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Report of Investigation

Utah Geological and Mineral Survey

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THERMAL WATERS OF UTAH

by
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CONTENTS

ILLUSTRATIONS

TABLES

ABSTRACT

Western and central Utah has 16 areas whose wells or springs yield hot water (35°C or higher), warm water (20°- 34.5°C), and slightly warm water (15.5°- 19.5°C). These areas and the highest recorded water temperature for each are: Lower Bear River Area, 105°; Bonneville Salt Flats, 88°; Cove Fort-Sulphurdale, 77°; Curlew Valley, 43°; East Shore Area, 60°; Escalante Desert, 149°; Escalante Valley (Roosevelt, 269°, and Thermo, 85°); Fish Springs, 60.5°; Grouse Creek Valley, 42°; Heber Valley (Midway, 45°); Jordan Valley, 58.5°; Pavant Valley-Black Rock Desert, 67°; Sevier Desert (Abraham-Crater Hot Springs, 82°); Sevier Valley (Monroe-Red Hill, 76.5°, and Joseph Hot Springs, 64°); Utah Valley, 46°; and Central Virgin River Basin, 42°. The only hot water in eastern Utah comes from the oil wells of the Ashley Valley Oil Field, which in 1977 yielded 4400 acre-feet of water at 43° to 55°C. Many other areas yield warm water (20° to 34.5°C) and slightly warm water (15.5° to 19.5°C).

With the possible exception of the Roosevelt KGRA, Crater Hot Springs in the Sevier Desert, and Coyote Spring in Curlew Valley, which may derive their heat from buried igneous bodies, the heat that warms the thermal waters is derived from the geothermal gradient. Meteoric water circulates through fractures or permeable rocks deep within the earth, where it is warmed; it then rises by convection or artesian pressure and issues at the surface as springs or is tapped by wells. Most thermal springs thus rise along faults, but some thermal water is trapped in confined aquifers so that it spreads laterally as it mixes with and warms cooler near-surface waters. This spreading of thermal waters is evident in Cache Valley, in Jordan Valley, and in southern Utah Valley; likely the spreading occurs in many other artesian basins where it has not yet been recognized. In the East Shore Area thermal water trapped in confined aquifers warms water in overlying aquifers.

Some of the areas of hot water, such as Roosevelt, Pavant-Black Rock, and Cove Fort-Sulphurdale, probably have a potential to produce electricity. But the many areas of warm and hot water whose temperatures are too low to produce electricity may still have their waters utilized for space heating, as is planned for Monroe, for greenhouses, and for the processing of farm produce.

In this report are tables that give records of about 1500 thermal springs and wells: 65 yield hot water, more than 400 yield warm water, and more than 1000 yield slightly warm water. The records include location, ownership, temperature, yield, depth (of wells), geologic unit, and some chemical analyses.

In this report temperatures are recorded in °C. To convert °C to °F multiply by 2, subtract 10%, and add 32. For example:

$22°C = 44-4.4+32=71.6°$ or $72°F$

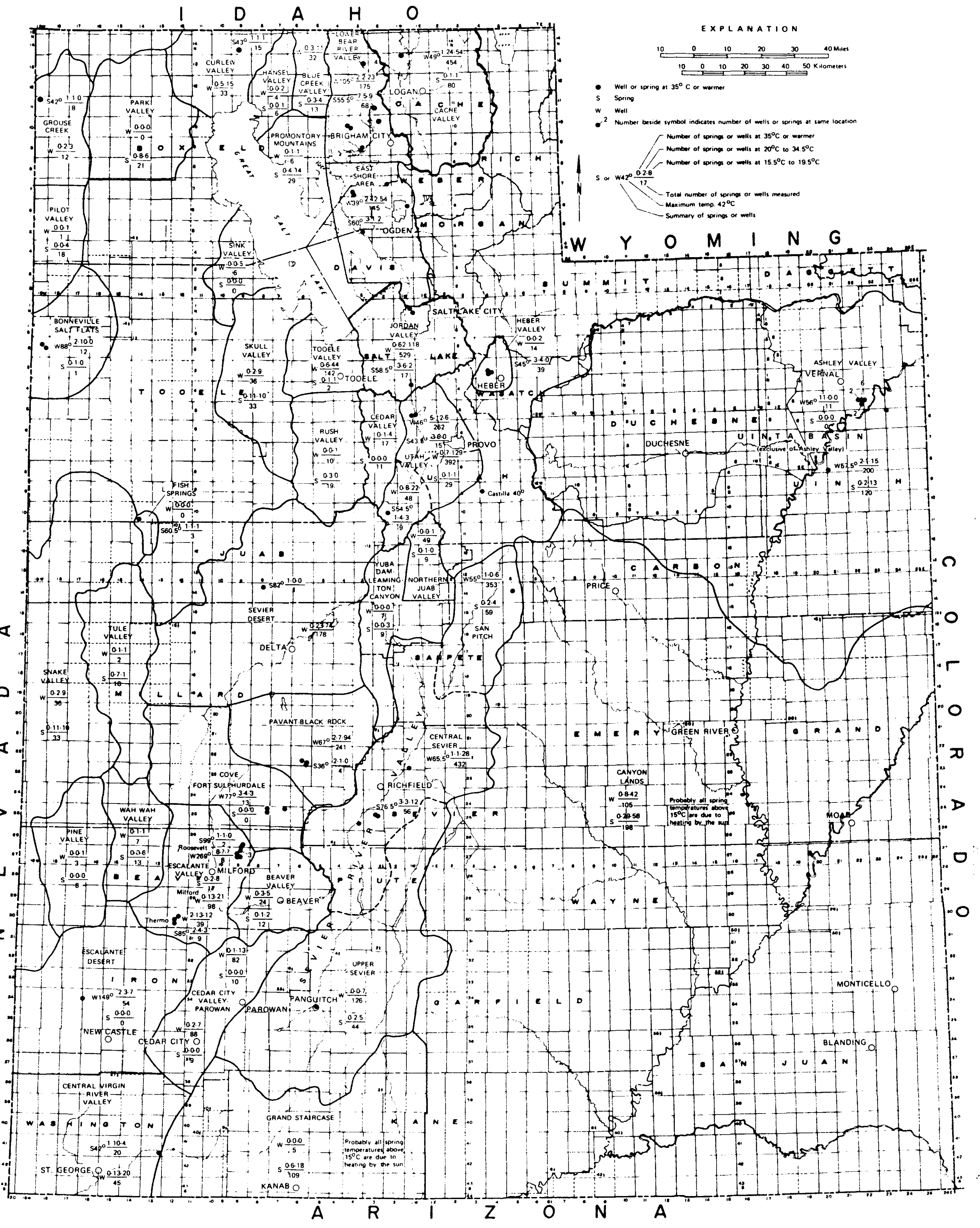

Figure 1. Map of Utah showing areas of thermal water.

INTRODUCTION

Summary of Occurrences of Thermal Water in Utah

Thermal waters are defined as those waters whose temperature is "appreciably above the mean annual temperature of the atmosphere" (Meinzer, 1923, p. 54). In this report, all water of 15.5°C or higher is considered to be thermal water. Thermal waters are here divided into three categories: hot water is 35°C or higher, warm water is 20° to 34.5°C, and slightly warm water is 15.5° to 19.5°C.

In western and central Utah there are 16 areas that have hot, warm, and slightly warm waters. In eastern Utah the only hot water comes from the oil wells of the Ashley Valley Oil Field. Warm and slightly warm water is discharged by wells or springs in 15 additional areas, scattered over the State, and slightly warm water occurs in 6 other areas. In addition, one isolated spring (Castilla) yields hot water of 40°, and three other springs and a well yield warm water of 20° to 16.5°. These areas and the number of springs and wells in each temperature range are shown on the map (fig. 1), and wells and springs that yield hot water are plotted on the map. Brief summaries of 16 significant areas are given here and all areas are discussed at greater length in the body of the report.

Lower Bear River Area -

Several hot springs have high yields of 450-5000 gallons per minute (gpm) but the water is moderately saline to briny (7000 to 35,000 or more milligrams per liter (mg/l) dissolved solids).

In a geothermal test well near Brigham City a bottom-hole temperature of 105°C was measured at 11,005 feet.

Bonneville Salt Flats -

Wells drilled in connection with salt recovery have temperatures that range between 24° and 31°C; two deep wells have temperatures of 43° at 1200 ft and 88° at 1636 ft respectively.

Cove Fort-Sulphurdale -

There are no records of water wells or springs in the Cove Fort-Sulphurdale area, but Rush (1977) measured temperatures in 13 wells or drill holes and the three highest were 77°, 49°, and 43°C in holes from 1000 to 300 feet deep. The computed geothermal gradients for those holes were 5.8°, 7.7°, and 7.1°C per 100 feet, respectively.

East Shore Area -

Temperatures and chemical analyses of water from wells drilled by Great Salt Lake Minerals and Chemicals Corp. north of Little Mountain suggest that heat from a fault zone rises through aquifers and confining beds and warms water at shallow depths without circulation of the hotter saltier water from the fault zone itself.

Escalante Desert -

Two wells yield large quantities of slightly to moderately saline hot water: one 500 feet deep near Newcastle yields 1700 gpm (pumped) of 35°C water, and one near Beryl Junction yields 1000 gppm (flow) of 149°C water from 7000 feet.

Escalante Valley -

The two Known Geothermal Resource Areas, Roosevelt and Thermo, with high temperatures of 269° and 85°C respectively, appear to have the potential to produce electricity, and Dotsons Warm Springs should be satisfactory for recreation. In addition, about 15 irrigation and domestic wells have water temperatures between 20° and 26.5°C.

If a 50-megawatt generating plant is put into operation at Roosevelt, a "spin-off" benefit probably will result because such a plant will have available about 500,000 gallons of waste water per hour at 116°C. Heat from this water could be used before the water is injected back into the geothermal reservoir (Val Finlayson, pers. commun., 1978).

Heber Valley -

Waters from several of the Midway Hot Springs are used in swimming pools.

Jordan Valley -

Three hot spring areas, Becks and Wasatch at the north end of the valley and Crystal near the south end, yield water of 40.5-58.5 °C. Becks and Wasatch have been used for recreation in the past, and the area around Crystal is being investigated to determine the feasibility of using some of the water for space heating in the Utah State Prison.

Warm water appears to move laterally in some of the artesian aquifers. Warm water of 20°-31°C is reported in about 60 wells and slightly warm water of 15.5°-19.5°C in another 120 wells. The areas of greatest concentration of warm water are a fan-shaped area in the north part of the valley and a north-south elongate area in the south-central part.

An area of possible interest for further exploration is about 3½ miles east of Magna where 5 wells show anomalously high silica contents of 71 to 82 mg/l. Water temperatures in these wells range from 17° to 21.5°C. Well depths from 105 to 156 feet, and dissolved solids from 976 to 1220 mg/l.

Pavant Valley - Black Rock Desert

Meadow and Hatton Hot Springs yield moderately saline water of 35°-36°C and a 90-ft well near Hatton Hot Spring yielded water to 67°C. Studies of chemical temperatures of these waters by Parry and Cleary and by Rush suggest that this area should be explored further for potential geothermal energy.

Sevier Desert -

Abraham (Crater) Hot Springs yields water at temperatures up to 82°C with 3200 to 3800 mg/l dissolved solids. Although it has been designated a Known Geothermal Resource Area (KGRA), chemical thermometer temperatures of 165°C (Na-K-Ca) and 110°C (SiO_2) reported by Parry and Cleary (1978, p. 8) suggest that the area has little potential as a high-temperature resource.

All 175 wells for which water temperatures have been reported have temperatures of 11.5°C or higher, 2°C above the mean annual air temperature. Seventy-four of those wells have water temperatures between 15.5° and 19.5°C and 20 have water temperatures between 20° and 28°C.

Sevier River Valley -

In the Central Sevier Valley, Monroe and Red Hill Hot Springs probably will soon be developed to provide space heating for schools and other buildings in Monroe. If that development is successful, it is likely that the water from Joseph Hot Spring could be similarly used.

In the San Pitch Valley, Crystal and Peacock Warm Springs yield fresh water at 22°C which is used for irrigation. A 5800-ft deep well flows 300 gpm of fresh water at 55°C.

Uinta Basin -

Only oil wells yield hot water (35°C or higher) in the Uinta Basin and only gas wells and two springs yield warm water (20° - 34.5°C).

In 1977 the Ashley Valley oil field produced more than 4400 acre-feet of hot water that was used for irrigation downstream from the field.

Utah Valley (Northern and Southern) and Goshen Valley -

The only hot springs in the area are at Saratoga (46°C), but water from the Burgin mine west of Goshen Valley yields moderately saline water at 54.5°C.

Despite the lack of hot water in southern Utah Valley there appears to be a heat source which heats water that then spreads laterally in the confined aquifers so that the median temperature of well water in southern Utah Valley is 14°C, 2½°C higher than the median temperature of well water in northern Utah Valley.

Central Virgin River Valley -

The median temperature of well waters in the Central Virgin River Valley is 18°C and of springs 20.5°C, both above the average annual air temperature of 16°C. The only hot water (42°C) is at LaVerkin Hot Springs which discharge about 10 cfs of moderately saline water (9500 mg/l dissolved solids) into the Virgin River.

Cache Valley -

The north-south faults that bound the graben of Cache Valley apparently permit warm water to rise from depth, but confining beds that overlie the artesian aquifers divert the water so that the heated water moves laterally away from the faults. Thus most of the warm and slightly warm water is concentrated in two tabular bodies, one on either side of the valley.

Canyon Lands -

Most of the warm water in the springs of Canyon Lands can be attributed to solar heating. Several "warm" springs of the Henry Mountains were remeasured in December 1977 and found to be definitely cool.

Purpose and Scope

This report is intended to provide information about the occurrence, geologic control, and potential for use of natural thermal waters of the State of Utah at 15.5°C or higher. Much of the information about thermal springs has come from J. C. Mundorff's report Major Thermal Springs of Utah, published in 1970 by Utah Geological and Mineralogical Survey as Water-Resources Bulletin 13 (in 1978 out of print). Information about wells that produce warm water and also additional information about warm-water springs have come from Technical Publications of the Utah Division of Water Rights, from other Water-Resources Bulletins of the Utah Geological and Mineral Survey, from Water-Supply Papers, Basic-Data Reports, Basic-Data Releases, Professional Papers, and Bulletins of the U.S. Geological Survey, and from unpublished records by the author.

The study consisted largely of compiling and evaluating information in published reports; one four-day field trip was made to remeasure temperatures of water from oil wells in the Ashley Valley oil field and to remeasure temperatures of a few springs in the Henry Mountains area. The study began on November 1, 1977, and the report was completed on May 31, 1978.

All work was done under Contract 78-5146 between the Utah Geological and Mineral Survey and the Contractor, Harry D. Goode, author of this report.

Evaluation of Temperature Measurements of Water in Springs and Wells

This study has considered all published occurrences of spring and well waters in Utah that have temperatures of 15.5°C or higher. These occurrences are listed in the tables that accompany each discussion of the thermal areas. Although it is recognized that a temperature of 16° recorded for a well 1000 feet deep is not as significant as the same temperature in a well 100 feet deep, the criterion used here is temperature and not depth of well, and the reader is left to evaluate the significance of the temperature/depth relationship.

Spring temperatures also must be evaluated not only because many springs issue from near-surface aquifers, such as thin pediments, that may be warmed by the sun, but also because spring temperatures are commonly measured where there is sufficient flow to make a conductance measurement or to collect a sample for chemical analysis rather than at actual points of seepage. Thus many above-normal temperatures of spring water are simply the result of excessive warming by the sun, and since most sampling and testing of spring waters is done during the warm-weather months, temperatures of 16° to as much as 30°C may not indicate an anomalous deep heat source.

During my studies of the Henry Mountains in the summers of 1975-76-77, I measured temperatures of 150 springs, of which 50 had temperatures of 15.5°C or higher. Where possible these temperatures were measured where the water issued from the ground but many of the springs yield water by seepage so these temperatures were measured where the flow became concentrated enough for a conductance measurement or for sample collection. A few developed springs were measured where the water flowed from a pipe. Obviously the temperatures measured in the summertime some distance from point of issue will be anomalously high. To verify this explanation, in December 1977 I measured temperatures of about 10 springs in the Henry Mountains that had showed temperatures of 60° or higher during summertime measurements. All the remeasurements were cooler; one spring that had been measured at 23° in summer was frozen in winter.

My experience with measurements of spring temperatures seems to be confirmed by repeated measurements recently published for five springs in the south-eastern

Uinta Basin (Conroy and Fields, 1977, p. 211). At each spring, temperatures were measured 9 to 14 times at approximately monthly intervals between December 1974 and September 1976.

Spring	gpm Range in yield	°C Range in temp.	°C Total Fluctuation
(D-15-20)15bbd	0.75 - 3	3 - 12.5	9.5
(D-15-23)36ddd	2.5 - 17	1 - 17	16
(D-15-24)10bcd	75 - 170	7 - 11	4
(D-15-25)13bad	24 - 60	5 - 12	7
(D-15-25)18cda	1 - 3.5	2 - 10	8

Although none of these springs has a particularly high temperature, all the highest temperatures were measured between the end of May and mid-September, suggesting some warming by the sun.

On Bonneville Salt Flats the U.S. Geological Survey in 1976 augered 119 test holes 1 to 19 ft deep (Lines, 1978). Water levels ranged from 1 inch above land surface to 11 feet below land surface, but most were within 2 ft of land surface. Temperatures measured in 60 of those holes between March 31 and April 7, 1976, ranged from 5° to 13°C with a median of 8°; temperatures measured in 40 of those holes between August 31 and September 28, 1976, ranged from 16° to 23° with a median of 21°. These measurements not only confirm the effect of the sun's heat on water temperatures but also indicate a magnitude of 13° for summer warming. Additional temperature measurements could refine the indicated magnitude of solar heating.

From the evidence above, I feel that many, probably most, of the temperature measurements of springs in the 16° to 30°C range are not indicators of a subsurface heat source, although I have included them in the tables.

Origin of the Thermal Waters

Essentially all the thermal waters of Utah have originated as meteoric water that has circulated deep below the surface of the earth and has been warmed by the normal or slightly elevated geothermal gradient. In some places, deeply circulating waters have warmed overlying bodies of water that now yield thermal water to wells by conduction. In a few places, such as Roosevelt Hot Springs, Abraham (Crater) Hot Springs, Coyote Spring in Curlew Valley, heating may result from a still-hot intrusive body or from adjacent volcanic rocks. It is unlikely that any of the thermal water is magmatic water (water derived from the cooling of magma as it solidifies).

Mundorff (1970, p. 6) has said that "nearly all thermal springs in Utah are in or very near fault zones that serve as escape routes for deeply circulated waters under artesian pressure." Meteoric water penetrates cracks and fissures in the bedrock of the mountains, moves deep within the earth and becomes heated, then seeks to escape back to the surface by the shortest possible route. Commonly, such a route is the fault that separates the mountain mass from the adjacent valley. Examples of this idealized system occur in many places in the Basin-Range Province in the western part of Utah, but the hot springs along the Wasatch Fault Zone present a special case because the bounding fault has only a shallow dip of about 35° (see discussion of Wasatch Fault Zone below). Where the meteoric water of the mountains penetrates only to moderate depths, it does not become heated but it may still return to the surface as cold springs along the bounding faults.

Many of the wells that produce thermal water are located on or near faults, some of which also have nearby thermal springs, such as those at Saratoga near the Utah Lake Fault Zone. But many areas in the artesian basins of the Basin-Range Province have thermal wells that are not near thermal springs and the water presumably is warmed by conduction from deeper circulating hot water. For example, two areas in Cache Valley yield warm water to wells and are near buried faults that separate the valley from the adjacent mountain; a large warm-water area in the north-central part of Jordan Valley is apparently related to a buried fault; and in the western part of the East Shore area several wells near Little Mountain yield warm water from an area that may be near a buried fault. In such areas it appears that heated water rises along the fault but its vertical movement is finally stopped by a relatively impermeable confining bed that overlies the fault. The heated water then moves laterally and mixes with other water in the permeable zone, but the constant supply of heat warms the water in permeable zones that overlie the confining bed above the fault and that water, generally appreciably fresher than the water that rises along the fault, becomes available to be withdrawn by wells. This system might be described as a natural heat-exchanging system whereby deeply circulating, commonly saline water transfers its heat by conduction to an overlying fresher-water aquifer from which it is separated by a relatively impermeable confining bed.

Hot Springs along the Wasatch Fault Zone

Four of the five hot spring areas along the Wasatch Front occur on faults that bound the distal ends of spurs that project from the front, and only one of the spring areas is on the main Wasatch frontal fault. In addition, the Cutler Warm Springs, temperature 21°-26.5°C, "issue from limestones of Paleozoic age along the bed and banks of the Bear River...about one mile east of the main Wasatch fault" (Mundorff, 1970, p. 50). The discussion below will suggest that the main deep conduit for hot water is the frontal fault, but that most of the readily visible hot and warm water finds shorter routes to the surface along the faults that bound the spurs than along the frontal fault itself. Furthermore, the frontal fault may, through buried splinter faults, transmit heat to many areas of warm water of 15°-20°C whose sources cannot be directly identified.

From north to south the five hot spring areas are:

	Spur	Distance in miles from main fault	°C	gpm Discharge	Total solids mg/l
Madsens (Crystal) (B-11-2)29da	Madsen	1½	51-55.5	500-1800	38,500 45,500
Utah (B-7-2)14dca	Pleasant View	2½	57-58	250-700	18,900 25,200
Ogden (B-6-1)23ccd		On frontal fault	49-65	35-100	8,650 8,820
Becks-Wasatch (B-1-1)14dcb	City Creek	4-5	52-56	60-450	13,100 13,900
(B-1-1)25db			40-42	310-1020	5,590 12,800
Crystal* (C-4-1)and (C-4-1)12b	Traverse Range	4	50-58	45-60	1,300 1,700

*Although Crystal Springs are included in this group, just as Gilbert included them, it should be pointed out that Mundorff (1970, p. 34) attributes the source of heat for these springs to the Tertiary volcanic rocks that are about 700 feet deep, as well as the geothermal gradient.

Gilbert, in his report on basin-range structure, mentions these five springs in part of his discussion of the Wasatch fault, which is excerpted below. First, Gilbert points out that the plane of the "frontal fault of the range," as measured at about 10 places, generally dips about 35°, with one measurement of 20° and another of 45° (1928, p. 22). Then he describes how the spurs are created as successive movements occur on the frontal fault:

> The local dip line is assumed to be straight except at a single place, low down, where a firmly fixed knob of strong rock projects from the footwall. During early stages of the movement (A) (fig. 2) weaker rocks of the valley block make the necessary adjustment by flow. At some later stage the knob punches out a piece of the valley block, creating a spur block. If the spur block were merely severed and the valley block moved away from it a chasm would be created (B) like the crevasse of a glacier, but the parts are too heavy to permit this, and their settling yields a condition like that shown in (C) (1928, p. 32).

