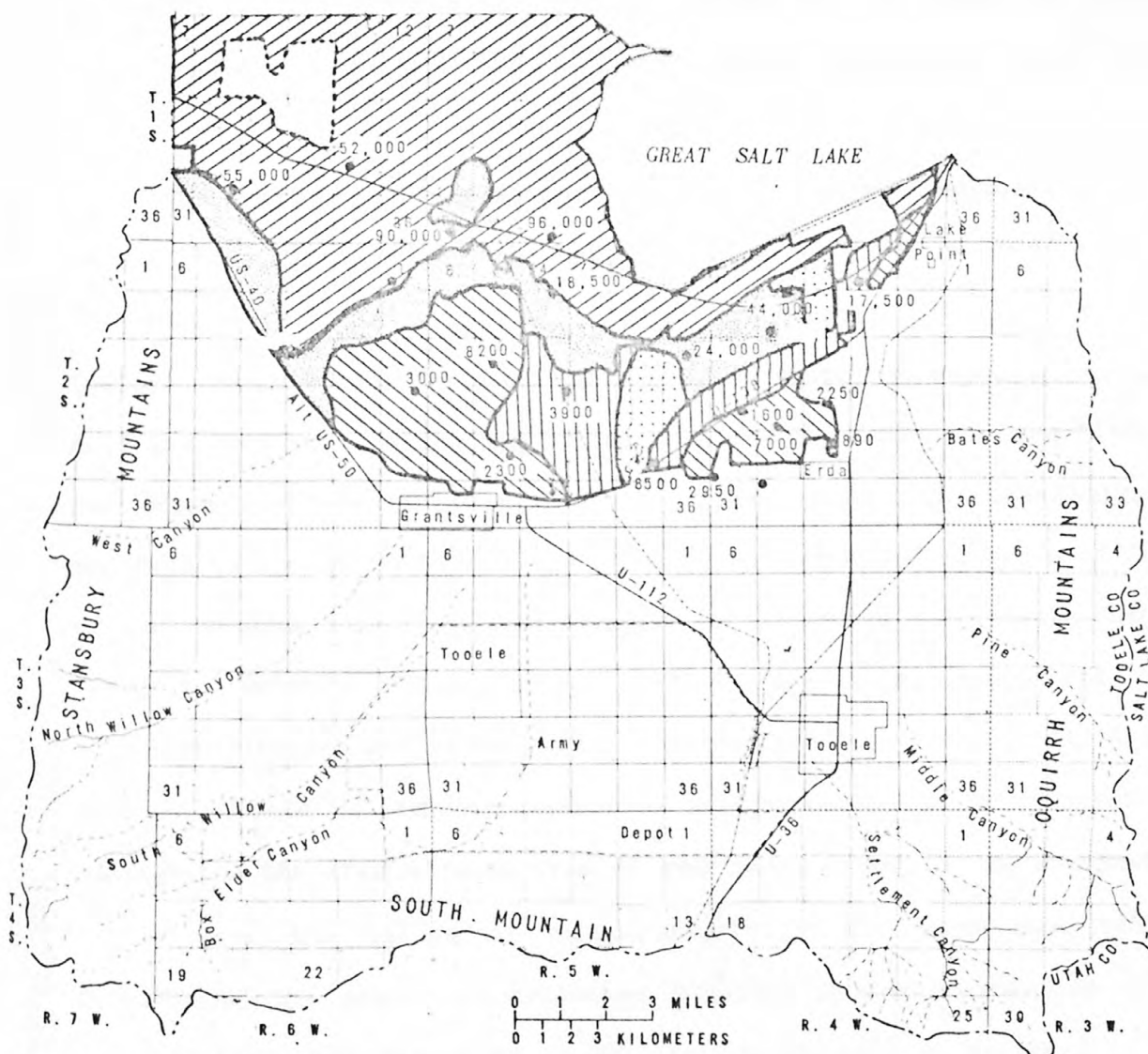
Evapotranspiration.--About 23,000 acre-ft (28 hm^3) of water was discharged by evapotranspiration from the ground-water reservoir in Tooele Valley in 1977. This does not represent a decrease from the 40,000 acre-ft (49 hm^3) reported by Gates (1965, p. 27); rather it represents the results of a more detailed investigation.

Water lost by evapotranspiration is discharged from the water-table aquifer in the northern part of the valley. Recharge to the water-table aquifer is from upward leakage from the artesian aquifers, excess irrigation water, precipitation, and spring flow. Therefore, an estimate of discharge by evapotranspiration from the water-table aquifer would be a good maximum approximation of discharge from the artesian aquifers by upward leakage.

Evapotranspiration occurs where the water is near the land surface and includes evaporation from bare soil surfaces and transpiration from plants. Plants that obtain their water supply mainly from the zone of ground-water saturation are called phreatophytes. The roots of phreatophytes are known to extend as deep as 129 ft (39.3 m) (Meinzer, 1927, p. 55); but for this study the only areas considered in estimating are the nonirrigated low-lying areas where there is a natural growth of phreatophytes and where the water table is within 10 ft (3.0 m) of the land surface. The reasons for these constraints are: (1) As shown by White (1932, p. 80), van Hylckama (1974, p. E28), and Mower (oral commun., 1978, from unpublished work in Jordan Valley), the rate of evapotranspiration decreases sharply with depth and is very small at depths exceeding 10 ft (3.0 m); and (2) because of the clearing of land for farming, there is very little natural phreatophyte growth where the depth to the water table is greater than 10 ft.

The rate of evapotranspiration depends on many factors, including plant species, depth to the water table, water quality, soil type, and climate. The most common phreatophytes in Tooele Valley are greasewood, rabbitbrush, saltgrass, and pickleweed. These plants usually grow in association with one species usually dominant in a particular area. For this reason, the phreatophytes were grouped into four associations as shown in table 4 and in figure 7.

Soil type, depth to water, and water quality usually govern which plant species will be dominant in a particular area. Water quality also is important in determining the rate of consumptive water use by each species. As shown by van Hylckama (1974, p. E28), the rate of evapotranspiration decreases as the specific conductance of the ground water increases (or water quality deteriorates). Figure 7 shows the specific conductance of the water



Base from U.S. Geological Survey
topographic maps

EXPLANATION



Bare soil



Dominantly greasewood with
pickleweed and local areas
of rabbitbrush and saltgrass



Dominantly pickleweed with
local areas of mixed salt-
grass and pickleweed



Dominantly rabbitbrush
and saltgrass



Dominantly saltgrass with
local areas of rabbitbrush

Boundary of drainage basin

18,000

• Location of shallow water-
table hole--number is specific
conductance in micromhos per
cm at 25°C, August-September,
1977

Figure 7.--Distribution of phreatophytes and specific conductance of
water near the water table in Tooele Valley.

in holes that were dug to the top of the water table. Because vegetation is sparse in areas where the specific conductance is high, water quality was not considered as a factor in determining evapotranspiration rates in Tooele Valley.

The area for which evapotranspiration was calculated was divided in two zones depending on whether the depth to the water table was 0-5 ft or 5-10 ft (0-1.5 m or 1.5-3.0 m). The rate of evapotranspiration (consumptive-use factor) in each zone for each of the four vegetation associations and bare soil was derived from studies by Robinson (1970), Mower and Nace (1957), Feth and Brown (1962), and Lines (1977). Rates reported by those authors were modified to account for the depth to water in Tooele Valley by using figure 34 of van Hylckama (1974, p. E28) in which he describes yearly water use versus depth to water. Thus, in the 0-5 ft (0-1.5 m) zone, the rate of evapotranspiration was decreased by 22 percent, and in the 5-10 ft (1.5-3.0 m) zone, the rate of evapotranspiration was decreased by 65 percent. Then multiplying the area of each type of vegetative cover by the consumptive-use factor gave the volume of evapotranspiration for each zone (table 3). Considering the number of estimates involved in the computation of evapotranspiration, the figure of 23,000 acre-ft (28 hm^3) is believed to have an accuracy of about 20 percent.

Subsurface flow to Great Salt Lake.--About 3,000 acre-ft (4 hm^3) annually discharges by upward leakage from the artesian aquifers into Great Salt Lake. The discharge was calculated by using an average transmissivity of about $1,000 \text{ ft}^2/\text{d}$ ($93 \text{ m}^2/\text{d}$), a hydraulic gradient of about 20 ft/mi (6 m/km), and a width of flow of about 15 mi (24 km). Although the calculations are based on only a few water levels and well logs, the discharge of 3,000 acre-ft (3.7 hm^3) per year is comparable to the 4,000 acre-ft (5 hm^3) per year ob-

Table 3.—Evapotranspiration in the northern part of Tooele Valley

Vegetative cover	Evapotranspiration where depth to water table is 0-5 ft (0-1.5 m)			Evapotranspiration where depth to water table is 5-10 ft (1.5-3 m)		
	Consumptive use (feet)	Acres	Acre-feet per year	Consumptive use (feet)	Acres	Acre-feet per year
Bare soil	0.09	26,000	2,340	0.02	3,200	60
Dominantly greasewood with pickleweed and local areas of rabbitbrush and saltgrass	1.1	6,300	6,930	.48	5,900	2,830
Dominantly pickleweed with local areas of mixed salt-grass and pickleweed	1.4	250	350	.63	5,800	3,650
Dominantly rabbitbrush and saltgrass	1.0	400	400	.45	1,400	630
Dominantly saltgrass with local areas of rabbitbrush	1.0	970	970	.45	9,700	4,360
		Subtotal	10,990		Subtotal	11,530
					TOTAL (all areas) (rounded)	23,000

tained for the discharge to Great Salt Lake from the Jordan Valley to the east (Hely, and others, 1971, p. 137).

Hydraulic properties

The hydraulic characteristics of the artesian aquifers were determined by pumping and recovery tests at wells. The digital-computer model was also used to estimate transmissivity by experimenting with transmissivity values until the water-level values generated by the model came into close agreement with the actual water-level measurements in the field. Table 4 gives a comparison between the transmissivity values obtained from aquifer tests and the values obtained from the "best-fit" condition in the model at the same location. Some of the values are almost identical, and where divergences exceeded 15 percent, the aquifer tests were short or the data collected gave questionable results. The transmissivity values obtained from the model are probably the most realistic where water-level data are available for the principal artesian aquifer, and particularly where the aquifer tests and model calibration gave similar results.

The model indicated that the transmissivity of the artesian aquifer ranges from about 260 ft²/d (24 m²/d) in the northern part of the valley near the lake to about 60,000 ft²/d (5,600 m²/d) near the mountains in the south. By contrast, field aquifer tests indicated a range from 2,100 to 56,000 ft²/d (195 to 5,200 m²/d) (table 4). The lowest and highest model values are gross estimates, being based on only a few well logs. Although the model was calibrated using those values, water-level data were not available to support them. Consequently, the calibration is not definitive near the lake and near the mountains.

The values of storage coefficient determined from short-term aquifer tests were approximately the same as those reported by Gates (1965, p. 29 and

Table 4.--Comparison of transmissivity values obtained from aquifer tests and model calibration

Method of analysis: D, drawdown, modified Hantush (Lohman, 1972, p. 32); MN, from Gates (1965, p. 29) who used the modified nonequilibrium method (Ferris and others, 1962, p. 98-100); R, recovery, modified Hantush (Lohman, 1972, p. 32).

Pumped well	Observation well (P, pumped well used as observation well)	Method of analysis	Transmissivity obtained from aquifer tests (ft ² /d)	Transmissivity obtained from model calibration (ft ² /d)
(C-2-4)31bdc-3	(C-2-4)31bcb-1	D	15,000	17,300
33aab-1	P	MN	25,000	25,500
(C-2-5)35ada-1	P	R	13,000	13,800
28cdc-1	P	R	21,000	18,200
30-dcc-1	P	R	2,100	9,500
(C-3-4)30acc-1	P	MN	56,000	34,600
(C-3-5)4bbb-2	(C-3-5)5aba-1	D	18,000	26,400

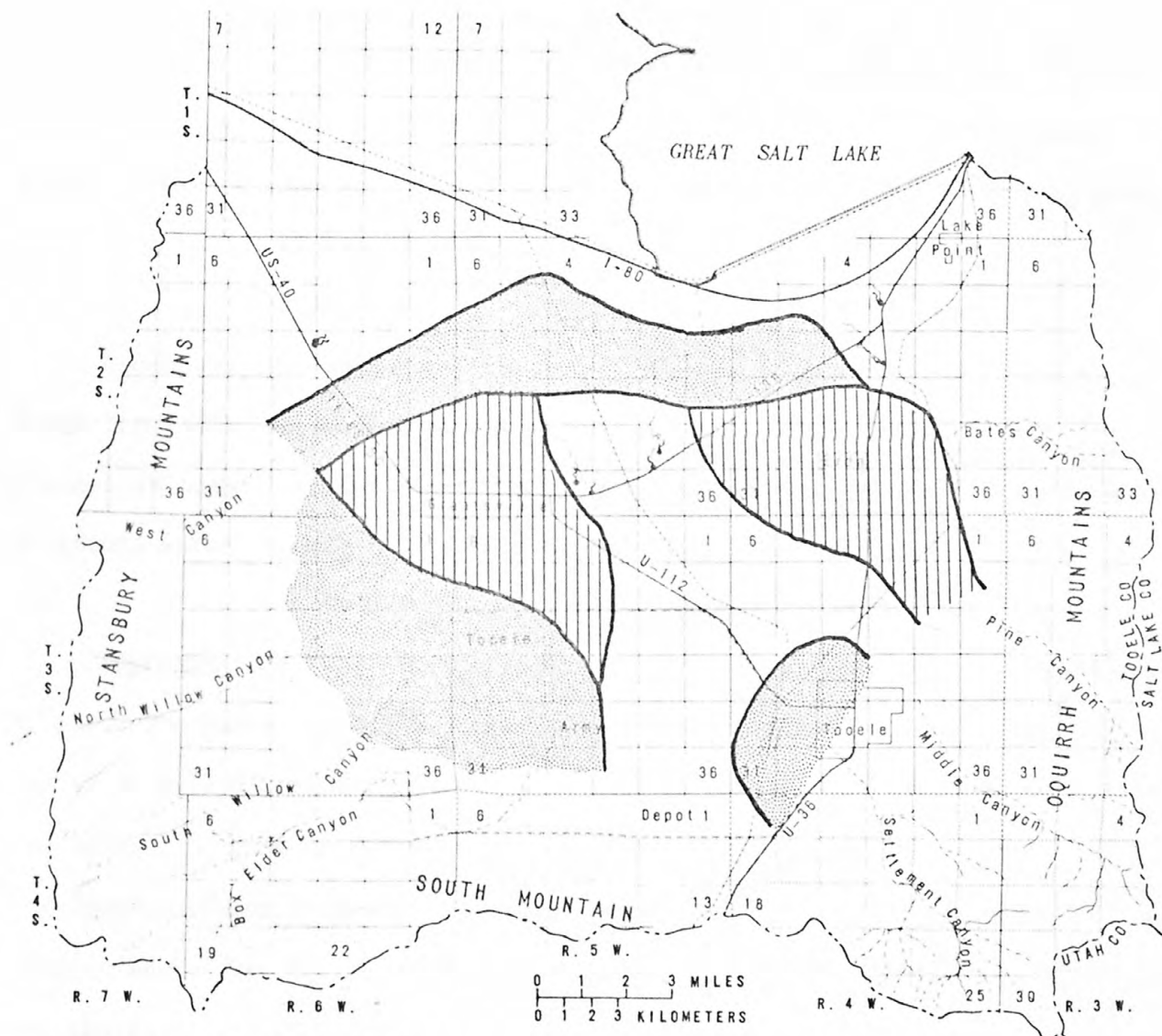
30). Gates' average of 0.002 was used for all the valley fill, although the storage coefficient probably varies considerably from place to place depending on the type of sediments and the competency of the confining bed. The model did not give any insight about the average value of the storage coefficient because the aquifer had not been stressed enough to remove more than a little water from storage.

Storage

The total amount of ground water in storage in the upper 1,000 ft (305 m) of saturated valley fill in Tooele Valley is estimated to be about 13 million acre-ft ($16,000 \text{ hm}^3$). This was estimated by using a specific yield of 0.1 for an area of 130,000 acres ($52,600 \text{ hm}^2$) in which the upper 1,000 ft (305 m) is saturated. The fill below 1,000 ft (305 m) was not considered because it probably is of low permeability and contains poor quality water, which would be extremely costly to lift from those depths. The amount of freshwater (less than 1,000 mg/L dissolved solids) in storage in the valley fill is estimated to be approximately 1.7 million acre-ft ($2,100 \text{ hm}^3$). This was estimated on the basis of the area and depth of sediments indicated in figure 8 and assuming a specific yield of 0.1.

In order to withdraw all the freshwater in storage, the total thickness of sediment saturated with freshwater would have to be completely dewatered. A more realistic estimate was made by assuming that 30 ft (9.1 m) of drawdown occurred evenly over the area of 58,000 acres ($23,470 \text{ hm}^2$) in which freshwater occurs. Using an average storage coefficient of 0.002, this would indicate that about 3,500 acre-ft (4.3 hm^3) of freshwater would be removed from storage.

Even with a drawdown of 30 ft (9.1 m), the ground-water reservoir would still be, for the most part, under artesian conditions and would remain satu-



EXPLANATION

-  Between 0 and 500 feet of valley fill saturated with water containing less than 1000 mg/L dissolved solids
-  Between 500 and 1000 feet of valley fill saturated with water containing less than 1000 mg/L dissolved solids
-  Saturated valley fill with water containing more than 1000 mg/L dissolved solids or water quality unknown

--- Boundary of drainage basin

Figure 8.--Approximate thickness of sediments saturated with freshwater (less than 1000 mg/L dissolved solids) in Tooele Valley.

rated. Thus, although substantial quantities of water are in storage in the valley fill, water-level fluctuations on the order of magnitude experienced in the past 30 years do not result in much water being taken from (or added to) storage because the water in the principal aquifer remains under artesian conditions.

CHANGES IN GROUND-WATER CONDITIONS, 1963-78

Ground-water conditions have changed in Tooele Valley since 1963 primarily owing to an increase in the amount of water withdrawn from wells. Changes in mine drainage near pine canyon apparently also have caused changes in ground-water conditions in the eastern part of the valley.

Well construction and well discharge

Approximately 223 wells were constructed during 1963-77 in Tooele Valley. The number of wells constructed ranged from a high of 28 in 1977 to a low of 6 in 1967 and averaged about 15 wells per year (fig. 9). Of the 223 new wells, 19 were designed for irrigation supply and the remainder for stock and domestic uses. Table 5 contains records for many of the new wells and also records for wells constructed prior to 1963 for which new data are available.

Since 1963, the amount of water discharged from wells has ranged from a high of about 33,000 acre-ft (40 hm^3) in 1974 to a low of about 20,000 acre-ft (25 hm^3) in 1965 and has averaged about 26,000 acre-ft (32 hm^3) per year. Figure 9 indicates that about 85 percent of the water discharged each year is used for irrigation, and the remainder is used for other purposes such as municipal, industrial, military, and domestic uses.

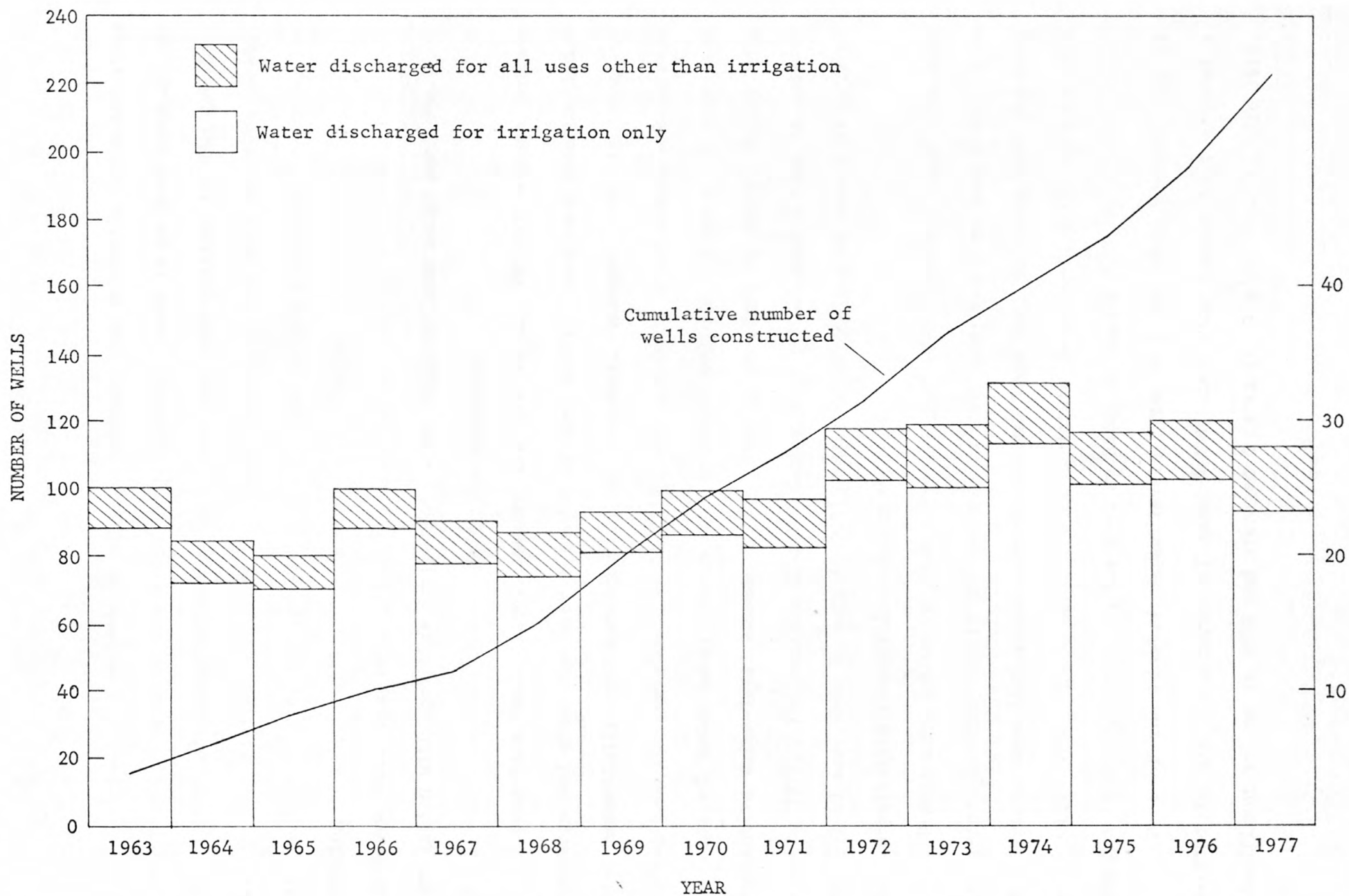


Figure 9.--Cumulative number of wells constructed and annual discharge from wells, 1963-77.

Although the amount of water discharged has gradually increased since 1963 as the number of new wells has increased, there is no true correlation. The amount of water withdrawn each year is also related to the previous winter's precipitation, which is a major factor in the soil moisture present at the beginning of the irrigation season, and to the precipitation during the growing season. Also, the amount of irrigated land has been increased, although this has been offset to some extent by the replacement of ditch irrigation with sprinkler irrigation, which requires less water per acre.

Water-level changes

Long-term water-level changes are the result of differences between recharge and discharge over a period of many years. Long-term changes, which are essentially an accumulation of seasonal changes, can be seen on hydrographs for individual wells (fig. 10), and their areal extent can be seen on maps of water-level change for selected periods. Figure 11 shows the cumulative water-level change in the artesian aquifers in Tooele Valley from 1963 to 1978. The maximum changes during that period were a rise of over 12 ft (3.7 m) near Erda in well (C-2-4)33add-1 and a decline of over 4 ft (1.2 m) near Grantsville in well (C-2-5)31bbd-3.

Hydrographs of wells (C-2-4)33aac-1 and (C-2-4)33add-1 (fig. 10) show the trend in water levels in the area of the long-term rise near Erda. Both hydrographs show that water levels declined from 1963 to about 1967 and then rose until 1976. The overall trends correlate fairly well with the long-term changes in precipitation in the area as shown in figure 4.

Part of the rise of water levels from 1972 to 1976, however, may be related to the discharge of mine water down Pine Canyon that assumed a significant volume in 1972 and averaged $5 \text{ ft}^3/\text{s}$ ($0.14 \text{ m}^3/\text{s}$) from 1975 to 1978.

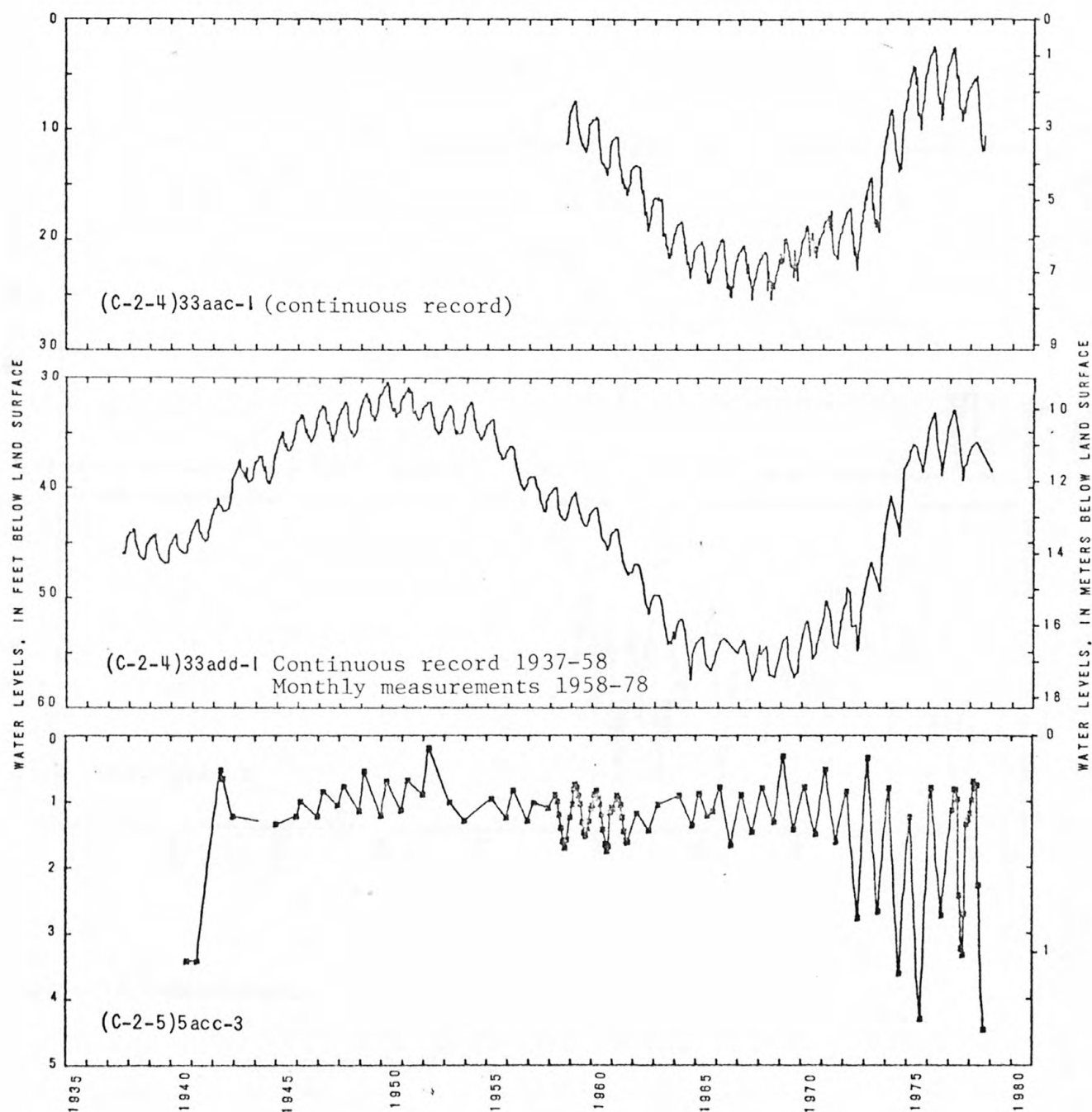


Figure 10.--Hydrographs of selected wells in Tooele Valley.

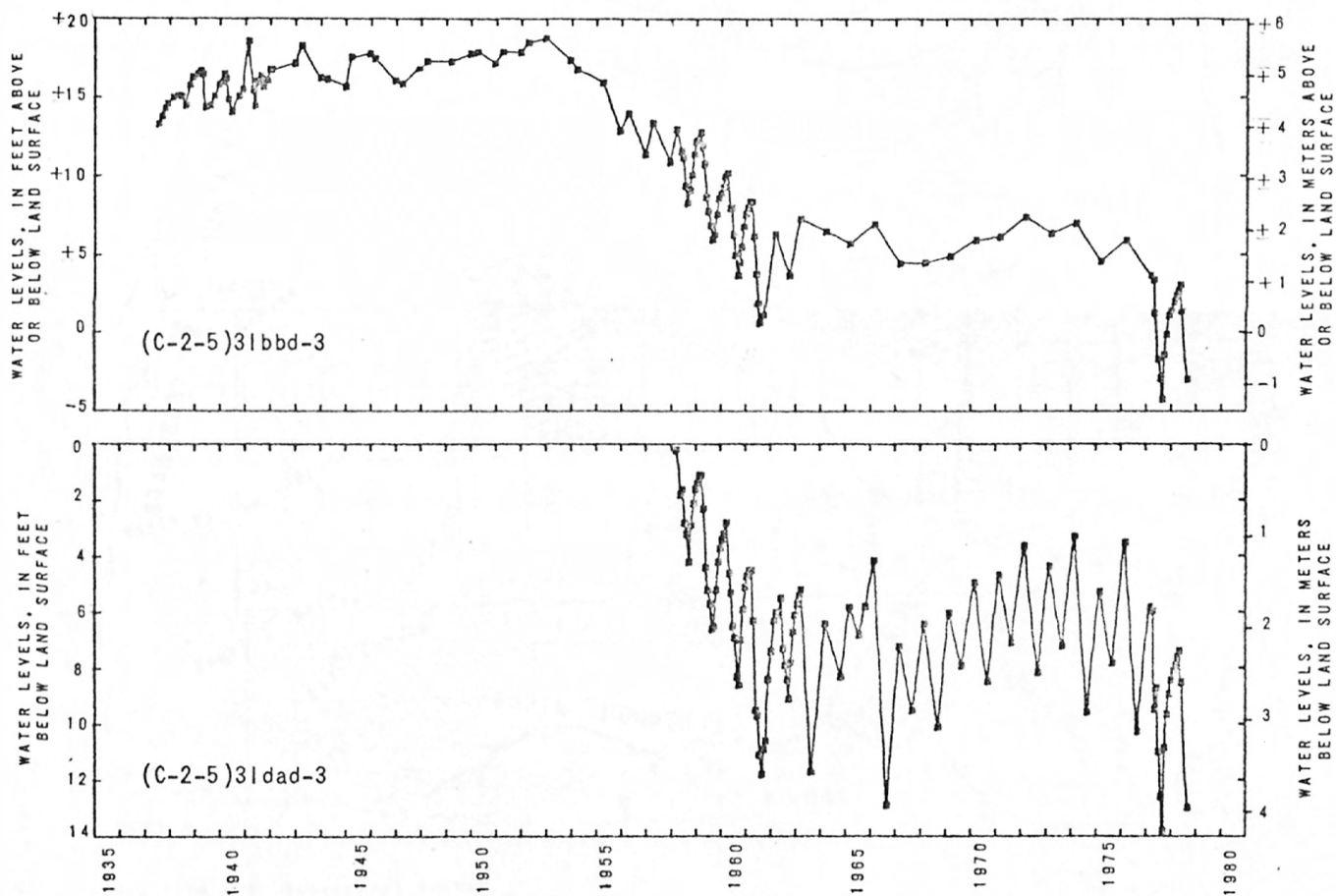
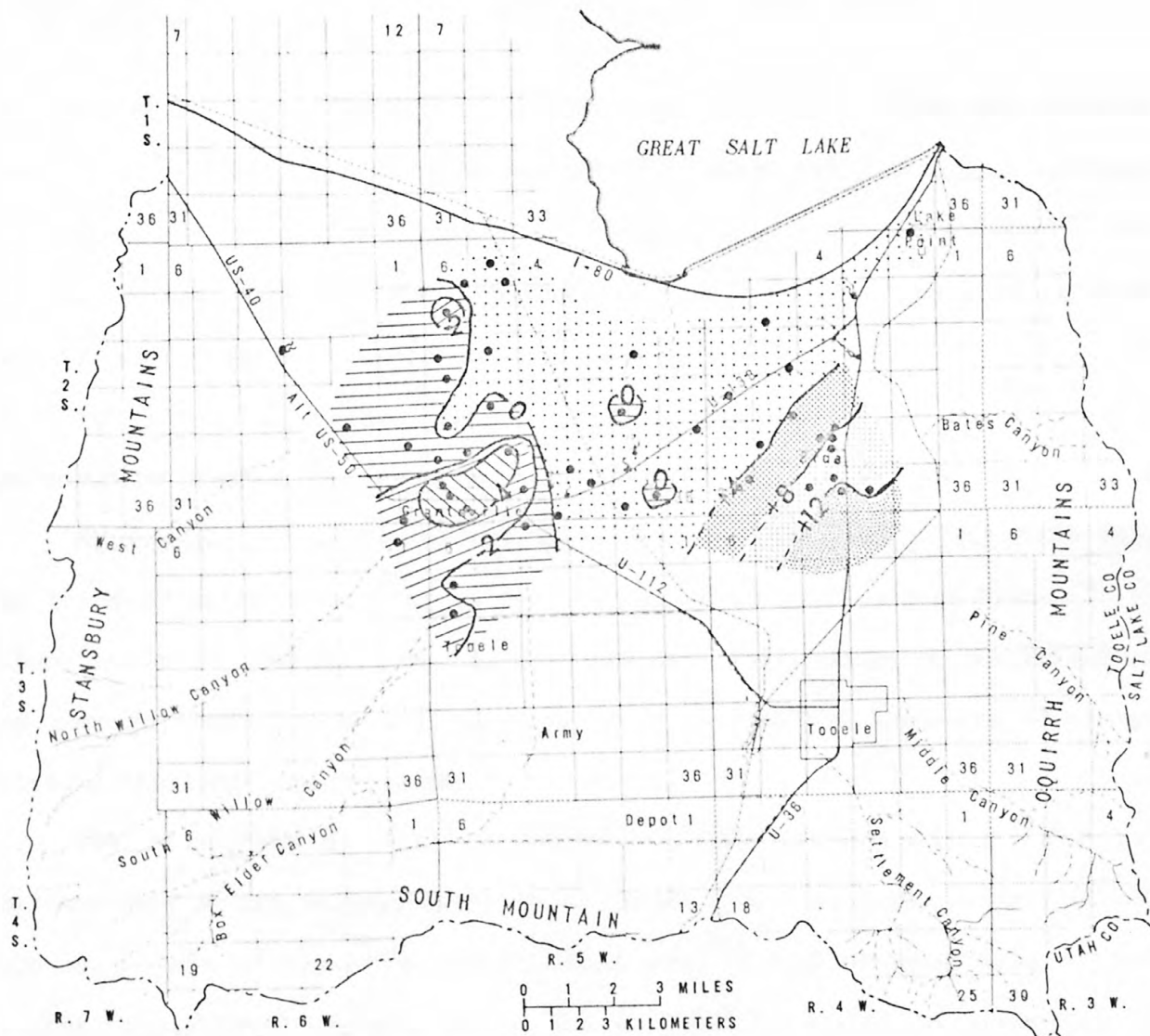


Figure 10.--Continued.