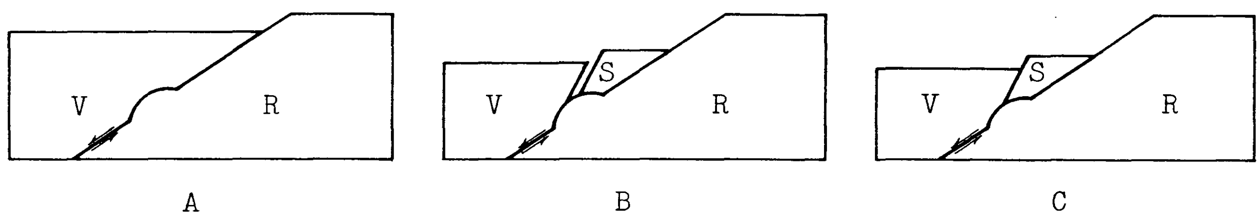

Figure 2. Ideal sections of progressive dislocation of valley block, V. and range block, R, to illustrate hypothetical derivation of spur block, S. (Source: Gilbert, 1928, fig. 27)

Gilbert continues:

> all four of the fault-block spurs are accompanied by thermal springs, whose waters rise along their bases.. The spur base is lower than adjacent parts of the range base, and the point of issue at each spur locality may be determined by that fact, but that conclusion does not explain the scarcity of thermal waters on the long line of the frontal fault. It may be that the outer faults of the spurs are peculiarly favorable for the conveyance of deep penetrating circulation because of the conveyance of the less perfect adjustment there of the fault walls (p. 32).

Gilbert then estimates that where the mean annual air temperature is 52° (11°C), as at Salt Lake City, and where the temperature gradient is 1°F for each 75 feet, rock temperature of 134° (56.5°C) is reached at depth of 6,150 feet.

This may be accepted as an underestimate of the depth to which water circulates on the faults that limit the spurs (p. 33).

When we realize that Gilbert also attributed the fluctuations of temperatures of some thermal springs to "the dilution of a practically constant discharge of uniformly hot water rising from the depths with a variable discharge of cool ground water," and that "in localities that show no indications of recent volcanism the heat of waters rising along the fault is presumably derived from the inner earth's store" (p. 33), we have to admit that Gilbert did a magnificent job of interpreting the geologic environment of the hot springs near the Wasatch fault zone. But I should like to expand on his interpretation of the reason for the concentration of hot springs on the faults bounding the spurs rather than on the main frontal fault. In addition to the "less perfect adjustment...of the fault walls" of the bounding faults, the steep bounding faults provide shorter conduits to the surface than does the frontal fault. From this we can infer that meteoric water circulates at great depth and is heated along the frontal fault, then rises to the surface by the shortest routes. The best exposed of these short routes are at the distal ends of the spurs, but it is likely that there are many similar small faults, now buried by surficial deposits, that act as escape routes for warm water that rises along the frontal fault elsewhere. These hidden escape routes may permit the rising of hot waters in many places that cannot be pinpointed, but instead effect a general warming of the subsurface water. This phenomenon could be the explanation for areas that produce water of 15° to 20°C, about 4° to 9° above the mean annual air temperature.

Marsell (Milligan and others, 1966, p. 4) suggests that "Commonly the heated water finds freer avenues of escape to the surface along the more open fissures in the 'footwall' of the fault than along the major fault plane itself. Thus many thermal springs issue at points several hundred feet back from the associated fault zone. Examples are: Cutler Thermal Springs, where Bear River breaches the Wasatch Range; the hot springs at the mouth of Ogden Canyon; and the LaVerkin Hot Springs along the Virgin River just east of the Hurricane Falt Zone."

Known Geothermal Resource Areas (KGRAs)

The Energy Resources Map of Utah (Utah Geol. & Mineral Survey, 1975) classifies geothermal areas into three categories, Original KGRA, Known Geothermal Resource Area defined by geologic criteria; Administrative KGRA, Known Geothermal Resource Area defined by competitive interest; and Area Potentially Valuable for Geothermal Resources (PVGRA). These areas and the areas under lease are listed here (Rush, 1978).

	Total Area (Km^2)	Area leased
Original KGRAs		
Roosevelt Hot Springs (Escalante Valley)	121	100
Abraham (Crater) Hot Springs (Sevier Desert)	70	70
Administrative KGRAs		
Navajo Lake	10	0
Lund (Escalante Desert)	16	14
Thermo Hot Springs (Escalante Valley)	100	54
Cove Fort-Sulphurdale	100	79
Monroe, Red Hill, Joseph (Sevier River)	66	2.9
PVGRAs		
Little Mountain (East Shore Area)		
East Tintic-Burgin Mine (Utah and Goshen Valleys)		
Wilsons Hot Springs (Fish Springs)		
Black Rock Desert-Neels well		
Bonneville Salt Flats		

Presumably these areas were clssified on their apparent potential to yield geothermal energy that could be used to generate electricity.

Since the publication of the map, Navajo Lake has been dropped from the list, and the Roosevelt, Thermo, and Cove Fort-Sulphurdale areas have been identified by Rush of the U.S. Geological Survey and by the Earth Science Laboratory of the University of Utah Research Institute as having potential for generating electric power. The Earth Science Laboratory has also recommended that the hot springs at Monroe be used for space heating in two schools and other municipal buildings in Monroe. These geothermal areas are discussed in more detail in the appropriate sections on individual areas.

Exploration south of Lund (see Escalante Desert) located 149°C water at 7000 feet, and exploration by Great Salt Lake Minerals and Chemicals Corp. near Little Mountain (see East Shore Area) located hot water at about 900 feet. No other exploration in those areas has been reported.

Further information about history and problems of developing the geothermal resources of Utah are contained in Utah Energy, Research Report No. 8 of the Office of Legislative Research (Millar and Searle, 1976).

Possible Uses for the Thermal Waters of Utah

This study originally set as its limit waters in the temperature range 15.5°-90°C, but this report has also included reported temperatures appreciably higher (such as the geothermal-test well near Beryl whose water temperature was reported as 300°F, 150°C). Therefore, we shall begin this section on utilization of thermal waters by removing from consideration all geothermal systems that may have a potential to produce electrical energy, say those above 392°F (200°C). Thus all thermal waters not used to generate power and all geothermal waters discarded after generation of power can be considered to be available for other uses.

The areas that have thermal waters are shown on figure 1; some of the possible uses are considered below.

Uses for thermal waters can be divided into three categories: domestic, in which the waters come into contact with human beings; agricultural, in which the waters come into contact with crops; and industrial, in which the waters are kept within the industrial system. For many of the specific uses within each category there are limitations about the chemical quality of the water that may be used. These limitations are complex and therefore no attempt will be made here to define the quality of water required for each use. Rather, some of the possible uses and the minimum temperatures needed for each use are listed here. (The interested reader is referred to a short discussion, Relationship of quality of water to use, in Hem, 1970, or to a more complete discussion in Water Quality Criteria by McKee and Wolf, 1963).

Domestic		Agricultural		Industrial	
Heating swimming pools	30°	Fish farming	20°	Space heating (with pumps)	15°-25°
Therapeutic bathing	40°	Soil warming	30°	All-year mining	30°
Home hot-water	90°	Greenhouse	50°	Deicing	30°
Public hot-water supplies at campgrounds, resorts, etc.	95°	Protein extraction from plants	50°	Space heating (optimum)	60°-90°
		Mushroom growing	50°	Refrigeration	70°
		Animal husbandry	60°	Drying cement	110°
		Drying produce	100°	Drying cement	110°
				Air conditioning (H_2O+Li+Br system)	110°

(Industrial uses continued)

Fresh water by distillation	120°
Sugar refining	120°
Evaporation of saline solutions	120°
Food canning	140°
Alumina	150°

Many more uses of thermal waters and the problems of such utilization are given in the papers presented at a symposium held in San Diego, California, January 31 - February 2, 1978. The papers were published by Geothermal Resources Council, P.O. Box 1033, Davis, California 15616, under the title Direct Utilization of Geothermal Energy: a Symposium.

Obviously the warm and hot waters of Utah could be put to many uses. So far, utilization has been minimal, a few greenhouses and swimming pools; but as other sources of energy become more costly we can expect appreciable development of thermal waters for space heating, greenhouses for year-round production of high-value crops, food processing, and many of the other uses listed above.

Recommendations for Future Work

Periodic Up-Dating of Thermal Data

This study has confined itself principally to data in published reports, supplemented by small amounts of information collected by the author in prior investigations of water resources. Thus, descriptions of some areas, such as Tooele Valley and Northern Utah Valley, depend on information collected more than 15 years ago. Therefore, there should be added to the tables presented here information collected since the last publication of data, and a program of periodically updating the file on thermal waters should be instituted.

Use of Thermal Water - Temperature and Quality Requirements

Some areas in Utah, such as the lower Bear River area and Ashley Valley, annually discharge thousands of acre-feet of hot water, and, if a 50-megawatt generating plant is put into operation at Roosevelt Hot Springs, many million gallons of water above the boiling point will be discharged each day as waste water from the plant.

This study has presented a short list of possible direct uses for thermal water. A fuller study could equate the amounts, temperature, and quality of thermal waters with the specific requirements of various uses.

Acknowledgments

This report on thermal water in Utah is the result of a study of the literature on ground water in Utah. The more than 1500 well and spring records that are included in the report were culled from about 6000 records of wells and springs on which water temperatures were measured and published by hydrologists of the U.S. Geological Survey over a period of many decades. Without this large amount of basic data, the records of water temperatures included here would have been appreciably less complete. Similarly, most of the discussions of geology have been taken from reports by geologists of the U.S. Geological Survey. Thus I owe a deep debt of gratitude to all whose material I have used.

Val Finlayson of Utah Power and Light Co. supplied me with information about geothermal test wells drilled near Brigham City and in the Escalante Desert, and Richard Peterson of Equity Oil Co. discussed the wells of the Ashley Valley Oil Field with me. To both I am grateful.

This report was prepared under contract #78-5146 between the Utah Geological and Mineral Survey and me. During the preparation of the report I received excellent cooperation from the drafting and clerical staff of the Utah Survey, and I am especially grateful to Donald T. McMillan, Director, for editing the manuscript and to Brad Taylor for preparing most of the tables of wells and springs that have slightly warm water. Wallace Gwynn and Peter Murphy contributed reports and made suggestions that were extremely helpful as the work progressed.

Selected References

The references listed here are references that apply to the geology or hydrology of large areas of Utah or to the subject of geothermal energy in general. The references that apply to the individual areas of Utah that are discussed in the next section are listed at the end of each sub-section.

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DESCRIPTIONS OF AREAS OF THERMAL WATERS

The thermal waters of Utah are divided into three catefories: hot at 25°C and higher, warm at 20° to 34.5°C, and slightly warm at 15.5° to 19.5°C. The seventeen areas of Utah that have hot water also have warm and slightly warm water. They will be discussed first, in alphabetical order. Then the areas that have warm and slightly warm water will be discussed followed by the areas that have only slightly warm water. Finally, a few isolated thermal springs and a well will be discussed.

The discussions of each area refer to tables of records of thermal springs and wells and of chemical analyses where they are available. These tables follow the text of the report.

References for the discussions and records of the individual areas follow each discussion. Additional references that apply to large areas of Utah or to thermal waters in general are given above at the end of the introductory section.

Areas That Have Hot, Warm, and Slightly Warm Water

Sixteen areas in the western and central part of Utah and the Ashley Valley oil field in the Uinta Basin in the eastern part of Utah yield hot, warm, and slightly warm water to wells or springs. The hottest water at 269°C has been measured in a geothermal test well in the Roosevelt KGRA in the Escalante Valley. That area probably has potential to generate electricity, perhaps as much as 300 megawatts. Another area, Monroe-Red Hill Hot Springs in the Sevier River Valley, is being developed to provide space heating. It is likely that the hot and warm waters of some of the other of these seventeen areas could be utilized for space heating, greenhouses, or food processing. Descriptions of these seventeen areas follow.

Lower Bear River Area

INTRODUCTION

The lower Bear River area includes the easternmost portion of Box Elder County. It encompasses about 700 square miles in the valleys of the Lower Bear River and its principal tributary, the Malad River.

SUMMARY of OCCURRENCES of HOT and WARM WATER

The hot- and warm-water springs of the Lower Bear River Valley yield water that is slightly saline to briny (2120 to 43,500 mg/l dissolved solids), and the hot springs above 42°C generally have high yields of 450 to 5000 gpm. Despite this seeming evidence for a subsurface source of high heat, the only geothermal test well in the area, (B-10-2)bcc, reported a temperature of only 105°C at 11,005 feet.

GEOLOGIC and HYDROLOGIC ENVIRONMENT

Precambrian and Paleozoic rocks form the mountains that bound the area on the east and west, and Cenozoic rocks fill the valleys. No rocks of Mesozoic age are exposed in the area, probably because the area was a highland of the Sevier Orogenic belt in late Mesozoic time and therefore early Mesozoic rocks that may have been deposited were eroded away.

Today the dominant structure is a narrow north-trending graben, or series of grabens, that is a continuation of the graben structure along the Wasatch Front farther south. Little Mountain, west of the main part of the graben, is a horst bounded by north-trending faults.

Cenozoic deposits fill the graben to thicknesses that may reach 8000 feet (Bjorklund and McGreevy, 1974, p. 11). These deposits are principally deltaic and lake-bottom deposits except around the margins of the valleys where there are alluvial, colluvial, and landslide deposits. The great bulk of the deltaic and lacustrine deposits consists of silt and clay with interbedded alluvial sand and sparse gravel. Except where this valley fill has been drained by streams that have dissected it, it is saturated, so saturated that Bjorklund and McGreevy, in their report on ground water, have mapped most of the valley fill, perhaps half of the total area, as areas of natural discharge (1974, plate 2). About 190,000 acre-feet of the natural discharge of 295,000 acre-feet per year is by springs and drains (figures adjusted from Bjorklund and McGreevy, 1974, p. 21). Springs near West Hills, Blue Springs Hills, and Little Mountain discharge about 30,000 acre-feet annually from Paleozoic limestone or from unconsolidated sediments nearby. Another 30,000 acre-feet is discharged by "springs along the west side of the Wasatch Range and Clarkston Mountain." And "at least 140,000 acre-feet of water is discharged annually from springs and drains on the valley floor" (Bjorklund and McGreevy, 1974, p. 23-24).

OCCURRENCES of WARM and HOT WATER

A now abandoned geothermal-test well had a reported bottom-hole temperature of 105°C from a depth of 11,005 feet (Val Finlayson, Utah Power & Light Co., pers. commun. 1978), and twelve springs and six water wells have reported water temperatures of 20° to 74°C (table 1A). Of the latter 18, nine are between 20° and 34°, six between 35° and 49°, and three others are at 51°, 53.5°, and 74° respectively. The highest temperature, 74°, was measured in a well, (B-9-3)27cba, 502 feet deep. This well produced gas and was plugged and abandoned. A companion well, (B-9-3)27cba2, 500 feet deep, also produced gas. Its water temperature, 43°, was measured in a pool, so it is probably appreciably lower than if measured at the discharge point. The geologic map of Bjorklund and McGreevy (1974, plate 1) shows a northwest-trending normal fault in the immediate vicinity of the two wells. Likely the fault is the source of the heat. Four wells (table 1A) have reported water temperatures of 20° to 29°. Two of these, (B-10-3)4add and (B-10-3)33dac, are nearly on a N-S line with the two wells above. If the inferred N-S fault that is shown on the Bjorklund-McGreevy geologic map were plotted about one mile to the west, all four of these wells would be close to that plot. The remaining two wells obtain their water from Paleozoic limestone and the Tertiary Salt Lake Formation, respectively. The source of the heat is unknown.

Of the dozen springs, five have temperatures of 21° to 26° and seven have temperatures from 42° to 53.5°. The five with the lower temperatures rise from the Oquirrh Formation or other Paleozoic rocks, and at least Cutler Warm Springs and the two near Little Mountain are controlled by faults; probably the other two are also. Stinking Hot Spring, Little Mountain Hot Spring, and Crystal Hot Spring are all controlled by faults. (See discussion of Hot Springs along the Wasatch Fault Zone for further information about Crystal Hot Spring and Cutler Warm Springs). The four springs that rise in (B-13-2)23 probably are those called Uddy Hot Springs by Mundorff. He says that they "issue from Paleozoic limestones at the small escarpment between the flood plain and the higher levels of the Malad River valley...The springs may issue in the vicinity of a fault concealed beneath the valley fill of Quaternary age" (1970, p. 32).

Only one of the warm-water wells, (B-12-3)15cdc, yields water of even passable quality, probably about 1000 mg/l dissolved solids; the other five apparently yield or did yield water that is too salty for use. Similarly, all the warm- and hot-water springs yield water that is slightly saline to briny (2120 to 43,500 mg/l dissolved solids). In general the hot springs above 42°C have high yields of 450 to 5000 gpm. Only Stinking Hot Spring yields less, an estimated 45 gpm. The five springs that have temperatures from 21° to 26° have appreciably lower yields of 2 to 15 gpm.

Twenty-two wells and eight springs yield water at temperatures from 15.5° to 19.5°C (table 1B). Conductance measurments show that the quality of this cooler water is appreciably better than the quality of the warmer water, but even several of these springs and wells yield slightly to moderately saline water of up to about 10,000 mg/l.

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Bonneville Salt Flats

INTRODUCTION

The Bonneville Salt Flats are in western Tooele County adjacent to the Nevada border. Wendover is the only town, and the principal industry is the extraction of salt from brines that underlie the salt flats. The wells drilled to explore for and recover the brines provide the principal information about subsurface temperature.

SUMMARY of OCCURRENCES of HOT and WARM WATER

Many shallow and deep wells drilled to extract brines from the Bonneville Salt Flats have reported warm and hot water. Two deep wells that seem to straddle a northeast-trending fault reached water of 43° at 1200 feet and 88°C at 1636 feet, respectively.

GEOLOGIC and HYDROLOGIC ENVIRONMENT

The Bonneville Salt Flats are in an asymmetric two-step graben whose axis trends about N50°E (Turk, 1973, fig. 3). The northwestern boundary of the graben is the Silver Island Mountains formed largely of Paleozoic sedimentary rocks, but "intruded by five stocks of unknown age, ranging in composition from quartz monzonite to granodiorite (Whelan and Petersen, 1974, p. 75). In addition, there are dikes of various compositions and "seven volcanic flows of rhyolite or andesitic composition in the southern Silver Island Range" (Whelan and Petersen, 1974, p. 77). The southeastern flank of the graben probably is composed of volcanic rock but it has no surface expression and is hidden by the valley fill.

"The basin overlying the volcanic rocks was filled with fluvial and later lacustrine sediments of Plio-Pleistocene age" (Turk, 1973, p. 1). The youngest deposits form the salt crust which underlies about 150 square miles "and ranges in thickness from a feather edge to nearly 5 feet in the center...The sediments underlying the salt crust are saturated with sodium chloride brine" (Turk, 1973, p. 1).

Turk (1973, p. 1) has identified three aquifers: 1) an alluvial fan aquifer off the southeast slope of the Silver Island Mountains that supplies brackish water to 27 wells, 2) "a deep stratified aquifer holding low-grade brine recoverable by deep wells, and 3) a shallow aquifer of lacustrine sediments containing high-grade brine which is harvested for its potassium chloride content."

OCCURRENCE of HOT and WARM WATERS

Turk reports one spring, Blue Lake Spring, (C-4-19)6d, about 15 miles south of Wendover, that yields moderately saline water at a temperature of 29°C (84°F). All other temperature data come from wells, of which only a few records are given here in table 2. Most of the wells, even one, (C-1-19)23cbc, that is 1496 feet deep, have water temperatures that range from 23°C to 35°C, but deep wells 1 and 3 reached water of 43°C at 1200 feet and 88°C at 1636 feet, respectively. These last two wells seem to straddle a southwestward extension of the inner fault on the southeast side of the graben.

Whelan and Petersen have computed reservoir temperatures using the Na-K-Ca method of Fournier and Truesdell, and have determined that the temperature for well #5 is 270°C, for DBW13, 199°C, and for DBW8, 285°C. Because the waters of DBW3 and 13 are so briny, Whelan and Petersen feel that the temperature at well #5, 270°C, may be the best indicator of the reservoir temperature (1974, p. 77).

Whelan and Petersen (1974, p. 78) conclude that "Bonneville Salt Flats just south of Wendover, Utah, possibly contain a geothermal reservoir. All of the theoretical requirements for the system could be present. There is a buried intrusive which could be the heat source; water in the form of brines appears to be present; the faulting of the Wendover Graben could provide the required permeability; and buried volcanics could provide the cap rock."

Although Turk (1973, p. 74) doesn't specifically deny the existence of a thermal reservoir, in his short discussion on the Great Salt Lake Desert he suggests that the warmth of the water may be due to a high geothermal gradient which results from a hindering of heat flow by the thick porous clay beds that underlie the desert. "The implication is that areas of thick clay accumulation, like the Great Salt Lake Desert, may have a low-temperature geothermal potential without a near-surface source of heat..."

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Cove Fort - Sulphurdale

Cove Fort-Sulphurdale, in an area of Quaternary volcanic rocks, is listed as an Administrative KGRA in the section on Known Geothermal Resource Areas, above. No records of water wells in the area were found in the literature, and Mundorff (1970, p. 50) reported an unsuccessful search for "Sulphurdale Hot Springs" that may have been related to the mining of sulfur deposits in the area.

Rush (1977) reported temperature measurements that he made in 13 wells or drill holes in the Cove Fort-Sulphurdale area, and I have computed geothermal gradients from his reported measurements:

Table 3. - Cove Fort-Sulphurdale. Measured temperatures and computed geothermal gradients in 13 drill holes. Data from Rush, 1977.

Coordinate of drill hole	Bottom depth	Bottom temp. °C	Reference depth	Reference temp. °C	Gradient °C/100ft
(C-23-8)28ba	104	18.94	20	15.34	4.3
33cd	295	22.34	105	15.89	3.4
(C-23-9)34cd	293	18.96	105	15.84	1.7
(C-24-8) 2ac	377	19.64	105	17.10	.9
9a	487	20.32	100	14.77	1.4
(C-24-9)12cc	493	21.00	100	16.14	1.2
25ba	168	13.20	100	12.84	.5

Coordinate of drill hole	Bottom depth	Bottom temp. °C	Reference depth	Reference temp. °C	Gradient °C/100ft
(C-25-7) 2cc	1000	77.20	100	25.10	5.8
(C-25-8) 1cc	400	43.00	100	21.85	7.1
7cc	206	17.83	105	16.60	1.2
12dc	437	49.30	100	23.47	7.7
(C-26-7)18cc	112	12.62	20	11.02	1.7
(C-26-8)27bc	289	14.80	105	12.82	1.1

Three of those holes show very high geothermal gradients of 5.8, 7.1, and 7.7, but only further exploration will reveal the potential of the area.

REFERENCE

Rush, F.E., 1977, Subsurface-temperature data for some wells in western Utah: U.S. Geol. Survey Open-File Report 77-132, 84 p.

Southern Curlew Valley, Utah

INTRODUCTION

Curlew Valley heads in southern Idaho, crosses into Utah, and drains into the northern part of Great Salt Lake. The Utah (southern) part of Curlew Valley encompasses about 550 square miles (Bolke and Price, 1969, p. 1). Probably fewer than 300 people live in the Utah portion of the valley and essentially all of them are engaged in agriculture, principally the raising of livestock.

SUMMARY of OCCURRENCES of HOT and WARM WATER

Coyote Spring, (B-14-10)33bcc, yields about 20 gpm of hot (43°C) moderately saline (3240 mg/l) water. Volcanic rocks crop out a mile or two from the spring and probably underlie the spring area at depth. Although only two wells, both about 10 miles southwest of the spring have reported warm saline water, the spring area would seem to be a likely place to explore for hotter water at depth.

Another area, between Rose Ranch and the Idaho border, has five wells with water of 20° - 24°C; three of these appear to line up with an inferred N-S fault. One of these wells, (B-15-9)28cbb, yields slightly saline water that has 77 mg/l silica and 2640 mg/l dissolved solids; two others yield fresh water. Probably water in this temperature range could be expected in the vicinity.