Base from U.S. Geological Survey
topographic maps

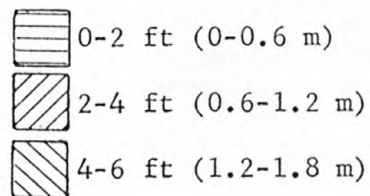
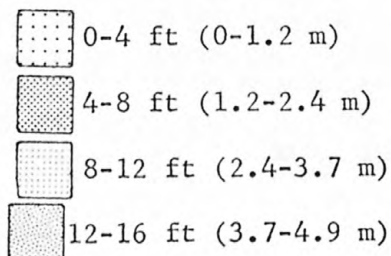
EXPLANATION

• Observation well

— 2 — Line of equal water-level change, in feet,
dashed where approximate

Increase

Decrease



— -- — Boundary of drainage basin

Figure 11.--Approximate change in potentiometric head in the artesian
aquifers in Tooele Valley, March-April 1963 to March-April 1978.

This mine discharge probably has had the same effect of raising ground-water levels as did the Elton tunnel during 1941-58 (Gates, 1965, p. 40).¹ Although discharge from wells had increased slightly in this area from 1963-78, and although precipitation during 1972-76 was about equal to the long-term average, water levels in wells (C-2-4)33add-1 and (C-2-4)33aac-1 (fig.10) rose 12-15 ft (3.7-4.6 m) between 1972 and 1976. This rapid water-level rise did not occur in other areas of the valley.

Hydrographs of wells (C-2-5)31dad-3 and (C-2-5)31bbd-3 (fig. 10) show the trend of water levels in the area of long-term decline near Grantsville. Water levels in the area fluctuate up and down in response to precipitation and pumpage, but the overall trend was down because the long-term discharge exceeded the long-term recharge.

The hydrograph of well (C-2-5)5acc-3 (fig. 10) is typical for the northern part of the valley, where water levels fluctuate comparatively little because of the distance to pumped wells and to the recharge areas. The seasonal water-level changes may be due to distant pumping or to changes in discharge by upward leakage to the overlying water-table aquifer. Upward leakage would be higher during the summer if the head difference between the artesian and water-table aquifers increases when the water table declines due to evapotranspiration.

¹The Carr Fork mine in Pine Canyon started copper production in September 1979 and full-operation output will be attained in 1980. At that time, the mine drainage (previously discharged down the canyon) will be diverted for use in a concentrating process and then discharged to a settling pond from which it will be pumped for reuse. This will result in a decrease in the recharge from the mine drainage to the aquifers in the Erda area.

Changes in storage

The amount of ground water in storage changes as water levels rise or fall depending upon the relation of recharge to discharge. The change in storage in Tooele Valley from 1963 to 1978 was estimated by using a storage coefficient of 0.002 and the average water-level change for the shaded area in figure 11. The net change thus calculated for the period 1963-78 was an increase in storage of 140 acre-ft (0.17 hm^3). Because the principal aquifer in Tooele Valley is artesian, within the historical range of water-level fluctuations, changes in water levels are mainly changes in artesian pressure and result in changes in storage that are small in relation to the amounts of recharge and discharge. The increase in storage since 1963, however, indicates that recharge from precipitation and mine drainage has more than offset the discharge to all sources.

HYDROLOGIC BUDGET OF THE ARTESIAN AQUIFERS

A hydrologic budget of the artesian aquifers in Tooele Valley was made for 1977. The budget, which equates water gains with water losses, assumes that storage changes are minimal. Water gains include recharge from precipitation, including subsurface flow from the surrounding consolidated rocks (originally precipitation in the mountains of the Tooele Valley drainage), and subsurface inflow from Rush Valley. Recharge from infiltration of mine drainage is not considered a long-term source and is not included. Water losses include discharge by wells, springs, upward leakage to the water-table aquifer and eventual loss by evapotranspiration, and subsurface outflow to Great Salt Lake.

The budget is summarized below, the various items being taken from previous sections in this report.

	Volume (acre-ft)
Water gains:	
Recharge from precipitation	52,000
Subsurface inflow from Rush Valley	<u>5,000</u>
Total	57,000
Water losses:	
Wells	28,000
Springs	17,000
Evapotranspiration	23,000
Subsurface outflow	<u>3,000</u>
Total	71,000

The difference between the total gains and losses represents errors inherent in estimating items in the budget, particularly recharge from precipitation and discharge by evapotranspiration and from springs. The estimates of discharge probably account for most of the difference. Part of the estimated 23,000 acre-ft (28 hm^3) discharged by evapotranspiration may be derived from local precipitation, excess irrigation water, and spring discharge. Also, part of the 27,000 acre-ft (33 hm^3) of spring discharge may be derived from the water-table aquifers.

Considering all the approximations and unknown factors involved in the estimates of water gains and losses, a reasonable figure for both sides of the hydrologic budget for the artesian aquifers in Tooele Valley probably is 60,000 acre-ft (74 hm^3).

CHEMICAL QUALITY

Gates (1965, p. 44-55) described the chemical quality of the ground water in Tooele Valley as of 1963. The following pages are devoted to

description of the situation in 1978 and an explanation of changes in chemical quality from 1963 to 1978. The discussion is based on the interpretation of the analyses of water samples collected since 1963 (table 7). For the period 1964-75, analyses are available for the water from six wells and one spring. During this study, chemical analyses were made on the water from 91 wells, 6 springs, 6 surface-water sites, and 6 tunnel and mine sites.

Status in 1978

The data gathered during this study indicate that the water in Tooele Valley can be placed in three major groups and one minor group according to chemical type based on the predominant cations and anions. Thomas (1946, p. 201) and Gates (1965, p. 44) described only the three major groups. The surface water in the mountains, which is probably typical of the recharge water, is of a calcium bicarbonate type. Most of the ground water is either a calcium magnesium bicarbonate type, a sodium chloride type, or a mixture of the two types (fig. 5). In several small areas near Erda, the ground water is of a mixed type, with sulfate as one of the major ions.

The water in the southwestern part of the valley is of the calcium bicarbonate type, whereas the water in the northern and middle parts of the valley is of the sodium chloride type. The change from the calcium bicarbonate type to the sodium chloride type or a mixture of the two types can be seen in figure 12. In general, the points on the bicarbonate side of the trilinear diagram represent samples from the recharge areas. As the water moves through the valley fill toward discharge points, the representative plotted points move toward the chloride side of the diagram. A change in water-level gradients due to pumping at wells may induce the movement of water of the sodium chloride type into areas where the water is of the calcium

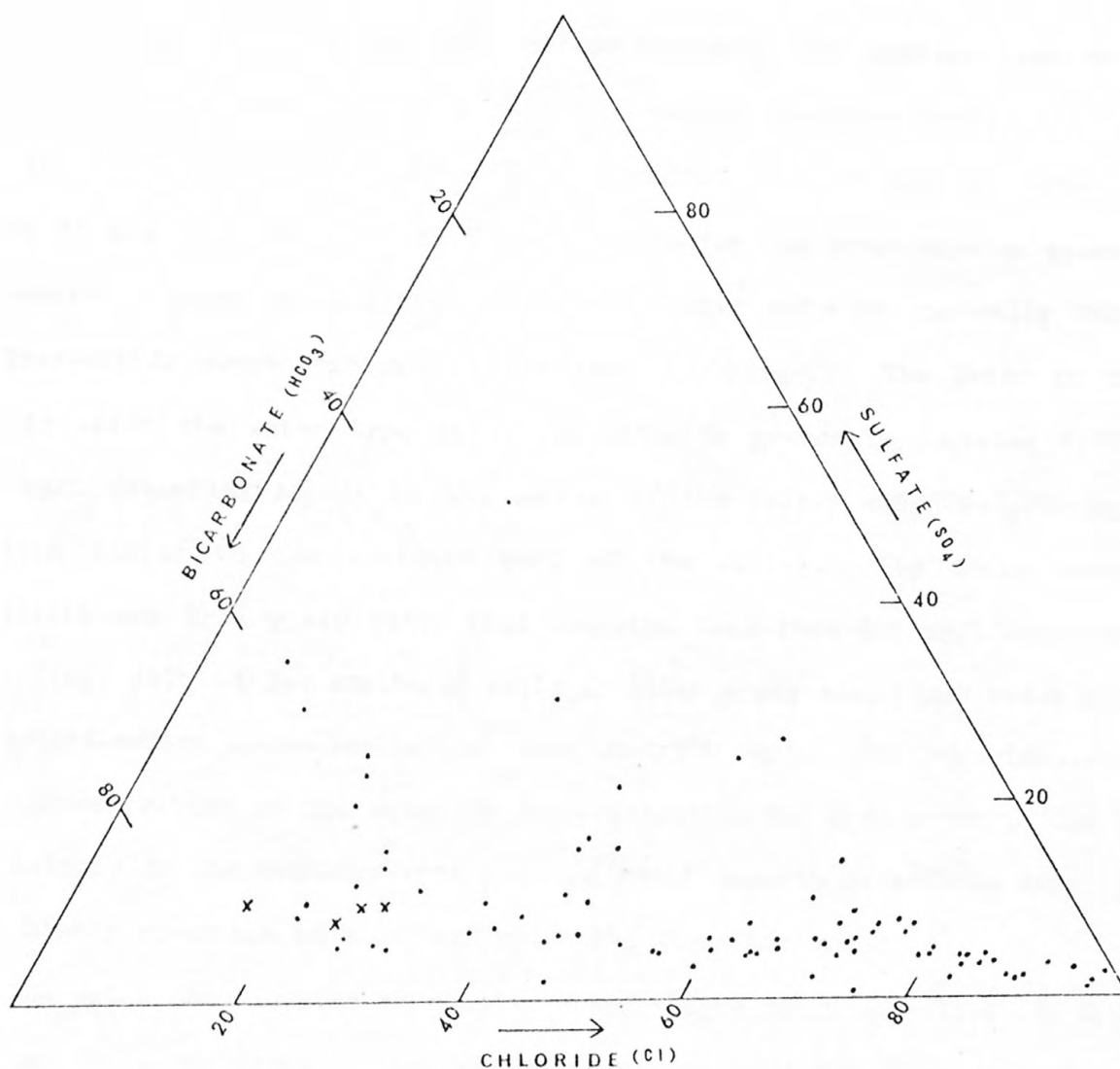


Figure 12.--Percentage of the major anions in ground water in Tooele Valley. Samples from recharge zones plot in the bicarbonate area, whereas samples from discharge zones plot in the chloride area. Surface-water samples from mountain streams are marked by an x.

bicarbonate type to form a mixture of the two types. Figure 13 shows that this may have already taken place near Erda and Grantsville.

Near Pine Canyon the water is of the mixed type with high sulfate concentrations. Discharge from the Elton tunnel and possibly the mine in Carr Fork may be the source of the high sulfate content. The similar type water southwest of Tooele may represent discharge from the Honerine tunnel.

The relation between water type and salinity can be seen by comparing figures 13 and 14. The water in the areas in which the water type is calcium bicarbonate or mixed calcium bicarbonate and sodium chloride generally has a dissolved-solids concentration of less than 1,000 mg/L. The water in the areas in which the water type is sodium chloride generally contains 1,000-3,000 mg/L dissolved solids in the center of the valley and 500-1,000 mg/L dissolved solids in the northern part of the valley. The areas around Grantsville and Erda yield water that contains less than 500 mg/L dissolved solids (fig. 14). A few scattered wells in other areas also yield water with a dissolved-solids concentration of less than 500 mg/L. The low dissolved-solids concentration in the water in the Grantsville and Erda areas is due to the proximity to the recharge area and the small amounts of soluble material in the highly permeable beds through which the water has moved.

The water deteriorates in quality downdip from the Grantsville and Erda areas and in other parts of the valley where the beds are fine grained and contain larger amounts of soluble material. The middle of the valley contains the poorest quality water, with the exception of the water discharging from Warm Springs and a well near Great Salt Lake (fig.14.). The dissolved solids in the water in the middle of the valley is generally between 1,000 and 3,000

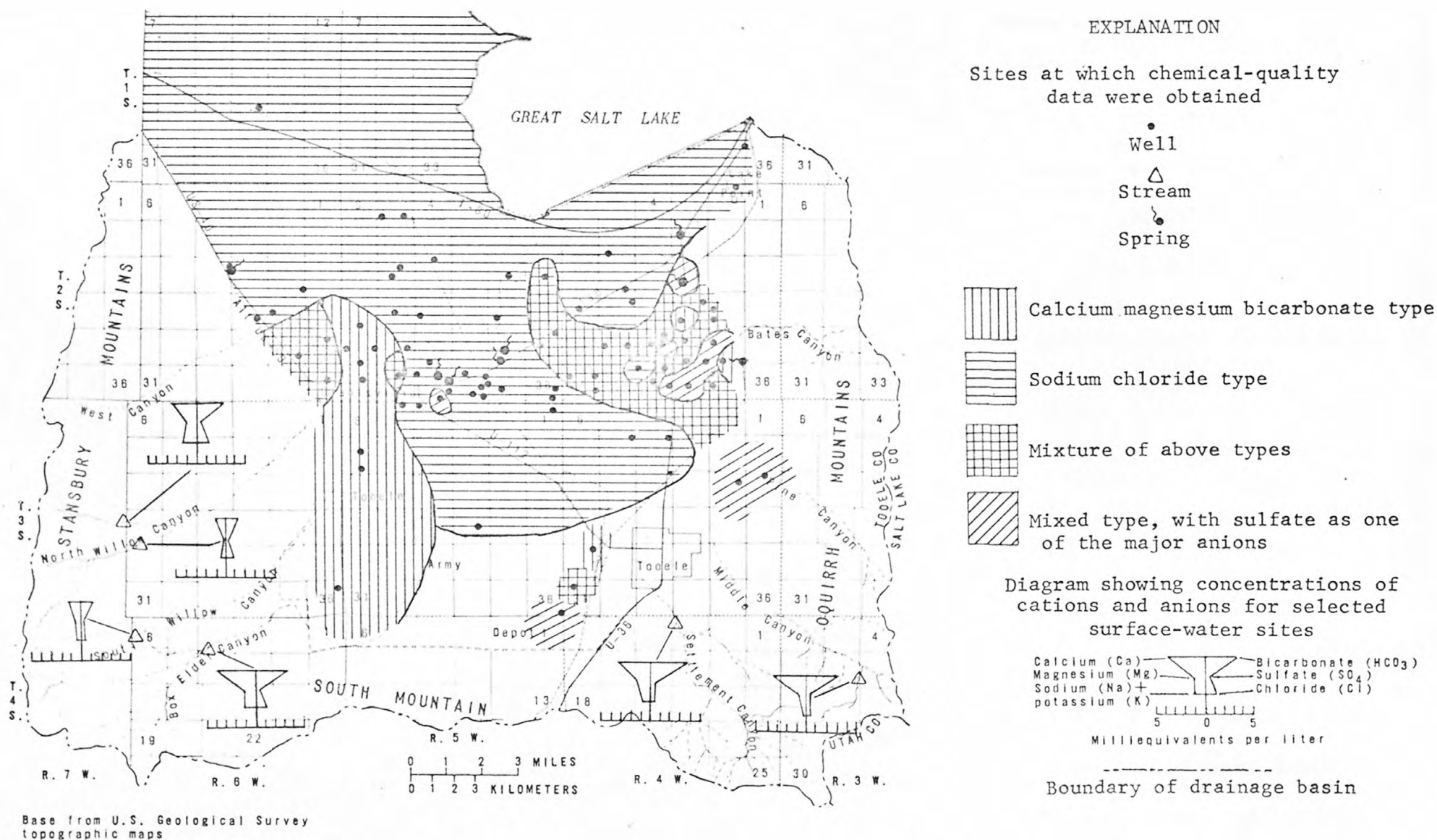


Figure 13.--Distribution of water types in the artesian aquifers and surface streams, 1977-78.

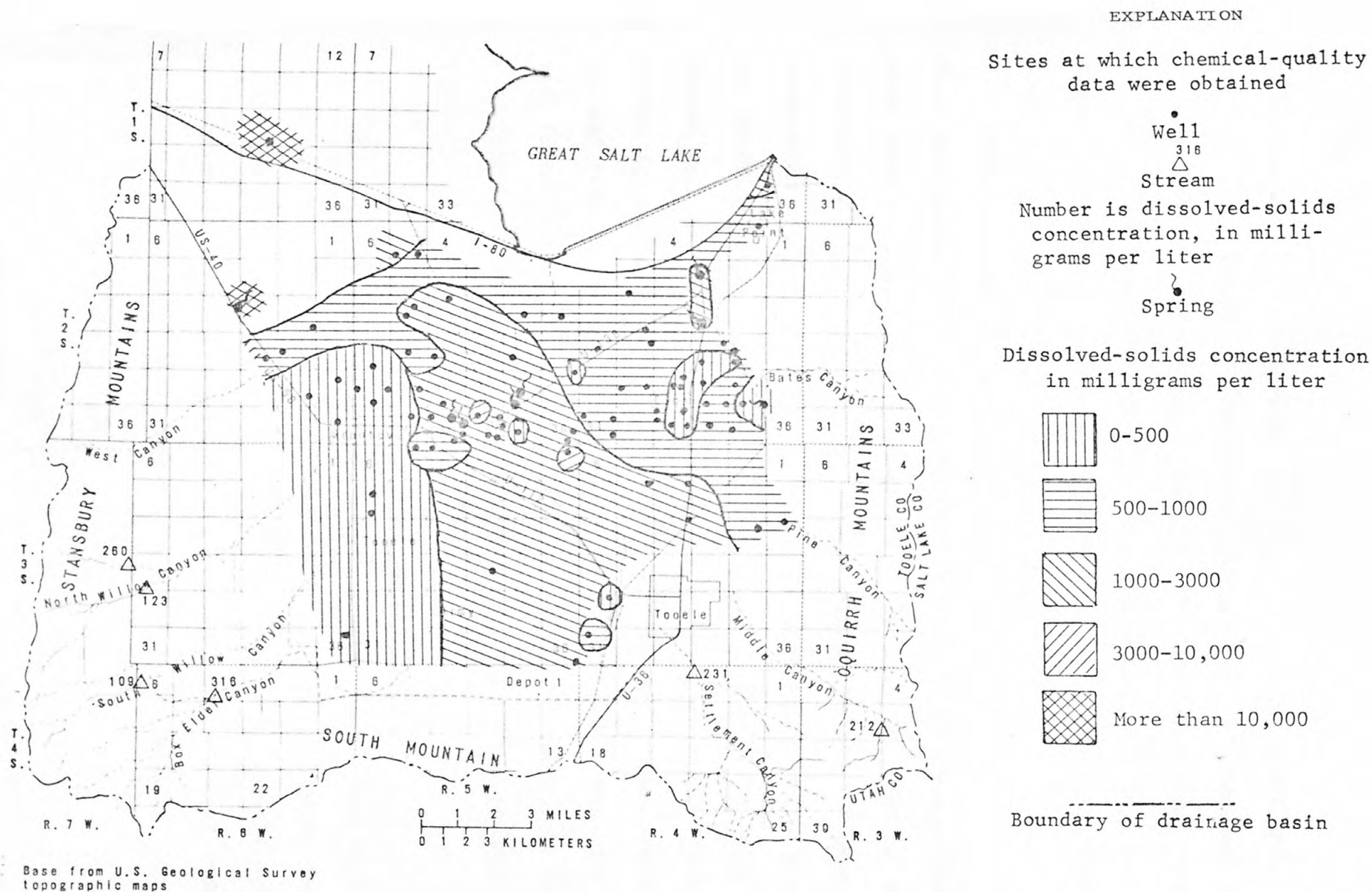


Figure 14.--Dissolved-solids concentration of water in artesian aquifers and surface streams, 1977-78.

mg/L, but two wells yield water with between 3,000 and 10,000 mg/L. The poor quality in the middle of the valley is a resultant of the small amount of recharge from the south-central margin of the valley which moves through fine-grained soluble sediments of relatively low permeability. Poor quality water also may be related to water rising along faults, such as Fishing Creek fault in sec. 33, T. 2 S., R. 5 W. (Gates, 1965, p. 18 and fig. 5).

Water quality may also change with depth, as has been observed south of Mill Pond Spring. Well (C-2-4)22ccb-4, which is 96 ft (29.3 m) deep, yields water with a dissolved-solids concentration of 1,460 mg/L, whereas well (C-2-4)22cca-3, which is 320 ft (97.5 m) deep, yields water with a dissolved-solids concentration of 413 mg/L. The more shallow well yielded water with sulfate and chloride concentrations of 500 and 300 mg/L, whereas the water from the deeper well had sulfate and chloride concentrations of 43 and 67 mg/L. The change in quality probably occurs as the water moves upward through fine-grained beds and dissolves mineral matter as it moves. The water level in well (C-2-4)22ccb-4, for example, is about 8 ft (2.4 m) below that in well (C-2-4)22cca-3, indicating an upward component of movement in the vicinity of the wells.

Changes in chemical quality, 1963-78

No large areas of significant change in water quality have been observed since Gates' study (1963b, p. 17-20; 1965, p. 44-52). Some of the changes that have been observed at individual wells may have resulted partly from differences in sampling procedure or analytical error. Also, samples from pumped wells may show small changes in quality if the rate or length of the pumping period changes.

Most of the water-quality changes observed have been in the heavily pumped area near Erda in secs. 29, 31, and 33, T. 2 S., R. 4 W. (Compare table 7 with table 4 in Gates (1963b, p. 17-20).) For example, the chloride concentration in well (C-2-4)33bbb-1 increased from 144 mg/L in 1961 to 300 mg/L in 1978, and the sulfate concentration in well (C-2-4)33add-1 increased from 55 mg/L in 1958 to 100 mg/L in 1978. The increase in chlorides probably is related to the movement of water of a sodium chloride type into the area as a result of pumping. The increase in sulfate possibly could result from recharge from either the Elton tunnel or mine discharge in Pine Canyon.

Another area of change is southwest of Tooele where the dissolved solids in water from well (C-3-5)36ddd-1 increased from 843 mg/L in 1957 to 1,383 mg/L in 1977. During the same period, the sulfate concentration increased from 135 to 235 mg/L while the chloride concentration increased from 210 to 378 mg/L. The change in water quality may be due to recharge or discharge from the Honerine tunnel, which is high in sulfate and chloride, or to deterioration of the well casing, thus allowing poor quality water to enter the well through sections of the casing that were not initially perforated when the well was drilled. The water from other wells in the same part of the valley, such as (C-3-4)30aac-1 and (C-3-4)31bba-1, has not changed appreciably in chemical quality, so the change observed at well (C-3-5)36ddd-1 is not widespread.

The drilling of new wells since 1963 made available water-quality data for two areas not described by Gates (1965, fig. 11). Northwest of the mouth of Pine Canyon, two wells yielded water with a relatively high sulfate concentration (fig. 13). The source of the sulfate is probably discharge from the Elton tunnel or mine discharge in Pine Canyon. An analysis of mine-

discharge water from site (C-3-3)18cba (sample taken after the water had passed through settling ponds and prior to its use for irrigation) showed a sulfate concentration of 560 mg/L (table 7). This water may be recharging and adding sulfate to the ground water in the area.

North and northwest of the city of Tooele, water from wells (C-3-4)8aaa-1, (C-3-4)9aaa-1 (C-3-5)1aca-1, and (C-3-5)22dab-1 contained high chloride concentrations (table 7). This may have resulted from the upward leakage of water containing high chloride concentration along faults or the presence of soluble salts of chlorides in the sediments of the area. The small amount of pumping and relatively small water-level changes in this area eliminates the possibility that poor quality water moved into the area because of large withdrawals from wells for irrigation.

PREDICTION OF FUTURE WATER LEVELS WITH A DIGITAL-COMPUTER MODEL

A finite-difference digital-computer model designed by Trescott and others (1976) was used to simulate the changes in water levels in the artesian aquifers in response to future pumping patterns. A discussion of the model, including the changes made to the program of Trescott and others (1976), model data, model grid, and model calibration are presented by Razem and Bartholoma (1980). The data used in the model were obtained by measurements of water levels, aquifer tests, examination of well logs, well- and spring-discharge measurements, estimation of other discharge, estimation of recharge, and experimentation during calibration.

The reliability of the predictions in the following pages can best be judged by considering water-level changes observed during the calibration of the model (Razem and Bartholoma, 1980).

The predicted water levels will probably be as reliable as those produced during calibration as long as pumpage and recharge are not radically different from that simulated during calibration. The changes in water levels measured in the field and the changes computed during the calibration of the model are similar at many locations (Razem and Bartholoma, 1980).

An average recharge was used for each pumping period in the model, and the recharge was not allowed to fluctuate in response to precipitation variations; thus, the computed hydrographs are smoother than the observed hydrographs. Future computed hydrographs will also be smoother than future observed hydrographs because the average recharge used does not take into account the normal deviations from average recharge rates.

Due to the lack of historical data in areas around the margins of the basin, such as near Pine Canyon, predictions for such marginal areas are not as reliable as those for areas where lengthy historical data are available, such as near Erda. Other factors which may cause future water-level changes to differ from the computed ones are effects of unpredicted mine dewatering and mine drainage, periods of extreme deviation from normal precipitation, establishment of a large well field that is not presently anticipated, or other large variances in the expected pumping patterns.

Future discharge, which is assumed to be from existing wells or new wells in their vicinity, was simulated at rates (1) approximately equal to, (2) 1.5 times, (3) double, and (4) triple the 1973-77 average discharge rate. The results that follow show predicted water-level changes from the computer-generated 1978 water levels which were used as a base. The simulations were for 30-year periods. Steady-state conditions were attained before 30 years in all simulations, however, because simulated increases in withdrawals from wells were balanced by changes in vertical leakage between the water-table and

the artesian aquifers. The changes in leakage were induced by the water-level declines caused by the withdrawals.

Discharge equal to the 1973-77 average discharge

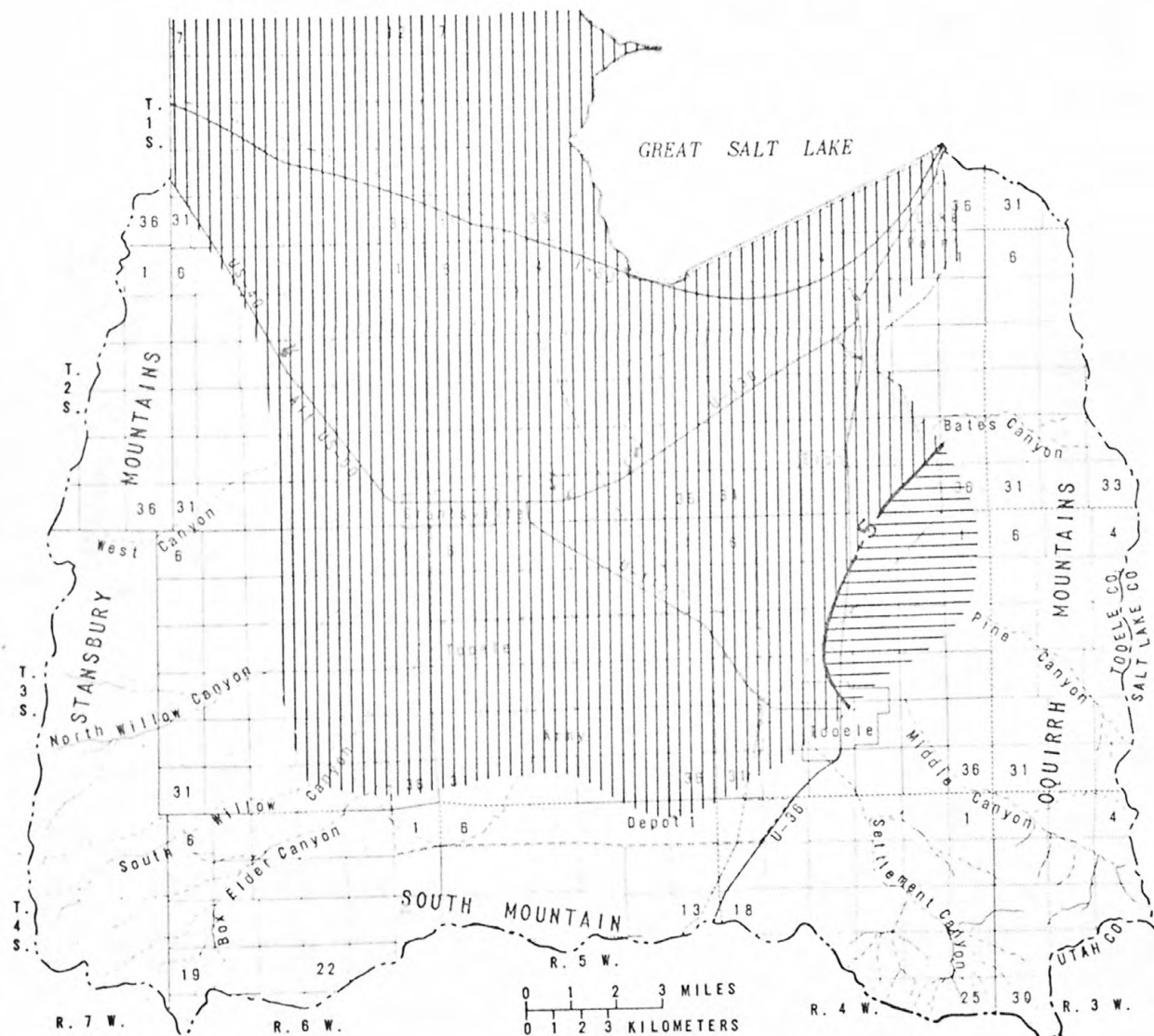
The model predicts that water levels will decline 5-10 ft (1.5-3.0 m) in the extreme southeast part of the valley near Pine Canyon and decline less than 5 ft (1.5 m) over the remainder of the valley (fig. 15) if well discharge continues at about the same rate as the 1973-77 average discharge. Steady-state conditions will occur after 1.8 years.

The water-level decline in the southeast part of the valley probably results from assuming a lower recharge rate from mine discharge after mining operations begin.