GEOLOGIC and HYDROLOGIC ENVIRONMENT

The Utah portion of Curlew Valley is flanked on the west by the Raft River Range and on the east by the Hansel Mountains. Northward the Utah portion receives drainage from Idaho and southward it opens toward Great Salt Lake. Within the Utah portion of the valley are hills of Tertiary and Quaternary felsic volcanic rocks and basalt that cap a gravity high which occupies the central and eastern portions of the valley (Baker, 1974, plate 2). Thus the valley fill in the central and eastern portions is probably less than 1000 feet thick whereas in the western portion there is a trough at least 3000 feet deep between the Raft River Range and the Wildcat Hills.

"The consolidated rocks surrounding Curlew Valley and underlying it at depth have been distorted by repeated episodes of structural deformation... The abundant faults, fractures, and associated solution openings form the principal conduits through which water moves in the older consolidated rocks in the Curlew Valley drainage basin. Major structural features probably exerted considerable influence on the distribution of the basaltic lava flows, which are an important element of the ground-water flow systems in the valley fill...(and provide) the principal source of water to many wells in the area" (Baker, 1974, p. 12-13).

Because the hydrology of the valley is complex, Baker (1974, p. 1) has distinguished three major ground-water flow systems "that contain water of suitable chemical quality for irrigation. A fourth flow system, which contains hot, saline water, is present at depth in the western part of the valley."

OCCURRENCES of HOT and WARM WATER

Hot (45°C) moderately saline water (3240 mg/l dissolved solids) is yielded by Coyote Spring, (B-14-10)33bcc (table 4-A). "Although no other source in Curlew Valley produces thermal water, two wells in the Kelton area (about 10 miles southwest of Coyote Spring) reportedly encountered hot saline water at depth (probably below 500 feet)... These data suggest that hot saline water may underlie at least part of the western half of Curlew Valley."

"The high temperatures of water in the system probably indicate the presence in the subsurface of a relatively young intrusive body that is still hot, or relatively deep circulation of the water" (Baker, 1974, p. 34). A mile long outcrop (dike?) of basalt that Baker has mapped about a mile west of Coyote Spring suggests that there may be a hydrologic barrier between the source of Coyote Spring and the thermal waters encountered in the two wells cited above, but the presence of volcanics in the Wildcat Hills that also lie between the spring and the wells and the gravity high in the same area are strong evidence for a deep volcanic source for the heat for both the spring and the wells.

A temperature of 25° is reported for a spring (B-13-12)30caaS that discharges near several presumably cooler springs that are near the base of an alluvial fan at the southeast corner of the Raft River Range. Other springs with temperatures of 21° to 23° are reported a few miles to the west in the Park Valley area.

Five wells in Ts. 14 and 15 N., R. 9 W. between the Rose Ranch and the Idaho border have reported temperatures of 20° to 24°C. In the vicinity are other wells 15.5° - 19°C. Baker's geologic map (1974, plate 2) shows an inferred N-S fault about on line with three of the wells (20.5° - 24°); he makes no specific mention of the wells or the fault, but if there is a fault it could be the source of heat for the warmer water.

The very saline Black Butte Spring, 20,300 mg/l dissolved solids, yields slightly warm water of 19° near a basalt outcrop (table 4-B).

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East Shore Area

INTRODUCTION

The East Shore Area lies between Great Salt Lake on the west and the foot of the Wasatch Range on the east (fig. 3). It includes the portions of Weber and Davis Counties that are west of the mountains and a small part of southern Box Elder County, in township 7 north. This area with a population of about 250,000 is second in Utah only to Salt Lake County which has about 508,000 people (Bur. of Econ. And Business Research, March 1976). It is the site of Weber State College, Hill Air Force Base, and the Clearfield Depot as well as other military and governmental agencies. The Weber County portion produces beef, dairy products, and poultry and has processing facilities to make them ready for market. The Davis County portion also is partly agricultural and industrial but much of its expansion in the last two decades has been to provide homes for people who work in Salt Lake Valley.

SUMMARY of PRINCIPAL OCCURRENCES, USE, and POTENTIAL for USE

Temperature measurements on 145 wells in the East Shore area (Bolke and Waddell, 1972, p. 40-51) suggest that in most areas west of Ogden wells of depths of a few hundred feet are likely to reach water of $15\frac{1}{2}^{\circ}$C or warmer, 4 or more degrees above the mean annual air temperature. Of the 145 wells, 45 that have temperatures of 20° or higher are listed in table 5-A and are discussed in some detail, 54 others that have temperatures of $15\frac{1}{2}^{\circ}$ to $19\frac{1}{2}^{\circ}$ are listed in table 5-B and only 47 have temperatures of 15° lower. The highest well water temperatures, 25° and 39°, are in a cluster of 13 wells drilled by Great Salt Lake Minerals and Chemicals Corp. to depths of 412 to 920 feet. The waters from all except the deepest of these wells have conductances that suggest the dissolved minerals content is 500 mg/l or less. So far, no use has been made of the heat from these well waters, but those wells reporting the higher temperatures would certainly have potential to provide space heating.

Three spring areas, Ogden, Utah, and Hooper Hot Springs, yield highly saline water of 57° to 60°C and another, Southwest Hooper Warm Springs, yields brine at about 32°C. The water from Utah Hot Springs is used to heat nearby buildings (Mundorff, 1970, p. 29); the water from the other springs is unused. The discharge of Ogden Hot Springs has been reported as 35 to 100 gpm, but the discharges of the other springs have not been reported. The waters from all these springs probably could be used for space heating.

GEOLOGIC and HYDROLOGIC ENVIRONMENT

The East Shore Area, like other areas along the Wasatch Front, is a structural graben whose eastern side is marked by the Wasatch fault and by the scarps along the face of the mountains. The western side is probably marked by buried faults east of Little Mountain and Antelope Island. Feth and others (1966, p. 26) say "that in general the bedrock surface (of the graben) is in the shape of an elongated trough, the deepest part of which is in the east-central part of T.6 N., R.2 W., about 3 miles north of the Ogden Municipal Airport and about 5 miles west of the Wasatch front. The gravity anomalies indicate that the unconsolidated or poorly consolidated rock in the trough has a maximum thickness of 6,000 - 9,000 feet." South of this area is another elongate gravity low that Cook and Berg (1961, p. 79) describe as the Farmington graben where "the thickness of the valley fill...is unknown..but exceeds 3500 feet."

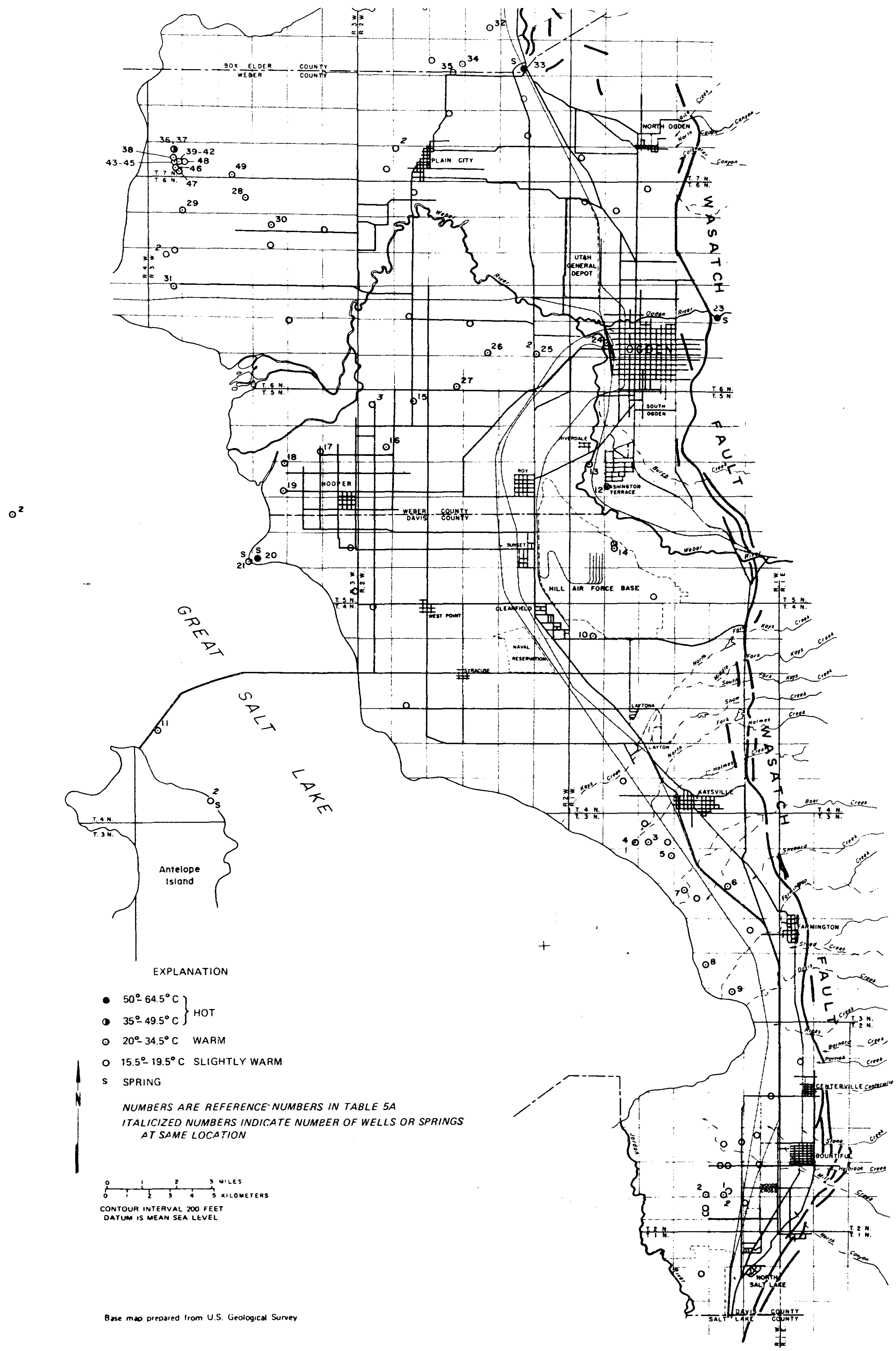

Figure 3. Map of East Shore Area showing thermal wells and springs.

The valley fill consists of detritus derived from the nearby Wasatch and from the Uinta Mountains to the east, and brought into the valley principally by the Weber and Ogden Rivers. During the high cycles of Lake Bonneville the rivers formed huge deltas that make up the bulk of the near-surface deposits, which today near the mountains provide relief of nearly a thousand feet above the flat lake plain near the shore of Great Salt Lake.

The character of the deep sediments in the valley fill is not known, but they are probably similar to the intertonguing alluvial and lacustrine deposits that make up the upper 1200 feet. These deposits are gravel and sand near the mountain front and largely sand, silt, and clay in the lower parts of the valley. Even the delta deposits laid down in Lake Bonneville have large proportions of silt and clay because the outflows from the Weber and Ogden Rivers traveled through estuaries before they reached the mountain front.

The unconsolidated deposits form extensive aquifers that are largely artesian so that there is a constant tendency toward upward movement of water. The widespread lacustrine clay beds that act as confining layers inhibit this tendency, but undoubtedly some upward movement occurs. Whether or not the hydraulic environment promotes the upward transfer of heat is not known, but only 6 of the 137 wells for which temperatures have been reported (Bolke and Waddell, 1972, p. 40-51) show temperatures as low as 11°, which is about the mean annual air temperature. In addition to the 45 wells that have temperatures of 20° or higher and are discussed in the section on occurrences of warm and hot water, about 60 wells report temperatures of 15° to 19° and about 25 others temperatures of 12° to 14°.

OCCURRENCES and CONTROL of WARM and HOT WATER

About 6 miles west of Plain City 14 wells (table 5-A) that range in depth from 399 to 806 feet yield water of good quality (260 to 531 mg/l dissolved solids) at temperatures from 21° to 39°C (Bolke and Waddell, 1972, plate 3). Another well in the same cluster reaches bedrock at 920 feet and produces 38° water of poorer quality (980 mg/l dissolved solids). For a full discussion of the findings of Bolke and Waddell the reader is referred to their report, Technical Publication No. 35, p. 16, but, briefly, they concluded that in that area there are "at least four distinct water-bearing zones...delineated on the basis of drillers' logs and water quality, water temperature, and water-level data obtained from 12 wells perforated at various depths." They further say that "the source of heat causing the abnormally high ground-water temperatures is unknown, but it may be an underlying hot body or warm water that is moving upward along a fault." However, because the water in the upper zones is not highly saline as is water of 32° to 60° that comes from Hooper Springs about 11 miles south, they believe that "the higher than normal temperatures probably result from conductive vertical heat transfer rather than from mixing with warm saline water." The higher silica content, 67 mg/l, of the water from the 920-foot well may indicate that some mixing occurs at about 900 feet.

Thirteen of the wells mentioned above were drilled by Great Salt Lake Minerals and Chemicals Corp. to obtain hot process water of 82°C or higher for their plant at Little Mountain.

Two highly saline springs, Hooper Hot Springs and Southwest Hooper Warm Springs, on the shore of Great Salt Lake about 2 miles southwest of Hooper, yield water of 60° and 32°. This hot and warm water is probably rising along the same fault that is believed to supply the heat for the GSLM&C Corp. wells mentioned above. (The geologic map of Feth and others (1966) shows a N-S trending fault that goes through Hooper Springs and extends nearly to the vicinity of GSLM&C Corp. wells.)

Two other hot springs, Ogden and Utah Hot Springs, have been mentioned in many reports, probably the first of which was Hayden's (1873, p. 175) observation on the spring near the mouth of Ogden Canyon, for which he reported a temperature of 121°F (49.5°C). Most authors assign the geothermal gradient as the source of the heat for these springs, both of which are on major faults (see discussion on springs along the Wasatch fault zone), but Pack (Pack and Carrington, 1921, p. 26-27) contended that, except in volcanic areas, surface waters cannot descend to depths great enough to supply hot springs, and therefore "most of such springs have their origin at very great depths, in other words, that the water issuing from them is coming to the surface for the first time... and is, therefore, known as 'magmatic' water."

In addition to the wells of Great Salt Lake Minerals and Chemicals Corp. and the warm and hot springs mentioned above, 30 wells whose depths range from less than 200 to about 1000 feet report temperatures of 20° to 25°C and one well in the Farmington Bay Refuge, 1220 feet deep, reports temperatures as high as 33°C. These wells generally seem to have a random distribution from Bountiful on the south nearly to Willard and from Ogden on the east to Antelope Island. The only pattern that can be discerned in their distribution is formed by the group of nine wells that stretches southwestward from Ogden to Hooper. Parallel to and partly coincident with this band of wells, Feth and others (1966, plate 3), show a band where the content of silt and clay below 200 feet is less (20 to 40% and 40 to 60%) than it is in adjacent areas (60-80%). The same map also suggests, although its coverage doesn't quite extend to that area, that the GSLM&C Corp. wells may be in an area where the subsurface sediments are slightly coarser (less than 40% silt and clay) than the surrounding sediments (40-60%). The connection between higher temperature and coarser texture, if indeed there is a connection, does not seem to occur in other areas where Feth and others have mapped low silt and clay contents.

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Escalante Desert

INTRODUCTION

The Escalante Desert occupies about 400 square miles in Iron and Washington Counties about 25 miles west and northwest of Cedar City. The principal communities are Enterprise, Newcastle, and Modena, with Beryl Junction a cross-roads community near the center of the area. The economy depends on agriculture, which in turn depends on nearly 80,000 acre-feet of ground water for irrigation each year (Sandberg, 1977, p. 14).

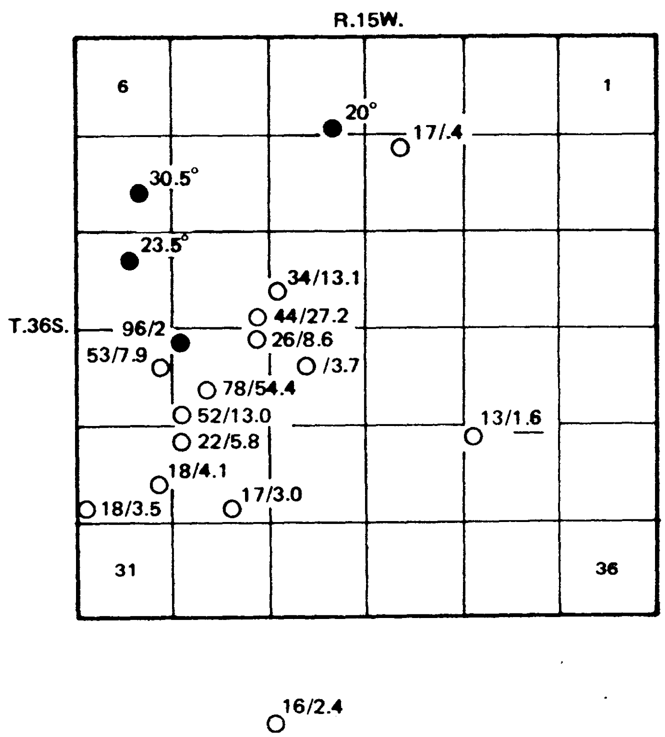

Figure 4 - Map of Newcastle area showing geothermal test holes (Rush, 1977).
● water well with temperature
○ geothermal test well
34/13.1 temperature at about 100 feet / gradient in °C per 100 feet
Underlined gradient calculated from less than 100 feet.

SUMMARY of OCCURRENCES and POTENTIAL for USE

In the Newcastle area, one well (C-36-15)20bbd, has produced boiling water, and three others have yielded warm water of 20° to 31°C (table 6). Rush (1977) measured temperatures on 15 wells in the vicinity of Newcastle and I have plotted those wells on figure 4. Also shown are temperatures at about 100 feet and the geothermal gradient in each well. The ultimate potential of this area is not known but the waters are satisfactory for irrigation and certainly could be used for greenhouses or space heating.

Near Beryl, a geothermal test well, drilled to a depth of 12,295 feet between April 8 and July 15, 1976, yielded a flow of 1000 gpm from a depth of 7000 feet. This water was at a temperature of 149°C and contained less than 4000 ppm dissolved solids. Although the temperature is too low for efficient production of electricity (Val Finlayson, Utah Power & Light Co. pers. commun. 1978) such a yield without pumping should be useful for crop processing.

GEOLOGIC and HYDROLOGIC ENVIRONMENT

The hills and low mountains that nearly surround the Escalante Desert are composed principally of Tertiary volcanic rocks with a few exposures of Cretaceous and Tertiary sedimentary rocks south and southwest of Newcastle. Crosby (1973, p. 31) has interpreted the Escalante Desert as a probable caldera. "The eastern rim of this probable caldera is downfaulted and covered by valley fill deposits of the Escalante Desert." The generally circular shape of this desert and the annular drainage of Shoal Creek west of Enterprise support the caldera hypothesis.

The desert itself is one of the most highly developed ground-water basins in Utah. Pumpage in the Beryl-Enterprise district has risen from about 50,000 acre-feet per year in the 1950's to nearly 80,000 acre-feet in the 1970's. (Sandberg, 1977, p. 57). Although there are no firm estimates of recharge to the ground-water reservoir, it has been generally believed that most of the water pumped comes from storage. Between 1950 and 1977 the water level in an observation well, (C-35-17)25dcd, in the area of high pumping, declined about 40 feet (Sandberg, 1977, p. 57). Much of this period, 1950 to 1964, was also a period of lower-than-normal precipitation, so the lowering of the water levels in response to pumpage from storage is hardly excessive.

OCCURRENCES of HOT and WARM WATER

Hot water of 149° and 95.5°C has been reported from a depth of 7000 feet in a 12,295-ft-deep geothermal-test well about 4 miles southwest of the Beryl siding on the Union Pacific Railroad and from a 500-foot-deep water well near Newcastle (table 5). The geothermal-test well flowed 1000 gpm and the water contained less than 4000 ppm dissolved solids (Val Finlayson, pers. comm. 1978). Ten other wells in the Newcastle area produce water at temperatures ranging from 20° to 78°C (fig. 4). Eleven other wells, six near Newcastle, four west of the main Beryl-Enterprise pumping area, and one about 12 miles southeast of Lund, yield slightly warm water of 15.5° to 19°C.

The temperature of the water from geothermal-test well was 111°C lower than the required temperature of 260°C, so there is no potential for generating electricity but a free flow of 1000 gpm at 149°C should make the water valuable for crop processing.

Although Sandberg in 1960 (p. 34) said that local residents reported hot water near Newcastle, it wasn't until the Christensen Bros. well was drilled in December 1975 that boiling water was encountered (Rush, 1978). Rush reports that a temperature log was run on January 20, 1976 after the well had been idle for several weeks. That log shows a hot-water aquifer between depths of 230 and 360 feet.

Rush (p. 49) computed the "reservoir temperature of the hydrothermal system to be 117°C and 293°C, using two geothermometers. The difference in estimates may result from either the mixing of thermal and nonthermal water or to misapplication of a geothermometer. If the higher temperature is valid, this would be a very hot hydrothermal reservoir. The depth of ground-water circulation to produce this upper limit without a shallow heat source would be about 7 km (23,000 feet) computed on the basis of a regional heat flow of 2 HFU", (heat flow units).

Crosby's map (1973, p. 28) shows a northeast-trending (buried?) normal fault very close to the Christensen well. Probably the hot water rises along the fault up to a confined permeable bed which permits it to move laterally.

Only further exploration can determine the potential of the Newcastle area as a source of geothermal energy, but meanwhile the hot water in the area of the Christensen well is of good enough quality for irrigation and it is certainly hot enough for use in greenhouses or for space heating.

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Escalante Valley

INTRODUCTION

Escalante Valley is in eastern Millard, Beaver, and Iron Counties. The Milford pumping district within the valley is one of the most heavily irrigated areas in Utah: from 1966 to 1975 irrigators pumped an average of 55,000 acre-feet of water each year; in 1976 they pumped 65,000 acre-feet. The valley is also the locale of two Known Geothermal Resource Areas (KGRA), Roosevelt and Thermo Hot Springs.

SUMMARY of OCCURRENCES and POTENTIAL for USE

Roosevelt Hot Springs and Thermo Hot Springs have been designated as KGRAs, and the extensive continuing exploration at Roosevelt strongly suggests that at least that area has potential to produce electricity, perhaps as much as 300 MW (megawatts). The potential at Thermo has yet to be tested.

Dotsons Warm Springs are warm enough ($36^{\circ}C$) and of satisfactory chemical quality to be used in swimming pools or greenhouses.

GEOLOGIC and HYDROLOGIC ENVIRONMENT

The mountains that essentially surround the Escalante Valley are geologically complex, and it can be presumed that the bedrock that underlies the valley fill of alluvium and lake deposits also is complex. Crosby (1973, p. 27-32) has described some of the structural complexities in more detail than will be covered here.

To the east are the Mineral Mountains which consist largely of a Tertiary granite "pluton, which is the largest exposed intrusive body in Utah, covering nearly 150 km^2" (Lipman and others, 1978, p. 134). The center of the range was also the site of extensive Pleistocene volcanic activity including rhyolite domes, obsidian-rich lava flows, and pyroclastics of ash-flow tuffs. "Potassium argon ages indicate that all the rhyolite of the Mineral Mountains was erupted between 0.8 and 0.5 m.y.ago" (Lipman and others, 1978, p. 133). The Roosevelt KGRA is on a north-south fault along the west flank of the Mineral Mountains and probably was affected by the Pleistocene volcanism.

To the west are the San Francisco Mountains consisting of Precambrian and Paleozoic rocks, largely metamorphosed, and Tertiary volcanics. To the southeast, also, are extensive Tertiary volcanics.

The mountain blocks are separated from the valley by fault zones that are largely hidden by overlying alluvium.

The valley fill consists of alluvium derived from the flanking mountains and brought in by the Beaver River, and lake deposits laid down in Pleistocene Lake Bonneville. The intertonguing of coarse-grained deposits of high permeability with fine-grained deposits of low permeability has resulted in three zones of high permeability separated by three zones of low permeability. The zones of high permeability make up the principal aquifer, which Mower and Cordova (1974, p.1) estimate to be as much as 840 feet thick.

Because of the high pumpage in the valley, the estimated discharge of 81,000 acre-feet exceeds the estimated recharge of 58,000 acre-feet, and has resulted not only in lowering water levels by as much as 30 feet since 1950, but also in compaction of the valley fill and subsidence of the land surface in an area about 1 mile wide and 11 miles long south of Milford (Mower and Cordova, 1974, p. 1-2).

OCCURRENCE of HOT and WARM WATER

Two hot springs, Roosevelt and Thermo, and one warm spring, Dodsons (Radium) (table 7-A), have been discussed rather extensively by Mundorff (1970) and I shall include his descriptions below. Since Mundorff completed his study, several workers have studied the Roosevelt area, among them Petersen (1973, 1974, 1975a, 1975b), who computed a Na-K-Ca reservoir temperature of 292° to $298^{\circ}C$, Rush (1978), and Lipman and others (1978), and there has been extensive drilling. "Phillips Petroleum Co., the successful bidder on the KGRA in 1974, is continuing exploration on the property. Numerous test wells so far drilled in the KGRA have documented the presence of a low-salinity liquid dominated geothermal system (Berge, Crosy, and Lenyer, 1976; Greider, 1976). The thermal anomaly covers approximately 32 km^2, and reservoir temperatures exceed 250°C"(Lipman and others, 1978, p. 134). Rush (1978, p. 30) says the "reservoir temperature is equal to or greater than 260°C." The latest report on the area (Ward and others, 1978) says that 7 productive wells and 4 "dry holes" have been drilled in the Roosevelt area (in T.26 and 27S., R.9 W.) and the highest temperature recorded was 269°C. The authors further make "a conservative estimate of $10km^2$ for the size of the region that may be brought into production. This area will support about 60 production wells (1 well per 40 acres) which at 5MW/well will yield 300 MW (megawatts) electricity" (p. 26, 27).

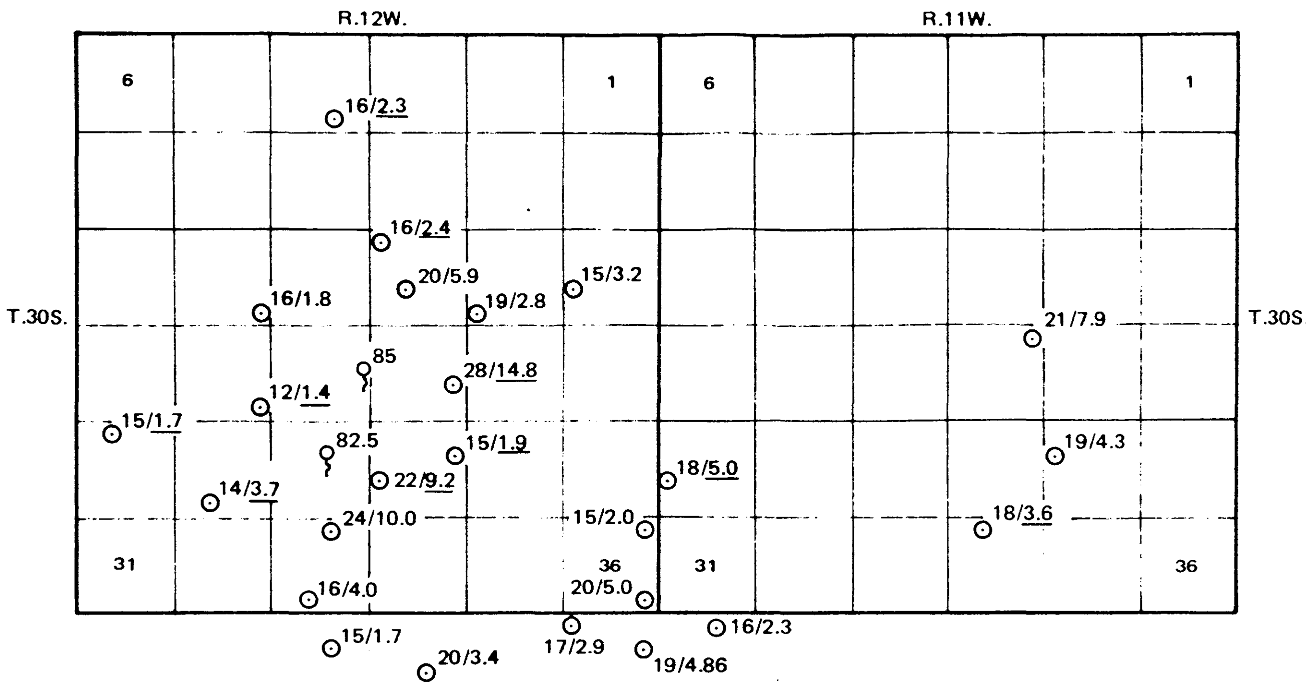

Figure 5 - Map of Thermo area showing geothermal test holes (Rush, 1977).
spring with temperature
geothermal test well
16/2.3 temperature at about 100 feet / gradient in °C per 100 feet
Underlined gradients calculated from less than 100 feet.

Rush (1978, p. 35-43) also studied the Thermo area and concluded that the hydrothermal reservoir is less than 4 km deep and has a temperature "equal to or less than 200°C." The holes that Rush used for his temperature measurements are shown on figure 5; also shown are temperatures at depth of 100 feet in each hole and the computed geothermal gradients.

In addition to the springs mentioned above, warm water at 21° to 33°C also occurs in three springs in the volcanics south of Minersville, in Salt Spring about one-quarter mile northwest of Roosevelt Hot Spring, and in Woodhouse Spring about 10 miles southwest of Milford.

About six wells near Milford and two wells southwest of Minersville yield water of 20° to 27°C. The Minersville town well drilled near Dotsons Spring yields water at 33.5°C that is essentially identical in chemical quality to the water from Dotsons Spring.

The follwing exerpts from Mundorff (1970, p. 42-43) give his interpretations of Dotsons Warm Springs and Thermo and Roosevelt Hot Springs.

Roosevelt (McKeans) Hot Springs

Roosevelt (McKeans) Hot Springs, (C-26-9)34dcb-S1, are in Beaver County, about 12 miles northeast of Milford and about 20 miles northwest of Beaver. Lee (1908, p. 20) reported that the largest of the springs in Roosevelt Hot Springs had a discharge of about 10 gpm, and that the temperature at the pipe leading from the spring was 190° F. He also stated that much of the silica contained in solution as the boiling water issued from the rocks was deposited as the water cooled. U. S. Geological Survey personnel reported a discharge of 1 gpm and a temperature of 185° F in November 1950 and reported a temperature of 131° F in September 1957. In May 1966 the spring was dry and appeared not to have discharged for several years.

Intrusive rocks of Tertiary age crop out immediately east of the former springs, and volcanic rocks of late Tertiary age crop out less than two miles southeast of the springs (figure 18). The springs issued from a fault zone along the west side of the Mineral Mountains. The heating of the water, probably of meteoric origin, may have been caused by contact with volcanic rocks or by an abnormally high geothermal gradient in the area where both intrusive and extrusive rocks of Tertiary age are common.

Lee (1908, p. 20 and 50) reported a dissolved-solids content of only 645 ppm and a discharge of 10 gpm. In 1950 the dissolved-solids content was 7,040 ppm at a measured discharge of 1 gpm. In 1957 the dissolved-solids content was 7,800 ppm. Lee's data show that the water was of the sodium sulfate chloride type; silica concentration (101 ppm) exceeded that of any single ion. In 1950 and 1957, the highly mineralized water was sodium chloride in type; silica content was very high (405 and 313 ppm). The analysis of a sample obtained in 1957 shows fairly high concentrations of boron and fluoride. The source of the dissolved solids is not known. If Lee's data are reliable, the spring discharge showed about a tenfold increase in dissolved-solids content with a tenfold decrease in discharge during a 50-year period. Lee (1908, p. 20) states that "the water contains a large amount of mineral in solution, as shown by the analysis in table 9"; but the data in table 9 of Lee's report do not show an especially "large amount of mineral in solution."

The very high silica concentrations indicate a possibility of marked increase in temperature with depth. The lack of spring flow during the past 10 years and the lack of information on the possible presence of a reservoir rock indicate that the geothermal potential of the area can be evaluated only by intensive subsurface exploration.

Radium (Dotsons) Warm Springs

Radium (Dotsons) Warm Springs, (C-30-9) 7aca-S1, issue from a seepage zone about 300 feet long along the south bank of the Beaver River about one mile east of Minersville in Beaver County. The springs issue from alluvium, but the source of the water probably is the faulted sedimentary rocks of Paleozoic age immediately northeast of the springs. Large areas of pyroclastic rocks of late Tertiary age are within one mile of the springs (figure 18).

Lee (1908, p. 21) reported that the discharge of the springs was 57 gpm and the temperature of the water was 97° F. On July 11, 1967, U. S. Geological Survey personnel measured a water temperature of 89° F and estimated that the total discharge from the spring zone was 100 gpm.

Chemical data obtained during 1963-67 show that the dissolved-solids content ranged from 956 to 1,020 ppm, that the water was of the sodium calcium sulfate type, that fluoride concentrations were moderately high, and that silica concentrations were low.

The altitude of the faulted mountains within a few miles of the springs is 2,000-3,000 feet higher than that of the springs. The presence of volcanic rocks of late Tertiary age in the vicinity of the springs suggests that the source of heat may be either volcanic or an abnormally high geothermal gradient in the zone of faulted sedimentary rocks adjacent to the volcanics. The spring discharge undoubtedly is meteoric water that infiltrates the faulted or porous rocks at higher altitudes a few miles from the springs; the water descends 2,000-3,000 feet through these rocks, is warmed, and issues along a fault zone in the immediate vicinity of the springs.

Thermo Hot Springs

Gilbert (*in* Howell, 1875, p. 257) stated that "Another group of hot springs, . . . is located . . . sixteen miles west of Minersville [Beaver County].

These springs, [(C-30-12)21-S and (C-30-12)28-S], are situated in the open desert, on two parallel ridges having a north and south trend, placed *en echelon*, about twenty rods apart, each eight or ten rods in width and 20 feet high, with a total length of about one and a half miles. These ridges have been formed mainly by the drifting sand, held together by the moisture and consequent vegetation, as no sinter nor tufa seems to be deposited by the springs. The highest temperature noted was 185° [F]." In contrast to Gilbert's report of sand ridges and the absence of tufa, Lee (1908, p. 22) reported that "The springs occur in two conspicuous mounds built up from the surface of the plain by silica deposited from the spring waters." U. S. Geological Survey personnel reported in July 1967 that the springs issue along the sides and top of calcareous travertine mounds. The southern mound, which has the most active spring, is about half a mile long, 200-250 feet wide, and 10-20 feet higher than the desert floor. The southern mound is mainly clay covered and has travertine along the sides. The hottest spring was on the south mound and had a temperature of 170° F. The two sets of observations, which were made nearly a century apart, indicate that the sand ridges observed by Gilbert have become partly indurated by calcium carbonate or silica that precipitated from the spring water. The observations of Lee (1908), however, indicate that appreciable chemical precipitation must have occurred by 1908. Perhaps older travertine deposits had been buried by drifting sand shortly before Gilbert's observations.

The springs issue from the alluvium in Escalante Valley, but the source of the water probably is rainfall on the faulted mountains northwest or southeast of the springs. A fault buried beneath the alluvium may control the location of the springs. Volcanic rocks of late Tertiary age crop out in the mountains within a few miles south of the springs (figure 18). The source of the heat probably is an abnormally high geothermal gradient that results from late Tertiary volcanism.

The dissolved-solids content of the water ranged from 1,470 to 1,500 ppm. The water is sodium sulfate in type although both bicarbonate and chloride anions are present in significant amounts. Silica concentration was fairly high—100 to 108 ppm. Results of spectrographic analyses were somewhat erratic; one sample showed unusual concentrations of aluminum, copper, and lead, but another sample obtained a year later at the same spring showed nothing unusual.

Discharge from the entire spring area was estimated to be about 200 gpm in July 1967.

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Fish Springs Group

"The Fish Springs group is in Juab and Tooele Counties, about 55 miles northwest of Delta" (Mundorff, 1970, p. 27). The springs rise from three general areas at the north end and northeast flank of the Fish Springs Range (see Table 8). Wilsons Hot (Health) Springs are principally in section 33, T.10 S., R.14 W., in Tooele County. Big Spring (North Springs) is in Juab County about a mile to the southeast of Wilsons Hot Spring at (C-11-14)3d, and Fish Springs are about 3 miles south of Big Spring in the eastern halves of sections 23 and 26, T.11 S., R.14 W.

The wording "Wilson Health Springs" on the Fish Springs NW quadrangle and Meinzer's reference to a bathhouse (1911, p. 125) indicate that at one time a resort existed at the hot springs, but Mundorff does not mention it so it probably no longer exists.

Mundorff's (1920, p. 37) interpretation of the group is given here:

Wilson Hot Springs consist of several springs that issue along a northeast-trending line that extends about half a mile into the Great Salt Lake Desert from the base of the Fish Springs Range. The springs issue from soft tufa mounds formed on valley fill of Quaternary age. The springs probably rise along a fault buried beneath the valley fill. Fish Springs Range, which is composed of faulted sedimentary rocks of Paleozoic age (figure 15), extends southward from Wilson Hot Springs and has altitudes more than 4,000 feet higher than those of the springs along the northeast base of the mountains. In July 1967, the temperature of the hottest measured spring in the group was 141° F at the edge of the pool and 168° F in the center of the pool; the estimated discharge was 100 gpm. The dissolved-solids content of these springs, which issue at the southern margin of Great Salt Lake Desert, is about 22,000 ppm; about 83 percent of the dissolved solids, by weight, is sodium chloride.

The discharge of Wilson Hot Springs probably is meteoric water that has circulated to depths of several thousand feet through the fault system of the Fish Springs Range. As the heated water moves up through highly saline lakebed sediments, either large quantities of salts are dissolved or relatively dilute hot water mixes with concentrated interstitial brines of the sediments. If a geothermal gradient of 1° F for each 100 feet of depth is assumed, circulation to a depth of about two miles would be required if the water does not cool as it moves upward and does not mix with cool shallow water. In this area, however, the geothermal gradient may be abnormally high. Volcanic rocks of late Tertiary age crop out about eight miles southeast and about 10 miles southwest of the springs, and a large intrusive igneous body of late Tertiary age crops out about 15 miles northeast of the springs. Although these igneous rocks probably are not the direct source of the heat, they may indicate the possibility that the geothermal gradient is as high as 1° F for each 50 feet or less of depth in the area surrounding the springs.

Both Big Spring, (C-11-14)3-S, and Fish Springs, (C-11-14)23-26-S, appear to be associated with the same fault zone, but not necessarily the same fault, that results in Wilson Hot Springs. The discharges of Big and Fish Springs have much lower temperatures than those for Wilson Hot Springs. Temperatures of these two springs range from about 65° to 82° F, and the dissolved-solids content is about 1,800 ppm for Fish Springs. The water is of the sodium chloride type; only about 60 percent of the dissolved solids, by weight, is sodium chloride compared to about 83 percent sodium chloride in Wilson Hot Springs. The total discharge of all springs in the Fish Springs group probably varies from less than 40 cfs to more than 60 cfs seasonally and from year to year. The relatively low temperature and dissolved-solids content of Fish Springs indicate that the water does not circulate to great depths and that the water does not have appreciable exposure to a saline environment, as compared to the water issuing from Wilson Hot Springs.

The discharge from Big Spring and the many Fish Springs supplies water to the Fish Springs National Wildlife Refuge where there are extensive pools and marshy areas that are inhabited by waterfowl.

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Grouse Creek Valley

Grouse Creek Valley is in Box Elder County near the northwest corner of Utah. Grouse Creek and its drainage basin include about 430 square miles. Probably fewer than 500 people live in the valley, most of them in Grouse Creek and Etna (Hood and Price, 1970, p. 3).

A hot spring (42°C) that yields 225 gpm of fresh water (248 mg/l dissolved solids) from Paleozoic rocks in the valley of Death Creek and a warm spring (20°C) that yields 215 gpm of fresh water (304 mg/l) from volcanic rocks near Kimber Ranch are the only thermal springs in Grouse Creek Valley (Table 9). The hot spring may derive its heat from nearby volcanic rocks, but it has only half as much silica (24 vs 47 mg/l) as the warm spring which does come from the volcanics. Both springs have low contents of dissolved solids; in fact the water from the hot spring probably contains less dissolved mineral matter than any other hot spring in Utah.

Two shallow wells, 62 and 92 feet deep, have water temperatures of 20°, and three other wells (60, 232, and 605 feet deep) have water temperatures of 16° and 18°.

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Hood, J. W., and Don Price, 1970, Hydrologic reconnaissance of Grouse Creek Valley, Box Elder County, Utah: Utah Dept. Nat. Resources Tech. Pub. No. 29, 49 p.

Heber Valley

Heber Valley, in Wasatch County, is a small (valley floor about 44 square miles) triangular-shaped "back valley" between the Wasatch Mountains on the west and the volcanic hills of the Wasatch-Uinta transition zone on the east. The upper plate of the great Charleston thrust fault forms a highland south of the valley.

Warm and hot water, 29° to 45°C, occurs as springs and in "hot pots" in the vicinity of Midway in the western part of the valley (see Table 10). These hot pots and springs were investigated rather thoroughly by Baker (1968) who also studied the ground water of the whole of Heber Valley (1970); therefore, I shall mention only briefly some of the pertinent points, for the most part, paraphrasing or quoting from Baker (1968), but with my additions in brackets.

"The hot pots are surrounded by a deposit of calcareous tufa that covers an area of about 4.5 square miles and locally is at least 70 feet thick. The tufa deposit forms a low terrace that is underlain by alluvium; water apparently rises through the alluvium from a bedrock source" (p. D63). Chemical analyses show that the water is not highly mineralized, about 1600 to 2050 mg/l dissolved solids, "but it is much more mineralized than other ground water in the area... which rarely exceeds, 1000 mg/l" (p. D65).

The geologic map of the Heber quadrangle (Bromfield, Baker, and Crittenden, 1970) gives clues to the possible sources of heat for the thermal water. "Carbonate rocks of Mississippian and Pennsylvanian age crop out extensively in the high mountains north and west of Midway and are overlain by younger (Triassic) sedimentary rocks of low permeability. The sedimentary rocks dip steeply toward the valley [and apparently are folded into a buried anticline whose crest is near the hot springs in the southwest quarter of section 26 (Bromfield and others, 1970)]. An intrusive body of Tertiary age crops out a short distance north of Midway, and the sedimentary rocks surrounding the intrusive are intensely fractured and faulted [along the Dutch Hollow and Pine Creek thrust faults]. According to C. S. Bromfield (oral commun. 1966), magnetic anomalies near Midway suggest that the intrusive body extends southeastward under the hot pots. If this is so, the fracturing of the sedimentary rocks in the vicinity of the intrusive body [and along the crest of the anticline] would provide the necessary break in the confining layers to permit water that is under artesian pressure in the carbonate rocks to escape to the surface" (p. D69).

"The following theory of the origin and continued existence of the hot pots is proposed. Meteoric water enters the carbonate rocks in the Wasatch Range, descends along fractures [probably principally the thrust planes] and solution openings, and dissolves minerals from the rocks through which it passes. This mineralized water is heated at depth and, under artesian pressure, returns to the surface through fractures in the rocks [such as the strong fault that cuts Triassic rocks on the south slope of Burgi Hill, a fault whose extension would go through the hot spring area near Mound City]. When the hot mineralized water nears the surface, the drop in confining pressure causes loss of dissolved carbon dioxide and resultant deposition of calcium carbonate (tufa)" (p. D69).

Two wells, one at the northern tip of the valley and the other near the southeast corner, yield slightly warm water of good quality (less than 450 mg/l dissolved solids) at 16°C. These wells are distant from the hot pots and cannot be related to them.

REFERENCES

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Bromfield, C. S., A. A. Baker, and M. D. Crittenden, Jr., 1970, Geologic map of the Heber quadrangle, Wasatch and Summit Counties, Utah: U.S. Geol. Survey Geologic Quadrangle Map GQ-864.

Jordan Valley

INTRODUCTION

Location

Jordan Valley encompasses about 400 square miles in Salt Lake County, Utah (figure 6). Except for the small number of people who live in Emigration, Mill Creek, Big Cottonwood, and Little Cottonwood Canyons, essentially all the 508,000 (1975 estimate) people of Salt Lake County live in Jordan Valley. Salt Lake City, the capital of Utah, is a center for light and heavy industry, oil refining, and tourism, and is the home of the University of Utah. Salt Lake County is one of the leading agricultural counties of the state.

Previous Work

The waters of Jordan Valley have been studied more intensively than those of any other area in Utah. In addition to early mention of thermal waters by the King report (1878), the other principal studies are by Richardson, Underground water in the valleys of Utah Lake and Jordan River, Utah (1906); Taylor and Leggette, Ground water in the Jordan Valley, Utah (1964); and Hely, Mower, and Harr, Water resources of Salt Lake County, Utah (1971). Records of wells, springs, streamflow, and water chemistry have been published by the U.S. Geological Survey as Basic-Data Reports No. 4 (1963), No. 11 (1966), No. 12 (1966), No. 13 (1966), No. 15 (1968), and No. 17 (1969).

Because much of this published work is useful as back ground material, extensive excerpts from the reports by Taylor and Leggette, by Marine and Price, and by Hely, Mower, and Harr are included after the references at the end of this discussion.

SUMMARY of OCCURRENCES, USES, and POTENTIAL for USE

Hot water occurs at Becks (55°C) and Wasatch (40°C) Hot Springs at the west end of the Salt Lake salient in the northern part of Jordan Valley and at Crystal (55°C) Hot Springs in the southern part of the valley. These waters are now unused but Becks and Wasatch have been used for recreation in the past and could be so used in the future; Crystal Hot Springs is being investigated for possible use by the nearby Utah State Prison.

Warm water (20-31°C) has been recorded for about 60 wells (Table 11-A) and slightly warm water (15.5°- 19.5°C) has been recorded for about 120 wells (Table 11-B). Some of these wells are in the southern part of the valley and are probably related to the same heat source as Crystal Hot Springs. The other wells form a large fan-shaped pattern in the northern part of the valley. The warmest water is in the center of the fan and the heat is probably supplied by a north-trending buried fault zone, from which it spreads laterally through the horizontal artesian aquifers.

The warm water in the southern part of the valley should have a potential use for space heating and greenhouses. The warm water in the north is now being used with heat pumps, and it has a good potential for such use as industry expands in that area.