Discharge 1.5 times the 1973-77 average discharge

The model predicts that water levels will decline less than 5 ft (1.5 m) in the north part of the valley (fig. 16) if well discharge is 1.5 times the 1973-77 average discharge. Water levels will decline between 5-10 ft (1.5-3.0 m) in the Grantsville area and in the southwest part of the valley; water levels will decline 10-15 ft (3.0-4.6 m) in the south part of the Erda area and the southeast part of the valley, including the Tooele area; and water levels will decline 15-20 ft (4.6-6.1 m) near Pine Canyon. Steady-state conditions will occur after 8.9 years.

If well discharge were allowed to increase by 1.5 times, most of the area where ground water was used for irrigation in 1978 would experience water-level declines of less than 10 ft (3.0 m) with the exception of part of the Erda area. In addition to the decline of water levels, however, the upward leakage from the artesian system to the water-table aquifer would decrease. This would result in a decline of the water table. If the water table declines below the roots of vegetation in the areas not irrigated, the

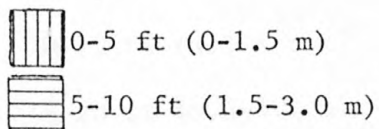


Base from U.S. Geological Survey
topographic maps

EXPLANATION

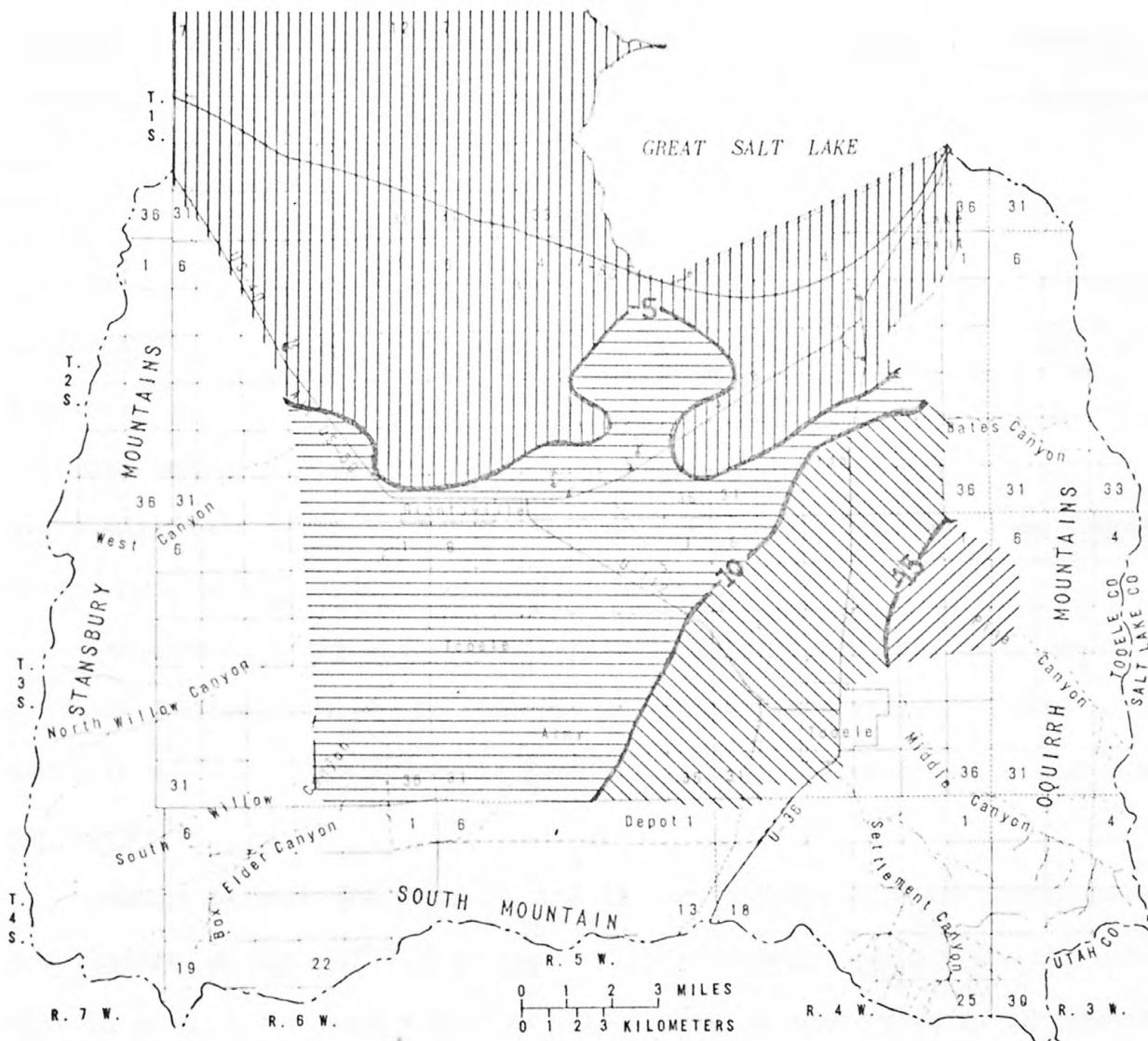
—5—
Line of equal water-level change, in feet

Decline



Boundary of drainage basin

Figure 15.--Predicted water-level changes in Tooele Valley for the period 1978-2008, assuming that well discharge is the same as the 1973-77 average discharge.



Base from U.S. Geological Survey
topographic maps

EXPLANATION

-5-

Line of equal water-level change, in feet

Decline

	0.5 ft (0-1.5 m)
	5-10 ft (1.5-3.0 m)
	10-15 ft (3.0-4.6 m)
	15-20 ft (4.6-6.1 m)

Boundary of drainage basin

Figure 16.--Predicted water-level changes in Tooele Valley for the period 1978-2008, assuming that well discharge is 1.5 times the 1973-77 average discharge.

existing natural vegetation will die. This is not expected to happen at a discharge rate of 1.5 times the 1973-77 average, assuming precipitation remains near average.

Discharge double the 1973-77 average discharge

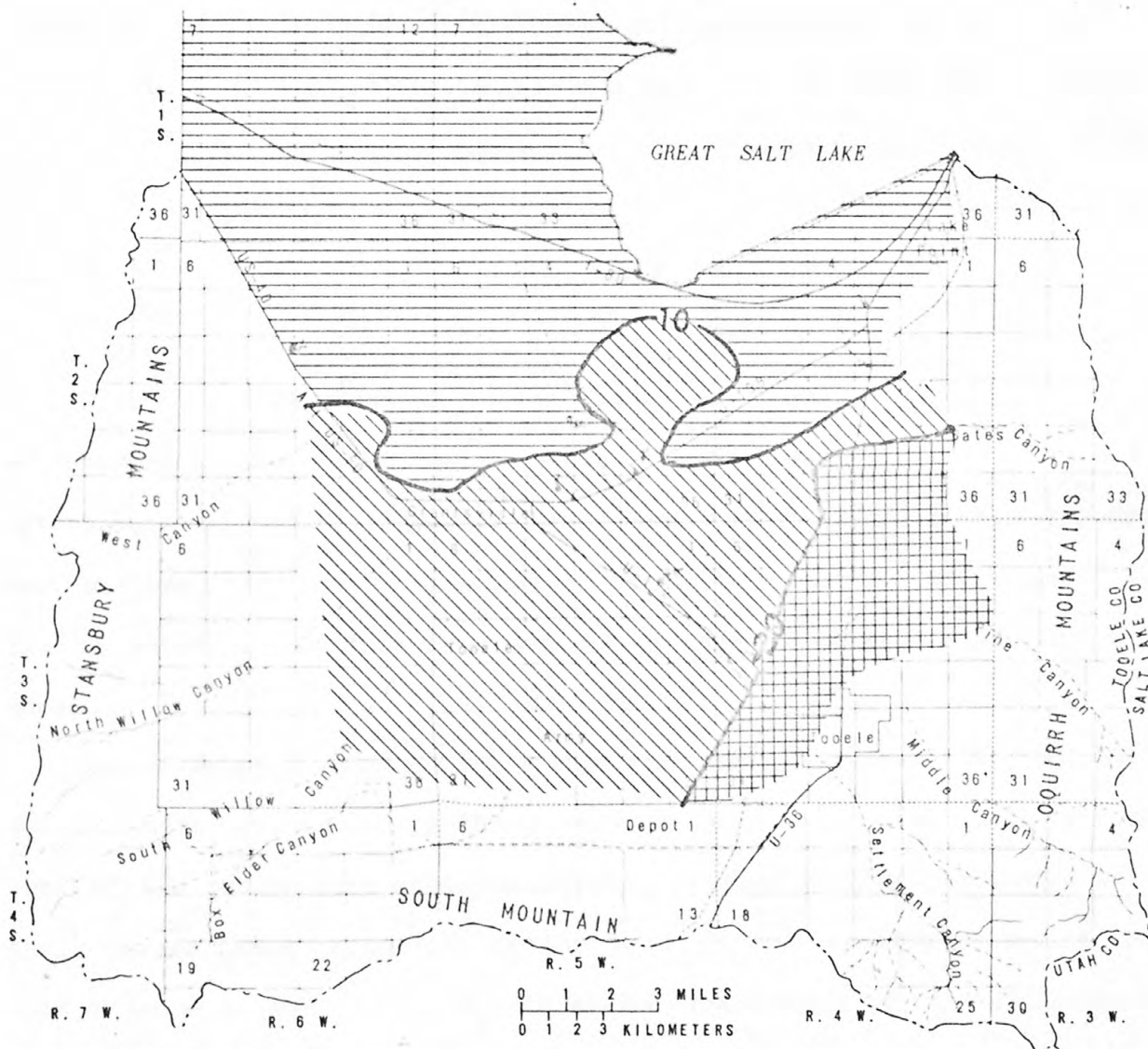
The model predicts that if well discharge is double the 1973-77 average discharge, most of the areas presently irrigated with ground water will experience water-level declines of 10-20 ft (3.0-6.1 m), and in parts of the Erda area water levels will decline 20-30 ft (6.1-9.1 m) (fig. 17). Water levels will decline 20-30 ft (6.1-9.1 m) near Tooele and near Pine Canyon. Steady-state conditions will occur after 8.9 years.

Assuming that the water table remains relatively stable while artesian pressures decline, a 15-20 ft (4.6-6.1 m) decline in artesian pressure would result in a reversal in hydraulic gradient between the water-table and artesian aquifers.

Leakage between the artesian and the water-table aquifers would therefore reverse in much of the valley. This eventually would cause the water table to decline, and such a decline might result in a decrease in the density of the natural phreatophytes. Also, the water-table aquifers contain water of poorer chemical quality than do the artesian aquifers. Reversing the direction of leakage would allow poorer quality water to move into the artesian aquifers.

Discharge triple the 1973-77 average discharge

Well discharge triple the 1973-77 average discharge cannot be simulated accurately with the model as it is presently devised. The two-dimensional model cannot handle water-level changes, storage, or other hydraulic properties for the water-table aquifer. In effect, in the model, the water-table



Base from U.S. Geological Survey
topographic maps

EXPLANATION

-10

Line of equal water-level change, in feet

Decline



0-10 ft (0-3.0 m)

10-20 ft (3.0-6.1 m)

20-30 ft (6.1-9.1 m)

Boundary of drainage basin

Figure 17.--Predicted water-level changes in Tooele Valley for the period 1978-2008, assuming that well discharge is double the 1973-77 average discharge.

aquifer provides an unlimited (and, therefore, unrealistic) source of water to the artesian system when the leakage becomes downward from the water-table aquifer into the artesian aquifers. A more realistic integration of the artesian and water-table aquifers will require the use of a three-dimensional model.

SUMMARY AND CONCLUSIONS

Discharge from wells in Tooele Valley increased by 7,000 acre-ft (8.6 hm³) between 1966 and 1977. Water levels in the artesian aquifers declined 2-4 ft (0.6-1.2 m) in the Grantsville area, rose 4-12 ft (1.2-3.7 m) in the Erda area, and remained relatively stable in the northern part of the valley. The rise in water levels near Erda may be related to mine discharge in Pine Canyon.

Ground-water quality did not change significantly between 1963 and 1978. However, wells drilled during those years in the south-central and southeast parts of the valley have encountered water of poor quality. Selected wells should be monitored to observe if the water of poor quality is moving into areas of water of good quality and to observe the effects of mine discharge on the water quality in the aquifers northwest of Pine Canyon.

Predictions made by a two-dimensional digital-computer model of the artesian aquifers indicated that for the period 1978-2008, water levels would decline less than 5 ft (1.5 m) in most of the valley if well discharge were maintained at the average discharge of 1973-77. If the well discharge were 1.5 times the 1973-77 average discharge, water levels would decline less than 15 ft (4.6 m) in most of the valley. If the well discharge were double the 1973-77 average discharge, water levels would decline a maximum of 30 ft (9 m). In order to predict the effects of well discharge more than double the 1973-77 average, a three-dimensional digital-computer model would be needed to adequately simulate the ground-water flow system.

REFERENCES CITED

- Carpenter, Everett, 1913, Ground water in Box Elder and Tooele Counties, Utah: U.S. Geological Survey Water-Supply Paper 333.
- Cook, D. R., (ed.), 1961, Geology of the Bingham mining district and northern Oquirrh Mountains: Utah Geological Society Guidebook No. 16.
- Criddle, W. D., Harris, Karl, and Willardson, L. S., 1962, Consumptive use and water requirements for Utah: Utah State Engineer Technical Publication 8 (revised).
- Eakin, T. E., Maxey, G. B., Robinson, T. W., Fredericks, J. C., and Loeltz, O. J., 1951, Contributions to the hydrology of eastern Nevada: Nevada State Engineer Water-Resources Bulletin 12.
- Ferris, J. G., Knowles, D. B., Brown, R. H., and Stallman, R. W., 1962, Theory of aquifer tests: U.S. Geological Survey Water-Supply Paper 1536-E.
- Feth, J. H., and Brown, R. J., 1962, Method for measuring upward leakage from artesian aquifers using rate of salt-crust accumulation: Article 40 in U.S. Geological Survey Professional Paper 450-B, p. B100-B101.
- Feth, J. H., Barker, D. A., Moore, L. G., Brown, R. J., and Veirs, C. E., 1966, Lake Bonneville: Geology and hydrology of the Weber Delta district, including Ogden, Utah: U.S. Geological Survey Professional Paper 518.
- Gates, J. S., 1962, Geohydrologic evidence of a buried fault in the Erda area, Tooele Valley, Utah: Article 142 in U.S. Geological Survey Professional Paper 450-D, D78-D80.
- _____, 1963a, Hydrogeology of Middle Canyon, Oquirrh Mountains, Tooele County, Utah: U.S. Geological Survey Water-Supply Paper 1619-K.
- _____, 1963b, Selected hydrologic data, Tooele Valley, Tooele County, Utah: U.S. Geological Survey Open-File Report (duplicated as Utah Basic-Data Report 7).
- _____, 1965, Re-evaluation of the ground-water resources of Tooele Valley, Utah: Utah State Engineer Technical Publication 12.
- Gilbert, G. K. 1890, Lake Bonneville: U.S. Geological Survey Monograph 1.
- Gilluly, James, 1932, Geology and ore deposits of the Stockton and Fairfield Quadrangles, Utah: U.S. Geological Survey Professional Paper 173.
- Hedman, E. R., and Kastner, W. M., 1977, Streamflow characteristics related to channel geometry in the Missouri River basin: U.S. Geological Survey Journal of Research, v. 5, no. 3, p. 285-300.

- Hely, A. G., Mower, R. W., and Harr, C. A., 1971, Water resources of Salt Lake County, Utah: Utah Department of Natural Resources Technical Publication 31.
- Hood, J. W., Price, Don, and Waddell, K. M., 1969, Hydrologic reconnaissance of Rush Valley, Tooele County, Utah: Utah Department of Natural Resources Technical Publication 23.
- Hood, J. W., and Waddell, K. M., 1968, Hydrologic reconnaissance of Skull Valley, Tooele County, Utah: Utah Department of Natural Resources Technical Publication 18.
- Johnson, W. W., 1958, Regional gravity survey of part of Tooele County, Utah: University of Utah, unpublished M.S. thesis.
- Kearney, T. H., Briggs, L. J., Shantz, H. L., McLane, J. W., and Piemeisel, R. L., 1914, Indicator significance of vegetation in Tooele Valley, Utah: Journal of Agricultural Research, v. 2, no. 5, p. 365-418.
- Lines, G. C., 1977, Hydrology and surface morphology of the Bonneville Salt Flats and Pilot Valley, Utah: U.S. Geological Survey Water-Supply Paper 2057.
- Lohman, S. W., 1972, Ground-water hydraulics: U.S. Geological Survey Professional Paper 708.
- Meinzer, O. E., 1927, Plants as indicators of ground water: U.S. Geological Survey Water-Supply Paper 577.
- Mower, R. W., and Nace, R. L., 1957, Water consumption by water-loving plants in the Malad Valley, Oneida County, Idaho: U.S. Geological Survey Water-Supply Paper 1412.
- Price, Don, 1979, Ground-water conditions in Utah, spring of 1979: Utah Division of Water Resources Cooperative Investigations Report 18.
- Razem, A. C., and Bartholoma, S. D., 1980, Digital-computer model of ground-water flow in Tooele Valley, Utah: U.S. Geological Survey Open-File Report.
- Rigby, J. K., (ed.), 1958, Geology of the Stansbury Mountains, Tooele County, Utah: Utah Geological Society Guidebook No. 13.
- Robinson, T. W., 1970, Evapotranspiration by woody phreatophytes in the Humboldt River valley near Winnemucca, Nevada: U.S. Geological Survey Professional Paper 491-D.
- Ryan, K. H., Nance, B. W., and Razem, A. C., in preparation, Physical, electrical and radioactive logs from freshwater test drilling in Tooele Valley, Utah: Utah Department of Natural Resources Information Bulletin.

- Thomas, H. E., 1946, Ground water in Tooele Valley, Tooele County, Utah: Utah State Engineer Technical Publication 4 in Utah State Engineer 25th Biennial Report, p. 91-238.
- Tooker, E. W., and Roberts, R. J., 1971a, Geologic map of the Garfield Quadrangle, Salt Lake and Tooele Counties, Utah: U.S. Geological Survey Geologic Quadrangle Map GQ-922.
- 1971b, Geologic map of the Mills Junction Quadrangle, Tooele County, Utah: U.S. Geological Survey Geologic Quadrangle Map GQ-924.
- Trescott, P. C., Pinder, G. F., and Larson, S. P., 1976, Finite-difference model for aquifer simulation in two dimensions with results of numerical experiments: U.S. Geological Survey Techniques of Water-Resources Investigations, Book 7, Chapter C1.
- U.S. Bureau Census, 1977, Current population reports: Series P-25, No. 692.
- U.S. Geological Survey, 1942, Water levels and artesian pressure in observation wells in the United States in 1941, Part 5, Northwestern States: U.S. Geological Survey Water-Supply Paper 940.
- van Hylckama, T. E. A., 1974, Water use by saltcedar as measured by the water budget method: U.S. Geological Survey Professional Paper 491E.
- White, W. N., 1932, A method of estimating ground-water supplies based on discharge by plants and evaporation from soil: U.S. Geological Survey Water-Supply Paper 659-A.

See text for description of numbering system.
 Measurements are in feet above(+) or below land-surface datum; E, estimated.
 LSD, land-surface datum.
 MSL, mean sea level.

(C-2-4) 2ABA-1
 LSD 4238.80 FT ABOVE MSL.
 HIGHEST WATER LEVEL 4.00 ABOVE LSD, DEC. 28, 1949,
 LOWEST WATER LEVEL 0.30 ABOVE LSD, MAR. 16, 1964.
 RECORDS AVAILABLE: 1936-41, 1946-62, 1964-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 16, 1964 +	0.30	MAR. 3, 1969 +	3.84	MAR. 8, 1974 +	8.10	SEP. 7, 1976 +	4.53
MAR. 2, 1965 +	1.89	MAR. 9, 1970 +	3.18	SEP. 5 +	6.52	MAR. 7, 1977 +	5.76
MAR. 1, 1966 +	4.90	MAR. 8, 1971 +	4.63	MAR. 6, 1975 +	8.96	OCT. 5 +	4.36
MAR. 6, 1967 +	3.47	MAR. 7, 1972 +	4.10	SEP. 4 +	3.00	MAR. 6, 1978 +	6.39
MAR. 1, 1968 +	6.15	MAR. 13, 1973 +	7.44	MAR. 10, 1976 +	6.92	SEP. 8 +	3.34

(C-2-4) 2BAA-3
 LSD 4236 FT ABOVE MSL.
 HIGHEST WATER LEVEL 17.60 ABOVE LSD, SEP. 5, 1974,
 LOWEST WATER LEVEL 9.00 ABOVE LSD, DEC. 28, 1960.
 RECORDS AVAILABLE: 1958-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 16, 1964 +	10.50	SEP. 3, 1969 +	12.60	MAR. 6, 1975 +	15.60	SEP. 13, 1977 +	11.9
NOV. 3 +	12.60	MAR. 9, 1970 +	12.40	SEP. 4 +	13.30	OCT. 5 +	11.7
MAR. 2, 1965 +	11.80	SEP. 17 +	11.80	MAR. 10, 1976 +	13.9	NOV. 9 +	11.4
OCT. 26 +	10.00	MAR. 8, 1971 +	10.60	SEP. 7 +	12.5	DEC. 12 +	12.90
MAR. 1, 1966 +	11.10	SEP. 1 +	12.20	MAR. 7, 1977 +	13.3	JAN. 9, 1978 +	13.10
SEP. 9 +	12.40	MAR. 7, 1972 +	14.00	APR. 15 +	13.35	FEB. 13 +	13.10
MAR. 6, 1967 +	11.20	SEP. 21 +	14.70	MAY 10 +	13.80	MAR. 6 +	13.25
SEP. 13 +	12.40	MAR. 8, 1973 +	14.80	JUNE 10 +	13.55	APR. 11 +	13.20
MAR. 1, 1968 +	11.90	SEP. 4 +	16.70	JULY 11 +	13.55	JUNE 9 +	13.22
SEP. 25 +	11.10	MAR. 8, 1974 +	15.70	AUG. 11 +	11.9	SEP. 8 +	11.34
MAR. 3, 1969 +	10.50	SEP. 5 +	17.60				

Table 6.--Water levels in selected wells, 1964-78

See text for description of numbering system.
Measurements are in feet above(+) or below land-surface datum; E, estimated.
LSD, land-surface datum.
MSL, mean sea level.

(C-2-4) 2ABA-1
LSD 4238.80 FT ABOVE MSL.
HIGHEST WATER LEVEL 4.00 ABOVE LSD, DEC. 28, 1949,
LOWEST WATER LEVEL 0.30 ABOVE LSD, MAR. 16, 1964.
RECORDS AVAILABLE: 1936-41, 1946-62, 1964-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 16, 1964 +	0.30	MAR. 3, 1969 +	3.84	MAR. 8, 1974 +	8.10	SEP. 7, 1976 +	4.53
MAR. 2, 1965 +	1.89	MAR. 9, 1970 +	3.18	SEP. 5 +	6.52	MAR. 7, 1977 +	5.76
MAR. 1, 1966 +	4.90	MAR. 8, 1971 +	4.63	MAR. 6, 1975 +	8.96	OCT. 5 +	4.36
MAR. 6, 1967 +	3.47	MAR. 7, 1972 +	4.10	SEP. 4 +	3.00	MAR. 6, 1978 +	6.39
MAR. 1, 1968 +	6.15	MAR. 13, 1973 +	7.44	MAR. 10, 1976 +	6.92	SEP. 8 +	3.34

(C-2-4) 2BAA-3
LSD 4236 FT ABOVE MSL.
HIGHEST WATER LEVEL 17.60 ABOVE LSD, SEP. 5, 1974,
LOWEST WATER LEVEL 9.00 ABOVE LSD, DEC. 28, 1960.
RECORDS AVAILABLE: 1958-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 16, 1964 +	10.50	SEP. 3, 1969 +	12.60	MAR. 6, 1975 +	15.60	SEP. 13, 1977 +	11.9
NOV. 3 +	12.60	MAR. 9, 1970 +	12.40	SEP. 4 +	13.30	OCT. 5 +	11.7
MAR. 2, 1965 +	11.80	SEP. 17 +	11.80	MAR. 10, 1976 +	13.9	NOV. 9 +	11.4
OCT. 26 +	10.00	MAR. 8, 1971 +	10.60	SEP. 7 +	12.5	DEC. 12 +	12.90
MAR. 1, 1966 +	11.10	SEP. 1 +	12.20	MAR. 7, 1977 +	13.3	JAN. 9, 1978 +	13.10
SEP. 9 +	12.40	MAR. 7, 1972 +	14.00	APR. 15 +	13.35	FEB. 13 +	13.10
MAR. 6, 1967 +	11.20	SEP. 21 +	14.70	MAY 10 +	13.80	MAR. 6 +	13.25
SEP. 13 +	12.40	MAR. 8, 1973 +	14.80	JUNE 10 +	13.55	APR. 11 +	13.20
MAR. 1, 1968 +	11.90	SEP. 4 +	16.70	JULY 11 +	13.55	JUNE 9 +	13.22
SEP. 25 +	11.10	MAR. 8, 1974 +	15.70	AUG. 11 +	11.9	SEP. 8 +	11.34
MAR. 3, 1969 +	10.50	SEP. 5 +	17.60				

(C-2-4) ACDC-1
 LSD 4229 FT ABOVE MSL.
 HIGHEST WATER LEVEL 13.10 ABOVE LSD, MAY 5, 1958.
 LOWEST WATER LEVEL 9.20 ABOVE LSD, SEP. 10, 1966.
 RECORDS AVAILABLE: 1958-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 27, 1964	+ 11.00	MAR. 7, 1969	+ 11.20	SEP. 6, 1974	+ 10.40	SEP. 8, 1977	+ 11.15
NOV. 2	+ 10.90	SEP. 3	+ 11.10	MAR. 6, 1975	+ 12.00	OCT. 5	+ 11.8
MAR. 8, 1965	+ 11.10	MAR. 11, 1970	+ 12.10	SEP. 4	+ 11.00	NOV. 9	+ 12.2
JULY 28	+ 10.80	SEP. 17	+ 11.40	MAR. 8, 1976	+ 12.6	DEC. 12	+ 11.45
OCT. 26	+ 10.80	MAR. 10, 1971	+ 11.20	SEP. 8	+ 11.8	JAN. 9, 1978	+ 11.75
MAR. 7, 1966	+ 10.60	SEP. 2	+ 10.80	MAR. 8, 1977	+ 11.6	FEB. 13	+ 11.70
SEP. 10	+ 9.20	MAR. 10, 1972	+ 10.80	APR. 14	+ 12.6	MAR. 8	+ 11.90
MAR. 6, 1967	+ 11.10	SEP. 21	+ 9.80	MAY 10	+ 12.4	APR. 11	+ 11.70
SEP. 13	+ 11.20	MAR. 9, 1973	+ 10.80	JUNE 10	+ 12.40	MAY 11	+ 12.20
MAR. 6, 1968	+ 11.20	SEP. 5	+ 11.70	JULY 11	+ 12.50	JUNE 9	+ 9.61
SEP. 25	+ 11.30	MAR. 11, 1974	+ 12.00	AUG. 11	+ 12.85		

(C-2-4) 9CDA-1
 LSD 0 FT ABOVE MSL.
 HIGHEST WATER LEVEL 20.70 ABOVE LSD, MAR. 26, 1964.
 LOWEST WATER LEVEL 11.40 ABOVE LSD, MAR. 7, 1967.
 RECORDS AVAILABLE: 1963-71.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 26, 1964	+ 20.7	MAR. 16, 1965	+ 20.1	MAR. 7, 1967	+ 11.4	MAR. 9, 1970	+ 19.1
MAR. 8, 1965	+ 19.4	MAR. 7, 1966	+ 14.4	MAR. 7, 1969	+ 14.5	MAR. 8, 1971	+ 19.9

(C-2-4)17UCD-1
 LSD 4252.63 FT ABOVE MSL.
 HIGHEST WATER LEVEL 22.40 ABOVE LSD, APR. 14, 1961,
 LOWEST WATER LEVEL 17.90 ABOVE LSD, MAR. 6, 1969.
 RECORDS AVAILABLE: 1958, 1961-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 18, 1964 +	19.90	MAR. 10, 1972 +	18.60	JUNE 10, 1977 +	20.95	JAN. 9, 1978 +	21.00
MAR. 8, 1965 +	19.60	MAR. 9, 1973 +	19.20	JULY 11	+ 20.8	FEB. 13	+ 21.45
MAR. 3, 1966 +	18.30	MAR. 11, 1974 +	20.30	AUG. 11	+ 20.90	MAR. 8	+ 21.60
MAR. 9, 1967 +	18.00	MAR. 6, 1975 +	20.50	SEP. 13	+ 20.55	APR. 11	+ 21.85
MAR. 6, 1968 +	18.20	MAR. 8, 1976 +	21.3	OCT. 5	+ 20.35	MAY 8	+ 21.60
MAR. 6, 1969 +	17.90	APR. 15, 1977 +	21.6	NOV. 9	+ 20.40	JUNE 9	+ 21.20
MAR. 10, 1970 +	18.00	MAY 10	+ 21.5	DEC. 12	+ 20.80	SEP. 8	+ 20.84
MAR. 10, 1971 +	18.50						

(C-2-4)19BDD-1
 LSD 4255 FT ABOVE MSL.
 HIGHEST WATER LEVEL 9.00 ABOVE LSD, MAR. 8, 1976,
 LOWEST WATER LEVEL 6.40 ABOVE LSD, OCT. 10, 1962.
 RECORDS AVAILABLE: 1961-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 24, 1964 +	7.10	MAR. 6, 1968 +	7.30	MAR. 10, 1972 +	7.60	MAR. 8, 1976 +	9.0
MAR. 9, 1965 +	6.90	MAR. 6, 1969 +	7.60	MAR. 19, 1973 +	8.00	MAR. 8, 1977 +	8.0
MAR. 4, 1966 +	7.30	MAR. 10, 1970 +	7.40	MAR. 11, 1974 +	8.30	OCT. 5	+ 7.3
MAR. 9, 1967 +	7.00	MAR. 10, 1971 +	7.60	MAR. 6, 1975 +	7.50	MAR. 8, 1978 +	8.6

(C-2-4)20DDC-1
 LSD 4300.20 FT ABOVE MSL.
 HIGHEST WATER LEVEL 20.70 ABOVE LSD, FEB. 25, 1941,
 LOWEST WATER LEVEL 8.20 ABOVE LSD, OCT. 22, 1937.
 RECORDS AVAILABLE: 1937, 1940-41, 1958-59, 1961-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 19, 1964 +	11.20	MAR. 1, 1968 +	12.30	MAR. 7, 1972 +	14.40	MAR. 8, 1976 +	17.9
MAR. 3, 1965 +	13.70	MAR. 5, 1969 +	12.15	MAR. 8, 1973 +	15.10	MAR. 7, 1977 +	17.0
MAR. 1, 1966 +	13.60	MAR. 10, 1970 +	14.00	MAR. 8, 1974 +	16.70	MAR. 6, 1978 +	18.1
MAR. 9, 1967 +	11.90	MAR. 8, 1971 +	14.30	MAR. 5, 1975 +	15.80		

(C-2-4)21A00-1
 LSD 4308 FT ABOVE MSL.
 HIGHEST WATER LEVEL 39.54 BELOW LSD, MAR. 8, 1976.
 LOWEST WATER LEVEL 42.28 BELOW LSD, OCT. 19, 1962.
 RECORDS AVAILABLE: 1961-71, 1973-77.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 16, 1964	41.17	MAR. 1, 1968	41.30	MAR. 8, 1973	40.75	MAR. 8, 1976	39.54
MAR. 2, 1965	41.18	MAR. 3, 1969	41.53	MAR. 8, 1974	40.14	SEP. 7	40.98
MAR. 1, 1966	41.39	MAR. 9, 1970	41.36	MAR. 5, 1975	39.75	MAR. 7, 1977	39.61
MAR. 6, 1967	41.56	MAR. 8, 1971	41.32				

(C-2-4)28AAC-1
 LSD 4337 FT ABOVE MSL.
 HIGHEST WATER LEVEL 49.12 BELOW LSD, FEB. 13, 1978.
 LOWEST WATER LEVEL 61.09 BELOW LSD, OCT. 9, 1962.
 RECORDS AVAILABLE: 1961-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 16, 1964	58.41	MAR. 8, 1971	58.40	APR. 13, 1977	54.27	JAN. 10, 1978	52.62
MAR. 3, 1965	58.76	MAR. 7, 1972	57.76	JUNE 3	60.75	FEB. 13	49.12
MAR. 1, 1966	59.00	MAR. 8, 1973	57.04	AUG. 12	57.37	MAR. 8	51.89
MAR. 7, 1967	59.47	MAR. 8, 1974	55.93	OCT. 6	58.12	APR. 12	51.93
MAR. 1, 1968	59.05	MAR. 5, 1975	54.79	NOV. 9	53.98	MAY 10	52.25
MAR. 3, 1969	59.19	MAR. 8, 1976	54.36	DEC. 13	53.12	SEP. 21	55.13
MAR. 9, 1970	58.58	MAR. 7, 1977	54.26				