Five wells whose water temperatures range from 17° to 21.5°C, and whose dissolved solids range from 976 to 1220 mg/l, show anomalously high silica of 71 to 82 mg/l. The wells range in depth from 105 to 156 feet and all are within an area of less than half a square mile about 3½ miles east of Magna. There is

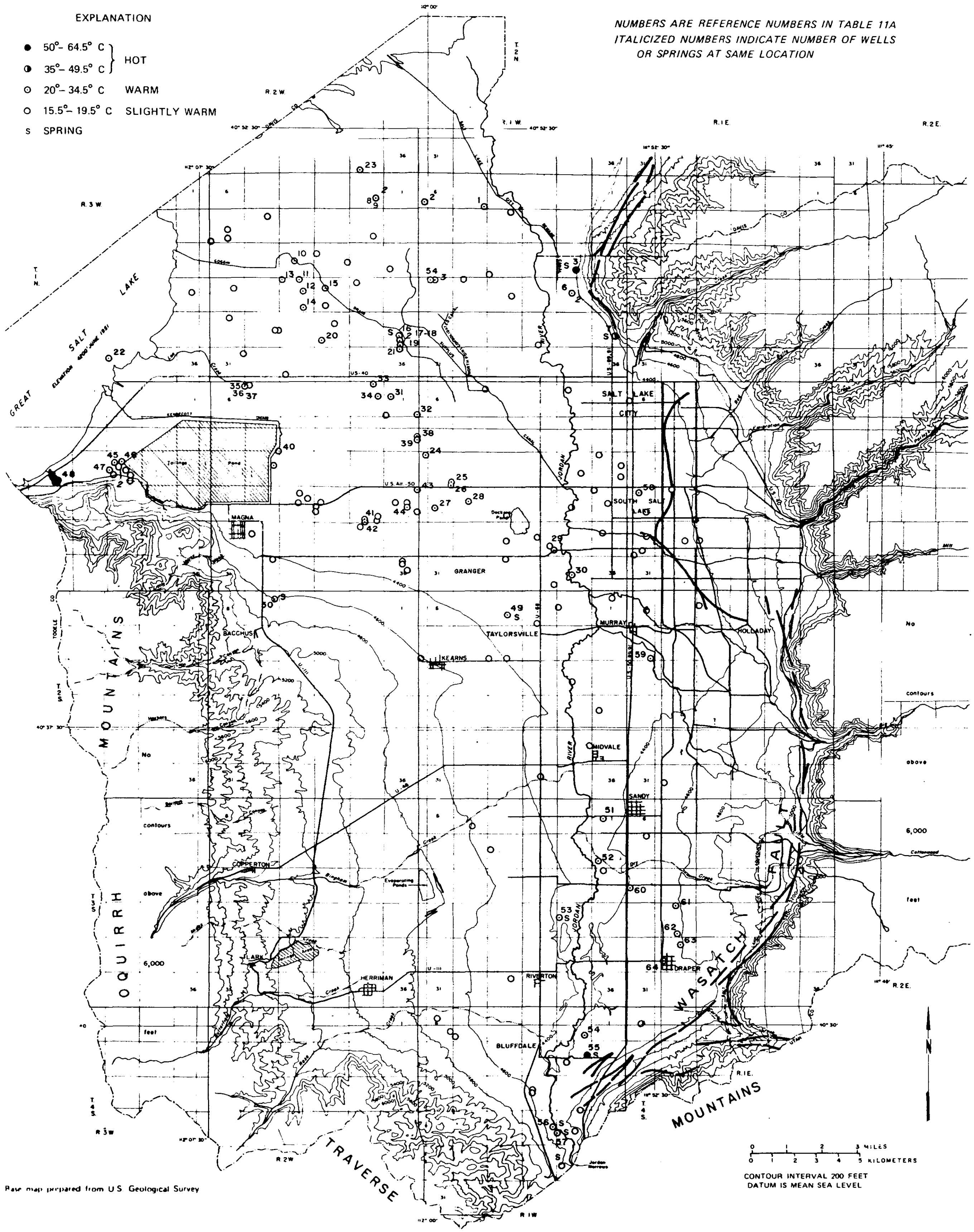

Figure 6. Map of Jordan Valley showing thermal wells and springs.

no ready explanation for the high silica content, but the anomaly is worthy of further investigation.

GEOLOGIC and HYDROLOGIC ENVIRONMENT

The Jordan Valley is a north-trending graben, bounded on the east by the Wasatch fault zone and on the west by exposed faults and by buried faults whose existence is based on geophysical data. Jordan Valley is separated from the Utah Valley graben on the south by the Traverse Range spur and from the East Shore graben on the north by the Salt Lake salient. The deepest part of the graben is a bowl-shaped depression in the southern part of the valley in the area of (clockwise from the northeast) Sandy, Draper, Bluffdale, Herriman, and South Jordan. The northwestern portion of the valley, including Granger, Taylorsville, and Magna, is underlain by a pediment that extends eastward from the foot of the Oquirrh Mountains almost to the center of the valley. The eastern edge of that pediment is bounded by a largely buried north trending fault zone that probably marks the western boundary of the graben in that area (Cook and Berg, 1961, p. 79, 80, 83, and plate 13).

The rocks of the Wasatch Range are largely metasediments of Precambrian age and marine sedimentary rocks of Paleozoic and Mesozoic age. The Oquirrh Mountains to the west are principally composed of the Oquirrh Formation of Pennsylvanian age.

The valley fill is composed of alluvial deposits brought in by streams from the mountains and of lacustrine deposits laid down along the shores and on the bottom of Pleistocene Lake Bonneville. The deposits near the mountains on the east, south, and southwest sides of the valley are predominantly thick gravel and sand, but those on the pediment in the northwest portion are thinner silt and clay. The lower portions of the valley are underlain by lake-bottom clay and silt.

The interbedded alluvial and lacustrine deposits have produced excellent aquifers separated by confining layers so that ground water occurs under artesian conditions in most areas of the valley, and in the lowest portions the aquifers supply flowing wells. The aquifers have been developed extensively; almost 12,000 wells were on record through 1969 (Hely, Mower, and Harr, 1971, p. 138), yet the area of flowing wells has changed little since G. B. Richardson published a map showing the area of artesian flow in 1904 (1906, plate VII). (See also Hely, Mower, and Harr, 1971, plate 1).

Recharge to the aquifers amounts to about 367,000 acre-feet per year and according to Hely, Mower, and Harr, 1971, comes from:

Seepage from bedrock	135,000
" " irrigated fields	81,000
" " precipitation on valley floor	60,000
" " major canals	48,000
" " creek channels	20,000
" " lawns and gardens	17,000
Underflow from channel fill & Jordan Narrows	4,000
Seepage from tailings pond	2,400
	367,000

This recharge is matched by discharge:

Into Jordan River	170,000
By wells	107,000
Evapotranspiration	60,000
Springs diverted for use	19,000
Other	11,000
	367,000

An appreciable but unmeasured part of this discharge is warm to hot water supplied by springs and wells.

OCCURRENCES of HOT and WARM WATERS

The hottest waters in Jordan Valley are yielded by Becks (55°C) and Wasatch (40°C) Hot Springs at the west end of the Salt Lake salient and by Crystal (55°-58°C) Hot Springs along the Steep Mountain fault on the north side of the Traverse Range salient. These springs are discussed in more detail in the section on Hot Springs along the Wasatch Fault Zone.

On Table 11-A are listed about 60 wells with temperatures of 20° to 31°C. Most of these wells have been plotted on maps by Marine and Prince and by Hely, Mower, and Harr that appear at the end of this discussion. Despite the differences in categories of temperature used for plotting, there is general agreement between the two maps. In the southern part of Jordan Valley there are areas of warm water that are probably related to the Crystal Hot Springs area. Some of the heat from the spring area may spread out northward in favorable confined aquifers. In the northern part of the valley there may be some heat that spreads laterally from the Warm Springs fault at the west end of the Salt Lake salient, but the principal warming apparently comes from the largely buried Granger-Taylorsville fault zone that trends slightly west of north in the valley center. The fan-shaped pattern of the area of warm water, with the warmest water near the center of the fan and with expansion of the fan northwestward in the same direction as ground water moves toward Great Salt Lake, strongly suggests that there is an upwelling of heat along the fault and lateral spreading of that heat in favorable confined aquifers.

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Taylor, G. H., R. M. Leggette, 1949, Ground water in the Jordan Valley, Utah: U.S. Geol. Survey Water-Supply Paper 1029, 257 p.

(The following excerpt is reprinted from Taylor, G. H., R. M Leggette, 1949, Ground water in the Jordan Valley, Utah: U.S. Geol. Survey Water-Supply Paper 1029, pages 35-41).

THERMAL SPRINGS

Thermal springs are common along the western front of the Wasatch Mountains and are probably associated with faulting. They generally occur in the localities where the mountains project into the valleys in what are locally termed points of the mountain. Some thermal springs are in the southern part of the Jordan River Valley just north of the point of the mountain at the Jordan Narrows, and others are at the point of the mountain in the northern part of the valley. These latter springs supply water for several bathhouses. Wasatch Springs Plunge (originally Warm Springs) and Beck's Hot Springs being the main resorts. Between these two resorts is a group of springs along the railroad tracks called Hobo Springs, which rise through numerous openings and flow to waste. The thermal springs have temperatures considerably above the mean annual air temperature of the valley and probably do not discharge from the main body of ground water in the Jordan River Valley. Their temperature is considerably above the average ground-water temperature, and their source is more deep-seated, probably being related to the Wasatch fault.

The Crystal Hot Springs, in the southern part of the valley, have not been used as much as those nearer Salt Lake City, and consequently less is known concerning them. The earliest mention that the writer has been able to find relating to the springs is from the records of the Mormon Church Library under date of May 21, 1850. A note was found dated October 14, 1854, that a soldier had fallen into the springs and drowned. They have been used as bathing pools but are used now only to supply water for irrigation. They do not contain the large amounts of sulfur and salts that are found in the hot springs north of Salt Lake City. In connection with a proposed development of the springs, a pumping test was made on the lower group of springs during October 1934, and the following report was prepared:[15]

A group of springs in the NE¼ sec. 11 and NW¼ sec. 12, T. 4 S., R. 1 W., Salt Lake base and meridian, yield hot water and are known as Crystal Hot Springs. The depths of the springs were not measured but reports of 400 to 600 feet were received. In general, there are two areas in which the springs arise, the eastern group lying about 15 to 20 feet higher than the western group. Also, the eastern group consists of two main bodies of water with numerous small openings surrounding them; while the western group, which has had dikes built around them, forms one body of water.

The natural discharge from the lower group was 1.44 cubic feet per second on June 30, 1934. The temperatures of three of the springs in the higher, or easterly, group on June 30, 1934, were 122°, 132°, and 137° F. The smaller spring had the highest temperature, and it is probable that the others were colder because of the cooling effect of larger surface areas. A pumping test on the westerly group on October 1, 1934, lowered the water surface to such an extent that a few individual springs were uncovered and isolated from the main body of water. The temperature of one of these springs, in the northeast corner of the main body, was 139° F. on October 3, 1934. During the pumping test, this spring did not flow into the main body. The level of the water in the spring fluctuated with the water level in the main body but stayed several inches higher at all times.

The surface of the water in most of the springs has an appearance of boiling in many places. This is caused by the escape of carbon dioxide (CO_2) gas from the water as it arises from the depths. A sample of water obtained from the main body on May 22, 1934, was analyzed by the chemist of Salt Lake City Corporation, as follows:

Analysis of water from Crystal Hot Springs, Utah

[Sample collected May 22, 1934. Analyzed by Salt Lake City Corporation]

	Parts per million
Silica (SiO_2)	60
Iron and aluminum oxides (Fe_2O_3 + Al_2O_3)	8
Calcium (Ca)	106
Magnesium (Mg)	25
Sodium and Potassium (Na+K)	304
Bicarbonate (HCO_3)	285
Sulfate (SO_4)	97
Chloride (Cl)	598
Total dissolved solids	1, 665
Total hardness as $CaCO_3$	368
pH	7. 6

A survey of the area of the lowest and largest lake formed by these springs and a pumping test to determine whether or not the rate of flow from the springs could be increased were begun on October 1, 1934, and completed on October 6, 1934. An automatic water-stage recorder was operated in conjunction with a 4-foot Cippoletti weir to determine the total amount of water pumped from the lake. The pumping was done under the direction of Mr. L. B. Glafcke by three engine-driven centrifugal pumps. An automatic water-stage recorder was in-

[15] Taylor, G. H., Pumping tests on Crystal Hot Springs: U. S. Geol. Survey, typewritten report, released Oct. 15, 1934.

stalled on the lake to obtain a continuous record of the lake fluctuations but, due to a faulty clock, the record was not continuous.

The stadia survey of the lake gave a surface area of 2.99 acres at the beginning of the test, or high-water area; and an area of 2.63 acres at the conclusion of the pumping, or low-water area. The natural flow from the lake before starting the pumps was 1.18 cubic feet per second. The pumps were started at 1:30 p. m., October 1, 1934, and were run more or less continuously, due to the difficulty in keeping all engines running, over a period of 26 hours. The average discharge of the pumps was about 4.6 cubic feet per second, and there was no other out-flow of water from the lake. The total amount of water withdrawn from the lake during the test was about 9.86 acre-feet, and the level of the entire lake was lowered a total of 2.52 feet. A bar across the lake, which was exposed during pumping, then separated the lake into two parts, and water ran from the eastern part to the western part, from which the pumping was taking place. The western part, which had a low-water area of 0.97 acre, was then lowered about 3 inches more, or a total of 2.77 feet. The amount of water which was withdrawn and which represented storage in the lake was about 7.3 acre-feet. As a natural flow of 1.18 cubic feet per second existed at the beginning of the test, the same amount of flow can be assumed to have been coming from the springs during the test and amounted to 2.53 acre-feet. Thus, the total amount of water available during the period of pumping was 7.3 acre-feet from lake storage and 2.53 acre-feet from natural spring flow, a total of 9.83 acre-feet. The pumps, operating at an average rate of about 4.6 cubic feet per second, removed 9.86 acre-feet. Thus, it is apparent that the pumping of water from the lake and the subsequent lowering of the level of the lake did not increase the natural flow from the springs to any measurable amount.

The rate at which the lake level rose after pumping ceased was then observed as a check upon the rate of spring inflow. After both portions of the lake were again joined and had the same level, the lake rose a total of 0.90 foot during the first 20.5 hours. The lake storage during this period represented a spring flow of 1.44 cubic feet per second. During the next 27.5 hours, the lake level rose 1.04 feet, representing an inflow of 1.30 cubic feet per second. During the 48 hours, the average rate of inflow was 1.36 cubic feet per second. The lake level then rose another 0.47 foot during the next 15 hours, equaling a rate of inflow of 1.12 cubic feet per second. The lake was then at the level at which it stood when the pumping test was started. Therefore, the average rate of spring inflow to the lake, after it had been allowed to rise 0.11 foot to establish an equilibrium after pumping operations, was 1.30 cubic feet per second. The lake was then allowed to rise about 5 inches above the level at the beginning of the test, which required 23 hours and showed an inflow during the period of 0.67 cubic foot per second. A small unmeasured outflow from the lake during this period will increase the observed rate of inflow a small extent. Thus, the average rate of spring inflow during a 96-hour period, with a small unaccounted-for leakage during about the last 20 hours, was 1.13 cubic feet per second. Therefore, it is concluded that no material increase in the flow from the springs was obtained by the pumping test and that the assumption of an average inflow of 1.18 cubic feet per second during the period of pumping was practically correct. However, the observations of the recovery of the lake level show that the flow from the springs was slightly more at the lower than at the higher lake levels. This would normally be expected, as the lowering of the lake level is equivalent to a lowering of the discharge point of the springs and a reduction of the operating pressure against which the springs are flowing.

Three 4-inch auger holes were put down on the north side of the lake at distances of about 65, 135, and 190 feet from the edge of the lake. One hole was put down on the south side of the lake about 45 feet from the edge of the lake. These holes were drilled to a few feet below the shallow ground-water level. The three holes on the north side of the lake showed that the ground water sloped away from the lake, the water levels in the wells being 6.53, 9.48, and 10.88 feet below the original lake level. The water level in the hole on the south side of the lake was 0.34 foot below the original lake level. Measurements showed that there was no change in the water levels in the test holes during the pumping test. Therefore, if there is any movement of water from the lake to the surrounding shallow ground water, the movement is slow and very little actual transfer of water occurs.

Reference points were established in one small and one large spring of the higher, or easterly, group of springs. Observations of the water levels of these two springs, during the pumping operations on the lower group of springs, showed that there was no fluctuation caused by the pumping. This indicates either no connection between the two main groups of springs or a connection through which the movement of water or transfer of pressure occurs very slowly.

The hot springs just north of Salt Lake City have been the site of considerable activity. Beck's Hot Springs and Wasatch Springs Plunge are favorite bathing places for many people, and the latter is now being operated as a municipal enterprise by the Salt Lake City Corporation.

The first mention of these springs was found in the records of the Mormon Church under date of July 26, 1847, two days after the earliest settlers entered the valley. As a matter of historical interest the following quotations are taken from the Church records:

July 26, 1847.—Dr. Willard Richards recommended me to go with Solomon Chamberlain to the hot mineral springs to bathe for the benefit of my health. I saddled a couple of his mules, went past many mineral springs to the largest, which washes out at the foot of a large rock, having a large stone in the mouth to stand on, as if purposely placed there. The water was so very hot that I was unable to bear my fingers in it four or five seconds. This spring, with other small springs, forms a deep lake and runs off with a rapid current by a course about four or five feet wide and one deep, into a large lake two or three miles long, upon which are several thousand of snipe or plover. We returned to the nearest hot spring and bathed in it; it was very warm and smelt very bad.

—Thomas Bullock.

July 26, 1847.—Some of the sick have been to bathe in one of the hot springs and pronounce the effects wonderfully beneficial; others are going this morning to try the same experiment. * * * This water is about as warm as dishwater and very salty. There is much filthy kind of substance collected on it, and the smell arising from it is truly nauseating and sickly, though generally supposed to be in no way unhealthy. * * * [Speaking of what is now Beck's Hot Springs] There is a rock at the mouth of the spring where a person can stand and see inside. Standing on this rock with your face near the mouth of the spring a strong, warm, sulphurous air is felt to come in gusts out of the rock, and it is so hot that it requires only a few minutes to start the perspiration. * * * It is as hot as the hottest dishwater ever used for dishes. Immediately on emerging from the rock, the water forms a lake about three rods in diameter and evidently pretty deep. The water is exceeding clear and nice to look at but very salty indeed. We could see the water boil up in many parts of the lake. The water escapes at the north side of the lake at the base of the rock and there forms a stream about four feet wide and 18 inches deep. We concluded we would go down the stream six or eight rods to wash our feet, naturally expecting the water to be cool, but in taking off our boots and socks we found it impossible to hold our feet in it a moment and could scarcely wash them by dashing the water on them with our hands and suddenly dipping them in and out. It is supposed this would boil an egg in about ten minutes. —William Clayton.

Beck's Hot Springs were extensively developed and a large hotel was built. The water from the springs was bottled and sold for medicinal purposes for some time. On September 25, 1898, the hotel and other buildings were destroyed by fire, but a bathing resort is still being maintained by private enterprise. An item in the Salt Lake Herald under date of August 26, 1888, states:

Use of the springs for bathing and medicinal purposes is increasing. The hot springs discharge something over 200 gallons per minute. The temperature is given as 129° F. A partial analysis shows a content of more than 10,000 parts per million of dissolved mineral matter, of which over 70 percent is sodium chloride (common salt). Hydrogen sulphide gas is also reported.

Wasatch Warm Springs were developed more rapidly than the other springs of the group, presumably because they were closer to the center of settlement. A bathhouse was opened on November 27, 1850, with a festival attended by the First Presidency of the Church and others. The popularity of the springs as a bathing resort gradually increased. Several attempts have been made to increase the flow from the springs by driving tunnels. An item in the Deseret News of July 17, 1922, stated that the old bathhouse and adjoining buildings, built more than 50 years earlier were burned and that a new municipal bathhouse was being opened just north of the burned buildings. In a report to the city engineer of Salt Lake City under date of June 18, 1928, Dr. Frederick J. Peck, professor of geology at the University of Utah, states:

According to apparently reliable information, it appears that the original supply from the warm springs was as small as or even smaller than the amount now flowing from the tunnel. Moreover, the volume has been repeatedly increased by the drilling of more tunnels, but in each case the flow has diminished to near its original size.

The following analyses of water from Wasatch Springs Plunge, made by Herman Harms, Utah State chemist, were supplied by the Salt Lake City Corporation. Samples 1 to 4 were collected by H. H. Smith, assistant city attorney, on August 18, 1921; samples 5 and 6 were collected by F. S. Fernstrom on September 6, 1921.

Analyses of water from Wasatch Springs Plunge, Utah

[Analyzed by Herman Harms, State chemist. Parts per million]

	1	2	3	4	5	6
Silica (SiO_2)	22	22	24	22	26	42
Iron and aluminum oxides ($Fe_2O_3+Al_2O_3$)	1.1	1.3	1.5	1.3	2.3	2.1
Calcium (Ca)	326	369	495	397	490	511
Magnesium (Mg)	66	86	107	83	108	113
Sodium and potassium (Na+K)	1,293	1,581	2,149	1,721	2,106	2,153
Bicarbonate (HCO_3)	235	87	177	163	87	141
Sulfate (SO_4)	712	838	971	840	1,036	3,702
Chloride (Cl)	2,101	2,671	3,682	2,882	3,612	3,702
Total dissolved solids	5,283	6,396	8,520	6,794	8,432	8,658
Temperature (° F.)	97	103	100	90		

1. Tunnel No. 1.
2. Tunnel No. 2.
3. Tunnel No. 3.
4. Wasatka.
5. Trench south of tunnel No. 3.
6. Trench north of tunnel No. 4.

The following table shows the discharge of the hot springs at Wasatch Springs Plunge, as furnished by the Salt Lake City Corporation, and includes all the measurements the writer was able to locate:

Flow from springs at Wasatch Springs Plunge, Utah

Date	Flow (second-feet)	Date	Flow (second-feet)	Date	Flow (second-feet)
1920		1930		1932	
Nov. 9	1.17	Apr. 30	2.24	Apr. 14	0.92
1924		May 20	2.27	25	.94
May 2	.80	June 10	2.20	May 28	.89
Oct. 3	2.10	July 6	1.81	July 15	1.16
1927		21	1.39	Aug. 12	1.11
Jan. 26	1.14	28	1.33	Sept. 14	1.07
Mar. 7	.82	Aug. 7	1.28	Oct. 22	1.07
Apr. 21	2.17	19	1.28	1933	
Oct. 25	1.52	Sept. 6	1.16	Feb. 8	1.11
1928		Oct. 1	1.16	Mar. 8	1.07
Apr. 19	1.25	23	1.16	May 21	1.05
May 8	1.16	Nov. 6	1.08	June 29	1.03
June 25	1.33	21	1.00	1934	
Aug. 13	1.45	Dec. 6	1.05	Jan. 27	1.11
Oct. 17	1.35	23	1.00	Apr 28	1.05
Nov. 25	1.90	1931		June 20	.84
1929		Jan. 19	.94	July 20	.84
Jan. 8	1.65	26	.94	Sept. 13	.69
Feb. 25	1.28	Feb. 10	.94	Dec. 22	.79
Mar. 29	1.39	25	1.28	1935	
Apr. 29	1.15	Mar. 5	1.52	Feb. 1	1.00
June 12	[1] 1.42	16	1.90	Apr. 22	1.58
Oct. 2	[2] 2.17	26	1.97	May 17	.94
Nov. 2	2.03	Apr. 23	1.70	July 8	1.00
Dec. 19	2.17	May 10	1.61	Nov. 15	1.22
1930		26	1.61	Dec. 27	1.70
Jan. 15	2.10	June 8	1.70	1936	
Feb. 1	2.17	July 28	1.00	Jan. 22	1.45
Mar. 1	2.10	Oct. 8	.91	Feb. 28	1.39
17	2.10	Dec. 1	.79	June 6	1.77
		21	.89	Aug. 22	1.77
		26	.89		
		1932			
		Jan. 28	.86		
		Feb. 20	.84		
		Mar. 12	.81		
1937		1938		1939	
Apr. 7	1.80	Mar. 15	1.28	Jan. 14	0.89
May 28	1.83	May 5	2.03	Feb. 14	.80
Nov. 26	1.33	June 25	1.16	Mar. 2	.80
1938		July 5	1.16	23	1.12
		Aug. 4	1.11	Apr. 15	1.45
Feb. 11	1.22	Nov. 16	.89	July 21	.92
				Oct. 14	1.00

[1] In excavating for the new concrete weirs north of the municipal bathhouse, it was discovered that the Wasatka pipe line was diverting over half a second-foot of water from the city conduit. This may affect all prior measurements except that on Nov. 9, 1920.