(C-2-4)28ACD-3
 LSD 4338.40 FT ABOVE MSL.
 HIGHEST WATER LEVEL 24.00 ABOVE LSD, MAR. 8, 1976.
 LOWEST WATER LEVEL 4.30 ABOVE LSD, SEP. 26, 1962.
 RECORDS AVAILABLE: 1941, 1958-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 18, 1964 +	12.30	MAR. 7, 1972 +	7.50	APR. 13, 1977 +	22.6	DEC. 13, 1977 +	20.40
MAR. 3, 1965 +	9.60	MAR. 8, 1973 +	8.00	MAY 11	+ 19.5	JAN. 10, 1978 +	20.70
MAR. 1, 1966 +	11.30	MAR. 8, 1974 +	20.30	JUNE 13	+ 16.25	FEB. 13	+ 20.90
MAR. 6, 1967 +	5.55	MAR. 5, 1975 +	20.70	JULY 12	+ 14.1	MAR. 6	+ 21.20
MAR. 1, 1968 +	5.00	SEP. 3	+ 14.90	AUG. 12	+ 18.7	APR. 12	+ 21.30
MAR. 3, 1969 +	6.87	MAR. 8, 1976 +	24.0	SEP. 8	+ 17.6	MAY 10	+ 22.00
MAR. 9, 1970 +	7.50	SEP. 7	+ 17.9	OCT. 6	+ 19.2	JUNE 8	+ 15.10
MAR. 8, 1971 +	8.40	MAR. 7, 1977 +	22.0	NOV. 9	+ 19.75	SEP. 8	+ 16.95

(C-2-4)28HDD-2
 LSD 4326.10 FT ABOVE MSL.
 HIGHEST WATER LEVEL 11.30 ABOVE LSD, MAR. 8, 1976.
 LOWEST WATER LEVEL 2.51 ABOVE LSD, SEP. 1, 1961.
 RECORDS AVAILABLE: 1961-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 16, 1964 +	5.30	MAR. 1, 1968 +	3.13	MAR. 7, 1972 +	4.31	MAR. 8, 1976 +	11.3
MAR. 3, 1965 +	4.70	MAR. 5, 1969 +	3.78	MAR. 8, 1973 +	4.52	MAR. 7, 1977 +	9.7
MAR. 1, 1966 +	3.63	MAR. 9, 1970 +	3.83	MAR. 8, 1974 +	5.73	MAR. 6, 1978 +	9.9
MAR. 6, 1967 +	3.24	MAR. 8, 1971 +	3.95	MAR. 5, 1975 +	6.77		

(C-2-4)28UDD-5
 LSD 4363 FT ABOVE MSL.
 HIGHEST WATER LEVEL 23.90 ABOVE LSD, MAR. 8, 1976,
 LOWEST WATER LEVEL 9.00 ABOVE LSD, MAR. 3, 1965.
 RECORDS AVAILABLE: 1941, 1958-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 16, 1964 +	10.60	MAR. 1, 1968 +	10.95	MAR. 7, 1972 +	12.10	MAR. 8, 1976 +	23.90
MAR. 3, 1965 +	9.00	MAR. 3, 1969 +	13.90	MAR. 8, 1973 +	13.70	MAR. 7, 1977 +	22.60
MAR. 1, 1966 +	12.60	MAR. 9, 1970 +	14.00	MAR. 8, 1974 +	17.10	MAR. 6, 1978 +	21.9
MAR. 6, 1967 +	11.30	MAR. 8, 1971 +	14.00	MAR. 5, 1975 +	20.50		

(C-2-4)29BCC-1
 LSD 4297.95 FT ABOVE MSL.
 HIGHEST WATER LEVEL 18.00 ABOVE LSD, FEB. 25, 1941,
 LOWEST WATER LEVEL 3.50 ABOVE LSD, SEP. 7, 1978.
 RECORDS AVAILABLE: 1941, 1961-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 19, 1964 +	4.89	MAR. 7, 1972 +	5.46	MAY 11, 1977 +	7.1	DEC. 13, 1977 +	7.50
MAR. 4, 1965 +	4.69	MAR. 8, 1973 +	5.80	JUNE 13	+ 7.65	JAN. 10, 1978 +	7.80
MAR. 7, 1966 +	4.74	MAR. 11, 1974 +	6.70	JULY 12	+ 5.8	FEB. 14	+ 8.10
MAR. 7, 1967 +	4.35	MAR. 5, 1975 +	7.00	AUG. 12	+ 6.61	MAR. 6	+ 8.6
MAR. 5, 1968 +	4.53	MAR. 8, 1976 +	8.5	SEP. 8	+ 5.50	MAY 8	+ 8.11
MAR. 4, 1969 +	4.41	MAR. 7, 1977 +	7.8	OCT. 6	+ 6.5	JUNE 8	+ 7.23
MAR. 10, 1970 +	4.46	APR. 13	+ 8.2	NOV. 9	+ 6.9	SEP. 7	+ 3.50
MAR. 9, 1971 +	4.94						

(C-2-4)290DA-1
 LSD 4327 FT ABOVE MSL.
 HIGHEST WATER LEVEL 17.60 ABOVE LSD, MAR. 6, 1978.
 LOWEST WATER LEVEL 6.70 ABOVE LSD, MAR. 7, 1972.
 RECORDS AVAILABLE: 1972-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 7, 1972 +	6.70	MAR. 8, 1974 +	12.00	MAR. 8, 1976 +	14.1	MAR. 6, 1978 +	17.60
MAR. 8, 1973 +	7.80	MAR. 5, 1975 +	14.00	MAR. 7, 1977 +	12.9		

(C-2-4)31ADA-1
 LSD 4339.25 FT ABOVE MSL.
 HIGHEST WATER LEVEL 16.10 ABOVE LSD, MAR. 8, 1976.
 LOWEST WATER LEVEL 4.02 BELOW LSD, SEP. 1, 1971.
 RECORDS AVAILABLE: 1958-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 17, 1964 +	8.10	MAR. 7, 1967 +	6.70	MAR. 9, 1971 +	7.70	MAR. 5, 1975 +	13.50
NOV. 3	+ 10.00	SEP. 13	+ 4.49	SEP. 1	4.02	SEP. 3	+ 1.97
MAR. 3, 1965 +	6.60	MAR. 5, 1968 +	7.70	MAR. 7, 1972 +	8.70	MAR. 8, 1976 +	16.1
JULY 28	+ 4.80	SEP. 25	+ 5.20	SEP. 21	1.18	SEP. 7	+ 13.0
OCT. 26	+ 9.60	MAR. 4, 1969 +	6.70	MAR. 8, 1973 +	8.20	MAR. 7, 1977 +	15.8
MAR. 2, 1966 +	10.60	SEP. 3	+ 4.90	SEP. 6	+ 6.70	OCT. 7	+ 12.6
SEP. 9	+ 4.32	MAR. 10, 1970 +	7.30	MAR. 11, 1974 +	13.90	MAR. 6, 1978 +	14.4
MAR. 7, 1967 +	6.70	SEP. 17	+ 6.30	SEP. 5	+ 9.90	SEP. 12	+ 11.25

(C-2-4)31BCB-1
 LSD 4320 FT ABOVE MSL.
 HIGHEST WATER LEVEL 29.90 ABOVE LSD, MAR. 24, 1959.
 LOWEST WATER LEVEL 6.10 ABOVE LSD, MAR. 4, 1965.
 RECORDS AVAILABLE: 1959-77.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 16, 1964 +	6.20	MAR. 5, 1968 +	6.73	MAR. 7, 1972 +	10.22	MAR. 5, 1975 +	13.50
MAR. 4, 1965 +	6.10	MAR. 4, 1969 +	7.15	MAR. 8, 1973 +	10.80	MAR. 8, 1976 +	16.0
MAR. 4, 1966 +	6.33	MAR. 10, 1970 +	8.74	MAR. 11, 1974 +	13.10	MAR. 7, 1977 +	18.1
MAR. 7, 1967 +	6.34	MAR. 9, 1971 +	8.79				

(C-2-4)31DAD-2
 LSD 4368.50 FT ABOVE MSL.
 HIGHEST WATER LEVEL 12.00 ABOVE LSD, DEC. 28, 1945.
 LOWEST WATER LEVEL 6.72 BELOW LSD, MAR. 4, 1968.
 RECORDS AVAILABLE: 1941-42, 1944-45, 1958-73.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 17, 1964	4.26	MAR. 7, 1967	6.61	MAR. 10, 1970	5.12	MAR. 7, 1972	2.68
MAR. 3, 1965	5.79	MAR. 4, 1968	6.72	MAR. 9, 1971	3.82	MAR. 8, 1973	1.10
MAR. 4, 1966	6.18	MAR. 4, 1969	6.66				

(C-2-4)310BC-1
 LSD 4356.65 FT ABOVE MSL.
 HIGHEST WATER LEVEL 0.85 ABOVE LSD, MAR. 8, 1976.
 LOWEST WATER LEVEL 11.70 BELOW LSD, MAR. 4, 1969.
 RECORDS AVAILABLE: 1958, 1960-76.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 17, 1964	9.18	MAR. 5, 1968	11.60	MAR. 9, 1971	9.03	MAR. 11, 1974	3.11
MAR. 3, 1965	10.30	MAR. 4, 1969	11.70	MAR. 7, 1972	8.04	MAR. 5, 1975	1.33
MAR. 4, 1966	10.68	MAR. 10, 1970	9.87	MAR. 8, 1973	6.96	MAR. 8, 1976 +	0.85
MAR. 7, 1967	11.24						

(C-2-4)32CBB-1
 LSD 4363.10 FT ABOVE MSL.
 HIGHEST WATER LEVEL 14.60 ABOVE LSD, MAR. 8, 1976.
 LOWEST WATER LEVEL 10.90 BELOW LSD, NOV. 3, 1964.
 RECORDS AVAILABLE: 1964-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
NOV. 3, 1964	10.90	SEP. 3, 1969	7.94	MAR. 5, 1975 +	12.20	SEP. 9, 1977 +	7.4
MAR. 3, 1965	0.81	MAR. 10, 1970 +	0.10	SEP. 3	+ 3.58	OCT. 6	+ 8.4
JULY 29	7.96	MAR. 9, 1971 +	1.46	MAR. 8, 1976 +	14.6	NOV. 9	+ 10.7
OCT. 26	2.62	SEP. 1	9.05	SEP. 7	+ 9.70	DEC. 12	+ 11.5
MAR. 4, 1966	1.15	MAR. 7, 1972 +	2.44	MAR. 7, 1977 +	14.4	JAN. 10, 1978 +	12.05
SEP. 9	8.55	SEP. 21	4.13	APR. 13	+ 12.0	FEB. 14	+ 12.40
MAR. 7, 1967	1.24	MAR. 8, 1973 +	3.95	MAY 11	+ 10.1	MAR. 8	+ 12.20
SEP. 13	8.55	SEP. 6	2.78	JUNE 13	+ 7.40	APR. 12	+ 12.90
MAR. 4, 1968	1.12	MAR. 11, 1974 +	8.30	JULY 12	+ 7.0	MAY 8	+ 11.13
SEP. 25	5.28	SEP. 5	+ 5.39	AUG. 12	+ 4.3	JUNE 8	+ 6.53
MAR. 4, 1969	1.25						

(C-2-4)33AAB-1
 LSD 4382 FT ABOVE MSL.
 HIGHEST WATER LEVEL 2.00 ABOVE LSD, MAR. 8, 1976, MAR. 7, 1977,
 LOWEST WATER LEVEL 20.67 BELOW LSD, SEP. 9, 1966.
 RECORDS AVAILABLE: 1960-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
APR. 27, 1963	12.34	APR. 30, 1964	14.50	JAN. 26, 1966	16.75	SEP. 21, 1972	19.92
MAY 25	15.94	MAY 28	14.30	FEB. 24	16.48	MAR. 8, 1973	10.91
JUNE 29	14.27	JUNE 29	14.67	MAR. 1	16.21	SEP. 27	10.91
JULY 20	15.67	OCT. 29	17.52	SEP. 9	20.67	MAR. 8, 1974	5.10
AUG. 10	15.86	NOV. 30	16.82	MAR. 7, 1967	16.91	MAR. 5, 1975	0.63
SEP. 10	16.87	DEC. 31	16.41	MAR. 20, 1968	17.09	MAR. 8, 1976 +	2.00E
OCT. 19	18.62	JAN. 28, 1965	16.32	MAR. 5, 1969	16.53	SEP. 7	3.59
OCT. 26	15.98	MAR. 2	16.08	SEP. 3	20.58	MAR. 7, 1977 +	2.00E
NOV. 30	15.09	MAR. 31	15.86	MAR. 9, 1970	15.17	MAY 15	0.38
DEC. 28	14.85	APR. 27	15.94	SEP. 17	17.65	OCT. 6	3.29
JAN. 25, 1964	14.61	MAY 27	17.62	MAR. 8, 1971	13.72	NOV. 15	3.00
FEB. 29	14.40	AUG. 30	19.49	SEP. 1	18.53	MAR. 8, 1978	1.26
MAR. 28	14.54	SEP. 29	18.81	MAR. 7, 1972	13.10	SEP. 21	7.18
MAR. 30	14.30	OCT. 26	18.31				

(C-2-4)33AAC-1
 LSD 4393.88 FT ABOVE MSL.
 HIGHEST WATER LEVEL 2.50 BELOW LSD, APR. 25, 1976.
 LOWEST WATER LEVEL 25.44 BELOW LSD, JULY 20, 1968.
 RECORDS AVAILABLE: 1958-78.

1964

5	19.06	18.68	18.63	18.40	19.20	21.02	20.77	22.20	.....	22.67	21.85	.....
10	18.95	18.63	18.58	18.42	19.15	21.22	21.11	22.01	.....	22.59	21.82	.....
15	.....	18.63	18.55	18.37	19.14	20.96	21.56	22.25	23.48	22.18	21.57	.....
20	18.78	18.67	18.48	18.42	19.73	20.54	22.15	22.26	23.16	22.03	.....	.....
25	18.77	18.65	18.54	18.43	20.48	20.37	22.30	22.43	22.95	22.04	.....	.....
EOM	18.75	18.58	18.44	18.41	20.58	20.59	22.06	22.94	22.61	22.09	21.09	.....

1965

5	.....	20.49	20.37	20.17	20.75	22.40	23.24	23.61	23.74	23.05	22.33	21.92
10	.....	20.44	.....	20.41	20.84	22.49	23.46	23.50	23.46	22.84	22.28	21.81
15	.....	20.44	.....	20.45	21.02	22.43	23.93	23.90	23.36	22.73	.....	.....
20	.....	20.45	.....	20.54	.....	22.89	23.14	24.01	23.22	22.70	.....	.....
25	.....	20.44	20.21	20.55	21.86	22.98	23.95	23.70	23.27	22.52	21.98E	.....
EOM	.....	20.39	20.18	20.56	22.04	23.08	23.89	23.82	23.35	22.33	.....	21.05

1966

5	20.94	20.48	.....	.....	20.63	23.06E	24.17	24.42	25.10	24.37	.....	21.84
10	20.82	20.46	.....	20.21E	21.43	23.04	24.02	24.89	24.93	24.31	.....	21.89
15	20.80	20.44	.....	20.20	22.26	23.54	24.42	24.99	24.50	23.88	22.48	21.81
20	.....	20.44	.....	20.20	22.83	24.03	24.44	25.13	24.49	23.60	22.42	21.72
25	.....	20.30E	.....	20.12	23.08	24.30	24.20	24.94	24.24	23.45	22.12	21.61
EOM	20.66	20.56	20.15E	19.96	20.45	23.06	24.37	24.28E	25.22	24.21	23.32	22.02

1967

5	21.37	21.07	20.82	20.60	21.14	22.81	23.23	23.63	24.54	23.78	23.18	22.38E
10	21.41	21.03	20.72	20.94	21.90	22.87	23.27	24.34	24.32	23.61	23.12	22.33
15	21.28	21.00	20.72	21.01	21.80	22.26	23.60	25.42	24.55	23.65	22.89	22.28
20	21.18	20.94	20.68	21.06	22.14	22.16	23.41	24.89	24.30	23.69	22.67	22.26
25	21.16	20.86	20.61	21.07	23.02	22.58	23.37	.....	24.17	23.51	22.54	22.23
EOM	21.10	20.84	20.57	.....	22.37	22.92	23.77	24.30	24.12	23.38	.....	22.19

1968

5	22.17	21.74	21.28	21.13	21.41	23.02	23.72	.....	24.43	23.72	23.05	21.89
10	21.94	.....	21.28	21.13	22.16	22.88	23.92	.....	24.49	23.39	22.84	21.76
15	21.87	.....	21.23	21.20	22.37	22.87	24.72	.....	24.54	23.41	.....	.....
20	21.84	.....	21.24	21.25	24.63	23.70	25.44	.....	24.06	23.22	22.43	.....
25	21.77	.....	21.21	.....	23.92	23.81	.....	23.86	24.04	23.19	22.14	.....
EOM	21.78	21.31	21.14	.....	23.11	23.65	.....	24.23	23.89	23.18	21.95	.....

1969												
5	22.14	.....	20.05	.....	.....	21.04	22.00	22.48	22.73	.....	.....	21.64
10	21.34	21.68	20.02	.....	20.24	21.46	22.29	23.04	21.00	22.11	22.46	21.52
15	21.41	21.74	20.08	19.92	20.50	22.20	22.54	23.44	21.30	.....	22.12	21.36
20	21.74	21.78	20.15	20.04	21.39	22.42	22.36	23.40	21.90	23.04	22.01	20.91
25	21.88	21.99	20.22	20.08	21.52	21.83	22.22	22.18	22.55	23.01	21.90	20.84
EOM	22.20	21.98	20.32	.....	21.40	21.58	22.30	22.44	22.85	23.71	21.88	20.71

1970												
5	20.64	20.03	.....	18.88	19.26	21.12	20.01	20.53	19.90	21.27	20.35	19.86
10	20.49	19.90	19.25	18.76	19.45	20.96	19.45	20.97	20.27	21.12	20.34	19.75
15	20.44	19.78	19.20	18.75	.....	20.37	19.68	21.02	21.23	21.04	20.21	19.63
20	20.36	19.73	19.19	18.73	.....	20.36	19.56	21.20	21.62	20.67	20.09	19.56
25	20.24	.....	19.02	19.14	.....	19.94	19.37	20.88	21.65	19.93	19.94	19.53
EOM	20.14	.....	18.99	19.12	21.46	20.01	19.66	20.17	21.44	20.43	19.85	19.44

1971												
5	.....	18.67	18.37	.....	18.02	17.41	20.59	.....	.....	20.93	19.79	19.44
10	.....	18.61	18.31	17.92	18.40	.....	20.95	.....	.....	20.75	19.68	19.29
15	19.34	18.52	18.32	17.89	18.93	.....	21.20	.....	.....	20.60	19.51	19.23
20	19.19	18.44	.....	17.88	19.16	.....	21.31	.....	.....	20.42	19.45	19.10
25	18.90	18.38	.....	17.86	19.01	.....	.....	.....	21.78	20.27	19.45E	18.92
EOM	18.75	18.38	.....	17.90	18.29	.....	.....	.....	21.24	19.99	19.45E	18.86

1972												
5	18.75	17.96	17.58	17.27	17.13	19.30E	21.07	21.46	21.59	20.93	18.87	18.15
10	18.65	17.87	17.59	17.30	17.11	20.08	21.39	22.00	21.87	20.60E	18.55	.....
15	18.57	17.75	17.61	17.29	18.01	20.13	21.11	22.40E	21.80E	20.23	18.35	17.86
20	18.37	17.66	17.50	17.24	18.53	20.60E	20.97	22.75	21.67	19.78	18.19	17.67
25	18.09	17.60	17.39	17.17	19.48	21.10	20.74	21.77	21.39	19.57	18.18	17.53
EOM	18.01	17.51	17.35	17.19	18.56	21.14	20.97	21.75	21.03	19.09	18.38	17.39

1973												
5	17.25	16.20E	15.44	14.85	14.42	16.70	18.52	18.22	18.87	16.26	13.67	12.23
10	16.90E	16.30E	15.22	14.78	14.68	16.70	18.87	18.22	19.31	16.06	13.50	12.10
15	16.60E	16.40E	15.24	14.67	14.98	16.98	18.82	18.44	18.38	15.67	13.06	11.92E
20	16.28	15.60	15.03	14.60E	17.20	17.70E	18.60	18.86	18.01	15.23	12.78	11.75E
25	16.20E	15.48	14.99	14.50E	17.23	18.47	18.74	18.47	17.35	14.43	12.56	11.57E
EOM	16.00E	15.48	14.90	14.40	16.91	18.39	18.22	18.84	16.67	13.83	12.32	11.36E

1974												
5	.....	10.19	9.50	8.47	8.67	.....	.....	.....	13.28	12.90E	10.27	8.35
10	10.98	10.10	9.22	8.32	9.07	.....	.....	.....	13.32	12.20E	9.67	8.09
15	10.86	9.95	9.09	8.25	9.43	.....	.....	.....	13.33	11.54	9.32	7.90
20	10.64	9.78	8.93	8.18	10.00	.....	.....	.....	13.27	11.14	9.10	7.74
25	10.48	9.57	8.77	8.22	10.27	11.65	.....	13.79	13.08	10.85	8.74	7.59
EOM	10.33	9.44	8.63	8.37	.....	.....	.....	.....	13.57	10.54	8.55	7.53

1975

5	7.50E	6.30E	5.54	4.94	4.25	5.00	6.30	8.52	9.95	8.31E	6.55	5.10
10	7.40E	6.20E	5.44	4.82	4.23	4.97	6.80E	8.52	9.54	8.16	6.30	4.91
15	7.30E	6.05	5.37	4.70	4.21	4.86	7.43	8.52	9.19	7.96	5.75	4.91
20	7.30E	5.97	5.28	4.57	4.43	5.84	7.98	8.55	8.88	7.49	5.59	4.76
25	6.70E	5.86	5.23	4.45	4.42	5.32	8.74	8.92	9.25	7.14	5.40	4.62
EOM	6.50E	5.79	5.07	4.33	4.78	5.21	8.52	9.01	8.54	6.75	5.30	4.35

1976

5	4.35	3.62	3.20	2.80	2.79	4.51	6.83	7.23	8.30	8.11	6.13	4.94
10	4.20	3.57	3.10	2.70	3.20	4.46	7.41	7.40	8.32	7.90	5.89	4.86
15	4.10	3.50	3.00	2.60	3.60	4.80	7.74	7.60	8.19	7.40	5.66	4.72
20	4.00	3.40	3.00	2.60	4.10	5.40	7.20	7.80	9.10	6.90	5.47	4.61
25	3.90	3.31	2.90	2.50	4.60	6.20	7.28	8.00	8.07	6.61	5.19	4.46
EOM	3.86	3.91	2.80	2.58	4.21	6.83	7.15	8.20	8.66	6.31	5.16	4.22

1977

5	4.19	3.52	3.16	2.69	3.70	5.13	7.20	8.20	9.12	8.00	7.80	6.80
10	4.08	3.44	2.99	2.58	4.00	5.18	7.50	8.42	8.99	8.28	7.44	6.69
15	4.03	3.37	2.98	2.55	4.50	6.07	7.80	8.52	9.00	8.54	7.30	6.48
20	3.86	3.43	2.80	2.79	5.00	6.34	8.10	9.18	8.64	8.16	7.14	6.49
25	3.75	3.38	2.67	3.10	5.34	6.60	8.13	9.22	8.43	8.18	7.02	6.50
EOM	3.59	3.18	2.63	3.40	5.33	6.90	8.16	8.93	8.31	8.10	6.89	6.40

1978

5	6.31	5.08	5.64	5.50E	5.29	7.10E	10.82	11.52	11.65	.....	.....	.....
10	6.23	5.81	5.62	5.52E	5.13	7.70E	10.51	11.96	11.89	.....	.....	.....
15	6.14	5.86	5.69	5.55E	5.27	8.30E	10.68	11.93	11.89	.....	.....	.....
20	6.17	5.88	5.56	5.58E	5.88	8.90E	10.49	12.03	11.13	.....	.....	.....
25	6.17	5.78	5.59	5.60E	5.87	9.50E	11.00	11.87	10.84	.....	.....	.....
EOM	6.10	5.71	5.42	5.60	6.46	10.10E	11.48	11.59	10.62	.....	.....	.....

(C-2-4)33ADD-1
 LSD 4417.92 FT ABOVE MSL.
 LOWEST WATER LEVEL 57.49 BELOW LSD, AUG. 31, 1967.
 RECORDS AVAILABLE: 1937-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
		MAY 31, 1967	55.03	MAR. 8, 1971	50.33	MAR. 5, 1975	36.71
		AUG. 31	57.49	MAR. 18	50.34	APR. 28	36.11
		OCT. 31	56.80	APR. 18	50.87	JUNE 24	36.29
		DEC. 6	55.35	MAY 7	51.09	OCT. 7	38.52
		JAN. 17, 1968	54.40	JULY 21	54.29	DEC. 9	36.42
		FEB. 2	55.15	SEP. 22	54.59	JAN. 6, 1976	35.00
		MAR. 1	54.84	OCT. 21	53.69	JAN. 30	34.55
		MAY 3	54.45	NOV. 29	52.12	FEB. 26	33.97
JAN. 24, 1964	52.67	JUNE 26	56.99	DEC. 29	51.39	MAR. 8	33.86
FEB. 25	52.18	AUG. 23	57.13	JAN. 28, 1972	50.76	MAR. 18	33.61
MAR. 30	52.00	SEP. 24	57.24	FEB. 29	49.90	APR. 26	33.20
APR. 30	52.06	OCT. 18	56.60	MAR. 7	49.12	JUNE 29	36.40
JUNE 29	53.46	JAN. 9, 1969	54.86	APR. 28	49.46	AUG. 2	37.40
SEP. 28	57.44	FEB. 5	54.32	MAY 31	52.59	SEP. 7	38.84
OCT. 29	55.18	MAR. 3	53.84	JULY 31	52.47	SEP. 27	38.28
NOV. 30	54.60	MAY 1	53.52	AUG. 24	54.77	DEC. 8	35.24
DEC. 31	54.16	MAY 26	55.60	SEP. 21	54.58	JAN. 13, 1977	34.37
MAR. 2, 1965	53.79	SEP. 3	57.21	OCT. 13	53.12	FEB. 8	33.78
MAR. 31	53.59	OCT. 6	56.92	NOV. 14	51.29	MAR. 7	33.37
APR. 27	53.68	NOV. 10	56.71	DEC. 14	50.18	MAR. 23	32.98
JUNE 28	56.08	NOV. 28	55.02	JAN. 18, 1973	49.15	APR. 15	32.91
AUG. 30	56.56	DEC. 4	54.77	FEB. 21	48.16	APR. 19	32.90
SEP. 29	56.56	JAN. 5, 1970	54.23	MAR. 8	47.86	JUNE 13	34.88
OCT. 26	56.02	FEB. 2	53.30	APR. 30	46.81	SEP. 9	39.27
NOV. 26	55.57	MAR. 9	52.52	SEP. 27	49.36	OCT. 6	37.93
DEC. 26	54.94	APR. 2	52.18	OCT. 30	46.46	NOV. 9	37.94
JAN. 26, 1966	54.53	MAY 1	52.19	JAN. 10, 1974	43.28	DEC. 6	37.03
FEB. 24	54.12	JUNE 23	53.91	FEB. 21	41.94	DEC. 13	37.06
MAR. 1	53.96	JULY 21	55.54	MAR. 8	41.60	JAN. 5, 1978	36.68
APR. 28	53.72	SEP. 17	55.15	APR. 9	40.80	JAN. 10	36.58
DEC. 30	55.08	OCT. 12	54.18	JUNE 24	42.50	FEB. 6	36.29
FEB. 1, 1967	54.51	NOV. 9	53.47	SEP. 5	44.36	MAR. 8	36.12
MAR. 7	54.26	DEC. 3	53.00	NOV. 26	38.27	MAR. 22	36.06
MAR. 28	53.91	JAN. 21, 1971	52.04	FEB. 12, 1975	37.40	APR. 27	35.86
APR. 30	54.04	FEB. 4	51.76				

LSD 4373.20 FT ABOVE MSL.
 HIGHEST WATER LEVEL 6.90 ABOVE LSD, MAR. 8, 1978.
 LOWEST WATER LEVEL 9.05 BELOW LSD, MAR. 1, 1968.
 RECORDS AVAILABLE: 1941-42, 1958-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 16, 1964	6.01	MAR. 1, 1968	9.05	MAR. 7, 1972	4.64	MAR. 8, 1976 +	2.2
MAR. 3, 1965	7.58	MAR. 3, 1969	8.42	MAR. 8, 1973	2.79	MAR. 7, 1977	0.22
MAR. 2, 1966	7.89	MAR. 9, 1970	6.92	MAR. 8, 1974 +	2.32	MAR. 8, 1978 +	6.90
MAR. 7, 1967	8.44	MAR. 8, 1971	5.31	MAR. 5, 1975 +	2.50		

(C-2-4) 34800-1
 LSD 4443 FT ABOVE MSL.
 HIGHEST WATER LEVEL 59.32 BELOW LSD, APR. 13, 1977.
 LOWEST WATER LEVEL 72.94 BELOW LSD, MAR. 8, 1973.
 RECORDS AVAILABLE: 1973-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 8, 1973	72.94	MAR. 8, 1976	60.31	APR. 13, 1977	59.32	JULY 12, 1977	67.67
MAR. 8, 1974	66.87	MAR. 7, 1977	59.94	JUNE 13	62.05	MAR. 22, 1978	62.98
MAR. 5, 1975	62.47						

(C-2-5) 5ACC-3
 LSD 4214 FT ABOVE MSL.
 HIGHEST WATER LEVEL 0.19 BELOW LSD, APR. 10, 1952.
 LOWEST WATER LEVEL 4.46 BELOW LSD, SEP. 7, 1978.
 RECORDS AVAILABLE: 1940-42, 1944-53, 1955-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 20, 1964	0.91	MAR. 6, 1969	0.31	SEP. 6, 1974	3.61	SEP. 9, 1977	3.33
NOV. 6	1.36	SEP. 3	1.42	MAR. 7, 1975	1.23	OCT. 4	2.71
MAR. 5, 1965	0.88	MAR. 11, 1970	0.78	SEP. 4	4.30	NOV. 8	1.34
JULY 29	1.21	SEP. 17	1.49	MAR. 9, 1976	0.79	DEC. 12	1.28
OCT. 27	1.15	MAR. 10, 1971	0.51	SEP. 9	2.73	JAN. 9, 1978	1.18
MAR. 3, 1966	0.78	SEP. 2	1.61	MAR. 9, 1977	1.13	FEB. 14	.98
SEP. 12	1.66	MAR. 10, 1972	0.85	APR. 15	0.81	MAR. 9	.69
MAR. 9, 1967	.90	SEP. 21	2.77	MAY 10	0.82	APR. 12	.80
SEP. 14	1.46	MAR. 12, 1973	0.34	JUNE 10	0.97	MAY 9	.75
MAR. 7, 1968	0.79	SEP. 6	2.67	JULY 12	2.42	JUNE 9	2.27
SEP. 25	1.31	MAR. 13, 1974	0.79	AUG. 11	3.23	SEP. 7	4.46

(C-2-5) 5000-4
 LSD 4210 FT ABOVE MSL.
 HIGHEST WATER LEVEL 3.77 ABOVE LSD, MAR. 9, 1978,
 LOWEST WATER LEVEL 1.51 ABOVE LSD, MAR. 7, 1975.
 RECORDS AVAILABLE: 1961-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 20, 1964 +	2.48	MAR. 7, 1968 +	2.65	MAR. 10, 1972 +	2.69	MAR. 9, 1976 +	1.60
MAR. 5, 1965 +	2.47	MAR. 6, 1969 +	2.72	MAR. 12, 1973 +	2.95	MAR. 9, 1977 +	1.53
MAR. 3, 1966 +	2.62	MAR. 11, 1970 +	2.58	MAR. 13, 1974 +	1.97	MAR. 9, 1978 +	3.77
MAR. 9, 1967 +	2.60	MAR. 10, 1971 +	2.72	MAR. 7, 1975 +	1.51		

(C-2-5) 6000-7
 LSD 4219.45 FT ABOVE MSL.
 HIGHEST WATER LEVEL 2.21 ABOVE LSD, MAR. 12, 1973,
 LOWEST WATER LEVEL 0.78 ABOVE LSD, SEP. 5, 1961.
 RECORDS AVAILABLE: 1961-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 17, 1964 +	1.48	MAR. 7, 1968 +	1.61	MAR. 10, 1972 +	1.65	MAR. 9, 1976 +	1.53
MAR. 5, 1965 +	1.46	MAR. 6, 1969 +	1.30	MAR. 12, 1973 +	2.21	MAR. 9, 1977 +	1.68
MAR. 3, 1966 +	1.65	MAR. 11, 1970 +	1.51	MAR. 13, 1974 +	1.96	MAR. 9, 1978 +	1.61
MAR. 9, 1967 +	1.53	MAR. 10, 1971 +	1.83	MAR. 7, 1975 +	1.43		

(C-2-5) 7800-1
 LSD 4230.78 FT ABOVE MSL.
 HIGHEST WATER LEVEL 4.32 ABOVE LSD, MAR. 12, 1973,
 LOWEST WATER LEVEL 0.85 ABOVE LSD, MAR. 9, 1977.
 RECORDS AVAILABLE: 1941, 1958, 1961-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 17, 1964 +	3.84	MAR. 7, 1968 +	3.95	MAR. 10, 1972 +	3.90	MAR. 9, 1976 +	1.14
MAR. 5, 1965 +	3.86	MAR. 6, 1969 +	4.24	MAR. 12, 1973 +	4.32	MAR. 9, 1977 +	0.85
MAR. 3, 1966 +	4.11	MAR. 11, 1970 +	3.86	MAR. 13, 1974 +	3.82	MAR. 9, 1978 +	1.02
MAR. 9, 1967 +	3.74	MAR. 10, 1971 +	4.19	MAR. 7, 1975 +	3.58		

LSD 4222 FT ABOVE MSL.
 HIGHEST WATER LEVEL 6.72 ABOVE LSD, MAR. 14, 1973.
 LOWEST WATER LEVEL 5.94 ABOVE LSD, MAR. 11, 1970; MAR. 6, 1975.
 RECORDS AVAILABLE: 1961, 1970-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 11, 1970 +	5.94	MAR. 14, 1973 +	6.72	MAR. 6, 1975 +	5.94	MAR. 8, 1977 +	6.3
MAR. 10, 1971 +	6.35	MAR. 12, 1974 +	6.20	MAR. 10, 1976 +	6.45	MAR. 13, 1978 +	6.1
MAR. 8, 1972 +	6.60						

(C-2-5)14088-1
 LSD 4221 FT ABOVE MSL.
 HIGHEST WATER LEVEL 22.10 ABOVE LSD, MAR. 20, 1964.
 LOWEST WATER LEVEL 14.40 ABOVE LSD, OCT. 12, 1961.
 RECORDS AVAILABLE: 1940, 1958, 1961-64, 1970-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 20, 1964 +	22.10	SEP. 4, 1975 +	17.60	JULY 11, 1977 +	18.3	JAN. 9, 1978 +	18.35
MAR. 11, 1970 +	17.40	MAR. 10, 1976 +	18.9	AUG. 11	+ 18.3	MAR. 12	+ 18.80
MAR. 10, 1971 +	17.70	SEP. 20	+ 17.5	SEP. 8	+ 18.5	APR. 11	+ 18.39
MAR. 8, 1972 +	18.20	MAR. 8, 1977 +	18.5	OCT. 4	+ 18.6	MAY 9	+ 18.80
MAR. 14, 1973 +	17.80	APR. 15	+ 19.1	NOV. 8	+ 18.55	JUNE 9	+ 18.72
MAR. 12, 1974 +	18.40	MAY 11	+ 18.45	DEC. 12	+ 18.35	SEP. 8	+ 18.02
MAR. 6, 1975 +	18.30	JUNE 10	+ 18.58				

(C-2-5)1780A-1
 LSD 4223.94 FT ABOVE MSL.
 HIGHEST WATER LEVEL 22.70 ABOVE LSD, MAR. 31, 1941.
 LOWEST WATER LEVEL 11.60 ABOVE LSD, SEP. 6, 1974.
 RECORDS AVAILABLE: 1941, 1961-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 20, 1964 +	14.70	SEP. 17, 1970 +	14.10	MAR. 7, 1975 +	14.60	JULY 12, 1977 +	14.0
MAR. 8, 1965 +	15.40	MAR. 10, 1971 +	15.60	SEP. 3	+ 12.70	AUG. 16	+ 14.3
MAR. 3, 1966 +	15.80	SEP. 2	+ 14.10	MAR. 10, 1976 +	15.1	SEP. 9	+ 13.45
MAR. 9, 1967 +	15.30	MAR. 9, 1972 +	16.00	SEP. 9	+ 13.3	OCT. 4	+ 13.6
MAR. 7, 1968 +	16.90	SEP. 21	+ 13.50	MAR. 9, 1977 +	15.0	NOV. 8	+ 14.0
SEP. 25	+ 14.60	MAR. 13, 1973 +	17.20	APR. 15	+ 14.82	DEC. 12	+ 14.80
MAR. 6, 1969 +	16.60	SEP. 6	+ 13.50	MAY 10	+ 15.1	JAN. 9, 1978 +	15.15
SEP. 3	+ 13.50	MAR. 13, 1974 +	15.50	JUNE 10	+ 14.9	MAR. 14	+ 15.90
MAR. 11, 1970 +	15.10	SEP. 6	+ 11.60				

(C-2-5)1880C-1
 LSD 4228 FT ABOVE MSL.
 HIGHEST WATER LEVEL 3.82 ABOVE LSD, MAR. 3, 1966,
 LOWEST WATER LEVEL 0.34 ABOVE LSD, MAR. 10, 1972.
 RECORDS AVAILABLE: 1961-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 17, 1964 +	2.74	MAR. 7, 1968 +	3.00	MAR. 10, 1972 +	0.34	MAR. 10, 1976 +	1.58
MAR. 5, 1965 +	3.29	MAR. 6, 1969 +	3.02	MAR. 12, 1973 +	2.12	MAR. 9, 1977 +	1.66
MAR. 3, 1966 +	3.82	MAR. 11, 1970 +	2.76	MAR. 13, 1974 +	1.46	MAR. 14, 1978 +	1.67
MAR. 9, 1967 +	2.71	MAR. 10, 1971 +	3.28	MAR. 7, 1975 +	0.72		

(C-2-5)1890C-1
 LSD 4230.40 FT ABOVE MSL.
 HIGHEST WATER LEVEL 4.38 ABOVE LSD, APR. 7, 1960,
 LOWEST WATER LEVEL 0.81 ABOVE LSD, MAR. 9, 1977.
 RECORDS AVAILABLE: 1959-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 17, 1964 +	2.43	MAR. 7, 1968 +	3.14	MAR. 4, 1972 +	2.59	MAR. 9, 1976 +	2.35
MAR. 5, 1965 +	3.36	MAR. 6, 1969 +	4.28	MAR. 13, 1973 +	3.45	MAR. 9, 1977 +	0.81
MAR. 3, 1966 +	3.14	MAR. 11, 1970 +	2.67	MAR. 13, 1974 +	2.23	MAR. 9, 1978 +	1.72
MAR. 9, 1967 +	2.50	MAR. 10, 1971 +	3.06	MAR. 7, 1975 +	1.86		

(C-2-5)1900C-1
 LSD 4242 FT ABOVE MSL.
 HIGHEST WATER LEVEL 21.60 ABOVE LSD, MAR. 8, 1977.
 LOWEST WATER LEVEL 0.04 ABOVE LSD, NOV. 29, 1958.
 RECORDS AVAILABLE: 1937-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 18, 1964 +	18.70	MAR. 7, 1968 +	19.10	MAR. 9, 1972 +	19.20	MAR. 9, 1976 +	19.50
MAR. 5, 1965 +	18.70	MAR. 6, 1969 +	19.40	MAR. 13, 1973 +	9.00	MAR. 8, 1977 +	21.6
MAR. 3, 1966 +	20.20	MAR. 11, 1970 +	18.60	MAR. 13, 1974 +	10.20	MAR. 9, 1978 +	21.2
MAR. 9, 1967 +	18.30	MAR. 11, 1971 +	18.60	MAR. 7, 1975 +	17.60		

(C-2-5)20ACC-1
 LSD 4236 FT ABOVE MSL.
 HIGHEST WATER LEVEL 12.00 ABOVE LSD, APR. 20, 1961.
 LOWEST WATER LEVEL 7.65 ABOVE LSD, SEP. 7, 1978.
 RECORDS AVAILABLE: 1961-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 20, 1964 +	10.50	MAR. 6, 1969 +	10.40	MAR. 13, 1974 +	10.10	MAR. 9, 1977 +	9.6
MAR. 5, 1965 +	9.60	MAR. 11, 1970 +	10.50	MAR. 7, 1975 +	9.70	OCT. 5 +	8.0
MAR. 7, 1966 +	10.80	MAR. 11, 1971 +	10.60	SEP. 4 +	7.70	MAR. 14, 1978 +	9.7
MAR. 9, 1967 +	10.00	MAR. 9, 1972 +	10.80	MAR. 9, 1976 +	11.1	SEP. 7 +	7.65
MAR. 7, 1968 +	10.90	MAR. 14, 1973 +	11.50	SEP. 9 +	8.3		

(C-2-5)21CDB-1
 LSD 4240 FT ABOVE MSL.
 HIGHEST WATER LEVEL 22.00 ABOVE LSD, MAR. 14, 1973.
 LOWEST WATER LEVEL 15.50 ABOVE LSD, OCT. 12, 1962.
 RECORDS AVAILABLE: 1962-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 18, 1964 +	19.80	MAR. 7, 1968 +	21.30	MAR. 10, 1972 +	18.70	MAR. 10, 1976 +	20.3
MAR. 9, 1965 +	18.30	MAR. 7, 1969 +	20.40	MAR. 14, 1973 +	22.00	MAR. 9, 1977 +	17.7
MAR. 7, 1966 +	19.80	MAR. 11, 1970 +	19.40	MAR. 13, 1974 +	17.90	MAR. 13, 1978 +	19.6
MAR. 9, 1967 +	17.80	MAR. 11, 1971 +	17.30	MAR. 7, 1975 +	17.40		

(C-2-5)23CAC-1
 LSD 4245 FT ABOVE MSL.
 HIGHEST WATER LEVEL 22.50 ABOVE LSD, FEB. 27, 1941.
 LOWEST WATER LEVEL 10.10 ABOVE LSD, SEP. 21, 1972.
 RECORDS AVAILABLE: 1940-41, 1958, 1961-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 20, 1964 +	14.10	MAR. 6, 1969 +	14.00	MAR. 12, 1974 +	14.70	JULY 11, 1977 +	12.60
NOV. 6 +	11.90	SEP. 3 +	11.60	SEP. 6 +	11.90	NOV. 8 +	12.85
MAR. 9, 1965 +	13.30	MAR. 11, 1970 +	14.10	MAR. 6, 1975 +	12.70	DEC. 12 +	12.97
JULY 28 +	11.90	SEP. 17 +	12.00	SEP. 4 +	12.60	JAN. 9, 1978 +	13.00
OCT. 27 +	11.80	MAR. 11, 1971 +	14.20	MAR. 10, 1976 +	13.5	FEB. 14 +	13.05
MAR. 3, 1966 +	14.10	SEP. 2 +	11.90	SEP. 20 +	12.6	MAR. 13 +	13.35
MAR. 8, 1967 +	13.80	MAR. 8, 1972 +	14.40	MAR. 8, 1977 +	13.0	APR. 11 +	13.10
SEP. 14 +	11.90	SEP. 21 +	10.10	APR. 14 +	13.1	MAY 10 +	12.77
MAR. 6, 1968 +	14.15	MAR. 13, 1973 +	14.70	MAY 11 +	12.9	JUNE 9 +	13.11
SEP. 25 +	12.30	SEP. 6 +	12.10	JUNE 10 +	12.85	SEP. 8 +	12.92

(C-2-5)25AAR-2
 LSD 4267 FT ABOVE MSL.
 HIGHEST WATER LEVEL 7.50 ABOVE LSD, MAR. 8, 1976.
 LOWEST WATER LEVEL 4.46 ABOVE LSD, OCT. 10, 1962.
 RECORDS AVAILABLE: 1961-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 27, 1964 +	4.91	MAR. 10, 1972 +	5.60	JUNE 10, 1977 +	6.50	JAN. 9, 1978 +	6.8
MAR. 9, 1965 +	4.61	MAR. 9, 1973 +	5.95	JULY 11	+ 6.10	FEB. 13	+ 6.9
MAR. 3, 1966 +	5.01	MAR. 11, 1974 +	6.19	AUG. 11	+ 6.0	MAR. 8	+ 7.2
MAR. 9, 1967 +	4.78	MAR. 6, 1975 +	5.98	SEP. 8	+ 5.0	APR. 12	+ 7.3
MAR. 6, 1968 +	4.88	MAR. 8, 1976 +	7.5	OCT. 5	+ 6.2	MAY 10	+ 7.38
MAR. 6, 1969 +	4.88	MAR. 8, 1977 +	7.27	NOV. 9	+ 6.40	JUNE 9	+ 6.75
MAR. 11, 1970 +	4.85	APR. 14	+ 7.40	DEC. 12	+ 6.60	SEP. 7	+ 5.00
MAR. 10, 1971 +	5.18	MAY 10	+ 6.1				

(C-2-5)25CDD-4
 LSD 4292 FT ABOVE MSL.
 HIGHEST WATER LEVEL 24.00 ABOVE LSD, MAR. 7, 1977,
 LOWEST WATER LEVEL 9.50 ABOVE LSD, OCT. 2, 1962.
 RECORDS AVAILABLE: 1961-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 19, 1964 +	10.40	MAR. 5, 1968 +	14.40	MAR. 7, 1972 +	13.00	MAR. 8, 1976 +	22.8
MAR. 9, 1965 +	11.30	MAR. 4, 1969 +	15.00	MAR. 9, 1973 +	14.10	MAR. 7, 1977 +	24.0
MAR. 4, 1966 +	12.20	MAR. 10, 1970 +	13.50	MAR. 11, 1974 +	16.30	MAR. 8, 1978 +	23.6
MAR. 9, 1967 +	13.60	MAR. 9, 1971 +	12.20	MAR. 7, 1975 +	18.40		

(C-2-5)27CCC-1
 LSD 4268.10 FT ABOVE MSL.
 HIGHEST WATER LEVEL 1.32 BELOW LSD, APR. 5, 1960,
 LOWEST WATER LEVEL 4.70 BELOW LSD, SEP. 3, 1969.
 RECORDS AVAILABLE: 1960-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 16, 1964	2.99	SEP. 24, 1968	4.08	SEP. 5, 1973	3.48	JUNE 13, 1977	2.04
NOV. 2	3.98	MAR. 4, 1969	3.18	MAR. 11, 1974	2.40	JULY 11	3.54
MAR. 4, 1965	3.70	SEP. 3	4.70	SEP. 5	3.40	AUG. 11	3.04
JULY 28	3.24	MAR. 10, 1970	3.50	MAR. 6, 1975	2.57	SEP. 8	4.32
OCT. 27	3.52	SEP. 17	4.18	SEP. 4	2.41	OCT. 5	3.35
MAR. 2, 1966	2.23	MAR. 9, 1971	3.57	MAR. 8, 1976	1.57	NOV. 9	2.71
SEP. 9	4.51	SEP. 1	3.46	SEP. 8	3.93	DEC. 12	2.36
MAR. 7, 1967	3.33	MAR. 8, 1972	2.58	MAR. 8, 1977	2.06	JAN. 9, 1978	2.19
SEP. 14	3.93	SEP. 21	4.32	APR. 14	2.01	MAR. 9	2.03
MAR. 15, 1968	3.08	MAR. 9, 1973	1.77	MAY 10	3.51		

(C-2-5)29ADC-2
 LSD 4255 FT ABOVE MSL.
 HIGHEST WATER LEVEL 18.20 ABOVE LSD, MAR. 7, 1968,
 LOWEST WATER LEVEL 3.40 ABOVE LSD, OCT. 12, 1962.
 RECORDS AVAILABLE: 1961-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 20, 1964 +	15.50	MAR. 7, 1968 +	18.20	MAR. 10, 1972 +	10.00	MAR. 10, 1976 +	10.4
MAR. 8, 1965 +	13.70	MAR. 7, 1969 +	13.30	MAR. 13, 1973 +	9.00	MAR. 9, 1977 +	8.1
MAR. 3, 1966 +	15.80	MAR. 11, 1970 +	12.00	MAR. 13, 1974 +	7.20	MAR. 13, 1978 +	8.0
MAR. 9, 1967 +	8.70	MAR. 11, 1971 +	11.40	MAR. 7, 1975 +	8.10		

(C-2-5)30CBD-1
 LSD 4260.41 FT ABOVE MSL.
 HIGHEST WATER LEVEL 9.00 ABOVE LSD, MAR. 10, 1972, MAR. 13, 1974,
 LOWEST WATER LEVEL 3.06 ABOVE LSD, OCT. 3, 1962.
 RECORDS AVAILABLE: 1961-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 27, 1964 +	6.00	MAR. 7, 1968 +	6.13	MAR. 10, 1972 +	9.00	MAR. 9, 1976 +	8.5
MAR. 4, 1965 +	6.55	MAR. 6, 1969 +	6.70	MAR. 13, 1973 +	8.90	MAR. 9, 1977 +	6.4
MAR. 2, 1966 +	6.20	MAR. 12, 1970 +	6.95	MAR. 13, 1974 +	9.00	MAR. 9, 1978 +	6.1
MAR. 8, 1967 +	4.95	MAR. 10, 1971 +	6.56	MAR. 7, 1975 +	7.50		

(C-2-5)30DAA-1
 LSD 4253.54 FT ABOVE MSL.
 HIGHEST WATER LEVEL 4.95 ABOVE LSD, MAR. 8, 1967,
 LOWEST WATER LEVEL 1.92 ABOVE LSD, OCT. 4, 1961.
 RECORDS AVAILABLE: 1961-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 20, 1964 +	3.24	MAR. 7, 1968 +	3.01	MAR. 9, 1972 +	3.35	MAR. 10, 1976 +	3.16
MAR. 8, 1965 +	3.08	MAR. 7, 1969 +	3.02	MAR. 13, 1973 +	3.44	MAR. 9, 1977 +	3.06
MAR. 7, 1966 +	3.40	MAR. 11, 1970 +	3.24	MAR. 13, 1974 +	3.17	MAR. 15, 1978 +	2.73
MAR. 8, 1967 +	4.95	MAR. 11, 1971 +	3.18	MAR. 7, 1975 +	2.49		

(C-2-5)31040-3
 LSD 4294.80 FT ABOVE MSL.
 HIGHEST WATER LEVEL 0.90 BELOW LSD, FEB. 27, 1942.
 LOWEST WATER LEVEL 12.43 BELOW LSD, JAN. 9, 1978.
 RECORDS AVAILABLE: 1942, 1958-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 16, 1964	9.04	MAR. 4, 1969	9.39	SEP. 5, 1974	9.37	SEP. 9, 1977	12.00
NOV. 2	9.51	SEP. 3	8.05	MAR. 6, 1975	10.74	OCT. 5	11.96
MAR. 4, 1965	8.03	MAR. 11, 1970	9.44	SEP. 3	8.10	NOV. 9	12.13
JULY 28	6.56	SEP. 17	8.98	MAR. 9, 1976	9.30	DEC. 12	12.20
OCT. 27	8.26	MAR. 9, 1971	9.26	SEP. 8	9.02	JAN. 9, 1978	12.43
MAR. 2, 1966	8.34	SEP. 1	7.77	MAR. 8, 1977	10.84	FEB. 14	12.33
SEP. 12	11.42	MAR. 8, 1972	8.96	APR. 14	10.93	MAR. 9	12.13
MAR. 8, 1967	5.47	SEP. 21	9.04	MAY 10	11.10	APR. 12	11.88
SEP. 14	9.70	MAR. 9, 1973	8.79	JUNE 10	10.85	MAY 9	10.86
MAR. 5, 1968	9.77	SEP. 5	7.92	JULY 11	11.07	JUNE 8	10.36
SEP. 24	9.05	MAR. 12, 1974	9.19	AUG. 11	11.65	SEP. 7	10.64

(C-2-5)31040-3
 LSD 4294.50 FT ABOVE MSL.
 HIGHEST WATER LEVEL 0.20 BELOW LSD, MAR. 20, 1958.
 LOWEST WATER LEVEL 13.81 BELOW LSD, SEP. 9, 1977.
 RECORDS AVAILABLE: 1958-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 16, 1964	6.40	MAR. 4, 1969	6.03	SEP. 5, 1974	9.57	SEP. 9, 1977	13.81
NOV. 2	8.30	SEP. 3	7.92	MAR. 6, 1975	5.27	OCT. 5	10.85
MAR. 4, 1965	5.82	MAR. 12, 1970	4.94	SEP. 3	7.82	NOV. 9	9.65
JULY 28	6.80	SEP. 17	8.48	MAR. 9, 1976	3.51	DEC. 12	8.92
OCT. 27	5.79	MAR. 9, 1971	4.68	SEP. 8	10.27	JAN. 9, 1978	8.43
MAR. 2, 1966	4.16	SEP. 1	7.09	MAR. 8, 1977	5.81	FEB. 14	8.10
SEP. 9	12.89	MAR. 8, 1972	3.63	APR. 14	5.95	MAR. 9	7.91
MAR. 8, 1967	7.22	SEP. 21	8.16	MAY 10	9.47	APR. 11	7.60
SEP. 14	9.51	MAR. 9, 1973	4.36	JUNE 10	8.70	MAY 9	7.39
MAR. 5, 1968	6.42	SEP. 5	7.20	JULY 11	10.98	JUNE 8	8.51
SEP. 24	10.10	MAR. 12, 1974	3.29	AUG. 11	12.58	SEP. 7	12.98

(C-2-5)320AD-1
 LSD 4291.95 FT ABOVE MSL.
 HIGHEST WATER LEVEL 2.13 BELOW LSD, MAR. 10, 1976.
 LOWEST WATER LEVEL 9.18 BELOW LSD, SEP. 5, 1973.
 RECORDS AVAILABLE: 1961-77.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 18, 1964	3.79	MAR. 8, 1967	4.42	SEP. 17, 1970	6.41	MAR. 12, 1974	4.01
NOV. 2	6.16	SEP. 14	7.90	MAR. 10, 1971	3.50	SEP. 5	8.60
MAR. 4, 1965	4.75	MAR. 5, 1968	4.25	SEP. 1	8.01	MAR. 6, 1975	3.64
JULY 28	7.70	SEP. 24	8.03	MAR. 8, 1972	3.34	SEP. 4	8.14
OCT. 27	6.42	MAR. 4, 1969	4.33	SEP. 21	6.91	MAR. 10, 1976	2.13
MAR. 2, 1966	3.14	SEP. 3	7.74	MAR. 9, 1973	3.32	SEP. 8	6.66
SEP. 9	2.79	MAR. 10, 1970	3.72	SEP. 5	9.18	MAR. 8, 1977	2.41

(C-2-5)33000-1
 LSD 4270.30 FT ABOVE MSL.
 HIGHEST WATER LEVEL 12.20 ABOVE LSD, MAR. 14, 1961.
 LOWEST WATER LEVEL 6.30 ABOVE LSD, OCT. 15, 1962.
 RECORDS AVAILABLE: 1961-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 27, 1964	10.00	MAR. 5, 1964	10.20	MAR. 8, 1972	9.80	MAR. 9, 1976	9.5
MAR. 4, 1965	8.40	MAR. 6, 1964	9.80	MAR. 13, 1973	9.30	MAR. 8, 1977	8.8
MAR. 4, 1966	10.40	MAR. 10, 1970	10.40	MAR. 13, 1974	7.60	MAR. 13, 1978	7.3
MAR. 8, 1967	9.60	MAR. 10, 1971	10.60	MAR. 6, 1975	7.20		

(C-2-5)33000-1
 LSD 4310 FT ABOVE MSL.
 HIGHEST WATER LEVEL 12.90 BELOW LSD, MAR. 14, 1958.
 LOWEST WATER LEVEL 24.17 BELOW LSD, MAR. 5, 1969.
 RECORDS AVAILABLE: 1958, 1962-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 19, 1964	18.98	MAR. 5, 1968	24.17	MAR. 8, 1972	19.39	MAR. 9, 1976	16.50
MAR. 4, 1965	23.42	MAR. 5, 1969	23.66	MAR. 9, 1973	19.23	MAR. 8, 1977	16.04
MAR. 4, 1966	22.91	MAR. 10, 1970	22.09	MAR. 11, 1974	18.95	MAR. 9, 1978	18.00
MAR. 7, 1967	23.92	MAR. 9, 1971	20.24	MAR. 6, 1975	18.01		

(C-2-5)34000-1
 LSD 4290 FT ABOVE MSL.
 HIGHEST WATER LEVEL 6.50 ABOVE LSD, FEB. 26, 1941.
 LOWEST WATER LEVEL 6.00 BELOW LSD, SEP. 29, 1961.
 RECORDS AVAILABLE: 1941, 1961-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 16, 1964	3.30	MAR. 5, 1968	3.25	MAR. 8, 1972	2.16	MAR. 8, 1976	0.20
MAR. 4, 1965	3.70	MAR. 4, 1969	3.26	MAR. 9, 1973	2.15	MAR. 8, 1977	0.08
MAR. 4, 1966	2.95	MAR. 10, 1970	2.80	MAR. 11, 1974	2.23	MAR. 9, 1978	.84
MAR. 7, 1967	3.48	MAR. 9, 1971	2.62	MAR. 6, 1975	1.53		

(C-2-5) 35600-1
 LSD 4308 FT ABOVE MSL.
 HIGHEST WATER LEVEL 29.85 BELOW LSD, MAR. 6, 1966.
 LOWEST WATER LEVEL 33.80 BELOW LSD, SEP. 9, 1977.
 RECORDS AVAILABLE: 1961-74, 1976-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 16, 1964	31.40	MAR. 9, 1971	33.16	JUNE 13, 1977	31.66	JAN. 9, 1978	31.23
MAR. 2, 1965	32.04	MAR. 8, 1972	32.81	JULY 19	33.54	FEB. 14	31.41
MAR. 2, 1966	31.34	MAR. 9, 1973	32.46	AUG. 11	32.82	MAR. 8	30.89
MAR. 7, 1967	32.10	MAR. 11, 1974	32.21	SEP. 7	23.80	APR. 12	30.85
MAR. 4, 1968	31.92	MAR. 8, 1976	31.10	OCT. 6	32.37	MAY 9	30.83
MAR. 4, 1969	31.84	MAR. 7, 1977	30.97	NOV. 9	31.94	JUNE 8	31.78
MAR. 10, 1970	32.87	MAY 11	32.35	DEC. 12	31.56	SEP. 7	33.34

(C-2-5) 35600-1
 LSD 4308 FT ABOVE MSL.
 HIGHEST WATER LEVEL 1.45 ABOVE LSD, MAR. 9, 1978.
 LOWEST WATER LEVEL 2.63 BELOW LSD, MAR. 9, 1973.
 RECORDS AVAILABLE: 1973-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 9, 1973	2.63	MAR. 1, 1975 +	.11	MAR. 7, 1977 +	.38	MAR. 9, 1978 +	1.45
MAR. 11, 1974	1.89	MAR. 8, 1976	1.50	DEC. 15	.68		

(C-2-6) 23600-2
 LSD 4295 FT ABOVE MSL.
 HIGHEST WATER LEVEL 23.85 BELOW LSD, MAR. 3, 1966.
 LOWEST WATER LEVEL 29.60 BELOW LSD, OCT. 5, 1977.
 RECORDS AVAILABLE: 1961-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 17, 1964	24.34	MAR. 12, 1970	24.98	MAR. 9, 1976	24.51	NOV. 9, 1977	28.20
MAR. 5, 1965	24.19	MAR. 9, 1971	25.01	MAR. 8, 1977	25.42	DEC. 12	27.27
MAR. 3, 1966	23.85	MAR. 10, 1972	24.40	APR. 14	25.62	JAN. 9, 1978	26.57
MAR. 8, 1967	25.10	MAR. 9, 1973	24.80	MAY 10	24.35	MAR. 9	25.87
MAR. 6, 1968	25.01	MAR. 12, 1974	24.25	OCT. 5	24.60	APR. 12	26.01
MAR. 5, 1969	24.98	MAR. 7, 1975	24.74				

(C-2-6)24CRR-2
 LSD 4243.15 FT ABOVE MSL.
 HIGHEST WATER LEVEL 17.60 ABOVE LSD, FEB. 26, 1941.
 LOWEST WATER LEVEL 7.40 ABOVE LSD, SEP. 9, 1976.
 RECORDS AVAILABLE: 1941, 1958-77.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 20, 1964 +	14.10	MAR. 5, 1969 +	16.40	MAR. 14, 1973 +	14.10	MAR. 10, 1976 +	12.1
MAR. 4, 1965 +	14.80	MAR. 12, 1970 +	14.80	MAR. 13, 1974 +	13.40	SEP. 9	+ 7.4
MAR. 7, 1966 +	14.00	MAR. 9, 1971 +	14.40	MAR. 7, 1975 +	11.30	MAR. 9, 1977 +	10.6
MAR. 8, 1967 +	15.90	MAR. 10, 1972 +	15.20	SEP. 3	+ 8.40	OCT. 5	+ 7.7
MAR. 6, 1968 +	15.90						

(C-2-6)24CRR-3
 LSD 4243.15 FT ABOVE MSL.
 HIGHEST WATER LEVEL 24.30 ABOVE LSD, MAR. 13, 1974.
 LOWEST WATER LEVEL 21.70 ABOVE LSD, MAR. 9, 1977
 RECORDS AVAILABLE: 1973-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 14, 1973 +	23.2	MAR. 7, 1975 +	23.5	MAR. 9, 1977 +	21.7	MAR. 9, 1978 +	22.0
MAR. 13, 1974 +	24.3	MAR. 10, 1976 +	23.4				

(C-2-6)25ABU-1
 LSD 4252.30 FT ABOVE MSL.
 HIGHEST WATER LEVEL 10.00 ABOVE LSD, FEB. 27, 1941.
 LOWEST WATER LEVEL 4.30 ABOVE LSD, SEP. 9, 1977.
 RECORDS AVAILABLE: 1941, 1958-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 19, 1954 +	6.30	MAR. 10, 1972 +	7.71	MAY 10, 1977 +	6.0	DEC. 12, 1977 +	5.51
MAR. 4, 1955 +	6.80	MAR. 13, 1973 +	7.74	JUNE 10	+ 5.92	JAN. 9, 1978 +	5.70
MAR. 3, 1966 +	7.50	MAR. 13, 1974 +	7.91	JULY 11	+ 4.96	FEB. 14	+ 6.10
MAR. 8, 1967 +	6.72	MAR. 7, 1975 +	7.03	AUG. 11	+ 4.43	MAR. 9	+ 6.40
MAR. 6, 1968 +	7.07	MAR. 9, 1976 +	7.7	SEP. 9	+ 4.30	APR. 12	+ 6.30
MAR. 5, 1969 +	7.44	MAR. 9, 1977 +	6.67	OCT. 5	+ 4.37	MAY 9	+ 6.20
MAR. 12, 1970 +	7.32	APR. 14	+ 6.25	NOV. 9	+ 4.97	JUNE 9	+ 6.26
MAR. 9, 1971 +	7.32						

(C-2-6)36UCC-1
 LSD 4373.70 FT ABOVE MSL.
 HIGHEST WATER LEVEL 85.57 BELOW LSD, JUNE 10, 1974, JUNE 15, 1974.
 LOWEST WATER LEVEL 98.00 BELOW LSD, SEP. 5, 1977.
 RECORDS AVAILABLE: 1937, 1940-78.

15	92.38	91.88	91.68	90.75	90.65	89.75	.....	91.88	.....	92.78	93.15	.....
20	.....	91.87	90.89	90.56	89.75	87.77	.....	.....	.....	94.87	.....	.....
25	92.32	92.07	90.88	90.45	89.61	87.64	.....	.....	.....	94.46	.....	.....
EOM	92.23	91.42	90.71	90.39	89.24	87.48	82.90	.....	92.55	92.54	94.04	91.76

1965

5	.....	90.19	89.70	88.89	88.81	87.44	86.89	89.32	90.75	90.15	89.60	89.01
10	.....	90.12	89.60	88.82	88.60	87.34	87.05	89.74	90.91	90.09	89.50	88.97
15	.....	90.05	89.43	88.92	88.40	87.06	87.24	89.85	91.04	89.94	89.42	88.91
20	.....	89.90	89.21	88.94	88.22	86.72	87.37	90.04	90.83	89.87	89.33	88.87
25	.....	89.70	89.01	88.93	87.94	86.75	87.39	90.21	90.43	89.81	89.20	88.74
EOM	90.60E	89.76	88.94	88.85	87.54	86.67	86.91	90.42	90.25	89.70	89.14	88.80

1966

5	88.77	.....	88.16	88.05	88.60	.....	93.52	95.59	95.50	97.72	.....	.....
10	88.64	.....	88.02	87.96	88.77	91.74	93.80	95.94	97.35	97.70	.....	.....
15	88.66	88.32	87.93	88.17	89.03	.....	94.29	96.09	97.44	95.38	.....	94.23
20	88.64	88.31	87.90	.....	90.21	.....	94.86	96.40	97.54	95.09	.....	.....
25	88.65	88.18	87.87	.....	91.24	92.78	95.34	96.76	97.84	94.92	.....	.....
EOM	.....	88.14	87.89	88.43	91.39	93.33	95.49	96.85	.....	93.75	.....	92.80

1967

5	.....	.....	92.11	.....	93.40	.....	89.77	93.44	95.40	.....	93.53	92.45
10	.....	.....	.....	92.42	93.92	.....	89.83	94.05	95.50	.....	93.30	.....
15	.....	.....	.....	92.79	93.24	.....	90.09	94.72	95.50	94.48	93.24	.....
20	.....	.....	92.01	93.21	93.12	.....	90.74	95.27	95.63	94.25	92.99	.....
25	.....	.....	91.92	93.34	92.56	.....	90.93	95.60	95.57	93.93	92.82	.....
EOM	92.80E	.....	91.62	93.73	92.37	89.92	91.84	95.13	95.25	93.70	92.64	.....