[2] After concrete weir was built.

(The following excerpt is reprinted from Marine, I. W., and Don Price, 1964, Geology and ground-water resources of the Jordan Valley, Utah: Utah Geol. and Mineralog. Survey Water-Resources Bull. 7, pages 55-59 and figure 30).

Chemical Quality of Ground Water by Districts

East Bench District

Most of the ground water in the East Bench district is of satisfactory chemical quality for domestic use and would meet most requirements for other uses. (See table 7 and fig. 28). All of the water is very hard, however, and it must be softened for many uses. Some of the water contains more than the maximum sulfate content of 250 ppm that is recommended for municipal supply by the U.S. Public Health Service (1962). Much of the water in the district is suitable for irrigation of most crops. According to the method of classification of irrigation waters of the U.S. Salinity Laboratory Staff (1954, p. 80), however, some of the water has a high salinity hazard (fig. 29), and special management practices may be necessary for irrigation.

Well (D-1-1)36bac-1 yields water that contains about 12 times the average sulfate content of water in the district (table 8). The well is within several hundred yards of the mountain front, opposite outcrops of the Park City Formation which is the source of the sulfate.

East Lake Plain District

Most of the ground water in the East Lake Plain district is very similar in chemical quality to the water in the East Bench district (table 7 and fig. 29.) This is to be expected, because much of the recharge for the East Lake Plain district comes from the East Bench district (fig. 16), and much of the sediment in the East Lake Plain district was derived from the East Bench district or from a common source.

Springs and wells near the Warm Springs fault along the west end of the Salt Lake salient yield water that contains more dissolved minerals than do other wells in the district. Water from Beck's Hot Springs, (B-1-1)14dcb (table 8), contains 27 times more dissolved solids than does the average water in the district (table 7). Well (B-1-1)36bac-29, which was perforated at several zones from 120 to 320 feet below land surface also yields water that contains an unusually high content of dissolved minerals (table 8). The spring and the well probably both yield water that is rising along the Warm Springs fault.

Cottonwoods District

Ground water in the Cottonwoods district contains less dissolved solids than does the ground water in any of the other districts in the Jordan Valley (table 7 and fig. 28).

The water is suitable for most domestic, municipal, and irrigational (fig. 29) uses, but most of the water is hard and some water contains more than the maximum sulfate content of 250 ppm that is recommended for municipal supply by the U.S. Public Health Service (1962).

Well (D-3-1)7ccd-1 yields water (table 8) that conta considerably more dissolved minerals than do other we in the district (table 7). The well probably draws wa from an aquifer that is being recharged by seepage fr fields that are being irrigated with water diverted fro Jordan River.

Southeast District

The chemical quality of water in the Southeast distri differs from place to place in the district (fig. 27), appar ently because some water is derived directly from precip tation, some from seepage from irrigation, and some ma be rising along faults. Precipitation infiltrates directl into the ground on and near the Draper spit, and nearb wells obtain water of good chemical quality that is char acterized by a low content of dissolved solids. A typica analysis of such water is from well (D-3-1)29abc-1 (tabl 8). Seepage from fields irrigated with water diverted fro the Jordan River is the main source of recharge below the Draper and East Jordan Canals (fig. 6), and water derived from this source has a high nitrate and sulfate content and is very hard. A typical analysis of such water is from well (D-3-1)30dcb (table 8). Water that may be rising along faults issues from Crystal Hot Springs and has been tapped by wells. A typical water of this type i distinguished from other waters in the district by its high temperature and high silica content. (See analysis for spring (C-4-1)11ad in table 8.)

West Slope District

Ground water in the West Slope district generally contains more dissolved solids and is harder than most ground water in the eastern part of the Jordan Valley (figs. 27 and 28 and table 6). The main sources of the dissolved minerals have been surface water poured on the land for irrigation and industrial waste water.

Water from springs and from wells less than 300 feet deep that are below the highest canal that carries Jordan River water is similar in chemical quality to the canal water. These waters generally contain more than 1,000 ppm of dissolved solids, and they have a relatively high nitrate content.

Waste water from industrial activities has contaminated the ground water in two known areas in the West Slope district. The evaporating ponds shown in figure 6 are used for the disposal of waste mine water. Water sampled from a seep, (C-3-1)18abc, at the base of a slope east of the ponds contains 17,400 ppm sulfates (table 8). A comparatively high sulfate content of 1,150 ppm in the water from well (C-3-1)9ccc-1 (table 8), about 1 1/2 miles east of the evaporating ponds, indicates that some of the water from the evaporating ponds is mixing with the ground water in this area.

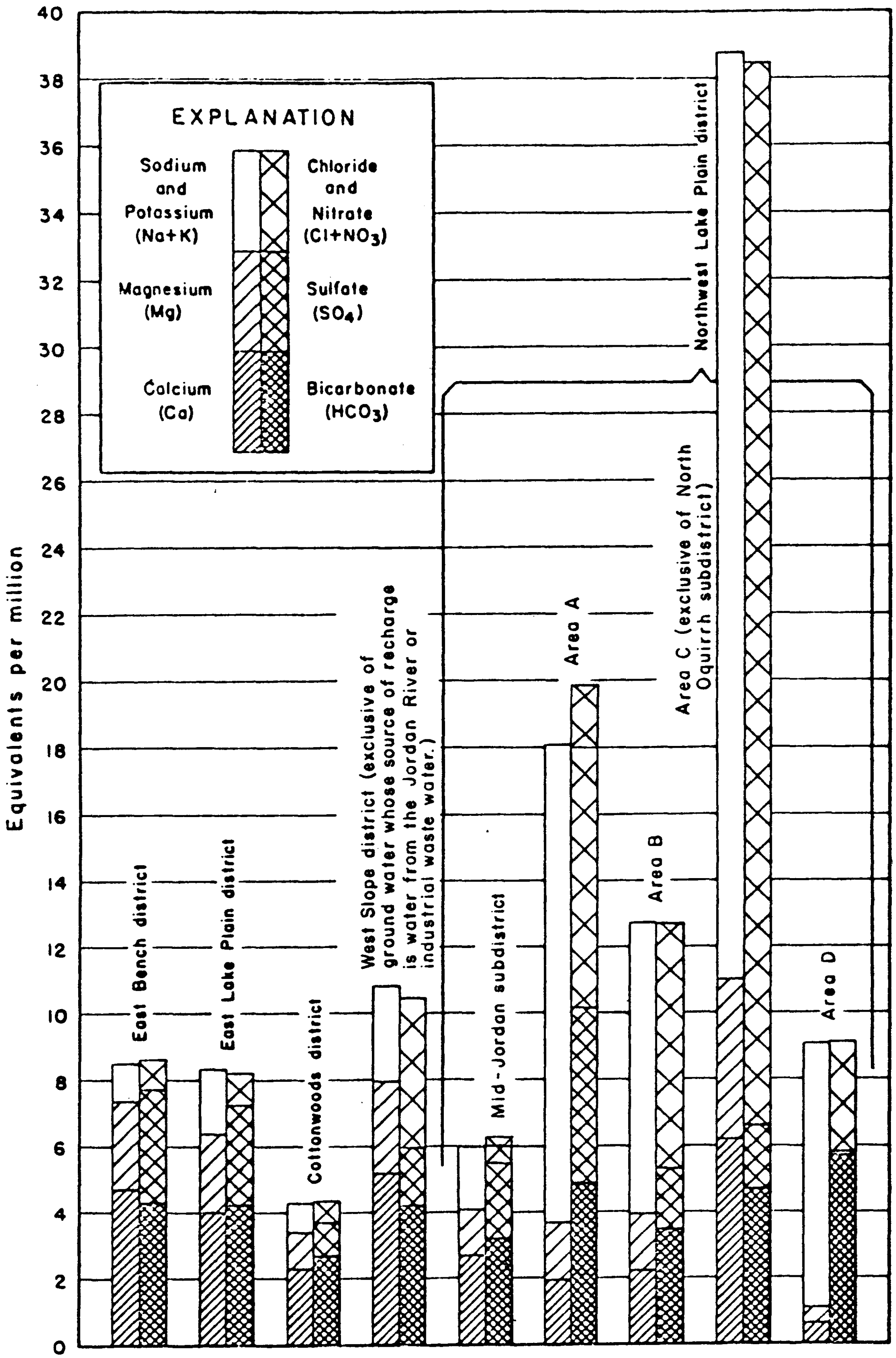

Figure 28. Chemical character of ground water in the Jordan Valley. (Compiled from the average analyses in table 7.)

TABLE 7

AVERAGE OF ANALYSES AND MAXIMUM AND MINIMUM NORMAL VALUES FOR CHEMICAL CONSTITUENTS, HARDNESS, AND CONDUCTIVITY IN THE JORDAN VALLEY[1]

District or area	Number of analyses		Parts per million: Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na + K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Dissolved solids 2/	Hardness as $CaCO_3$	Specific conductance (micromhos/cm at 25°C)
East Bench		Max.	19	0.12	144	52	67	341	386	45	12.0	774	552	1,080
district	25	Ave.	13	.02	94	32	26	264	164	30	3.6	602	336	790
		Min.	6	.00	64	22	1	104	70	7	.0	320	206	556
East Lake Plain		Max.	25	1.80	135	49	160	554	338	187	9.9	764	526	1,200
district	63	Ave.	17	.10	80	29	46	258	147	33	1.5	487	321	783
		Min.	8	.00	27	14	6	144	2	6	.0	251	108	431
Cottonwoods		Max.	54	.26	107	45	85	323	282	125	9.7	718	415	731
district	64	Ave.	13	.03	45	14	19	163	50	23	2.7	253	190	376
		Min.	5	.00	9	4	2	54	3	4	.0	75	38	156
Southeast		Max.	60	.28	162	146	352	478	549	598	31.0	1,390	1,004	2,470
district	12	Ave.	Not meaningful											
		Min.	17	.01	56	8	19	203	38	8	.5	255	184	409
West Slope		Max.	65	.60	229	61	148	360	317	329	19.0	1,240	790	1,700
district 3/	31	Ave.	35	.13	104	34	66	250	90	156	4.6	643	387	1,033
		Min.	9	.00	59	19	32	173	20	57	.8	365	245	725
Northwest Lake Plain district:														
Mid-Jordan		Max.	58	1.0	85	28	92	302	214	74	5.8	508	324	758
subdistrict	20	Ave.	29	.38	54	17	44	194	105	26	1.1	356	205	564
		Min.	15	.01	27	9	21	133	6	10	.0	244	127	394
area A		Max.	82	.18	64	36	384	405	338	325	23.0	1,430	326	2,280
	9	Ave.	67	.06	39	21	332	296	228	301	13.1	1,158	186	1,926
		Min.	57	.01	24	13	277	241	163	270	7.0	976	135	1,640
area B		Max.	64	.20	62	36	279	276	145	295	6.5	950	296	1,600
	9	Ave.	48	.05	42	22	203	212	90	259	2.5	816	195	1,395
		Min.	8	.00	25	12	135	144	44	190	.0	678	118	1,220
area C		Max.	63	.40	269	141	1,060	700	278	2,125	13.0	3,600	1,250	6,300
(exclusive	13	Ave.	41	.14	124	59	640	286	93	1,130	5.3	2,220	550	4,121
of North Oquirrh subdistrict)		Min.	21	.00	24	11	291	66	1	510	.0	1,080	136	1,980
North Oquirrh		Max.	19	-	321	214	3,670	336	231	6,280	-	10,800	-	-
subdistrict	5	Ave.	15	-	223	108	2,220	307	139	3,946	-	6,861	-	-
		Min.	12	-	110	48	760	283	60	1,330	-	2,485	-	-
area D		Max.	28	.15	14	8	208	452	3	140	.9	567	64	926
	3	Ave.	27	.10	12	5	185	343	2	122	.6	523	55	884
		Min.	26	.02	11	3	171	270	1	91	.3	492	50	853

1/ The averages and ranges in this table indicate the type of water that is obtained from most wells in each district or area. Analyses for isolated occurrences of water that contain unusually high concentrations of one or several constituents were not used in compiling the table.

2/ Calculated from determined constituents.

3/ Exclusive of ground water whose source of recharge is water from the Jordan River or industrial waste water.

TABLE 8

CHEMICAL ANALYSES OF WATER FROM SELECTED WELLS AND SPRINGS IN THE JORDAN VALLEY

Well or spring number	Date of Collection	Temperature (°F)	Parts per million											Percent sodium	Sodium adsorption ratio (SAR)	Specific conductance (micromhos/cm at 25°C)	pH	Analysis by[2]
			Silica (SiO_2)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na+K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Nitrate (NO_3)	Dissolved solids[1]	Hardness as $CaCO_3$	Noncarbonate hardness as $CaCO_3$					
(B-1-1) 14dcb	8-29-47	-	35	688	136	4,100	235	800	7,210	-	13,100	2,280	2,080	80	37	19,400	-	GS
36bac-29	7-11-50	-	-	-	-	-	233	896	3,252	-	-	1,978	708	-	-	-	-	UO
(C-1-1) 34cdc-2	8-18-58	57	55	85	55	97	198	179	228	2.4	798	437	275	33	2.0	1,310	7.9	GS
(C-2-2) 5aac	8- 4-58	68	57	363	105	195	409	284	310	856	2,370	1,340	1,000	24	2.3	3,320	7.5	GS
(C-3-1) 9ccc-1	8-13-58	57	33	425	156	122	544	1,150	225	7.5	2,390	1,700	1,250	14	1.3	2,960	7.1	GS
18abc[3]	9-11-58	-	139	648	2,390	3,290	-	17,400	388	.7	24,300	11,400	11,400	38	13	9,970	3.0	GS
(C-4-1) 11ad	5-22-34	137	60	106	25	304	285	97	598	-	[4] 1,665	368	134	-	-	-	7.6	SL
(D-1-1) 36bac-1	3- 3-54	-	-	590	162	72	136	2,060	28	-	-	2,140	2,030	7	.7	3,100	7.4	GS
(D-3-1) 7ccd-1	9-15-58	59	22	234	92	337	314	726	480	7.7	2,050	964	707	43	4.7	2,970	7.4	GS
29abc-1	9-15-58	55	18	56	11	19	214	38	7.5	.5	255	184	9	19	.6	409	7.8	GS
30dcb	3- 6-33	-	-	162	146	352	478	549	555	31	[4] 2,030	1,000	612	43	4.8	-	-	GS

1/ Dissolved solids are calculated from determined constituents except as noted.

2/ Analysis by: GS, U.S. Geological Survey; SL, City Chemist, Salt Lake City, Utah; UO, Utah Oil Refining Co.

3/ Analysis includes acidity of 54 ppm as H_2SO_4 and density of 1.019.

4/ Residue on evaporation.

The unusually high nitrate concentration of 856 ppm (table 8) in the water from spring (C-2-2)5aac which issues from a surface outcrop of the Salt Lake Formation indicates that this water may be contaminated with waste from a powder plant which is about a mile up the hydraulic gradient from the spring.

The South Fan subdistrict of the West Slope district contains most of the large-diameter irrigation wells in the Jordan Valley, and, therefore, the quality of the ground water in relation to irrigation is particularly important. Native water in the subdistrict, which is not contaminated by surface water or industrial waste water, has a low sodium hazard and a high salinity hazard (fig. 29), according to the method of classification of irrigation waters of the U.S. Salinity Laboratory Staff (1954, p. 80).

Northwest Lake Plain District

Differences in chemical quality of the ground water in the Northwest Lake Plain district have warranted a division of the district, for the discussion of water quality, into five areas that differ somewhat from the ground-water subdistricts. These areas are the Mid-Jordan subdistrict and four areas designated as A, B, C, and D (fig. 27).

The ground water in the Mid-Jordan subdistrict contains less dissolved solids than does the water in any other area except the Cottonwoods district (fig. 27 and table 7). It is likely that water moves from the Cottonwoods district directly to the Mid-Jordan subdistrict. The water from well (C-1-1)34cdc-2 in the Mid-Jordan subdistrict contains 798 ppm of dissolved solids (table 8). This is anomalously high, and fluctuations of the water level in this well indicate that some of the recharge for this well comes from irrigation water that is obtained from the Jordan River.

The ground water in area A is derived mostly from seepage of irrigation water from the adjacent West Slope district, and like the Jordan River water, it contains a large amount of dissolved solids (fig. 27 and table 7). Water in this area does not meet U.S. Public Health Service standards (1962) for municipal use, although it is used for municipal and domestic supply. The water has a high sodium-salinity hazard (fig. 29); therefore, its use for irrigation may require special soil management practices.

The ground water in area B contains less dissolved solids than does the water in area A and more dissolved solids than does the water in the Mid-Jordan subdistrict (fig. 27 and table 7). Apparently the water in area B is a mixture of the water of poor quality from area A and the better quality water from the Mid-Jordan subdistrict.

The ground water in area C everywhere contains more than 1,000 ppm of dissolved solids and in places contains considerably more (fig. 27). The water in the extreme western part of the area (that part occupied by the North Oquirrh subdistrict) in general contains more dissolved solids than does water in other parts of the area, but the proportions of constituents are similar (table 7). The water in area C is not suitable for most purposes (fig. 28 and table 7), but large quantities are used in the milling, smelting, and refining of ores.

The ground water in area D contains considerably less dissolved solids than does the water in area C (fig. 27). This is surprising, considering the closeness of area D to Great Salt Lake. The water in area D is of the sodium bicarbonate type, and it contains practically no calcium, magnesium, and sulfate (fig. 28 and table 7). The presence of this soft water that contains less than 600 ppm of dissolved solids so close to Great Salt Lake suggests that some of the water in area D may be coming from the East Shore area, north of the Jordan Valley.

Temperature of Ground Water

The temperature of ground water as measured and reported in the Jordan Valley ranges from 46° to 139° F. (fig. 30). The temperature of the water in most wells and springs, however, ranges from 52° to 60° F. Temperatures below 52° F. were measured by Taylor and Leggette (1949, p. 192-193 and 245-247) from a few wells less than 250 feet deep in the eastern part of T. 1 S., R. 1 W., and the western part of T. 1 S., R. 1 E. A temperature of 46°F. was reported from well (C-3-2)5acb-1 which is 1,274 feet deep.

The temperature of the ground water exceeds 60° F. principally in two areas in the Jordan Valley. The smaller of the two areas is in the southeastern part of the valley, west of Draper (fig. 30). The highest temperature recorded in this area is 139° F., at Crystal Hot Springs (spring number (C-4-1)11ad), and the temperature of the ground water apparently decreases away from the springs. The high temperatures are probably caused by hot water moving upward along a fault zone at or near Crystal Hot Springs.

The geothermal gradient in the area, as indicated by temperatures measured at different depths in well (D-3-1)18cbb-1 in January 1959 may be about 2 1/2° F. per hundred feet. The measurements were made with a maximum thermometer, and they indicate maximum temperatures between the surface and the depths shown, as follows: 100 - 70°; 400 - 87°; 500 - 87°; 600 - 90°; 800 - 90°; 1,025 - 95°; 1,093 - 95°.

The larger of the two areas of high-temperature ground water occupies much of the northern part of the Jordan Valley (fig. 30). The eastern margin of this area is marked by several hot springs which rise along the Warm Springs fault (Taylor and Leggette, 1949, p. 35), and the warmest water reported is 129° F., at Beck's Hot Springs (spring number (B-1-1)14dcb). Most of the wells west of Beck's Hot Springs yield water warmer than 60° F. It is unlikely that underflow from the spring area has any effect on the temperature of the ground water more than 1 mile west of the springs, however, because water-level data for the area indicate that the direction of movement of the ground water on the west side of the Jordan River is toward the east or northeast (fig. 16).

The source of the heat for the large area of warm water west of the Jordan River is not known. Warm water may be rising along a fault zone such as suggested by Cook and Berg (1961, p. 81), or the heat may result from exothermic reactions in the organic clays of the area. At the western margin of the area, warm water may be rising along the faults which bound the north end of the Oquirrh Mountains.

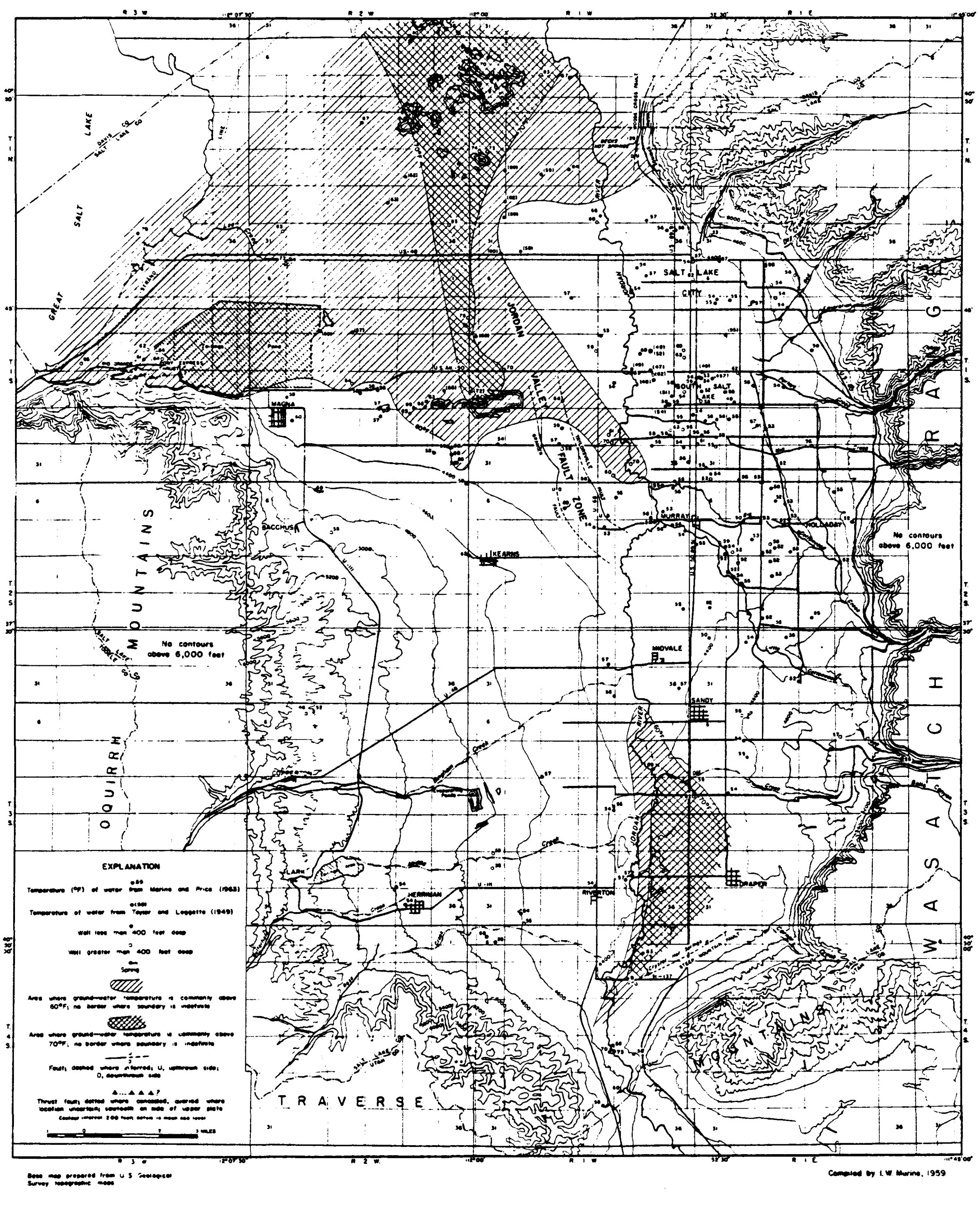

Figure 30. Map showing selected faults and temperatures of ground water in the Jordan Valley, Utah.