1968

5	92.03	.....	91.00	89.45	89.42	89.10	89.74	92.82	94.41	94.70	92.78	92.02
10	.....	91.52	.....	.....	89.93	88.80	90.46	93.03	94.60	94.20	92.50	91.92
15	.....	.....	.....	.....	89.93	88.65	90.97	93.08	94.75	93.91	.....	91.85
20	.....	.....	90.92	.....	89.70	88.43	91.67	93.37	.....	93.63	92.26	91.78
25	.....	.....	90.79	.....	89.53	88.70	91.91	93.63	95.05	93.40	92.17	91.63
EOM	.....	.....	.....	.....	89.47	89.08	92.50	94.08	95.21	93.10	92.01	91.60

1969

5	91.47	91.08	90.55	89.64	88.23	87.14	87.75	89.93	92.10	.....	91.90	90.85
10	91.42	91.18	90.52	89.38	87.86	87.12	87.30	90.27	92.49	93.54	91.58	90.77
15	91.34	90.99	90.46	88.92	87.60	87.77	87.71	90.59	92.88	93.43	91.25	90.75
20	91.23	90.85	90.32	88.46	87.33	87.89	88.08	91.00	93.01	92.85	91.12	90.54
25	91.16	90.74	90.23	.....	87.10	88.14	.....	.....	93.19	92.53	91.02	90.50
EOM	91.16	90.68	89.95	.....	86.94	87.54	87.47	.....	93.42	92.23	90.90	90.34

1970

5	90.33	89.55	.....	89.31	91.33	89.65	89.82	92.29	94.01	94.65	93.20	92.15
10	90.04	89.50	.....	89.70	91.18	89.46	89.56	92.58	94.15	94.86	92.95	91.94
15	89.91	89.53	89.13	90.14	90.79	88.92	90.24	93.00	94.31	94.94	92.74	91.78
20	89.85	89.54	89.05	90.56	90.26	88.78	90.74	93.55	94.39	94.42	92.50	91.55

1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982
EOM	89.50	89.35	88.92	91.22	89.65	88.81	91.01	91.77	92.76	93.85	92.23	91.31
1971												
5	.....	89.07	88.87	88.78	88.00	86.28	88.40	90.05	91.84	92.33	90.55	89.30
10	.....	88.88	88.93	88.79	87.79	85.96	88.80	90.25	91.87	92.34	90.33	89.24
15	90.96	88.75	88.98	88.74	87.54	85.68	87.64	90.77	92.00	92.32	90.15	89.23
20	90.81	88.77	88.89	88.60	87.24	85.01	88.32	91.16	92.03	91.93	89.97	89.19
25	90.66	88.71	88.81	88.44	87.04	85.06	88.93	91.63	92.10	91.45	89.79	89.04
EOM	89.78	88.80	88.77	88.34	86.73	85.28	88.57	91.84	92.25	90.95	89.57	89.01
1972												
5	88.87	88.07	87.61	87.19	86.64	85.83	88.45	91.35	93.11	93.61	.....	91.18
10	88.71	88.09	87.50	87.17	86.63	85.82	88.95	91.81	.....	93.58	.....	90.95
15	88.54	87.97	87.52	87.12	86.34	85.91	87.45	92.22	.....	93.71	92.05	90.77
20	88.41	87.89	87.40	86.97	86.39	85.57	90.00	92.45	.....	93.78	91.80	90.62
25	88.21	87.76	87.29	86.72	86.16	87.32	90.48	92.56	93.52	93.74	91.63	90.57
EOM	88.07	87.64	87.40	86.72	85.93	87.88	91.01	92.43	93.56	93.68	91.40	90.43
1973												
5	90.35	89.42	88.95	87.88	87.47	85.75	88.49	89.23	91.22	91.55	89.64	89.16
10	90.25	89.24	88.74	87.82	87.16	85.80	87.14	89.54	91.40	90.95	89.58	89.05
15	90.07	89.20	88.69	87.83	86.98	85.88	87.68	89.87	91.29	90.54	89.47	88.95
20	89.95	89.16	88.39	87.84	86.70	85.90	88.10	90.20	91.46	90.22	89.30	88.82
25	89.77	89.12	88.50	87.82	86.42	85.90	88.47	90.53	91.67	90.00	89.20	88.63
EOM	89.50	89.04	88.02	87.68	85.87	85.02	88.89	91.02	91.58	89.71	89.24	88.55
1974												
5	.....	87.85	87.39	87.02	86.39	85.71	87.10	90.06	92.50	93.87	94.08	91.58
10	88.33	87.78	87.40	87.08	86.13	85.57	87.76	90.39	92.81	93.90	93.42	91.33
15	88.23	87.68	87.35	86.93	86.12	85.57	88.25	90.62	93.10	94.08	93.01	91.18
20	88.08	87.62	87.29	86.82	85.98	85.74	88.75	91.29	93.30	94.17	92.72	91.04
25	87.99	87.53	87.13	86.57	85.93	85.67	88.12	91.67	93.60	94.24	92.10	90.95
EOM	87.92	87.44	87.07	86.50	85.87	85.48	88.75	92.13	93.89	94.24	91.78	90.94
1975												
5	90.82	90.40	90.01	89.43	88.95	88.26	87.06	88.39	91.65	93.10	90.92	90.12
10	90.73	90.24	89.95	89.29	88.98	87.96	87.12	88.93	92.02	92.93	90.95	89.87
15	90.72	90.24	89.93	89.14	88.77	87.68	87.12	89.68	92.17	92.50	90.91	89.80
20	90.58	90.12	89.87	89.15	88.74	87.20	87.45	90.29	92.44	92.17	90.88	89.71
25	90.49	90.15	89.67	89.08	88.91	88.90	87.71	90.63	92.70	91.63	90.63	89.66
EOM	90.43	90.12	89.57	89.08	88.59	88.93	88.22	91.13	92.94	91.27	90.31	89.54
1976												
5	89.45	88.99	88.56	88.15	88.20	89.30	91.08	93.37	95.12	94.34	93.50	92.29
10	89.46	88.98	88.29	88.10	88.25	89.19	91.61	93.67	94.59	94.16	93.17	92.22
15	89.34	88.87	88.33	88.10	88.30	89.04	92.14	93.96	94.60	94.07	92.95	92.11
20	89.27	88.85	88.20	88.05	88.40	89.13	92.46	94.16	94.54	94.00	92.70	92.04
25	89.13	88.74	88.20	88.04	88.50	89.93	92.46	94.40	94.52	93.91	92.48	91.99
EOM	89.07	88.53	88.15	88.10	88.90	90.50	92.46	94.81	94.40	93.82	92.40	91.88
1977												
5	91.83	91.45	91.17	90.78	92.22	93.71	95.70	97.44	98.50	97.17	96.07	94.85
10	91.78	91.43	91.12	90.88	92.26	94.05	96.10	97.78	98.59	96.95	95.91	94.75

15	91.78	91.32	91.05	90.99	92.34	94.40	95.45	96.06	96.47	96.81	95.51	94.60
20	91.74	91.23	90.88	91.12	92.62	94.74	95.42	96.24	97.23	96.72	95.47	94.52
25	91.66	91.22	90.71	91.32	92.45	93.07	93.75	94.46	97.63	96.61	95.17	94.47
EOM	91.54	91.13	90.64	91.54	93.17	95.42	97.17	98.55	97.41	96.34	94.96	94.35

1978

5	94.16	93.60	92.98	92.74	92.25	91.93	93.13	96.24	97.60	.....	.....	.....
10	94.04	93.52	92.87	92.73	92.06	92.04	93.74	96.83	97.50	.....	.....	.....
15	93.98	93.40	92.86	92.58	92.04	92.18	94.35	97.00	97.50	.....	.....	.....
20	93.90	93.40	92.75	92.43	91.92	92.20	94.85	97.20	97.40	.....	.....	.....
25	93.80	93.39	92.78	92.35	91.96	92.40	95.30	97.40	97.10	.....	.....	.....
EOM	93.73	93.30	92.74	92.34	91.93	92.50	95.77	97.70	97.60	.....	.....	.....

(C-3-4) 8AAA-1
 LSD 4550 FT ABOVE MSL.
 HIGHEST WATER LEVEL 164.09 BELOW LSD, MAR. 31, 1977
 LOWEST WATER LEVEL 169.08 BELOW LSD, OCT. 7, 1977
 RECORDS AVAILABLE: 1977-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 31, 1977	164.09	APR. 4, 1977	164.17	OCT. 7, 1977	169.08	MAR. 7, 1978	166.97

(C-3-4) 9AAA-1
 LSD 4596 FT ABOVE MSL.
 HIGHEST WATER LEVEL 212.50 BELOW LSD, APR. 15, 1977.
 LOWEST WATER LEVEL 222.01 BELOW LSD, SEP. 15, 1978.
 RECORDS AVAILABLE: 1977-78.

1977

DAY	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
5				212.72	213.37	214.45	215.61	216.48	217.78	217.77	217.86E	217.19
10				212.71	213.79	214.50	215.94	216.71	218.01	217.87E	217.74	217.10
15				212.50	214.04	214.65E	216.23	216.94	217.97	217.98E	217.58E	216.85
20				212.51	214.24	214.80E	216.43	217.25	217.99	217.98E	217.42	217.04
25				212.69	214.22	214.96	216.52	217.45	217.93	217.97E	217.30	216.88
EOM			212.53	213.01	214.36	215.26	216.50	217.57	217.89	217.97E	217.25E	216.86

1978

5	216.73	216.45	216.22	216.08	216.06	217.12	219.36	220.80	221.71	221.60	221.33E	220.51
10	216.68	216.32	216.26	216.02E	216.06	217.50E	219.67	221.02	221.86	221.67	221.25	220.55
15	216.53	216.37	216.36	215.96	216.06	217.89	219.94	221.25	222.01	221.67	221.17	220.43
20	216.63	216.45	216.23	215.88	216.32	218.24	220.18	221.44	221.94	221.59E	220.96	220.37
25	216.58	216.34	216.24	215.90	216.51	218.60	220.38	221.54	221.71	221.50E	220.78	220.27
EOM	216.49	216.25	216.08	215.99	216.84	218.98	220.63	221.64	221.58	221.42E	220.69	220.13

(C-3-4) 13ABR-1
 LSD 4990 FT ABOVE MSL.
 HIGHEST WATER LEVEL 576.44 BELOW LSD, APR. 13, 1977.
 LOWEST WATER LEVEL 585.10 BELOW LSD, MAR. 21, 1978.
 RECORDS AVAILABLE: 1977-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
APR. 13, 1977	576.44	AUG. 12, 1977	580.40	DEC. 14, 1977	583.41	MAR. 21, 1978	585.10
MAY 11	576.60	SEP. 13	581.40	JAN. 10, 1978	583.86	APR. 13	584.60
JUNE 13	577.07	OCT. 7	582.31	FEB. 13	584.96	MAY 11	584.85
JULY 12	578.46	NOV. 10	583.09				

LSU 4990 FT ABOVE MSL.
 HIGHEST WATER LEVEL 534.07 BELOW LSU, JUNE 22, 1977.
 LOWEST WATER LEVEL 540.90 BELOW LSU, SEP. 6, 1976.
 RECORDS AVAILABLE: 1977-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JUNE 22, 1977	534.07	OCT. 7, 1977	537.25	FEB. 13, 1978	538.72	MAY 11, 1978	538.84
JULY 12	534.39	NOV. 10	537.91	MAR. 21	538.71	JUNE 8	539.17
AUG. 12	535.46	DEC. 14	537.95	APR. 12	538.81	SEP. 6	540.90
SEP. 13	536.48	JAN. 10, 1978	538.09				

(C-3-4)16AAA-1
 LSU 4742 FT ABOVE MSL.
 HIGHEST WATER LEVEL 357.16 BELOW LSU, APR. 13, 1977.
 LOWEST WATER LEVEL 365.22 BELOW LSU, SEP. 6, 1976.
 RECORDS AVAILABLE: 1977-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 28, 1977	358.29	JULY 12, 1977	359.58	DEC. 13, 1977	361.77	APR. 13, 1978	361.17
APR. 13	357.16	AUG. 12	360.49	FEB. 13, 1978	361.20	MAY 11	360.96
MAY 11	357.83	SEP. 13	357.18	MAR. 14	360.93	SEP. 6	365.22
JUNE 13	358.58	OCT. 7	361.93				

(C-3-4)17ACC-1
 LSU 4691 FT ABOVE MSL.
 HIGHEST WATER LEVEL 315.87 BELOW LSU, APR. 20, 1977.
 LOWEST WATER LEVEL 323.63 BELOW LSU, SEP. 6, 1976.
 RECORDS AVAILABLE: 1977-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
APR. 20, 1977	315.87	AUG. 12, 1977	320.68	DEC. 13, 1977	320.20	APR. 13, 1978	318.48
MAY 11	316.52	SEP. 9	320.36	JAN. 10, 1978	319.61	MAY 10	318.58
JUNE 13	317.21	OCT. 7	320.75	FEB. 13	319.13	JUNE 8	319.56
JULY 12	318.36	NOV. 10	320.73	MAR. 21	318.68	SEP. 6	323.63

(C-3-4)26U8D-1
 LSU 5409 FT ABOVE MSL.
 HIGHEST WATER LEVEL 488.79 BELOW LSU, JAN. 10, 1978.
 LOWEST WATER LEVEL 489.06 BELOW LSU, AUG. 12, 1977.
 RECORDS AVAILABLE: 1977-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
APR. 7, 1977	489.03	AUG. 12, 1977	489.06	NOV. 10, 1977	489.12	JAN. 10, 1978	488.79
JUNE 13	488.93	SEP. 13	489.01	DEC. 13	489.05	FEB. 13	489.03
JULY 12	488.91	OCT. 7	489.17				

(C-3-4)300AC-1
 LSD 4857 FT ABOVE MSL.
 HIGHEST WATER LEVEL 379.75 BELOW LSD, APR. 24, 1977
 LOWEST WATER LEVEL 387.54 BELOW LSD, MAR. 12, 1970
 RECORDS AVAILABLE: 1970, 1973, 1977-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 12, 1970	387.54	MAR. 25, 1973	382.85	APR. 24, 1977	379.75	MAR. 1, 1978	382.12

(C-3-4)320CC-1
 LSD 4977 FT ABOVE MSL.
 HIGHEST WATER LEVEL 494.50 BELOW LSD, MAR. 24, 1977,
 LOWEST WATER LEVEL 516.07 BELOW LSD, SEP. 13, 1977.
 RECORDS AVAILABLE: 1977-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 24, 1977	494.50	JULY 12, 1977	506.04	OCT. 7, 1977	515.03	JAN. 10, 1978	498.98
APR. 21	494.75	AUG. 12	496.22	NOV. 10	508.92	FEB. 13	497.40
MAY 10	494.90	SEP. 13	516.07	DEC. 13	497.50	MAR. 14	497.60
JUNE 10	501.40						

(C-3-5) 1ACA-1
 LSD 4394 FT ABOVE MSL.
 HIGHEST WATER LEVEL 49.50 BELOW LSD, APR. 12, 1978.
 LOWEST WATER LEVEL 66.22 BELOW LSD, SEP. 7, 1978.
 RECORDS AVAILABLE: 1977-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
JUNE 28, 1977	65.65	OCT. 28, 1977	58.84	JAN. 9, 1978	51.09	MAY 9, 1978	51.60
AUG. 11	62.61	NOV. 9	53.28	MAR. 21	50.29	JUNE 8	58.85
SEP. 13	66.11	DEC. 12	51.66	APR. 12	49.50	SEP. 7	66.22
OCT. 6	59.30						

LSD 4312.20 FT ABOVE MSL.
 HIGHEST WATER LEVEL 18.68 BELOW LSD, DEC. 31, 1977.
 LOWEST WATER LEVEL 21.70 BELOW LSD, SEP. 8, 1978.
 RECORDS AVAILABLE: 1940-42, 1944-46, 1957, 1959-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 16, 1964	18.73	MAR. 12, 1970	18.60	MAR. 6, 1975	18.68	DEC. 12, 1977	19.40
MAR. 4, 1965	19.39	MAR. 10, 1971	18.16	MAR. 9, 1976	17.18	JAN. 9, 1978	19.17
MAR. 2, 1966	17.90	MAR. 8, 1972	17.97	MAR. 8, 1977	17.39	MAR. 9	18.73
MAR. 8, 1967	19.04	MAR. 9, 1973	18.25	APR. 14	18.70	APR. 12	17.89
MAR. 5, 1968	18.83	MAR. 12, 1974	18.25	NOV. 7	19.97	SEP. 8	21.70
MAR. 5, 1969	19.13						

(C-3-5) REC-1
 LSD 4433 FT ABOVE MSL.
 HIGHEST WATER LEVEL 136.57 BELOW LSD, MAR. 12, 1974.
 LOWEST WATER LEVEL 148.50 BELOW LSD, OCT. 18, 1961.
 RECORDS AVAILABLE: 1960-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 18, 1964	143.25	MAR. 15, 1968	141.68	MAR. 8, 1972	138.03	MAR. 9, 1976	137.03
MAR. 9, 1965	143.50	MAR. 5, 1969	141.51	MAR. 9, 1973	139.14	MAR. 8, 1977	139.82
MAR. 2, 1966	140.00	MAR. 12, 1970	140.31	MAR. 12, 1974	136.57	MAR. 9, 1978	143.13
MAR. 8, 1967	144.00	MAR. 9, 1971	139.96	MAR. 6, 1975	139.51	APR. 11	142.79
MAR. 5, 1968	142.50						

(C-3-5) TOLL-1
 LSD 4508 FT ABOVE MSL.
 HIGHEST WATER LEVEL 202.90 BELOW LSD, MAR. 20, 1958.
 LOWEST WATER LEVEL 226.90 BELOW LSD, OCT. 6, 1977.
 RECORDS AVAILABLE: 1958-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 18, 1964	212.00	MAR. 8, 1967	212.13	MAR. 9, 1971	210.70	SEP. 8, 1976	A
NOV. 6	213.00	SEP. 14	219.92	MAR. 8, 1972	208.85	MAR. 8, 1977	209.70
MAR. 9, 1965	210.55	MAR. 5, 1968	211.42	MAR. 9, 1973	209.70	OCT. 6	226.90
OCT. 27	210.82	MAR. 6, 1969	211.54	MAR. 12, 1974	207.71	MAR. 9, 1978	214.76
MAR. 2, 1966	209.20	MAR. 12, 1970	210.61	MAR. 6, 1975	209.79	APR. 11	212.05
SEP. 12	215.06	SEP. 17	215.83	MAR. 9, 1976	207.95		

A = WELL BEING PUMPED

(C-3-5) 220AH-1
 LSD 4553 FT ABOVE MSL.
 HIGHEST WATER LEVEL 239.60 BELOW LSD, MAY 3, 1978
 LOWEST WATER LEVEL 241.53 BELOW LSD, SEP. 21, 1978.
 RECORDS AVAILABLE: 1978-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 10, 1978	240.05	MAY 3, 1978	239.60	JUNE 2, 1978	240.18	SEP. 21, 1978	241.53
MAR. 30	239.90						

(C-3-6) 18DR-1
 LSD 4454 FT ABOVE MSL.
 HIGHEST WATER LEVEL 157.60 BELOW LSD, MAR. 4, 1958,
 LOWEST WATER LEVEL 172.79 BELOW LSD, OCT. 18, 1961.
 RECORDS AVAILABLE: 1958-78.

DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL	DATE	WATER LEVEL
MAR. 16, 1964	164.56	MAR. 6, 1968	164.75	MAR. 8, 1972	160.97	MAR. 10, 1976	161.02
MAR. 9, 1965	166.55	MAR. 5, 1969	164.56	MAR. 9, 1973	162.03	MAR. 8, 1977	164.11
MAR. 2, 1966	161.91	MAR. 12, 1970	163.32	MAR. 12, 1974	161.44	MAR. 5, 1978	166.06
MAR. 9, 1967	165.83	MAR. 9, 1971	162.69	MAR. 6, 1975	168.01		

LOCATION	SITE	DATE OF SAMPLE	DEPTH OF WELL (FT)	TEMPER- ATURE (DEG C)	SILICA, DIS- SOLVED (MG/L AS SI02)	IRON, DIS- SOLVED (UG/L AS FE)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)
(C- 1- 4)26DDD- 1	GW	78-06-23	227	--	11	--	--	99	57	570
(C- 1- 5)31DCB- 1	GW	77-09-08	9.0	23.0	--	--	--	--	--	--
(C- 1- 5)33DBC- 1	GW	77-09-08	9.0	21.0	--	--	--	--	--	--
(C- 1- 6)22DDC- 1	GW	78-06-22	630	--	49	--	--	3400	220	1300
(C- 1- 6)27AAD- 1	GW	77-09-08	9.0	20.5	--	--	--	--	--	--
(C- 1- 6)29DDD- 1	GW	77-09-19	8.0	18.0	--	--	--	--	--	--
(C- 2- 4) 2ABA- 1	GW	78-06-13	232	16.5	18	--	--	23	4.1	340
(C- 2- 4) 2BAA- 3	GW	78-05-31	451	17.0	--	--	--	--	--	--
(C- 2- 4) 3CBC- 1	GW	77-09-08	9.0	20.0	--	--	--	--	--	--
(C- 2- 4) 8ABD- 1	GW	77-09-08	9.0	14.5	--	--	--	--	--	--
(C- 2- 4) 8CDC- 1	GW	76-09-08	--	14.5	--	--	--	--	--	--
	GW	77-07-11	--	14.5	--	--	--	--	--	--
	GW	78-06-14	345	14.0	50	--	--	46	42	180
(C- 2- 4) 8CDC- 2	GW	77-09-08	9.0	17.0	--	--	--	--	--	--
(C- 2- 4)10BCA-S1	SP	78-06-28	--	16.5	15	--	--	86	36	530
(C- 2- 4)15CAC-S1	SP	78-06-27	--	17.0	18	--	--	110	50	320
(C- 2- 4)17DAD- 1	GW	76-09-08	--	17.0	--	--	--	--	--	--
	GW	77-06-10	--	15.0	--	--	--	--	--	--
	GW	77-07-11	--	15.5	--	--	--	--	--	--
	GW	78-05-11	--	16.5	--	--	--	--	--	--
(C- 2- 4)17DCD- 1	GW	78-05-08	--	14.5	--	--	--	--	--	--
	GW	78-06-19	--	14.5	48	--	--	46	26	200
(C- 2- 4)198DD- 1	GW	76-09-08	--	13.0	--	--	--	--	--	--
	GW	78-05-11	--	13.0	--	--	--	--	--	--
	GW	78-06-19	450	13.0	50	--	--	43	29	140
(C- 2- 4)19DBB- 1	GW	77-10-14	9.0	--	--	--	--	--	--	--
(C- 2- 4)20AAD- 1	GW	78-07-27	691	17.0	18	--	--	41	23	230
(C- 2- 4)20CDD- 1	GW	77-09-02	9.0	16.5	--	--	--	--	--	--
(C- 2- 4)20DDC- 1	GW	78-05-04	200	12.0	--	--	--	--	--	--
(C- 2- 4)218DD- 1	GW	77-09-02	17	13.0	--	--	--	--	--	--
(C- 2- 4)22ADA- 1	GW	78-06-13	262	--	22	--	--	76	35	58
(C- 2- 4)22CCA- 3	GW	77-05-04	--	--	--	--	--	--	--	--
	GW	78-06-13	320	17.0	16	--	--	68	32	42
(C- 2- 4)22CCB- 4	GW	66-06-27	96	15.5	--	--	--	--	--	--
	GW	69-09-03	--	12.0	--	--	--	--	--	--
	GW	70-07-12	--	13.0	--	--	--	--	--	--
	GW	72-07-18	--	13.0	22	--	--	200	83	260
	GW	73-07-03	--	13.0	21	--	--	170	79	230
	GW	75-06-24	--	13.0	20	--	--	170	73	230
	GW	76-06-11	--	13.0	19	20	0	170	74	220

SOLIDS, SUM OF CONSTI- TUEENTS, DIS- SOLVED (MG/L)	POTAS- SIMU, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HCO3)	CAR- BONATE (MG/L AS CO3)	ALKA- LINITY (MG/L AS CACO3)	SULFATE DIS- (MG/L AS SO4)	CHLO- RIDE, DIS- (MG/L AS CL)	FLUO- RIDE, DIS- (MG/L AS F)	BORON, DIS- (UG/L AS B)	SUM OF CONSTI- TUEENTS, DIS- SOLVED (MG/L)	LOCATION	DATE OF SAMPLE	78-06-23	29	260	210	55	1100	.4	280	2050	(C- 1- 4) 26DD- 1
												77-09-08	--	--	--	--	--	--	--	--	(C- 1- 5) 31DCB- 1
												77-09-08	--	--	--	--	--	--	--	--	(C- 1- 6) 22DDC- 1
												78-06-22	250	62	51	790	11000	.0	670	17000	(C- 1- 6) 27AAD- 1
												77-09-19	--	--	--	--	--	--	--	--	(C- 1- 6) 29DD- 1
												78-06-13	5.7	180	150	42	360	.8	110	882	(C- 2- 4) 28AA- 1
												78-05-31	--	--	--	--	--	--	--	--	(C- 2- 4) 28AA- 3
												77-09-08	--	--	--	--	--	--	--	--	(C- 2- 4) 3CBC- 1
												77-09-08	--	--	--	--	--	--	--	--	(C- 2- 4) 8ABD- 1
												76-09-08	--	--	--	--	--	--	--	--	(C- 2- 4) 8CDC- 1
												77-07-11	--	--	--	--	--	--	--	--	(C- 2- 4) ACDC- 2
												78-06-14	3.8	190	160	5.9	350	.6	130	772	(C- 2- 4) 10BCA-S1
												78-09-08	--	--	--	--	--	--	--	--	(C- 2- 4) 15CAC-S1
												78-06-28	15	280	230	110	820	.6	190	1750	(C- 2- 4) 17DAD- 1
												76-09-08	11	250	210	290	460	.2	210	1380	(C- 2- 4) 198DD- 1
												77-06-10	--	--	--	--	--	--	--	--	(C- 2- 4) 17DCD- 1
												77-07-11	--	--	--	--	--	--	--	--	(C- 2- 4) 198DD- 1
												76-09-08	--	--	--	--	--	--	--	--	(C- 2- 4) 20ADD- 1
												78-06-19	7.4	250	210	27	290	.3	60	768	(C- 2- 4) 20ADD- 1
												78-05-11	--	--	--	--	--	--	--	--	(C- 2- 4) 20ADD- 1
												78-06-19	6.1	240	200	32	320	.2	90	789	(C- 2- 4) 20AAD- 1
												78-07-27	--	--	--	--	--	--	--	--	(C- 2- 4) 21BDD- 1
												77-10-14	--	--	--	--	--	--	--	--	(C- 2- 4) 22ADA- 1
												78-06-13	3.3	290	240	43	120	.2	50	501	(C- 2- 4) 22CCA- 3
												77-05-04	--	--	--	--	--	--	--	--	(C- 2- 4) 22CCB- 4
												78-06-13	1.8	290	240	43	67	.1	40	413	(C- 2- 4) 22CCB- 4
												66-06-27	--	288	236	--	275	--	--	--	(C- 2- 4) 22CCB- 4
												69-09-03	--	307	252	--	248	--	--	--	(C- 2- 4) 22CCB- 4
												70-07-12	--	296	243	610	500	--	--	--	(C- 2- 4) 22CCB- 4
												72-07-18	8.6	310	254	560	330	.1	320	1540	(C- 2- 4) 22CCB- 4
												75-06-24	9.0	307	252	510	300	.2	310	1460	(C- 2- 4) 22CCB- 4
												76-06-11	8.8	314	258	500	300	.2	310	1460	(C- 2- 4) 22CCB- 4

LOCATION	DATE OF SAMPLE	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)	SODIUM PERCENT	SODIUM AD- SORP- TION RATIO	SPF- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)
(C- 1- 4) 26DDD- 1	78-06-23	480	270	71	11	3250	--
(C- 1- 5) 31DCB- 1	77-09-08	--	--	--	--	90000	--
(C- 1- 5) 33DBC- 1	77-09-08	--	--	--	--	96000	--
(C- 1- 6) 22DDC- 1	78-06-22	9400	9300	23	5.8	39000	--
(C- 1- 6) 27AAD- 1	77-09-08	--	--	--	--	57000	--
(C- 1- 6) 29DDD- 1	77-09-19	--	--	--	--	55000	--
(C- 2- 4) 2ABA- 1	78-06-13	74	0	90	17	1490	--
(C- 2- 4) 2BAA- 3	78-05-31	--	--	--	--	2200	--
(C- 2- 4) 3CBC- 1	77-09-08	--	--	--	--	17500	--
(C- 2- 4) 8ABD- 1	77-09-08	--	--	--	--	44000	--
(C- 2- 4) 8CDC- 1	76-09-08	--	--	--	--	1350	--
	77-07-11	--	--	--	--	1300	--
	78-06-14	290	130	57	4.6	1225	--
(C- 2- 4) 8CDC- 2	77-09-08	--	--	--	--	3000	--
(C- 2- 4) 10BCA-S1	78-06-28	360	130	75	12	3500	--
(C- 2- 4) 15CAC-S1	78-06-27	480	280	58	6.4	2275	--
(C- 2- 4) 17DAD- 1	76-09-08	--	--	--	--	1210	--
	77-06-10	--	--	--	--	1020	--
	77-07-11	--	--	--	--	960	--
	78-05-11	--	--	--	--	1160	--
(C- 2- 4) 17DCD- 1	78-05-08	--	--	--	--	1200	--
	78-06-19	220	17	65	5.8	1160	--
(C- 2- 4) 19BDD- 1	76-09-08	--	--	--	--	1050	--
	78-05-11	--	--	--	--	1000	--
	78-06-19	230	46	57	4.0	975	--
(C- 2- 4) 190BB- 1	77-10-14	--	--	--	--	1600	--
(C- 2- 4) 20AAD- 1	78-07-27	200	0	71	7.1	1220	--
(C- 2- 4) 20CDD- 1	77-09-02	--	--	--	--	7000	--
(C- 2- 4) 20DDC- 1	78-05-04	--	--	--	--	890	--
(C- 2- 4) 21BDD- 1	77-09-02	--	--	--	--	2250	--
(C- 2- 4) 22ADA- 1	78-06-13	330	96	27	1.4	790	--
(C- 2- 4) 22CCA- 3	77-05-04	--	--	--	--	660	--
	78-06-13	300	64	23	1.1	660	--
(C- 2- 4) 22CCB- 4	66-06-27	--	--	--	--	1730	7.8
	69-09-03	568	316	--	--	1700	7.9
	70-07-12	--	--	--	--	2840	--
	72-07-18	840	600	40	3.9	2610	7.2
	73-07-03	750	500	40	3.7	2400	7.4
	75-06-24	730	470	40	3.7	2200	--
	76-06-11	730	470	39	3.5	2100	7.4

LOCATION	SITE	DATE OF SAMPLE	DEPTH OF WELL (FT)	TEMPER- ATURE (DEG C)	SILICA, DIS- SOLVED (MG/L AS SI02)	IRON, DIS- SOLVED (UG/L AS FE)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)
(C- 2- 4)23CB8- 1	GW	78-06-15	225	--	20	--	--	89	36	62
(C- 2- 4)23CB8- 1	GW	78-06-21	241	--	17	--	--	66	33	50
(C- 2- 4)26BCB- 1	GW	78-06-13	161	16.5	23	--	--	120	54	89
(C- 2- 4)26CCC- 1	GW	77-05-04	243	16.5	--	--	--	--	--	--
(C- 2- 4)26CDC- 1	GW	78-06-27	340	--	17	--	--	65	27	40
(C- 2- 4)26DDD-S1	SP	78-06-27	--	16.0	10	--	--	71	26	30
(C- 2- 4)27BBA- 1	GW	77-05-03	105	13.5	--	--	--	--	--	--
(C- 2- 4)27BDC- 1	GW	77-07-08	475	16.0	--	--	--	--	--	--
	GW	78-06-27	--	15.0	16	--	--	68	31	42
	GW	78-07-14	--	15.0	--	--	--	--	--	--
	GW	78-07-27	--	15.5	--	--	--	--	--	--
(C- 2- 4)27CCA- 1	GW	77-05-03	140	13.5	--	--	--	--	--	--
(C- 2- 4)27CCA- 2	GW	77-05-03	145	14.5	--	--	--	--	--	--
(C- 2- 4)27CDC- 1	GW	77-04-28	--	14.5	--	--	--	--	--	--
	GW	77-08-03	--	14.0	--	--	--	--	--	--
	GW	78-06-13	220	13.5	16	--	--	110	45	130
	GW	78-07-06	--	14.0	--	--	--	--	--	--
(C- 2- 4)27DDD- 1	GW	78-06-21	270	--	21	--	--	88	42	78
(C- 2- 4)28AAB- 1	GW	77-05-04	173	14.0	--	--	--	--	--	--
(C- 2- 4)28AAC- 1	GW	77-05-03	--	13.5	--	--	--	--	--	--
	GW	77-07-01	--	14.5	--	--	--	--	--	--
	GW	78-06-13	182	12.5	13	--	--	68	24	49
	GW	78-07-13	--	14.5	--	--	--	--	--	--
(C- 2- 4)28ACD- 3	GW	76-09-07	--	13.5	--	--	--	--	--	--
	GW	77-05-03	--	13.5	--	--	--	--	--	--
	GW	78-07-25	190	13.5	13	--	--	66	25	50
(C- 2- 4)28BAD- 1	GW	77-09-02	5.0	17.0	--	--	--	--	--	--
(C- 2- 4)28BDC- 1	GW	76-09-07	368	14.5	--	--	--	--	--	--
(C- 2- 4)28BDD- 2	GW	77-05-03	--	14.0	--	--	--	--	--	--
	GW	78-05-04	--	13.0	--	--	--	--	--	--
	GW	78-06-19	--	13.0	11	--	--	60	19	58
(C- 2- 4)28CBC- 1	GW	77-07-01	--	16.0	--	--	--	--	--	--
	GW	78-07-14	421	14.5	--	--	--	--	--	--
(C- 2- 4)28CBD- 2	GW	77-07-01	--	15.5	--	--	--	--	--	--
	GW	78-07-06	503	15.0	--	--	--	--	--	--
(C- 2- 4)28CDD- 1	GW	77-06-30	191	15.5	--	--	--	--	--	--
(C- 2- 4)28DAB- 1	GW	77-07-15	--	14.5	--	--	--	--	--	--
	GW	78-07-14	178	14.5	--	--	--	--	--	--
(C- 2- 4)28DBA- 3	GW	78-06-01	165	13.0	--	--	--	--	--	--
(C- 2- 4)29ADC- 1	GW	76-09-07	150	13.5	--	--	--	--	--	--

[illegible]

LOCATION	DATE OF SAMPLE	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)	SODIUM PERCENT	SODIUM AD- SORP- TION RATIO	SPF- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)
(C- 2- 4)23BCB- 1	78-06-15	370	170	26	1.4	860	--
(C- 2- 4)23CBB- 1	78-06-21	300	63	26	1.3	750	--
(C- 2- 4)26BCB- 1	78-06-13	520	270	27	1.7	1250	--
(C- 2- 4)26CCC- 1	77-05-04	--	--	--	--	900	--
(C- 2- 4)26CDC- 1	78-06-27	270	27	24	1.1	650	--
(C- 2- 4)26DDD-S1	78-06-27	280	110	19	.8	600	--
(C- 2- 4)27BBA- 1	77-05-03	--	--	--	--	1900	--
(C- 2- 4)27BDC- 1	77-07-08	--	--	--	--	690	--
	78-06-27	300	84	23	1.1	700	--
	78-07-14	--	--	--	--	650	--
	78-07-27	--	--	--	--	650	--
(C- 2- 4)27CCA- 1	77-05-03	--	--	--	--	880	--
(C- 2- 4)27CCA- 2	77-05-03	--	--	--	--	1300	--
(C- 2- 4)27CDC- 1	77-04-28	--	--	--	--	1120	--
	77-08-03	--	--	--	--	1175	--
	78-06-13	460	210	38	2.6	1340	--
	78-07-06	--	--	--	--	1150	--
(C- 2- 4)27DDD- 1	78-06-21	390	170	30	1.7	1000	--
(C- 2- 4)28AAB- 1	77-05-04	--	--	--	--	820	--
(C- 2- 4)28AAC- 1	77-05-03	--	--	--	--	880	--
	77-07-01	--	--	--	--	1000	--
	78-06-13	270	55	28	1.3	680	--
	78-07-13	--	--	--	--	925	--
(C- 2- 4)28ACD- 3	76-09-07	--	--	--	--	650	--
	77-05-03	--	--	--	--	650	--
	78-07-25	270	63	29	1.3	680	--
(C- 2- 4)28BAD- 1	77-09-02	--	--	--	--	890	--
(C- 2- 4)28BDC- 1	76-09-07	--	--	--	--	850	--
(C- 2- 4)28BDD- 2	77-05-03	--	--	--	--	640	--
	78-05-04	--	--	--	--	650	--
	78-06-19	230	39	35	1.7	700	8.0
(C- 2- 4)28CBC- 1	77-07-01	--	--	--	--	1400	--
	78-07-14	--	--	--	--	1200	--
(C- 2- 4)28CBD- 2	77-07-01	--	--	--	--	1025	--
	78-07-06	--	--	--	--	1000	--
(C- 2- 4)28CDD- 1	77-06-30	--	--	--	--	810	--
(C- 2- 4)28DAB- 1	77-07-15	--	--	--	--	725	--
	78-07-14	--	--	--	--	710	--
(C- 2- 4)28DBA- 3	78-06-01	--	--	--	--	750	--
(C- 2- 4)29ADC- 1	76-09-07	--	--	--	--	1180	--

LOCATION	SITE	DATE OF SAMPLE	DEPTH OF WELL (FT)	TEMPER- ATURE (DEG C)	SILICA, DIS- SOLVED (MG/L AS SiO2)	IRON, DIS- SOLVED (UG/L AS FE)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)
(C- 2- 4)29ADC- 1	GW	77-08-01	--	13.5	--	--	--	--	--	--
	GW	78-05-04	--	12.5	--	--	--	--	--	--
	GW	78-06-20	--	13.5	18	--	--	46	18	190
(C- 2- 4)29BCC- 1	GW	76-09-07	--	13.0	--	--	--	--	--	--
	GW	77-06-13	--	13.0	--	--	--	--	--	--
	GW	78-05-08	--	12.5	--	--	--	--	--	--
	GW	78-07-25	300	14.0	21	--	--	44	20	160
(C- 2- 4)29CCD- 1	GW	76-06-17	462	15.0	--	--	--	--	--	--
(C- 2- 4)30CCC- 1	GW	77-09-08	9.0	14.0	--	--	--	--	--	--
(C- 2- 4)31AAD- 1	GW	78-05-03	206	14.0	--	--	--	--	--	--
(C- 2- 4)31ACC- 9	GW	78-07-25	200	16.5	15	--	--	58	19	130
(C- 2- 4)31ADA- 1	GW	76-09-07	200	16.0	--	--	--	--	--	--
	GW	78-05-03	--	15.5	--	--	--	--	--	--
	GW	78-06-19	--	15.5	17	--	--	61	20	110
(C- 2- 4)31ADD- 6	GW	76-06-22	271	16.0	--	--	--	--	--	--
	GW	77-07-15	--	16.5	--	--	--	--	--	--
	GW	78-07-11	--	17.0	--	--	--	--	--	--
(C- 2- 4)31BCB- 1	GW	76-09-08	--	17.0	--	--	--	--	--	--
	GW	78-06-21	343	--	18	--	--	69	24	120
(C- 2- 4)31BCD- 1	GW	77-07-06	--	18.0	--	--	--	--	--	--
	GW	78-07-10	--	18.0	--	--	--	--	--	--
(C- 2- 4)31CAA- 2	GW	78-05-03	183	15.5	--	--	--	--	--	--
(C- 2- 4)31CDA- 2	GW	77-06-08	--	18.5	--	--	--	--	--	--
	GW	78-07-10	500	17.5	--	--	--	--	--	--
(C- 2- 4)31DAD- 2	GW	76-06-22	--	17.5	--	--	--	--	--	--
	GW	77-06-08	--	17.0	--	--	--	--	--	--
	GW	77-07-15	--	17.0	--	--	--	--	--	--
	GW	78-07-11	--	17.0	--	--	--	--	--	--
	GW	78-07-25	480	16.5	15	--	--	59	20	120
(C- 2- 4)31DBC- 1	GW	77-07-06	--	16.5	--	--	--	--	--	--
	GW	78-07-11	221	17.0	--	--	--	--	--	--
(C- 2- 4)31DBD- 1	GW	77-07-15	300	17.0	--	--	--	--	--	--
	GW	78-07-11	--	17.0	--	--	--	--	--	--
(C- 2- 4)31DBD- 2	GW	78-05-17	183	15.0	--	--	--	--	--	--
(C- 2- 4)32BAC- 1	GW	77-07-05	450	17.0	--	--	--	--	--	--
	GW	78-07-11	--	16.0	--	--	--	--	--	--
(C- 2- 4)32B88- 1	GW	77-09-08	13	14.0	--	--	--	--	--	--
(C- 2- 4)32CAC- 1	GW	77-06-07	500	20.0	--	--	--	--	--	--
	GW	78-07-27	--	17.0	--	--	--	--	--	--
(C- 2- 4)32CBD- 1	GW	76-06-22	437	16.0	--	--	--	--	--	--

[illegible]

LOCATION	DATE OF SAMPLE	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)	SODIUM PERCENT	SODIUM AD- SORP- TION RATIO	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)
(C- 2- 4)29ADC- 1	77-08-01	--	--	--	--	1100	--
	78-05-04	--	--	--	--	1075	--
	78-06-20	190	0	68	6.0	1125	--
(C- 2- 4)29BCC- 1	76-09-07	--	--	--	--	1000	--
	77-06-13	--	--	--	--	1000	--
	78-05-08	--	--	--	--	990	--
	78-07-25	190	0	64	5.0	850	--
(C- 2- 4)29CCD- 1	76-06-17	--	--	--	--	1280	--
(C- 2- 4)30CCC- 1	77-09-08	--	--	--	--	2950	--
(C- 2- 4)31AAD- 1	78-05-03	--	--	--	--	700	--
(C- 2- 4)31ACC- 9	78-07-25	220	2	56	3.8	935	--
(C- 2- 4)31ADA- 1	76-09-07	--	--	--	--	910	--
	78-05-03	--	--	--	--	770	--
	78-06-19	230	13	50	3.1	940	--
(C- 2- 4)31ADD- 6	76-06-22	--	--	--	--	920	--
	77-07-15	--	--	--	--	800	--
	78-07-11	--	--	--	--	850	--
(C- 2- 4)31BCB- 1	76-09-08	--	--	--	--	1030	--
	78-06-21	270	50	49	3.2	960	--
(C- 2- 4)31BCD- 1	77-07-06	--	--	--	--	950	--
	78-07-10	--	--	--	--	950	--
(C- 2- 4)31CAA- 2	78-05-03	--	--	--	--	775	--
(C- 2- 4)31CDA- 2	77-06-08	--	--	--	--	1300	--
	78-07-10	--	--	--	--	1325	--
(C- 2- 4)31DAD- 2	76-06-22	--	--	--	--	950	--
	77-06-08	--	--	--	--	900	--
	77-07-15	--	--	--	--	925	--
	78-07-11	--	--	--	--	950	--
	78-07-25	230	8	53	3.4	910	--
(C- 2- 4)31DBC- 1	77-07-06	--	--	--	--	900	--
	78-07-11	--	--	--	--	920	--
(C- 2- 4)31DBD- 1	77-07-15	--	--	--	--	975	--
	78-07-11	--	--	--	--	975	--
(C- 2- 4)31DBD- 2	78-05-17	--	--	--	--	825	--
(C- 2- 4)32BAC- 1	77-07-05	--	--	--	--	1275	--
	78-07-11	--	--	--	--	1175	--
(C- 2- 4)32BBB- 1	77-09-08	--	--	--	--	3900	--
(C- 2- 4)32CAC- 1	77-06-07	--	--	--	--	850	--
	78-07-27	--	--	--	--	900	--
(C- 2- 4)32CBD- 1	76-06-22	--	--	--	--	950	--

LOCATION	SITE	DATE OF SAMPLE	DEPTH OF WELL (FT)	TEMPER- ATURE (DEG C)	SILICA, DIS- SOLVED (MG/L AS SI02)	IRON, DIS- SOLVED (UG/L AS FE)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)
(C- 2- 4)32CBD- 1	GW	77-06-07	--	17.5	--	--	--	--	--	--
	GW	78-07-14	--	--	--	--	--	--	--	--
(C- 2- 4)33AAB- 1	GW	77-05-09	--	--	--	--	--	--	--	--
	GW	77-06-03	--	17.0	--	--	--	--	--	--
	GW	78-06-29	403	15.0	13	--	--	59	19	63
	GW	78-07-10	--	15.5	--	--	--	--	--	--
(C- 2- 4)33ABB- 4	GW	78-06-01	80	13.0	--	--	--	--	--	--
(C- 2- 4)33ADD- 1	GW	76-06-22	--	14.0	--	--	--	--	--	--
	GW	77-05-09	--	14.0	--	--	--	--	--	--
	GW	77-06-03	--	15.0	--	--	--	--	--	--
	GW	78-06-13	160	--	13	--	--	81	27	49
	GW	78-07-13	--	15.0	--	--	--	--	--	--
(C- 2- 4)33BBB- 1	GW	77-06-06	--	16.0	--	--	--	--	--	--
	GW	78-07-25	277	14.5	13	--	--	54	19	210
(C- 2- 4)33BCB- 3	GW	77-06-06	--	16.0	--	--	--	--	--	--
	GW	77-06-06	--	16.0	--	--	--	--	--	--
	GW	78-07-25	--	14.5	13	--	--	52	17	160
	GW	78-07-26	--	14.5	--	--	--	--	--	--
(C- 2- 4)33BDD- 1	GW	77-06-30	--	14.5	--	--	--	--	--	--
	GW	78-06-20	421	--	14	--	--	55	20	90
	GW	78-07-06	--	--	--	--	--	--	--	--
(C- 2- 4)33DAC- 1	GW	77-07-01	155	15.0	--	--	--	--	--	--
	GW	78-07-13	--	15.5	--	--	--	--	--	--
(C- 2- 4)34ADC- 1	GW	77-05-09	303	15.0	--	--	--	--	--	--
	GW	77-07-05	--	14.5	--	--	--	--	--	--
	GW	78-07-13	--	14.5	--	--	--	--	--	--
(C- 2- 4)34BDD- 1	GW	77-05-09	215	14.0	--	--	--	--	--	--
	GW	78-06-27	--	--	15	--	--	110	43	76
(C- 2- 4)34BDD- 2	GW	77-05-09	254	14.5	--	--	--	--	--	--
	GW	77-06-02	--	15.0	--	--	--	--	--	--
	GW	78-07-13	--	13.5	--	--	--	--	--	--
(C- 2- 4)35CBC- 1	GW	76-06-22	--	14.5	--	--	--	--	--	--
	GW	77-05-09	--	15.0	--	--	--	--	--	--
	GW	77-06-06	--	16.0	--	--	--	--	--	--
	GW	78-06-27	--	14.0	17	--	--	77	34	77
	GW	78-07-13	--	14.5	--	--	--	--	--	--
	GW	78-08-09	304	14.5	19	--	--	75	35	72
(C- 2- 5) 5CCC- 2	GW	78-05-12	--	16.0	--	--	--	--	--	--
	GW	78-06-22	--	--	56	--	--	110	78	190
(C- 2- 5) 5DCD- 4	GW	78-05-12	--	15.0	--	--	--	--	--	--

[illegible]

LOCATION	DATE OF SAMPLE	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)	SODIUM PERCENT	SODIUM AD- SORP- TION RATIO	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)
(C- 2- 4) 32CBD- 1	77-06-07	--	--	--	--	925	--
	78-07-14	--	--	--	--	880	--
(C- 2- 4) 33AAB- 1	77-05-09	--	--	--	--	630	--
	77-06-03	--	--	--	--	525	--
	78-06-29	230	21	38	1.8	660	--
	78-07-10	--	--	--	--	540	--
(C- 2- 4) 33ABB- 4	78-06-01	--	--	--	--	760	--
(C- 2- 4) 33ADD- 1	76-06-22	--	--	--	--	730	--
	77-05-09	--	--	--	--	700	--
	77-06-03	--	--	--	--	600	--
	78-06-13	310	84	25	1.2	750	--
	78-07-13	--	--	--	--	700	--
(C- 2- 4) 33BBB- 1	77-06-06	--	--	--	--	1100	--
	78-07-25	210	0	68	6.3	1200	--
(C- 2- 4) 33BCB- 3	77-06-06	--	--	--	--	1100	--
	77-06-06	--	--	--	--	1100	--
	78-07-25	200	0	63	4.9	960	--
	78-07-26	--	--	--	--	950	--
(C- 2- 4) 33BDD- 1	77-06-30	--	--	--	--	800	--
	78-06-20	220	15	47	2.6	825	--
	78-07-06	--	--	--	--	800	--
(C- 2- 4) 33DAC- 1	77-07-01	--	--	--	--	675	--
	78-07-13	--	--	--	--	690	--
(C- 2- 4) 34ADC- 1	77-05-09	--	--	--	--	850	--
	77-07-05	--	--	--	--	825	--
	78-07-13	--	--	--	--	800	--
(C- 2- 4) 34BDD- 1	77-05-09	--	--	--	--	1980	--
	78-06-27	450	230	27	1.6	1100	--
(C- 2- 4) 34BDD- 2	77-05-09	--	--	--	--	1010	--
	77-06-02	--	--	--	--	850	--
	78-07-13	--	--	--	--	1000	--
(C- 2- 4) 35CBC- 1	76-06-22	--	--	--	--	900	--
	77-05-09	--	--	--	--	890	--
	77-06-06	--	--	--	--	850	--
	78-06-27	330	140	33	1.8	950	--
	78-07-13	--	--	--	--	900	--
	78-08-09	330	130	32	1.7	--	--
(C- 2- 5) 5CCC- 2	78-05-12	--	--	--	--	2350	--
	78-06-22	600	510	41	3.4	2050	--
(C- 2- 5) 5DCD- 4	78-05-12	--	--	--	--	950	--

LOCATION	SITE	DATE OF SAMPLE	DEPTH OF WELL (FT)	TEMPER- ATURE (DEG C)	SILICA, DIS- SOLVED (MG/L AS SI02)	IRON, DIS- SOLVED (UG/L AS FE)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)
(C- 2- 5) 5DCD- 4	GW	78-06-15	417	15.0	56	--	--	48	38	130
(C- 2- 5) 6DDD- 7	GW	78-05-12	360	16.0	--	--	--	--	--	--
(C- 2- 5) 7BDD- 1	GW	78-06-02	300	15.0	--	--	--	--	--	--
(C- 2- 5) 7DDD- 3	GW	78-07-10	500	15.5	--	--	--	--	--	--
(C- 2- 5) 9AAB- 1	GW	77-09-26	9.0	18.5	--	--	--	--	--	--
(C- 2- 5) 13ACC- 1	GW	78-05-15	--	13.5	--	--	--	--	--	--
	GW	78-06-14	280	13.5	50	--	--	51	15	150
(C- 2- 5) 13ACD- 1	GW	77-09-12	9.0	19.0	--	--	--	--	--	--
(C- 2- 5) 13BCA- 1	GW	78-05-15	767	21.5	--	--	--	--	--	--
(C- 2- 5) 14DBB- 1	GW	76-09-20	--	13.5	--	--	--	--	--	--
	GW	77-07-11	--	14.0	--	--	--	--	--	--
	GW	78-05-09	--	13.5	--	--	--	--	--	--
	GW	78-06-14	300	13.0	29	--	--	52	25	220
(C- 2- 5) 16BAA- 1	GW	78-06-22	400	13.0	26	--	--	59	34	290
(C- 2- 5) 17ABD- 1	GW	78-06-22	--	13.0	23	--	--	110	46	240
(C- 2- 5) 17BAD- 1	GW	78-05-12	165	12.5	--	--	--	--	--	--
(C- 2- 5) 17BDA- 1	GW	76-09-09	--	12.5	--	--	--	--	--	--
	GW	77-06-10	--	13.0	--	--	--	--	--	--
	GW	77-07-12	--	13.0	--	--	--	--	--	--
	GW	78-05-12	--	12.5	--	--	--	--	--	--
	GW	78-06-20	100	12.5	24	--	--	93	42	220
(C- 2- 5) 17CAA- 1	GW	77-09-09	9.0	13.0	--	--	--	--	--	--
(C- 2- 5) 18BDC- 1	GW	78-05-18	425	16.0	--	--	--	--	--	--
(C- 2- 5) 18DCC- 1	GW	78-05-12	300	14.0	--	--	--	--	--	--
(C- 2- 5) 19ABC- 1	GW	78-05-18	200	14.0	--	--	--	--	--	--
(C- 2- 5) 19DCC- 1	GW	78-06-14	350	--	22	--	--	40	13	34
(C- 2- 5) 20ACC- 1	GW	76-09-09	240	13.5	--	--	--	--	--	--
	GW	78-05-12	--	13.0	--	--	--	--	--	--
	GW	78-06-20	--	13.0	38	--	--	55	30	120
(C- 2- 5) 21AAD- 1	GW	76-09-20	230	15.0	--	--	--	--	--	--
	GW	77-08-05	--	15.0	--	--	--	--	--	--
(C- 2- 5) 21AAD- 2	GW	77-08-14	9.0	17.0	--	--	--	--	--	--
(C- 2- 5) 21CBB- 1	GW	76-09-09	165	13.5	--	--	--	--	--	--
	GW	77-08-05	--	14.0	--	--	--	--	--	--
	GW	78-06-21	--	14.0	30	--	--	95	42	200
(C- 2- 5) 23CAC- 1	GW	76-09-20	80	14.5	--	--	--	--	--	--
	GW	77-07-11	--	14.5	--	--	--	--	--	--
	GW	78-05-10	--	14.0	--	--	--	--	--	--
	GW	78-06-19	--	14.0	28	--	--	130	52	370
(C- 2- 5) 25AAB- 2	GW	78-05-10	--	13.0	--	--	--	--	--	--

[illegible]

LOCATION	DATE OF SAMPLE	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)	SODIUM PERCENT	SODIUM AD- SORP- TION RATIO	SPF- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)
(C- 2- 5) 5DCD- 4	78-06-15	280	150	50	3.4	1125	--
(C- 2- 5) 6DDD- 7	78-05-12	--	--	--	--	5500	--
(C- 2- 5) 7RDD- 1	78-06-02	--	--	--	--	430	--
(C- 2- 5) 7DDD- 3	78-07-10	--	--	--	--	1100	--
(C- 2- 5) 9AAB- 1	77-09-26	--	--	--	--	18500	--
(C- 2- 5) 13ACC- 1	78-05-15	--	--	--	--	900	--
	78-06-14	190	0	63	4.7	925	--
(C- 2- 5) 13ACD- 1	77-09-12	--	--	--	--	24000	--
(C- 2- 5) 13BCA- 1	78-05-15	--	--	--	--	1650	--
(C- 2- 5) 14DBB- 1	76-09-20	--	--	--	--	1500	--
	77-07-11	--	--	--	--	1325	--
	78-05-09	--	--	--	--	1300	--
	78-06-14	230	11	67	6.3	1300	--
(C- 2- 5) 16BAA- 1	78-06-22	290	110	68	7.4	1870	--
(C- 2- 5) 17ABD- 1	78-06-22	460	280	53	4.8	1900	--
(C- 2- 5) 17BAD- 1	78-05-12	--	--	--	--	1525	--
(C- 2- 5) 17BDA- 1	76-09-09	--	--	--	--	1700	--
	77-06-10	--	--	--	--	1725	--
	77-07-12	--	--	--	--	1675	--
	78-05-12	--	--	--	--	1625	--
	78-06-20	410	220	54	4.8	1660	--
(C- 2- 5) 17CAA- 1	77-09-09	--	--	--	--	8200	--
(C- 2- 5) 18BDC- 1	78-05-18	--	--	--	--	450	--
(C- 2- 5) 18DCC- 1	78-05-12	--	--	--	--	420	--
(C- 2- 5) 19ABC- 1	78-05-18	--	--	--	--	370	--
(C- 2- 5) 19DCC- 1	78-06-14	150	22	32	1.2	425	--
(C- 2- 5) 20ACC- 1	76-09-09	--	--	--	--	1080	--
	78-05-12	--	--	--	--	1050	--
	78-06-20	260	110	49	3.2	1050	--
(C- 2- 5) 21AAD- 1	76-09-20	--	--	--	--	2300	--
	77-08-05	--	--	--	--	2075	--
(C- 2- 5) 21AAD- 2	77-08-14	--	--	--	--	3900	--
(C- 2- 5) 21CBB- 1	76-09-09	--	--	--	--	1800	--
	77-08-05	--	--	--	--	1550	--
	78-06-21	410	210	51	4.3	1700	--
(C- 2- 5) 23CAC- 1	76-09-20	--	--	--	--	2200	--
	77-07-11	--	--	--	--	2275	--
	78-05-10	--	--	--	--	2500	--
	78-06-19	540	340	59	6.9	2300	--
(C- 2- 5) 25AAB- 2	78-05-10	--	--	--	--	825	--

LOCATION	SITE	DATE OF SAMPLE	DEPTH OF WELL (FT)	TEMPER- ATURE (DEG C)	SILICA, DIS- SOLVED (MG/L AS SI02)	IRON, DIS- SOLVED (UG/L AS FE)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)
(C- 2- 5)25AAB- 2	GW	78-06-19	202	13.5	25	--	--	48	22	100
(C- 2- 5)25CDD- 4	GW	78-06-21	467	12.0	--	--	--	58	4.2	200
(C- 2- 5)26CDC-S2	SP	78-06-29	--	18.0	24	--	--	150	49	700
(C- 2- 5)26DAC- 1	GW	77-09-08	13	15.5	--	--	--	--	--	--
(C- 2- 5)27ADD- 1	GW	76-09-20	355	18.5	--	--	--	--	--	--
(C- 2- 5)28CDC- 1	GW	78-06-28	357	17.0	23	--	--	140	55	250
(C- 2- 5)29ADC- 2	GW	76-09-09	--	14.5	--	--	--	--	--	--
	GW	77-08-04	--	14.5	--	--	--	--	--	--
	GW	78-05-01	--	14.5	--	--	--	--	--	--
	GW	78-06-14	290	14.5	23	--	--	180	80	100
(C- 2- 5)29DBA- 1	GW	77-09-08	12	16.5	--	--	--	--	--	--
(C- 2- 5)29DCD- 5	GW	78-05-02	340	14.5	--	--	--	--	--	--
(C- 2- 5)30BCC- 1	GW	76-09-09	445	14.0	--	--	--	--	--	--
	GW	77-08-04	--	14.5	--	--	--	--	--	--
	GW	78-06-26	--	14.0	18	--	--	61	17	33
(C- 2- 5)30BCD- 1	GW	78-07-10	225	11.5	--	--	--	--	--	--
(C- 2- 5)30CBC- 1	GW	78-05-01	140	12.0	--	--	--	--	--	--
(C- 2- 5)30CBD- 1	GW	76-09-09	--	12.5	--	--	--	--	--	--
	GW	77-08-04	--	13.5	--	--	--	--	--	--
	GW	78-05-01	--	11.5	--	--	--	--	--	--
(C- 2- 5)30CCC- 1	GW	76-09-09	175	13.0	--	--	--	--	--	--
	GW	77-08-04	--	13.0	--	--	--	--	--	--
	GW	78-05-01	--	13.0	--	--	--	--	--	--
(C- 2- 5)30DAA- 1	GW	76-09-09	--	14.0	--	--	--	--	--	--
	GW	77-08-04	--	14.0	--	--	--	--	--	--
	GW	78-05-02	--	14.0	--	--	--	--	--	--
(C- 2- 5)30DCC- 1	GW	78-06-20	--	13.5	18	--	--	36	12	34
	GW	77-08-04	--	14.0	--	--	--	--	--	--
	GW	78-06-14	510	13.0	21	--	--	63	20	27
	GW	78-07-10	--	14.5	--	--	--	--	--	--
	GW	78-07-26	--	13.5	--	--	--	--	--	--
(C- 2- 5)318BD- 3	GW	78-05-08	125	13.0	--	--	--	--	--	--
(C- 2- 5)32ABC- 3	GW	78-06-28	309	15.5	21	--	--	64	27	32
(C- 2- 5)32BCB- 1	GW	78-07-10	580	15.5	--	--	--	--	--	--
(C- 2- 5)32BDA- 1	GW	77-07-08	315	16.0	--	--	--	--	--	--
	GW	78-07-10	--	15.0	--	--	--	--	--	--
(C- 2- 5)32DBB- 1	GW	77-07-08	485	16.0	--	--	--	--	--	--
	GW	78-07-10	--	16.0	--	--	--	--	--	--
(C- 2- 5)33ACC- 1	GW	76-06-11	--	17.0	--	--	--	--	--	--
(C- 2- 5)33ADD-S1	SP	78-06-28	--	15.5	25	--	--	110	47	350

LOCATION	DATE OF SAMPLE	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HCO3)	CAR- BONATE (MG/L AS CO3)	ALKA- LINITY (MG/L AS CACO3)	SULFATE DIS- SOLVED (MG/L AS SO4)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	BORON, DIS- SOLVED (UG/L AS B)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)
(C- 2- 5)25AAB- 2	78-06-19	3.1	270	--	220	26	140	.2	50	497
(C- 2- 5)25CDD- 4	78-06-21	6.7	24	--	20	6.4	410	.3	10	--
(C- 2- 5)26CDC-S2	78-06-29	12	230	--	190	47	1400	.3	150	2500
(C- 2- 5)26DAC- 1	77-09-08	--	--	--	--	--	--	--	--	--
(C- 2- 5)27ADD- 1	76-09-20	--	--	--	--	--	--	--	--	--
(C- 2- 5)28CDC- 1	78-06-28	4.5	220	--	180	70	590	.1	80	1240
(C- 2- 5)29ADC- 2	76-09-09	--	--	--	--	--	--	--	--	--
	77-08-04	--	--	--	--	--	--	--	--	--
	78-05-01	--	--	--	--	--	--	--	--	--
	78-06-14	4.0	160	--	130	33	590	.1	40	1090
(C- 2- 5)29DBA- 1	77-09-08	--	--	--	--	--	--	--	--	--
(C- 2- 5)29DCD- 5	78-05-02	--	--	--	--	--	--	--	--	--
(C- 2- 5)30BCC- 1	76-09-09	--	--	--	--	--	--	--	--	--
	77-08-04	--	--	--	--	--	--	--	--	--
	78-06-26	2.0	190	--	160	19	75	.1	30	319
(C- 2- 5)30BCD- 1	78-07-10	--	--	--	--	--	--	--	--	--
(C- 2- 5)30CBC- 1	78-05-01	--	--	--	--	--	--	--	--	--
(C- 2- 5)30CBD- 1	76-09-09	--	--	--	--	--	--	--	--	--
	77-08-04	--	--	--	--	--	--	--	--	--
	78-05-01	--	--	--	--	--	--	--	--	--
(C- 2- 5)30CCC- 1	76-09-09	--	--	--	--	--	--	--	--	--
	77-08-04	--	--	--	--	--	--	--	--	--
	78-05-01	--	--	--	--	--	--	--	--	--
(C- 2- 5)30DAA- 1	76-09-09	--	--	--	--	--	--	--	--	--
	77-08-04	--	--	--	--	--	--	--	--	--
	78-05-02	--	--	--	--	--	--	--	--	--
(C- 2- 5)30DCC- 1	78-06-20	1.9	170	--	140	14	45	.1	30	245
	77-08-04	--	--	--	--	--	--	--	--	--
	78-06-14	1.7	180	--	150	14	93	.1	30	329
	78-07-10	--	--	--	--	--	--	--	--	--
	78-07-26	--	--	--	--	--	--	--	--	--
(C- 2- 5)31BBD- 3	78-05-08	--	--	--	--	--	--	--	--	--
(C- 2- 5)32ABC- 3	78-06-28	2.1	150	--	120	12	140	.1	30	372
(C- 2- 5)32BCB- 1	78-07-10	--	--	--	--	--	--	--	--	--
(C- 2- 5)32BDA- 1	77-07-08	--	--	--	--	--	--	--	--	--
	78-07-10	--	--	--	--	--	--	--	--	--
(C- 2- 5)32DBB- 1	77-07-08	--	--	--	--	--	--	--	--	--
	78-07-10	--	--	--	--	--	--	--	--	--
(C- 2- 5)33ACC- 1	76-06-11	--	--	--	--	--	--	--	--	--
(C- 2- 5)33ADD-S1	78-06-28	9.8	250	--	210	99	670	.5	170	1430