(The following excerpt is reprinted from Hely, A. G., R. W. Mower, and C. A. Harr, 1971, Water Resources of Salt Lake County Tech. Pub. 31, pages 169-172).

Concentrations, in milliequivalents per liter

	(C-1-1)26ccd-1	(C-1-1)9aab-1	Difference
Calcium and magnesium	4.85	2.93	-1.92
Sodium	.91	3.52	+2.61
Chloride	.42	1.13	+.71
Surplus sodium			.69

Exchange of equivalent amounts of sodium for calcium and magnesium leaves a surplus of 0.69 milliequivalents of sodium, which is nearly equal to the 0.71 milliequivalent increase in the chloride concentration. Between wells (C-1-1)9aab-1, (C-1-1)5aad-4, and (B-1-1)19bab-1 the increase in dissolved-solids content is due principally to the large increase in the sodium and chloride content as the water moves slowly through thick deposits of fine sediments that contain large quantities of salts. Sulfate decreased between the latter two wells, due to reduction to sulfide. Hydrogen sulfide, and in places methane gas, is characteristic of ground water in most of the northern part of the valley.

Temperature

The temperature of ground water varies considerably areally and with depth, but it is not subject to pronounced fluctuation as is air temperature. At depths of only a few feet beneath the land surface, the insulation from temperature fluctuations at the surface is sufficient to maintain a nearly constant water temperature, which generally is a degree or two above the mean annual air temperature. At greater depths, the water temperature tends to increase with depth because of the geothermal gradient.

This general pattern of ground-water temperature is modified locally where recharge to an aquifer is by unusually cold or hot water. For example, large quantities of recharge by melting snow tend to lower the temperature; and upward movement of hot water from great depth or from near a local heat source (such as a large body of relatively recent volcanic rocks) tends to raise it.

Table 29 shows the water temperatures measured at various depths from temperature logs of selected wells in Jordan Valley and the change in temperature per 100 feet between the depths at which measurements were made. The average of the temperature gradients is 1.2°C per 100 feet. In general, the temperature gradient is much below the average in wells near areas of recharge. Those gradients that are much above the average are in wells near bodies of relatively recent volcanic rocks or areas of discharge near the Great Salt Lake.

The temperature of water in the principal aquifer ranges from about 7°C (45°F) at the mouth of Little Cottonwood Canyon to about 56°C (133°F) at Becks Hot Springs. The lower temperature is about 5.6°C (10°F) below the 1951-60 mean annual air temperature at the Cottonwood Weir climatologic station (near the mouth of Big Cottonwood Canyon) and reflects the effects of recharge by melting snow. The higher temperature is the result of upward movement of hot water along the Warm Springs fault.

The areal distribution of the water temperature in the principal aquifer is shown in figure 78. The indicated boundaries between temperature zones are only approximate because they are

Table 29.—Average change in the water temperature, in degrees Celsius, per 100 feet in selected wells, in Jordan Valley

Aquifer: A, principal aquifer; B, deposits of Tertiary age; C, principal aquifer and deposits of Tertiary age.
Temperature: Determined by thermistor survey in well.

Well number	Aquifer	Temperature (° C)	Depth (feet)	Temperature (° C)	Depth (feet)	Change in temperature per 100 feet (° C)
(A-1-1)31ccc-2	A	13.8	160	14.0	370	0.1
(B-1-3)34bcb-1	A	26.3	672	28.1	744	2.5
(C-1-1)19caa-1	C	25.5	452	32.8	1,038	1.2
20bdd-1	C	24.8	611	26.0	908	.4
24bbd-2	C	17.2	484	19.2	740	.8
25aab-4	C	13.9	100	20.5	930	.8
25bdb-1	C	17.1	550	18.2	986	.3
30dca-1	C	14.7	144	17.0	385	1.0
(C-1-2)24aaa-2	A	23.3	192	24.7	454	.5
24dba-1	C	23.8	307	30.9	840	1.3
25aad-1	C	15.1	300	26.1	778	2.3
(C-1-3)15bca-2	C	15.3	60	27.5	520	2.7
	B	27.5	520	27.7	869	.1
15cbb-2	C	16.3	35	30.5	430	3.6
	B	30.5	430	30.5	570	.0
15dbb-1	C	14.7	20	18.9	435	1.0
(C-2-1)3cdd-4	A	14.3	30	20.2	637	1.0
9ccc-1	B	16.6	187	23.8	781	1.2
12aab-1	C	14.0	150	19.2	608	1.1
(C-2-1)24bcd-1	C	12.7	80	25.3	986	1.4
25ddb-2	C	15.0	90	24.2	785	1.3
(C-2-2)9bdb-1	B	13.5	100	14.2	448	.2
(C-3-1)1cab-2	C	16.2	50	29.3	766	1.8
5dbb-1	C	13.9	185	17.6	440	1.5
(C-3-2)4adb-1	C	14.9	160	18.2	880	.5
(C-4-2)1bbb-1	C	13.0	82	17.0	531	.9
9bad-1	B	14.3	135	22.1	590	1.7
(D-1-1)16caa-1	A	11.2	60	13.3	466	.5
(D-2-1)6dbb-10	C	11.5	20	18.0	650	1.0
8daa-5	C	10.5	18	14.5	434	1.0
(D-3-1)2ccc-1	C	12.9	550	14.8	996	.4
4bbb-1	A	11.7	324	11.7	800	.0
	B	11.7	800	13.0	886	1.5
18cba-1	A	15.5	80	20.5	308	2.2
20baa-1	C	15.7	197	19.9	542	1.2
21ada-1	C	11.1	400	11.5	626	.2
29cbc-1	C	18.0	58	30.6	269	6.0

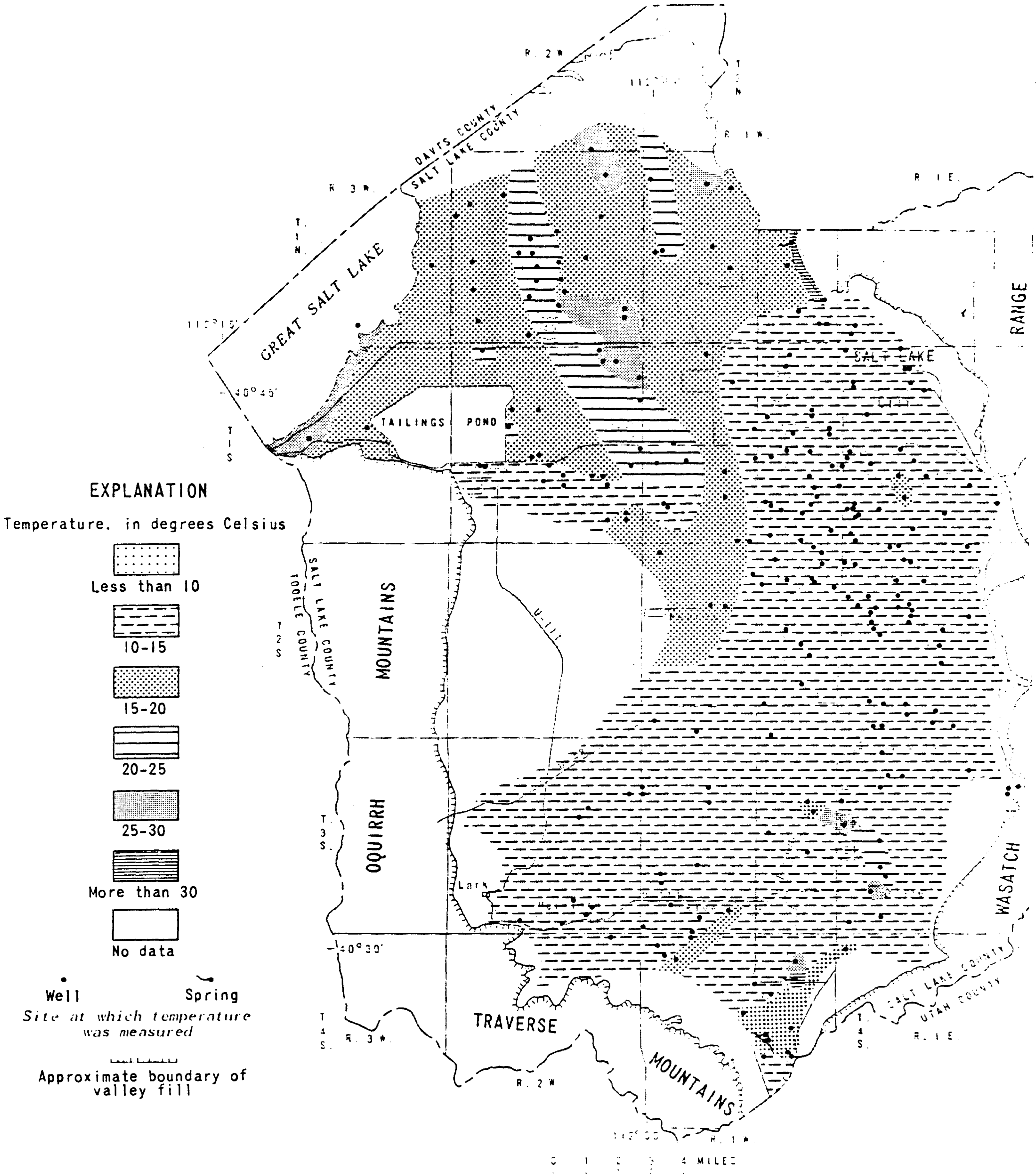

Figure 78.—Areal distribution of water temperature in the principal aquifer in Jordan Valley.

based on available temperature data, which generally represent only a portion of the aquifer. Thus, the map represents measured temperatures at existing wells rather than averages for the entire aquifer.

Figure 78 indicates that in general water temperatures are lower near areas of recharge from the mountains and higher near the area of discharge in the northern part of the valley. Departures from the general pattern exist locally near Becks and Crystal Hot Springs, (B-1-1)14dcb-S1 and (C-4-1)11ad-S1; in the southeast part of the valley near Draper where wells have encountered an extensive body of volcanic rocks; and in the north-central part of the valley. The source of heat in the latter area may be exothermic reactions in organic clays in the valley fill (Marine and Price, 1964, p. 59).

WATER USE AND WATER LOSS

Although the available water supply often limits the amount of water use, there is no simple relation between the two quantities because of the many kinds of use. Some uses, such as the generation of hydroelectric power, may involve neither depletion of the supply nor impairment of its quality. Most other uses, however, involve withdrawal of water from surface or underground sources, consumption of a part, and return of the remainder (usually with some impairment of the quality). Also, the storage of water in surface reservoirs to make it available for use involves a loss by evaporation.

Records of water use in Salt Lake County generally are limited to records of withdrawal. The amounts of water returned to streams and aquifers and the amounts consumed can be determined or approximated only by indirect means.

Summary of withdrawals

The mean annual withdrawal of surface water for use in Salt Lake County during October 1963 to September 1968 was 455,000 acre-feet, and the withdrawal of ground water during January 1964 to December 1968 was 126,000 acre-feet. All withdrawals are listed by type of use in table 30. The classification of uses is only approximate. Some of the water shown under municipal use, for example, may have been used in small industrial plants. Domestic use may be similar to municipal use, but as used herein, it applies where there is no public supply. Water from springs within Jordan Valley is included with ground water; and water from springs at or above canyon mouths is included with surface water. The summary in table 30 does not include temporary withdrawals in pipelines for hydroelectric-power generation.

The combined withdrawal from seven Wasatch streams during 1964-68 for all uses (except power generation) was 93,700 acre-feet per year—about 62 percent of the corresponding runoff at the canyon mouths and about 70 percent of the normal runoff (table 4). Most of the remaining runoff was wasted to Great Salt Lake.

The withdrawals from Deer Creek Reservoir through the Salt Lake City aqueduct were less than 22 percent of the amount available to the Metropolitan Water District of Salt Lake City (61,700 acre-ft), but some of the district's share was delivered through the Utah Lake Distributing Co. Canal for irrigation.

The total of the withdrawals from the Jordan River exceeded the discharge of the river at any one point because of the gains in streamflow within the Jordan Valley and reuse of water previously diverted and returned to the river.

Pavant Valley - Black Rock Desert

INTRODUCTION

Pavant Valley is in eastern Millard County, in west-central Utah. The area considered covers about 300 square miles and includes the towns of Holden, Fillmore, Meadow, and Kanosh, whose total population is about 4000. The economy depends on agriculture, but tourism and mining of volcanic cinders contribute to the economy (Mower, 1965).

SUMMARY of OCCURRENCES and POTENTIAL of the HOT and WARM WATERS

Warm to hot springs about 5 miles southwest of Meadow yield water of 30°-41°C, and water in a nearby 90-foot well is 67°C. Mundorff (1970) concluded that although some heat may be contributed to the spring by nearby late Tertiary or Quaternary volcanics it is likely that the heating is due to the normal geothermal gradient and therefore the area has "questionable geothermal potential." Later workers, Parry and Cleary, and Rush, have used geothermometers to conclude that deep water temperatures may range from 180° to 230°C, and Parry and Cleary have stated that Pavant Valley is "a prime target for further exploration."

Most well waters in the valley are in the range of 11°- 22°C, and the median temperature is 15°C. Thus in most areas where there now are wells, the chance of reaching water of 15.5°C or higher is almost 1 in 2.

GEOLOGIC and HYDROLOGIC ENVIRONMENT

Pavant Valley is at the eastern border of the Basin and Range Physiographic Province and is bounded on the east and south by the Pavant Range, which is in the Colorado Plateau Province. A low ridge of extinct volcanoes and flows separate the valley from the main part of the Sevier Desert to the west (Mower, 1965, p. 10).

The valley fill consists of the Sevier River(?) Formation, more than 800 feet thick, pre-Lake Bonneville lake beds, from 0 to nearly 800 feet in thickness, basalt flows from two extinct volcanoes in parts of the area, and intertonguing alluvial fans and lacustrine deposits of Lake Bonneville (Mower, 1965, p. 19). Water flows from the creeks of the Pavant Range into the valley-fill deposits and has saturated them so thoroughly that extensive evapotranspiration occurs over an area of about 35,000 acres in the lower western parts of the valley (Mower, 1975).

Irrigation wells pumped about 82,000 acre-feet each year from 1966-75, with general declines in water levels of less than 1 foot per year.

OCCURRENCE of WARM and HOT WATERS

Warm to hot water occurs in two spring areas and in a well about 5 miles southwest of Meadow, and warm water occurs in 7 wells scattered around the valley (Table 12-A), but these occurrences can be appreciated better from the background of Mower's interpretation (1965, p. 72).

> "TEMPERATURE
>
> The temperature of water from 178 wells in Pavant Valley ranged from 52° to 85°F (11°- 29.5°C). The temperature of the shallowest water is about the same as the mean annual air temperature of 52°F (11°C). Ground-water temperature increases an average of 1°F for each 80 feet of depth in the sediments in the valley. The temperature also increases westward from the mountains toward areas of

recent volcanic activity. Near the mountains along the east side of the valley, the temperature of the ground water ranges from 52° to 57°F (11°- 14°C); along the west side of the valley, the temperature ranges from about 60° to 85°F (15.5°- 29.5°C), except that the temperature of water from wells in the basalt aquifer ranges from 54° to 57° (12°- 14°C). A temperature of 143°F (61.5°C) was measured for springs along Devil's Ridge west of Hatton, but the rate of flow is only 1 or 2 gpm. Wells in Pavant Valley have not been known to tap water warmer than 85°F (29.5°C). (Well (C-22-6)35ddb, was drilled after Mower wrote his report).

"The temperature of ground water, in general, increases 1°- 3°F (0.5°- 1.5°C) through the irrigation season. This temperature rise is caused principally by excess irrigation water that has been warmed at the land surface and has returned to the aquifer and by upward migration of warmer water from lower depths."

Next, a comment on and a couple of additions to Mower's interpretation. Mower's Basic-Data Report No.5 (1963) records temperatures of 239 wells. As Mower says above, the temperatures range from 11°- 29.5°C, but only one is at 29.5°C and the rest range from 11°- 22°C. The median temperature is 15°C, 94 wells have slightly warm water with temperatures between 15.5°- 19.5°C, and 7 have warm water with temperatures of 20°- 29°C. The pattern formed by plotting the slightly warm to warm water simply shows a scattering among the other wells that yield slightly cooler water. Appreciably warmer water occurs in the warm or hot springs and hot-water wells southwest of Meadow (Table 12-A), but conflicting reports of the temperatures require some explanation. Meadow "Hot" Spring was measured in the summer of 1970 by Rush (1978) at 30°C. Dennis, Maxey, and Thomas (1946) report a temperature of 35°C from "Warm Spring" which they locate on a map in the same place, (C-22-6)27ddc, as the Meadow spring measured by Rush.

Hatton Hot Spring, (C-22-6)35ddc, was measured in the summer of 1976 by Rush (1978) at 36°C. Dennis, Maxey, and Thomas (1946) show a Winepa Hot Spring at (C-22-6)35dca, but do not give a temperature. As quoted above, Mower (1965) reports a temperature of 63°C for Devil's Ridge Spring, for which Dennis, Maxey, and Thomas give a temperature of 13°C, and Rush also reports a temperature of 13°C at the site, (C-22-6)34baa, where Dennis, Maxey, and Thomas plotted Devil's Ridge Spring. Probably Mower measured a temperature at Hatton Hot Spring and erroneously reported it as Devil's Ridge. This explanation seems to be confirmed by the 67°C temperature that Rush measured in a 90-foot well, (C-22-6)35ddb, close to Hatton Hot Spring.

Mundorff (1970, p. 40-41) also has reported on Meadow and Hatton Hot Springs and his statements are worth repeating:

"Meadow...and Hatton...Hot Springs...issue from valley-fill deposits of Tertiary or Quaternary age. Basalt flows of Quaternary age are only about three miles north of the springs; basalt flows of late Tertiary age are about three miles west of the springs and in the vicinity of Black Rock Volcano about three miles south of the springs...

"Temperature of the water of Meadow Hot Springs was 84°F (29°C) in May 1966 and was 106°F (41°C) in May 1967; a discharge of 60 gpm was estimated in 1957. Hatton Hot Springs have not flowed for several years; the temperature of the water was 100°F (38°C) in 1957.

"Chemical data obtained during the past 25 years at Meadow Hot Springs show that the dissolved-solids content has ranged from 4,690 to 4,900 ppm and that the water is of the sodium chloride type. In equivalents per million, calcium is about half that of sodium, and sulfate is about half that of chloride.

The germanium content of a sample obtained in May 1966 was fairly high (571 mg/l) but the germanium content of two other samples obtained during 1966 and 1967 was not especially high. Bromide (400 mg/l, iodide (450 mg/l), and cobalt (20 mg/l) were fairly high in a sample obtained in May 1967. Silica concentration did not exceed 50,000 mg/l in any sample analyzed.

"Some heat undoubtedly is furnished by the nearby volcanic flows of late Tertiary and Quaternary age. The dissolved solids content of water at Meadow and Hatton Hot Springs (4,670-4,900 ppm) is somewhat similar to that of the ground water in the general area of the springs. Water from a well about five miles northeast of the springs has dissolved-solids content of 8,050 ppm. The depths of these wells range from 100 to 527 feet. If ground water similar to that found in the described wells were in contact with the volcanic flows or were circulated to a depth of 3,000 feet, water having the chemical and thermal characteristics of the hot springs would result.

"Despite the proximity of volcanic rocks of late Tertiary and Quaternary age, the immediate area of the springs appears to be of questionable geothermal potential. The relatively low temperature of the spring water, the low silica content, and the similarity in chemical quality of the spring water and the ground water in a fairly large surrounding area are not favorable indicators of a large increase in temperature at fairly shallow depth."

In contrast to Mundorff's opinion that the Meadow and Hatton spring areas have "questionable geothermal potential," Parry and Cleary, who computed Na-K-Ca and SiO_2 temperatures for many springs and wells in the Pavant Valley, conclude that "the combination of water chemistry, young silicic volcanics, and proximity to known geothermal areas make Pavant Valley a prime target for further exploration" (1978, p. 1). They computed mixing models to explain the low silica content of the water from Meadow Hot Springs; "those models suggest a hot water temperature of 190° to 230°C and a cold water fraction of 86% to 90%" (1978, p. 26).

Rush also studied Meadow and Hatton Hot Springs and concluded that "the temperature of the hydrothermal reservoir, estimated with geothermometers is about 180°C or less" (1978, p. 71). Rush outlined an elongate area of about 3 sq. mi. surrounding Hatton Hot Spring where he reports that high heat flow results in rapid snowmelt, and goes on to say that "subsurface temperatures of 70°C can be expected at depths of as little as 10 m. under these snowmelt areas" (1978, p. 72).

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Sevier Desert

INTRODUCTION

The Sevier Desert occupies about 3000 square miles in Juab, Millard, and Tooele counties in central Utah. The center of population is Delta, and the principal activities are agriculture and raising of livestock. Beryllium ore that is mined in Juab County west of the Sevier Desert is processed at a plant near Lynndyl. Probably about 10,000 people live in the area under consideration.

SUMMARY of OCCURRENCES of HOT and WARM WATER

The only hot water in the area is reported from Abraham (Crater) Hot Springs, which issue from a tufa mound near a Quaternary basalt flow. Temperatures to 82°C have been measured and total solids content ranges from 3200 to 3800 ppm. The area has been designated as a KGRA (Energy Resources Map of Utah, 1975) and thus is deemed to be worthy of further investigation.

All well water in the Sevier Desert is in the 11°- 28°C range (Tables 12-A and B). The lowest reported temperature is 1° above the reported mean annual air temperature of 10°C (Mower and Feltis, 1968, p. 10). Water south of Delta is apparently slightly warmer than water north of Delta. Although no strong pattern can be developed from the occurrences, a well south of Delta appears to have 5 chances in 6 of reaching water of 15.5° or higher, whereas a well north of Delta has only 1 chance in 3.

GEOLOGIC and HYDROLOGIC ENVIRONMENT

The Sevier Desert of this report includes Tintic Valley and the northern portion of a huge closed intermontane structural basin that extends southward into the Sevier Lake basin and Pavant Valley. The Sevier River drains the High Plateaus to the southeast of the basin and would flow, if not fully diverted in the vicinity of Delta, into the Sevier Lake basin. The Sevier Desert is bounded by, clockwise from the southwest, the Cricket, Little Drum, Drum, and McDowell Mountains on the west, Simpson, Sheeprock, and West Tintic Mountains on the north, and East Tintic, Gilson, and Canyon Mountains on the east. All are typical fault-block ranges of the Basin-range Physiographic Province.

The valley floor is underlain principally by lake-bottom deposits of silt and clay that were laid down in Pleistocene Lake Bonneville. The continuity of the lake-bottom deposits in several places is interrupted by Plio-Pleistocene volcanic rocks that stand above the lake plain. Along the eastern side of the valley are extensive sand dunes. Interfingering with the lake deposits are stream-laid deposits brought in by the Sevier River and by streams from the surrounding mountains during dry climatic cycles when the basin was not filled with a lake. Altogether, the valley-fill deposits probably aggregate more than 6000 feet.

The complex interfingering of fine-grained and coarser-grained deposits has formed two principal artesian aquifers in much of the basin and a multi-aquifer artesian system "from the Leamington-Oak City area west and southwest toward Sevier Lake" (Mower and Feltis, 1968, p. 15). The unconsolidated deposits of the basin are probably more than 1000 feet thick in much of the basin and "in excess of 8000 feet near the center of the basin" (Mower and Feltis, 1968, p. 35). By using an average saturated thickness of 775 feet for the main part of the desert and 300 feet for the Old River Bed area, Mower and Feltis (p. 36) have computed the volume of ground water in storage at more than 400 million acre-feet. Water is discharged from this closed basin by natural evapotranspiration and by pumpage from wells; recharge comes from streams, irrigation ditches, and irrigated fields and probably by underflow from the mountains that border the basin.