LOCATION	DATE	OF	SAMPLE	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)	SODIUM PERCENT	SODIUM RATIO	SODIUM AD- SORP- TION RATIO (MICRO- MHOS)	PH
(C- 2- 5) 25AAB- 2	78-06-19	210			0	50	3.0	850	--
(C- 2- 5) 25CDD- 4	78-06-21	160			140	72	6.8	1300	--
(C- 2- 5) 26CDD-52	78-06-29	580			390	72	13	3900	--
(C- 2- 5) 26DAC- 1	77-09-08	--			--	--	--	8500	--
(C- 2- 5) 27ADD- 1	76-09-20	--			--	--	--	2500	--
(C- 2- 5) 28CDC- 1	78-06-28	580		400	48	4.5	2100	2100	--
(C- 2- 5) 29ADC- 2	76-09-09	--		--	--	--	--	2050	--
	77-08-04	--		--	--	--	--	2200	--
	78-05-01	--		--	--	--	--	2100	--
	78-06-14	780		650	22	1.6	2025	2025	--
(C- 2- 5) 29DBA- 1	77-09-08	--		--	--	--	--	2300	--
(C- 2- 5) 29DCD- 5	78-05-02	--		--	--	--	--	1850	--
	76-09-09	--		--	--	--	--	510	--
(C- 2- 5) 30BCC- 1	76-09-09	--		--	--	--	--	480	--
(C- 2- 5) 30BCD- 1	78-07-10	--		--	--	--	--	650	--
	78-05-01	--		--	--	--	--	670	--
	76-09-09	--		--	--	--	--	920	--
	77-08-04	--		--	--	--	--	875	--
	78-05-01	--		--	--	--	--	850	--
(C- 2- 5) 30CCC- 1	76-09-09	--		--	--	--	--	720	--
	77-08-04	--		--	--	--	--	770	--
	78-05-01	--		--	--	--	--	720	--
	76-09-09	--		--	--	--	--	425	--
(C- 2- 5) 30DAA- 1	77-08-04	--		--	--	--	--	530	--
	78-05-02	--		--	--	--	--	390	--
	78-06-20	140		0	34	1.3	450	450	--
	77-08-04	--		--	--	--	--	525	--
	78-06-14	240		92	20	.8	625	625	--
	78-07-10	--		--	--	--	--	520	--
(C- 2- 5) 31HBD- 3	78-07-26	--		--	--	--	--	540	--
	78-05-08	--		--	--	--	--	980	--
	78-06-28	270		150	20	.8	725	725	--
	78-07-10	--		--	--	--	--	480	--
(C- 2- 5) 32BDA- 1	77-07-08	--		--	--	--	--	420	--
(C- 2- 5) 32DBB- 1	78-07-10	--		--	--	--	--	550	--
	77-07-08	--		--	--	--	--	1020	--
	78-07-10	--		--	--	--	--	1200	--
(C- 2- 5) 33ACC- 1	76-06-11	--		--	--	--	--	1600	--
(C- 2- 5) 33ADD-S1	78-06-28	470		260	61	7.0	2250	2250	--

LOCATION	SITE	DATE OF SAMPLE	DEPTH OF WELL (FT)	TEMPER- ATURE (DEG C)	SILICA, DIS- SOLVED (MG/L AS SI02)	IRON, DIS- SOLVED (UG/L AS FE)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)
(C- 2- 5)33BBC- 1	GW	77-07-08	411	16.5	--	--	--	--	--	--
(C- 2- 5)33BCB- 3	GW	78-06-26	260	14.5	18	--	--	150	61	200
(C- 2- 5)33DAD- 3	GW	66-06-27	371	18.8	--	--	--	--	--	--
	GW	69-07-15	--	18.0	--	--	--	--	--	--
	GW	72-07-18	--	18.0	28	--	--	110	53	260
	GW	74-07-01	--	18.0	27	--	--	80	68	230
	GW	75-07-07	--	21.5	28	--	--	120	54	300
	GW	76-06-17	--	19.0	25	10	10	100	50	270
	GW	77-07-06	--	20.5	--	--	--	--	--	--
(C- 2- 5)33DAD- 4	GW	78-06-29	120	18.5	26	--	--	110	50	270
	GW	78-07-07	--	--	--	--	--	--	--	--
(C- 2- 5)33DBA- 2	GW	77-07-20	154	16.0	--	--	--	--	--	--
(C- 2- 5)33DCD- 1	GW	77-07-07	285	20.0	--	--	--	--	--	--
	GW	78-06-14	--	--	27	--	--	100	47	180
	GW	78-07-27	--	200	--	--	--	--	--	--
(C- 2- 5)34ADD- 2	GW	78-06-29	125	--	23	--	--	130	49	600
(C- 2- 5)34BCA- 3	GW	77-07-07	320	23.0	--	--	--	--	--	--
	GW	78-06-28	--	22.5	30	--	--	220	93	900
	GW	78-07-07	--	22.0	--	--	--	--	--	--
(C- 2- 5)34DAA- 1	GW	78-06-29	99	18.5	22	--	--	140	51	550
(C- 2- 5)34DAB- 1	GW	78-06-28	112	--	22	--	--	120	46	480
(C- 2- 5)34ddb- 1	GW	78-06-28	154	--	27	--	--	250	92	1500
(C- 2- 5)34ddb- 2	GW	78-06-28	184	--	22	--	--	130	52	450
(C- 2- 5)35ADD- 1	GW	77-07-15	513	16.0	--	--	--	--	--	--
	GW	77-09-09	--	17.5	--	--	--	--	--	--
(C- 2- 5)35CBD- 1	GW	78-06-19	400	15.5	6.7	--	--	16	13	150
(C- 2- 5)35DBB- 1	GW	76-06-22	223	20.0	--	--	--	--	--	--
	GW	78-07-27	--	20.0	--	--	--	--	--	--
(C- 2- 5)35DBB- 2	GW	76-06-22	120	19.5	--	--	--	--	--	--
	GW	77-06-08	--	21.0	--	--	--	--	--	--
	GW	78-07-10	--	20.0	--	--	--	--	--	--
(C- 2- 5)36ADC- 1	GW	77-07-08	442	18.5	--	--	--	--	--	--
(C- 2- 5)36RDD- 1	GW	76-06-22	445	17.0	--	--	--	--	--	--
	GW	77-07-06	--	19.0	--	--	--	--	--	--
	GW	78-07-26	--	18.0	--	--	--	--	--	--
(C- 2- 5)36DAC- 1	GW	77-06-08	201	18.5	--	--	--	--	--	--
	GW	78-06-19	--	--	18	--	--	70	25	290
	GW	78-07-10	--	18.0	--	--	--	--	--	--
(C- 2- 5)36DCD- 1	GW	76-06-22	--	18.5	--	--	--	--	--	--
	GW	77-07-06	--	19.5	--	--	--	--	--	--

[illegible]

LOCATION	DATE OF SAMPLE	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)	SODIUM PERCENT	SODIUM AD- SORP- TION RATIO	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)
(C- 2- 5)33BBC- 1	77-07-08	--	--	--	--	2130	--
(C- 2- 5)33BCB- 3	78-06-26	630	460	41	3.5	2175	--
(C- 2- 5)33DAD- 3	66-06-27	--	--	--	--	1930	7.8
	69-07-15	440	240	--	--	1950	7.7
	72-07-18	490	300	53	5.1	2270	7.2
	74-07-01	480	280	51	4.6	2050	7.7
	75-07-07	520	340	55	5.7	2300	7.1
	76-06-17	460	260	56	5.5	2100	7.3
	77-07-06	--	--	--	--	2050	--
(C- 2- 5)33DAD- 4	78-06-29	480	230	54	5.4	2100	--
	78-07-07	--	--	--	--	1850	--
(C- 2- 5)33DBA- 2	77-07-20	--	--	--	--	1900	--
(C- 2- 5)33DCD- 1	77-07-07	--	--	--	--	1500	--
	78-06-14	440	240	46	3.7	1480	7.8
	78-07-27	--	--	--	--	1450	--
(C- 2- 5)34ADD- 2	78-06-29	530	340	71	11	3500	--
(C- 2- 5)34BCA- 3	77-07-07	--	--	--	--	5750	--
	78-06-28	930	780	67	13	5200	--
	78-07-07	--	--	--	--	5100	--
(C- 2- 5)34DAA- 1	78-06-29	560	380	68	10	3500	--
(C- 2- 5)34DAB- 1	78-06-28	490	290	68	9.4	2800	--
(C- 2- 5)34DDB- 1	78-06-28	1000	860	76	21	8340	7.7
(C- 2- 5)34DDB- 2	78-06-28	540	350	64	8.4	2800	--
(C- 2- 5)35ADD- 1	77-07-15	--	--	--	--	1800	--
	77-09-09	--	--	--	--	1640	--
(C- 2- 5)35CBD- 1	78-06-19	93	0	77	6.8	875	--
(C- 2- 5)35DBB- 1	76-06-22	--	--	--	--	1750	--
	78-07-27	--	--	--	--	1750	--
(C- 2- 5)35DBB- 2	76-06-22	--	--	--	--	3300	--
	77-06-08	--	--	--	--	3000	--
	78-07-10	--	--	--	--	3200	--
(C- 2- 5)36ADC- 1	77-07-08	--	--	--	--	1075	--
(C- 2- 5)36BDD- 1	76-06-22	--	--	--	--	1850	--
	77-07-06	--	--	--	--	1725	--
	78-07-26	--	--	--	--	1550	--
(C- 2- 5)36DAC- 1	77-06-08	--	--	--	--	1850	--
	78-06-19	280	64	69	7.6	1725	--
	78-07-10	--	--	--	--	1775	--
(C- 2- 5)36DCD- 1	76-06-22	--	--	--	--	4000	--
	77-07-06	--	--	--	--	3600	--

LOCATION	SITE	DATE OF SAMPLE	DEPTH OF WELL (FT)	TEMPER- ATURE (DEG C)	SILICA, DIS- SOLVED (MG/L AS SI02)	IRON, DIS- SOLVED (UG/L AS FE)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)
(C- 2- 5)36DCD- 1	GW	78-07-14	325	19.5	17	--	--	150	55	680
(C- 2- 6)14DDD- 1	GW	76-09-09	434	19.0	--	--	--	--	--	--
	GW	78-06-22	--	19.0	23	--	--	35	11	260
(C- 2- 6)16AAD-S1	SP	66-03-15	--	24.4	27	--	--	584	188	8910
	SP	78-06-26	--	27.0	26	--	--	750	200	9000
(C- 2- 6)16ADB- 1	GW	77-09-08	12	21.2	--	--	--	--	--	--
(C- 2- 6)22DBD- 1	GW	78-06-22	139	--	71	--	--	80	29	81
(C- 2- 6)23CBB- 1	GW	66-06-27	210	20.0	--	--	--	--	--	--
	GW	72-07-18	--	--	55	--	--	35	14	210
	GW	74-07-03	--	20.5	--	--	--	--	--	--
	GW	75-07-08	--	20.0	52	--	--	33	11	180
	GW	76-06-22	--	20.0	--	--	--	--	--	--
	GW	76-07-03	--	20.5	54	--	--	33	13	200
	GW	77-07-26	--	20.5	--	--	--	--	--	--
	GW	78-06-26	--	--	48	--	--	34	12	200
(C- 2- 6)23CDC- 2	GW	77-07-20	397	16.5	--	--	--	--	--	--
(C- 2- 6)24AAB- 1	GW	77-09-12	10	15.0	--	--	--	--	--	--
(C- 2- 6)24ADD- 1	GW	76-09-09	--	13.0	--	--	--	--	--	--
	GW	77-08-05	--	13.5	--	--	--	--	--	--
(C- 2- 6)24CBB- 2	GW	76-09-09	--	12.5	--	--	--	--	--	--
	GW	78-05-18	--	12.5	--	--	--	--	--	--
(C- 2- 6)24CBB- 3	GW	78-05-18	360	14.0	--	--	--	--	--	--
(C- 2- 6)24DCD- 1	GW	78-06-02	150	12.5	--	--	--	--	--	--
(C- 2- 6)25ABA- 1	GW	78-06-02	250	11.5	--	--	--	--	--	--
(C- 2- 6)25ABD- 1	GW	77-06-10	--	12.0	--	--	--	--	--	--
	GW	77-07-11	--	12.0	--	--	--	--	--	--
	GW	78-05-09	--	11.0	--	--	--	--	--	--
	GW	78-06-20	--	11.0	23	--	--	66	21	31
(C- 2- 6)25ACD- 4	GW	76-09-09	190	12.5	--	--	--	--	--	--
	GW	78-05-02	--	13.0	--	--	--	--	--	--
(C- 2- 6)25BCA- 1	GW	78-05-02	200	13.5	--	--	--	--	--	--
(C- 2- 6)25BCB-1	GW	78-05-02	125	12.0	--	--	--	--	--	--
(C- 2- 6)26DAC- 1	GW	76-06-22	--	13.5	--	--	--	--	--	--
	GW	78-06-22	246	13.5	18	--	--	80	21	42
(C- 2- 6)36ACC- 2	GW	78-06-21	465	14.0	24	--	--	85	25	33
(C- 3- 3)18CBA-	SS	78-01-11 ¹	--	8.5	20	10	360	160	70	13
(C- 3- 3)18CBB-	SS	78-01-11 ²	--	12.0	19	10	500	160	71	12
(C- 3- 3)28BCA-	SS	78-01-11 ³	--	26.0	15	10	10	39	21	7.3
(C- 3- 3)28BDC-	SS	78-01-11 ⁴	--	17.0	25	50	1700	190	150	17
(C- 3- 4)8AAA- 1	GW	77-04-28	--	18.0	--	--	--	--	--	--

[illegible]

LOCATION	DATE OF SAMPLE	HARD- NESS (MG/L AS CACO3)	HARD- NESS, NONCAR- BONATE (MG/L CACO3)	SODIUM PERCENT	SODIUM AD- SORP- TION RATIO	SPF- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)
(C- 2- 5)36DCD- 1	78-07-14	600	400	71	12	3600	--
(C- 2- 6)14DDD- 1	76-09-09	--	--	--	--	1400	--
	78-06-22	130	26	80	9.8	1450	--
(C- 2- 6)16AAD-S1	66-03-15	2230	2040	88	82	40400	7.5
	78-06-26	2700	2500	87	75	25900	--
(C- 2- 6)16ADB- 1	77-09-08	--	--	--	--	17500	--
(C- 2- 6)22DBD- 1	78-06-22	320	200	34	2.0	900	--
(C- 2- 6)23CBB- 1	66-06-27	--	--	--	--	1330	7.6
	72-07-18	150	0	72	7.6	1370	7.5
	74-07-03	--	--	--	--	1220	--
	75-07-08	130	0	72	6.9	1100	7.7
	76-06-22	--	--	--	--	1230	--
	76-07-03	140	0	73	7.5	1310	7.9
	77-07-26	--	--	--	--	1180	--
	78-06-26	130	0	73	7.5	1270	--
(C- 2- 6)23CDC- 2	77-07-20	--	--	--	--	975	--
(C- 2- 6)24AAB- 1	77-09-12	--	--	--	--	3000	--
(C- 2- 6)24ADD- 1	76-09-09	--	--	--	--	480	--
	77-08-05	--	--	--	--	380	--
(C- 2- 6)24CBB- 2	76-09-09	--	--	--	--	470	--
	78-05-18	--	--	--	--	440	--
(C- 2- 6)24CBB- 3	78-05-18	--	--	--	--	460	--
(C- 2- 6)24DCD- 1	78-06-02	--	--	--	--	550	--
(C- 2- 6)25ABA- 1	78-06-02	--	--	--	--	520	--
(C- 2- 6)25ABD- 1	77-06-10	--	--	--	--	540	--
	77-07-11	--	--	--	--	700	--
	78-05-09	--	--	--	--	625	--
	78-06-20	250	87	21	.9	625	--
(C- 2- 6)25ACD- 4	76-09-09	--	--	--	--	650	--
	78-05-02	--	--	--	--	500	--
(C- 2- 6)25BCA- 1	78-05-02	--	--	--	--	540	--
(C- 2- 6)25BCB-1	78-05-02	--	--	--	--	580	--
(C- 2- 6)26DAC- 1	76-06-22	--	--	--	--	750	--
	78-06-22	290	160	24	1.1	750	--
(C- 2- 6)36ACC- 2	78-06-21	320	140	18	.8	775	--
(C- 3- 3)18CBA-	78-01-11	690	560	4	.2	1080	8.4
(C- 3- 3)18CBB-	78-01-11	690	550	4	.2	1000	8.2
(C- 3- 3)28BCA-	78-01-11	180	61	8	.2	350	8.0
(C- 3- 3)28BDC-	78-01-11	1100	890	3	.2	1650	7.1
(C- 3- 4)8AAA- 1	77-04-28	--	--	--	--	2350	--

LOCATION	SITE	DATE OF SAMPLE	DEPTH OF WELL (FT)	TEMPER- ATURE (DEG C)	SILICA, DIS- SOLVED (MG/L AS SI02)	IRON, DIS- SOLVED (UG/L AS FE)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)
(C- 3- 4) 8AAA- 1	GW	78-06-26	675	--	13	--	--	83	27	400
(C- 3- 4) 9AAA- 1	GW	78-06-06	573	15.5	13	--	--	67	25	320
(C- 3- 4) 13AB8- 1	GW	73-07-02	660	--	--	30	50	107	44	47
	GW	73-08-01	--	--	--	50	15	117	45	47
	GW	74-02-01	--	--	--	20	195	118	43	45
	GW	77-10-31	--	--	--	150	63	102	46	45
(C- 3- 4) 14ADB- 1	GW	74-07-11	--	--	--	40	147	129	54	37
	GW	77-10-31	--	--	--	310	129	118	52	40
	GW	78-06-08	656	13.0	13	--	--	120	58	39
(C- 3- 4) 16AAA- 1	GW	78-09-21	927	14.0	13	--	--	120	35	420
(C- 3- 4) 30AAC- 1	GW	77-02-28	496	--	13	<60	<20	57	19	42
(C- 3- 4) 318BA- 1	GW	78-02-28	700	--	26	<60	<20	91	35	98
(C- 3- 5) 1ACA- 1	GW	77-10-28	365	20.0	18	1000	30	540	200	1600
(C- 3- 5) 4ABD- 1	GW	77-07-07	--	18.0	--	--	--	--	--	--
	GW	78-07-07	--	17.5	--	--	--	--	--	--
(C- 3- 5) 488B- 2	GW	66-06-27	407	15.5	--	--	--	--	--	--
	GW	69-07-15	--	14.0	--	--	--	--	--	--
	GW	70-07-11	--	15.0	--	--	--	--	--	--
	GW	72-07-18	--	16.0	23	--	--	100	39	190
	GW	73-07-03	--	16.0	22	--	--	99	36	180
	GW	75-06-25	--	16.0	21	--	--	90	32	180
	GW	76-06-11	--	16.0	21	10	0	94	34	190
	GW	77-07-07	--	17.0	--	--	--	--	--	--
	GW	77-07-26	--	17.0	--	--	--	--	--	--
	GW	78-06-21	--	16.0	23	--	--	100	36	190
	GW	78-07-05	--	16.5	--	--	--	--	--	--
(C- 3- 5) 5ABA- 1	GW	78-06-20	412	14.0	23	--	--	88	34	69
	GW	78-07-26	--	13.5	--	--	--	--	--	--
(C- 3- 5) 7ABC- 1	GW	76-06-11	390	12.0	--	--	--	--	--	--
	GW	77-07-08	--	13.0	--	--	--	--	--	--
	GW	78-06-20	--	12.0	20	--	--	58	17	27
	GW	78-07-05	--	13.0	--	--	--	--	--	--
(C- 3- 5) 7DCC- 1	GW	76-06-11	289	14.0	18	10	0	62	16	21
	GW	77-07-26	--	15.0	19	--	--	60	16	23
	GW	78-07-05	--	14.0	--	--	--	--	--	--
	GW	78-07-25	--	--	18	--	--	62	17	22
(C- 3- 5) 22DAB- 1	GW	78-06-05	428	19.0	23	--	--	110	41	330
(C- 3- 5) 36DDD- 1	GW	77-02-28	752	--	24	60	<20	171	71	115
(C- 3- 6) 18DB- 1	GW	76-07-22	418	14.0	--	--	--	--	--	--
	GW	77-05-02	--	14.0	--	--	--	--	--	--

[illegible]

LOCATION	DATE OF SAMPLE	HARD- NESS (MG/L AS CAC03)	HARD- NESS. NONCAR- BONATE (MG/L CAC03)	SODIUM PERCENT	SODIUM AD- SORP- TION RATIO	SPF- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)
(C- 3- 4) 8AAA- 1	78-06-26	320	110	73	9.8	2400	--
(C- 3- 4) 9AAA- 1	78-06-06	270	41	72	8.5	1850	--
(C- 3- 4) 13ABB- 1	73-07-02	449	240	--	1.0	--	7.4
	73-08-01	479	260	--	.9	--	7.9
	74-02-01	472	320	17	.9	--	7.8
	77-10-31	444	270	18	.9	--	7.6
(C- 3- 4) 14ADB- 1	74-07-11	547	350	13	.7	--	7.7
	77-10-31	509	310	15	.8	--	7.6
	78-06-08	540	290	14	.7	980	--
(C- 3- 4) 16AAA- 1	78-09-21	440	220	67	8.7	2550	--
(C- 3- 4) 30AAC- 1	77-02-28	243	--	29	1.2	624	7.9
(C- 3- 4) 31BBA- 1	78-02-28	379	--	36	2.2	1209	7.6
(C- 3- 5) 1ACA- 1	77-10-28	2200	2000	61	15	11690	--
(C- 3- 5) 4ABD- 1	77-07-07	--	--	--	--	1425	--
	78-07-07	--	--	--	--	1400	--
(C- 3- 5) 48BB- 2	66-06-27	--	--	--	--	1730	8.0
	69-07-15	414	232	--	--	1720	7.7
	70-07-11	--	--	--	--	1720	--
	72-07-18	410	230	50	4.1	1800	7.5
	73-07-03	400	210	49	3.9	1760	7.5
	75-06-25	360	170	52	4.1	1280	--
	76-06-11	370	190	52	4.3	1700	7.5
	77-07-07	--	--	--	--	1500	--
	77-07-26	--	--	--	--	1560	--
	78-06-21	400	220	51	4.1	1570	--
	78-07-05	--	--	--	--	1600	--
(C- 3- 5) 5ABA- 1	78-06-20	360	200	29	1.6	1025	--
	78-07-26	--	--	--	--	850	--
(C- 3- 5) 7ABC- 1	76-06-11	--	--	--	--	540	--
	77-07-08	--	--	--	--	500	--
	78-06-20	210	34	21	.8	530	--
	78-07-05	--	--	--	--	520	--
(C- 3- 5) 7DCC- 1	76-06-11	220	49	17	.6	520	7.4
	77-07-26	220	43	19	.7	525	--
	78-07-05	--	--	--	--	560	--
	78-07-25	220	61	17	.6	500	7.7
(C- 3- 5) 22DAB- 1	78-06-05	440	230	61	6.8	2300	7.2
(C- 3- 5) 36DDD- 1	77-02-28	710	--	26	1.9	1913	7.7
(C- 3- 6) 18DB- 1	76-07-22	--	--	--	--	900	--
	77-05-02	--	--	--	--	770	--

LOCATION	SITE	DATE OF SAMPLE	DEPTH OF WELL (FT)	TEMPER- ATURE (DEG C)	SILICA, DIS- SOLVED (MG/L AS SI02)	IRON, DIS- SOLVED (UG/L AS FE)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)
(C- 3- 6) 18DB- 1	GW	78-07-05	--	14.0	--	--	--	--	--	--
(C- 3- 6) 19BCB-	SW	78-06-23	--	15.5	14	--	--	49	12	30
(C- 3- 6) 19CDC-	SW	78-06-07	--	10.0	9.0	--	--	24	5.6	10
(C- 3- 6) 36AAC- 1	GW	78-02-28 ⁶	780	--	19	830	<20	72	19	33
(C- 4- 3) 9BCC-	SS	78-06-27	--	8.0	9.6	--	--	82	25	12
(C- 4- 3) 9CBB-	SW	78-06-27	--	12.5	11	--	--	66	9.8	6.0
(C- 4- 4) 3BBU-	SW	78-06-27	--	10.5	9.6	--	--	63	14	9.4
(C- 4- 5) 13CAC-	SS	78-06-23	--	19.5	39	--	--	220	49	110
(C- 4- 6) 4CAD-	SW	78-06-23	--	11.5	12	--	--	83	17	25
(C- 4- 6) 6CA	SW	71-08-24	--	10.0	--	--	--	--	--	--
	SW	71-09-22	--	7.5	--	--	--	--	--	--
	SW	71-10-21	--	6.0	--	--	--	--	--	--
	SW	71-12-02	--	3.5	--	--	--	--	--	--
	SW	71-12-30	--	3.0	--	--	--	--	--	--
	SW	72-02-17	--	4.5	--	--	--	--	--	--
	SW	72-04-04	--	7.0	--	--	--	--	--	--
	SW	72-05-03	--	10.0	--	--	--	--	--	--
	SW	72-05-31	--	9.5	--	--	--	--	--	--
	SW	72-06-23	--	9.5	--	--	--	--	--	--
	SW	72-07-25	--	12.0	--	--	--	--	--	--
	SW	72-08-24	--	10.0	--	--	--	--	--	--
	SW	72-10-13	--	9.0	--	--	--	--	--	--
	SW	72-11-14	--	5.0	--	--	--	--	--	--
	SW	72-12-14	--	2.5	--	--	--	--	--	--
	SW	73-01-18	--	4.0	--	--	--	--	--	--
	SW	73-02-21	--	3.5	--	--	--	--	--	--
	SW	73-03-27	--	4.5	--	--	--	--	--	--
	SW	73-04-30	--	7.0	--	--	--	--	--	--
	SW	73-05-17	--	9.0	--	--	--	--	--	--
	SW	73-05-24	--	7.0	--	--	--	--	--	--
	SW	73-06-04	--	7.0	--	--	--	--	--	--
	SW	73-06-22	--	7.5	--	--	--	--	--	--
	SW	73-07-23	--	10.0	--	--	--	--	--	--
	SW	73-08-21	--	9.5	--	--	--	--	--	--
	SW	75-10-07	--	8.0	--	--	--	--	--	--
	SW	75-11-10	--	4.5	--	--	--	--	--	--
	SW	75-12-09	--	4.0	--	--	--	--	--	--
	SW	76-01-19	--	3.0	--	--	--	--	--	--
	SW	76-02-11	--	3.0	--	--	--	--	--	--
	SW	76-04-26	--	5.5	--	--	--	--	--	--

[illegible]

LOCATION	DATE OF SAMPLE	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)	SODIUM PERCENT	SODIUM AD- SORP- TION RATIO	SPF- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)
(C- 3- 6) 18DB- 1	78-07-05	--	--	--	--	800	--
(C- 3- 6) 19BCB-	78-06-23	170	24	27	1.0	380	--
(C- 3- 6) 19CDC-	78-06-07	83	15	21	.5	195	--
(C- 3- 6) 36AAC- 1	78-02-28	271	--	22	.9	673	7.7
(C- 4- 3) 98CC-	78-06-27	310	110	8	.3	480	--
(C- 4- 3) 9CBB-	78-06-27	210	49	6	.2	480	--
(C- 4- 4) 38BD-	78-06-27	220	43	9	.3	400	--
(C- 4- 5) 13CAC-	78-06-23	750	540	24	1.7	1600	--
(C- 4- 6) 6CA	78-06-23	280	97	16	.7	535	--
	71-08-24	--	--	--	--	270	--
	71-09-22	--	--	--	--	340	--
	71-10-21	--	--	--	--	320	--
	71-12-02	--	--	--	--	300	--
	71-12-30	--	--	--	--	290	--
	72-02-17	--	--	--	--	310	--
	72-04-04	--	--	--	--	340	--
	72-05-03	--	--	--	--	340	--
	72-05-31	--	--	--	--	215	--
	72-06-23	--	--	--	--	185	--
	72-07-25	--	--	--	--	315	--
	72-08-24	--	--	--	--	300	--
	72-10-13	--	--	--	--	335	--
	72-11-14	--	--	--	--	275	--
	72-12-14	--	--	--	--	270	--
	73-01-18	--	--	--	--	320	--
	73-02-21	--	--	--	--	335	--
	73-03-27	--	--	--	--	340	--
	73-04-30	--	--	--	--	240	--
	73-05-17	--	--	--	--	210	--
	73-05-24	--	--	--	--	225	--
	73-06-04	--	--	--	--	175	--
	73-06-22	--	--	--	--	245	--
	73-07-23	--	--	--	--	230	--
	73-08-21	--	--	--	--	285	--
	75-10-07	--	--	--	--	350	--
	75-11-10	--	--	--	--	340	--
	75-12-09	--	--	--	--	360	--
	76-01-19	--	--	--	--	280	--
	76-02-11	--	--	--	--	355	--
	76-04-26	--	--	--	--	350	--

LOCATION	SITE	DATE OF SAMPLE	DEPTH OF WELL (FT)	TEMPER- ATURE (DEG C)	SILICA, DIS- SOLVED (MG/L AS SI02)	IRON, DIS- SOLVED (UG/L AS FE)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)
(C- 4- 6) 6CA	SW	76-05-26	--	7.0	--	--	--	--	--	--
	SW	76-07-06	--	11.0	--	--	--	--	--	--
	SW	76-08-02	--	10.0	--	--	--	--	--	--
	SW	76-09-08	--	9.5	--	--	--	--	--	--
	SW	76-10-21	--	5.0	--	--	--	--	--	--
	SW	76-11-10	--	6.0	--	--	--	--	--	--
	SW	76-12-08	--	3.5	--	--	--	--	--	--
	SW	77-01-13	--	3.0	--	--	--	--	--	--
	SW	77-02-08	--	2.0	--	--	--	--	--	--
	SW	77-03-11	--	2.5	--	--	--	--	--	--
	SW	77-04-19	--	6.0	--	--	--	--	--	--
	SW	77-05-02	--	9.0	--	--	--	--	--	--
	SW	77-05-24	--	7.0	--	--	--	--	--	--
	SW	77-06-15	--	10.0	--	--	--	--	--	--
	SW	77-07-18	--	13.0	--	--	--	--	--	--
	SW	77-08-16	--	11.5	--	--	--	--	--	--
	SW	77-09-09	--	10.0	--	--	--	--	--	--
	SW	77-10-12	--	7.0	--	--	--	--	--	--
	SW	77-11-09	--	4.0	--	--	--	--	--	--
	SW	77-12-06	--	5.0	--	--	--	--	--	--
	SW	78-01-05	--	4.0	--	--	--	--	--	--
	SW	78-02-06	--	3.5	--	--	--	--	--	--
	SW	78-03-02	--	5.0	--	--	--	--	--	--
	SW	78-04-03	--	6.5	--	--	--	--	--	--
	SW	78-04-27	--	6.5	--	--	--	--	--	--
	SW	78-05-26	--	8.0	--	--	--	--	--	--
	SW	78-07-03	--	11.0	--	--	--	--	--	--
	SW	78-08-30	--	10.5	--	--	--	--	--	--

LOCATION	DATE OF SAMPLE	HARD- NESS (MG/L AS CAC03)	HARD- NESS, NONCAR- BONATE (MG/L CAC03)	SODIUM PERCENT	SODIUM AD- SORP- TION RATIO	SPF- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)
(C- 4- 6) 6CA	76-05-26	--	--	--	--	240	--
	76-07-06	--	--	--	--	230	--
	76-08-02	--	--	--	--	230	--
	76-09-08	--	--	--	--	310	--
	76-10-21	--	--	--	--	340	--
	76-11-10	--	--	--	--	340	--
	76-12-08	--	--	--	--	290	--
	77-01-13	--	--	--	--	340	--
	77-02-08	--	--	--	--	340	--
	77-03-11	--	--	--	--	320	--
	77-04-19	--	--	--	--	300	--
	77-05-02	--	--	--	--	210	--
	77-05-24	--	--	--	--	290	--
	77-06-15	--	--	--	--	240	--
	77-07-18	--	--	--	--	300	--
	77-08-16	--	--	--	--	330	--
	77-09-09	--	--	--	--	350	--
	77-10-12	--	--	--	--	340	--
	77-11-09	--	--	--	--	360	--
	77-12-06	--	--	--	--	340	--
	78-01-05	--	--	--	--	330	--
	78-02-06	--	--	--	--	360	--
	78-03-02	--	--	--	--	340	--
	78-04-03	--	--	--	--	300	--
	78-04-27	--	--	--	--	340	--
	78-05-26	--	--	--	--	220	--
	78-07-03	--	--	--	--	195	--
	78-08-30	--	--	--	--	310	--

All analyses are by the U.S. Geological Survey except where noted.

¹Mine-discharge water sampled above settling pond.

²Mine-discharge water sampled below settling pond.

³Mine-discharge water from new workings sampled at discharge point.

⁴Mine-discharge water from old workings sampled at discharge point.

⁵Data provided by Anaconda Co.

⁶Data provided by Tooele Army Depot.





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