OCCURRENCES of HOT and WARM WATER

The only hot water in the Sevier Desert occurs at Abraham (Crater) Hot Springs (C-14-8)10S and 15S which are about 16 miles north-northwest of Delta (Table 13-A). According to Mundorff (1970, p. 37-40), "these springs issue from a tufa mound about 15 feet high and several hundred feet in diameter on the floor of the Sevier Desert along the east side of a Quaternary basalt flow (Fumerole Butte)... Water temperatures near the center of the spring area are about 180°F (82°C)... In July 1967, the total discharge from all springs was estimated to be about 250 gpm" although other estimates have ranged from 700 to 5000 gpm. "Dissolved solids content ranges from about 3,200 to 3,800 ppm... (hence) the water is unsuitable for most uses... The absence of boiling temperatures, the low silica concentrations, and the large water discharge during some periods indicate that test drilling would be necessary to determine if temperature increase with depth is sufficient to sustain an economically feasible geothermal development."

Rush (1978) inventoried about 40 orifices at Crater Hot Springs and estimated total flow at about 1400 gpm with additional seepage of about 700 gpm. He believes the water rises along a north northwest-trending fault from a reservoir about 1.3 km deep or "only 200m deeper than the estimated base of the alluvial valley fill... The estimated temperature of the hydrothermal reservoir is only 110°C" (p. 63).

Slightly warm (15.5°- 19.5°C) and warm (20°- 34.5°C) water up to 28° is common in the wells whose temperatures are recorded by Mower and Feltis (1964) (Table 13-B). Basic-Data Report No. 9 lists about 600 wells. Of these, temperatures were measured on 171. The lowest temperature of 11°C, 1° above mean annual air temperature, was recorded on only one well. Eighty other wells have reported temperatures of 12° to 15°, 70 wells of 15.5° to 19.5°, and 20 of 20° to 28°. The wells of 15.5° to 19.5° are scattered all over the mapped area; all eleven wells measured in Juab County are in that temperature range. The wells whose temperatures are 20° to 28° fit no apparent pattern, but 11 of the 20 are south of Delta as are 33 of the 70 that are between 15.5° and 19.5°. Furthermore, only 8 other wells were measured in the area south of Delta: all were 14.5° to 15°.

It therfore appears that a well south of Delta has about 5 chances in 6 of penetrating water above 15.5°, and a well elsewhere about 1 chance in 3.

There is no ready explanation why the water of the Sevier Desert has above-normal temperature. Possibly there is deep-seated heat near Pavant Butte to the south and certainly there is heat near Fumarole Butte, the source of heat for Abraham Springs; but there is no indication of increase in water temperature toward those possible sources, so the mystery remains.

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Sevier River Valley

INTRODUCTION

The Sevier River heads on the Markagunt Plateau, and its pringipal tributary, the East Fork Sevier River, heads on the Pausaugunt Plateau, both in south-central Utah. The two northeastward-dipping plateaus are separated by the north-trending Sevier fault which has raised the Pausaugunt on the east above the Markagunt on the west. Both streams flow generally northward, and the East Fork is joined near Antimony by Otter Creek, which flows southward from the Fish Lake Plateau. The East Fork then flows westward to meet the main Sevier River at Kingston. Beyond Kingston, the Sevier continues northward, past Marysvale, Sevier, Joseph, Richfield, Salina, and Redmond to Gunnison where it is joined by the San Pitch River, which drains the east flank of the Wasatch Plateau and flows southward to meet the Sevier. The river then flows northwestward through Sevier Bridge Reservoir which holds the flow of the river behind Yuba Dam. After passing Yuba Dam, the river continues northwestward to the Canyon Range where it makes a right-angle turn to the southwest, then through Leamington Canyon to the Sevier Desert.

SUMMARY of OCCURRENCES of HOT and WARM WATER and POTENTIAL for USE

Three hot springs, Monroe (41°- 64°C), Red Hill (74°- 76°C), and Joseph (62°- 64°C), yield water that is hot enough for direct space heating and plans are underway by the town of Monroe to develop the nearby hot springs for heating schools and other buildings.

LeFevre spring 10 miles north of Panguitch yields 15 gpm of water at 26°-32°C. Possibly development of the spring area could increase the yield for heating a greenhouse. The nearby Tebbs spring yields a greater quantity, 280 gpm, of cooler but still warm water at 20°C.

The heat from the fresh waters of Johnson Warm Spring, 25°C, 10 gpm, 418 mg/l dissolved solids, and of Richfield Warm Springs, 22°C, 700 gpm, 307 mg/l dissolved solids, is going to waste but might have potential for the future.

The yields and quality of waters of the two warm springs in the San Pitch Valley, Crystal, 22°C, 346-1260 gpm, 466 mg/l dissolved solids, are adequate for irrigation. These waters could be used to warm greenhouses.

The 5800-ft deep well, (D-14-5)16bdd, that flows nearly 300 gpm of fresh water at 55°C from the Masuk-Emery could be an indicator of a valuable resource. The depth involves a high first cost, but the freshness, temperature, and artesian flow might offset that cost over a long period.

GEOLOGIC and HYDROLOGIC ENVIRONMENT

Both main branches of the Sevier River begin as spring flow from the Tertiary Wasatch Formation. They flow northward and traverse broad exposures of Tertiary volcanics into which they have cut steep canyons, some of the steepest downstream from their confluence at Kingston. Near Richfield the valley is flanked by Tertiary and Mesozoic sedimentary rocks, which contain the river until it reaches the Canyon Range. There the river has cut through Paleozoic and Precambrian rocks as well as Mesozoic rocks. The tributary San Pitch River Valley is flanked principally by Cretaceous and Tertiary sedimentary rocks from the headwaters to the confluence with the Sevier.

The northward course of the Sevier River probably is fault controlled, because many faults are parallel to or sub-parallel to the trend of the valley. The faults are most evident in the Central Sevier area from Sevier to Gunnison where the river valley is a graben and Monroe and Red Hill Hot Springs rise on the eastern flanking fault.

In its course from the High Plateaus to the Sevier Desert, the river flows through many small alluvium-filled basins that are separated by buried bedrock barriers or by exposed bedrock barriers through which the river has cut canyons. These basins are essentially saturated with water, which is drawn on by wells to supplement irrigation water supplied by the river.

The Sevier River is the most highly appropriated river in Utah and, perhaps, in the United States. Much of its flow is probably used for irrigation several times before it finally reaches its last use in the Sevier Desert, about 200 miles from its sources in the High Plateaus.

In the discussions that follow, the warm and hot waters that occur in the Sevier River drainage will be considered under three headings:

- Upper Sevier: Headwaters of Sevier River, East Fork Sevier River, and Otter Creek to Kingston
- Central Sevier: Mainstem of the Sevier River from Kingston to Yuba Dam
- San Pitch: San Pitch River drainage to its junction with the Sevier

OCCURRENCES of WARM and HOT WATER

Upper Sevier - Headwaters to Kingston

Two springs about 10 miles north of Panguitch yield warm water (Table 14). The LeFevre spring yields about 15 gpm of water that ranges from 26° - 32°C. It rises from a fault zone that cuts the Tertiary Wasatch Formation. The nearby Tebbs spring, (C-33-5)16cdc, yields 280 gpm of water of excellent quality, 218 mg/l dissolved solids, at temperatures from 10° - 20°C. It rises from alluvium. Five other springs and two wells yield water of 15.5° - 18°C. One of these springs is in Panquitch Valley, one in Circle Valley, two in East Fork Valley, and one in Grass Valley. Both wells are in Grass Valley.

Central Sevier - Kingston to Yuba Dam

One deep (9638 ft) oil-test well and three spring areas report hot water (Table 15-A). Two other springs and one well yield warm water between 20° - 25°C. Because the oil-test well is so deep its water temperature of 65°C can hardly be considered an asset, but the three hot spring areas, Monroe, (C-25-3)10dda, at 42°, Red Hill, (C-25-3)11cac, at 78°, and Joseph, (C-25-4)23aac, at 64° are significant. All three springs rise on faults: Monroe and Red Hill on the Sevier Fault on the east side of the valley and Joseph on the Dry Wash Fault which is west of outcrops of volcanic rock near the center of the valley.

Rush (1978) has studied Monroe, Red Hill, and Joseph Hot Springs. He concludes that Monroe and Red Hill are part of the same spring system and are fed by a hydrothermal reservoir about 4 km deep and having a temperature as high as 160°C. He also believes that Joseph Hot Spring is related to a hydrothermal reservoir about 4 km deep at a temperature of about 160°C.

Johnson Warm Springs, (C-25-3)27aba, at 25°C, also issue from the Sevier Fault about 2 miles south of Monroe Hot Springs, and Richfield Warm Springs, (C-23-3)26aca, 20° to 22°C, issues from the Elsinore Fault zone on the west side of the valley about half a mile west of Richfield.

Mundorff (1970, p. 41-42) discusses all these springs in some detail:

Monroe Hot Springs issue from a single tufa mound that extends for about half a mile along the mountain front; the width of the mound is about 600 feet from the mountain front to the base, and the height is 75-100 feet. The springs issue from seepage zones and from fissures and cracks that have been enlarged by local residents to increase the spring yield. Discharge is at two major points—one near the center of the mound and the other at the base. The largest spring on the mound discharges about 50 gpm; water temperature was 148° F on February 13, 1967. The other large spring dischaiges about 40 gpm from the base of the mound; water temperature was 106° F. Several small springs discharge from the surface of the mound. The total discharge of Monroe Hot Springs was about 150-200 gpm on February 13, 1967. In addition to the visible discharge from the springs, some water evaporates directly from the mound surface; saturated areas high on the mound above the spring areas and extending to the mountain front indicate that artesian pressure is forcing water to the surface of the mound.

Red Hill Hot Spring issues from a tufa mound about 600 feet long, 200-300 feet wide, and about 50 feet high. The only spring that issues from the mound discharges as much as 150 gpm from a crevice in the north-central part of the mound. The water temperature was 167° F on February 13, 1967; a temperature of 169° F was reported for "Monroe Hot Springs" (Carpenter and Young, 1963, p. 17), but this temperature actually was for Red Hill Hot Spring.

Johnson Warm Spring issues along the Sevier fault about two miles south of Monroe Hot Springs. Richardson (1907, p. 58) reported a flow of 180 gpm and a temperature of 80° F. In April 1967, U.S. Geological Survey personnel reported a flow of 10 gpm and a temperature of 77° F.

Both Monroe and Red Hill Hot Springs have dissolved-solids contents ranging from about 2,600 to 2,900 ppm and are of the sodium sulfate chloride type. Johnson Warm Spring has a much lower dissolved-solids content and is of the calcium sulfate type. One of the small springs in the Monroe Hot Springs showed a high manganese content (346 μg/l). Johnson Warm Spring had one of the highest molybdenum contents (18 μg/l) of all thermal springs in Utah.

Joseph Hot Springs issue from tufa deposited by the springs over the Dry Wash fault. Extensive areas of volcanic rocks crop out immediately east of the fault. Water temperatures of 145° and 148° F were measured in 1966 and 1967. Discharge of the springs probably averages 30 gpm. Dissolved-solids content of Joseph Hot Springs ranges between about 5,000 and 5,200 ppm—nearly double that of Monroe and Red Hill Hot Springs. The water is of the sodium chloride type. The concentration of calcium is about the same for Monroe, Red Hill, and Joseph Hot Springs; sulfate is somewhat greater in Joseph Hot Springs than in Monroe and Red Hill Hot Springs. In Joseph Hot Springs, chloride (in equivalents per million) is nearly double that of sulfate; but in Monroe and Red Hill Hot Springs, chloride and sulfate are about equal (in equivalents per million).

The presence of volcanic rocks of late Tertiary age along the faults from which Monroe, Red Hill and Joseph Hot Springs issue indicates that these rocks probably contribute to the heating of the water. They may be a direct source of heat for some of the water, and the volcanic activity that resulted in these rocks may have resulted in an abnormally high geothermal gradient. The depth of circulation and the amount of dilution by cool shallow ground water are not known. The major faults certainly furnish the avenues of escape for the water that enters the earth's surface at altitudes much higher than those of the springs, but the depth of circulation in the fault zone is unknown.

Richfield Warm Springs, (C-23-3)26aca-S1, are about half a mile west of Richfield in Sevier County. These springs issue at a fault contact between alluvium and sandstones of Tertiary age in the Elsinore fault zone along the west side of the Sevier River valley (figure 17). Numerous faults occur in the eastern part of the Pavant Range, which is immediately west of the springs. Volcanic rocks of late Tertiary age crop out about two miles south of the springs and extend for many miles southwestward along the west side of the Sevier River valley; similar outcrops are common along the east side of the valley.

Richardson (1907, p. 58) reported that spring discharge was 1,440 gpm and that water temperature was 74° F. In June 1966, discharge was 700 gpm and water temperature was 72° F. Dissolved-solids content of the springs is low—about 300 ppm; the water is of the magnesium calcium bicarbonate type.

The presence of numerous faults in the mountains one to five miles west of the springs, the large discharge of the springs and the low dissolved-solids content indicate that the spring discharge is meteoric water that descends not more than 2,000-3,000 feet and is heated slightly by the geothermal gradient. The altitude in some areas of possible infiltration is more than 2,000 feet higher than that of the springs. The geothermal gradient within the mountains is sufficient to raise the temperature of the water 15°-20°

Recent investigations (continuing into 1978) at Monroe Hot Springs by the Department of Geology and Geophysics of the University of Utah probably will lead to the developing of those springs for heating of schools and several other buildings in Monroe (S. H. Ward, pers. commun. 1978).

Slightly warm water (15.5°- 19.5°C) has been reported in 29 wells and 11 springs (Table 14-B). Two of these springs yield large quantities of water: Fayette Spring, 1900 gpm at 18°C, and Redmond town spring, 6000 gpm at 19°C. Richardson (1907, p. 58) reported a temperature as high as 70°F (21°C) and a flow of 13.5 cfs for Redmond Springs.

San Pitch River - Headwaters to confluence with Sevier River

Two springs, Crystal (Livingston Warm Spring), (D-18-2)13cad, and Peacock (Nine Mile Warm Spring), (D-19-2)4dca, consistently yield water at 22°- 22.5°C, and one deep well, (D-14-5)16bdd, yields fresh artesian water of 55°C from the Masuk and Emery Sandstone members of the Mancos Shale between the bottom of the casing at 5388 and the plug at 5800-5900 (Table 16-A). Both springs rise along faults so it is likely that they and the deep well derive their heat from the geothermal gradient.

Six wells yield slightly warm water of 15.5°- 19°C and four springs and a mine tunnel yield water of 15.5°- 18.5°C (Table 15-B).

Robinson (1968, Tables 1 and 2) measured temperatures of about 350 wells and 51 springs. Except for the deep well that yields water of 131°F (55°C), temperatures ranged from 46°F (8°C) to 66°F (19°C) and averaged 52°F (11°C). Temperatures of water from the springs ranged from 37°F (3°C) to 73°F (22°C) and averaged 52°F (11°C).

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Uinta Basin

INTRODUCTION

The Uinta Basin includes most of northeastern Utah south of the crest of the Uinta Mountains. It encompasses more than 10,000 square miles including nearly all of Uintah and Duchesne Counties as well as parts of Carbon, Emery, Grand, Utah, and Wasatch Counties. Many oil fields have been developed in the Uinta Basin, beginning with the Ashley Valley field in 1949.

SUMMARY of PRINCIPAL OCCURRENCES, USE, and POTENTIAL

Warm to hot water between 20° and 55°C is yielded in quantity by wells in the Ashley Valley oil field (43°- 55°, 4400 acre-feet per year, approximately 1500 ppm dissolved solids), by a spring in Split Mountain Canyon (30°, 2700 gpm, 942 ppm), by a water well converted from an oil-test well about 5 miles southeast of Jensen (43°-46°, 200 gpm, 2000 ppm)(this well apparently abandoned December 1977), and by springs that rise along a fault or faults in the Duchesne River valley about 2 miles northwest of Hanna (26°, 2250 gpm, 454 ppm). All the water except that from the spring in Split Mountain is used for irrigation, but without any attempt to make use of the heat.

The water that rises with the oil in Ashley Valley is run through settling tanks that separate the oil and water. The water is then disposed of into ponds and ultimately into ditches by which it enters the irrigation system east of the field. Such water could be used for space heating in the immediate vicinity, perhaps even in Naples or Jensen, or for extending the growing season by using large greenhouses.

The warm water from the springs northwest of Hanna similarly might be used in greenhouses.

Slightly warm water, 15.5°- 19.5°C, is yielded by 13 springs and 7 shallow wells that are between 12 and 160 feet deep. One spring yields 117 gpm and another 40 gpm but the rest of the springs and wells all yield 20 gpm or less. These waters are in the temperature range suitable for use in heat pumps, but only the water from the wells might be so used for the springs are generally remote from human habitations. Most of the springs and wells yield water containing less than 1000 ppm dissolved solids but four springs and two wells yield water containing 1000 to 2770 ppm.

GEOLOGIC ENVIRONMENT

"The Uinta Basin is an asymmetric syncline with an axis that is concave southward and generally parallel to the eastward-trending Uinta Mountains that lie to the north. Beds that form the north flank of the basin dip steeply southward away from the Uinta Mountains. Beds that form the south flank dip up to 5° northward toward the axis of the syncline. Rocks of Precambrian, Cambrian, and Mississippian through Tertiary ages are exposed" along the steep north flank of the basin and have been identified in oil wells (Feltis, 1966, p. 9). Only

Tertiary rocks are exposed over the rest of the basin; they extend from the foot of the Uinta Mountains to the crest of the Book Cliffs where they have been cut off by the erosion that has exposed Cretaceous rocks at the base of the cliffs.

Significant faults parallel the east-west trend of the basin axis along the south flanks of the mountains. In the northeastern part of the basin is the Deep Creek fault zone which trends northwest-southeast about where the trend of the axis of the basin turns southeastward. All these faults cut the Paleozoic as well as Tertiary rocks and therefore probably provide conduits for water from the mountains to get into the deep subsurface. In addition, the rocks along the flank of the mountains have joints that may also act as conduits for water.

Although warm and hot waters are reported in several localities in the Uinta Basin, there appears to be no significant source of heat other than the normal geothermal gradient. A few springs, whose temperatures are all below 32°C, rise along faults and one rises on the Split Mountain anticline. Wells in the Ashley Valley oil field yield water of 43° to 53°C from depths of about 4200 feet, but the water itself may be coming from formations 1000 to 2000 feet below the well bottoms.

OCCURRENCES of HOT to WARM WATER

Ashley Valley Oil Field

The principal occurrence of hot water in the Uinta Basin is in the Ashley Valley oil field in township 5 south, range 22 east, where several wells yield water of 43° to 53°C from depths of about 4200 feet below the land surface (Table 17). Probably all the other wells in the 28-well field yield water of about the same temperature but temperature information on them has not been reported. Total water yield of the oil field in 1963 was nearly 29 million

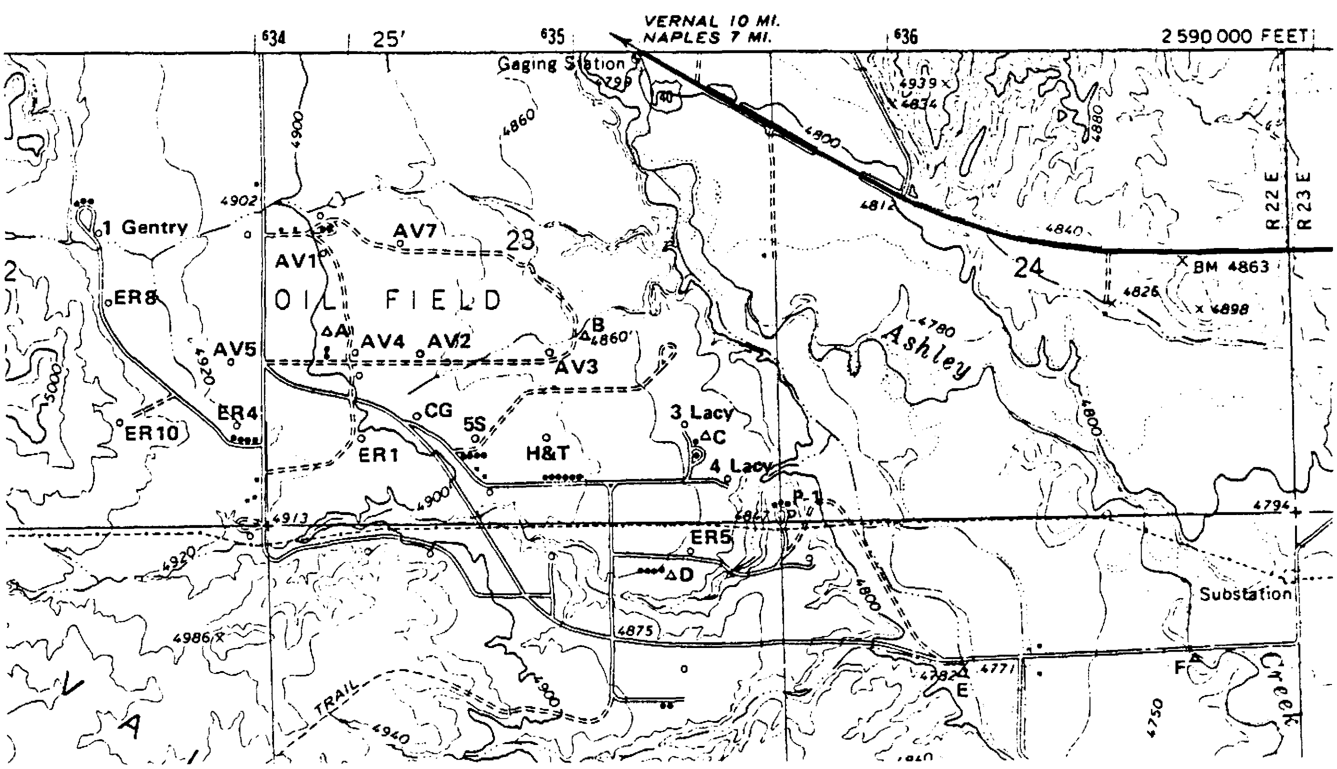

Figure 7. Map of Ashley Valley Oil Field showing oil well locations and water temperature measurement sites. scale: 1:24,000

Table 18 - EXPLANATION for Figure 7 and records of water temperature and conductance in the Ashley Valley oil field

Symbols & measuring points	Ownership or description	Temperature °C	Conductance mmho	Date
AV-2,3,4,5,7	Equity Oil Co.			
ER-1,2,4,5, 6,8,10	Energy Reserves (Formerly Pan American)			
H & T	Hollandsworth and Travis	56°	2400	12/7/77
3 & 4 Lacy	R. Lacy			
P-1	Polumbus Corp.	45	2500	do
CG	Crain and Griffith T.E.Hall #1	50	1600	do
5S	Thomas E. Hall 5S	47	1620	do
A	Composite of Equity wells AV-2,3,4,5,7	49	1580	do
B	Composite of Equity wells AV-2,3,4,5,7 below settling ponds; half a mile below A	16	1150	do
C	Composite of Lacy 3 and 4	53	2700	do
D	Composite of ER-1,2,4,5,6,8	50	1800	12/6/77
E	Composite of ditch water and outflow from oil field	20	2900 2940	12/7/77 11/4/60
F	Ashley Creek	2	3700	12/7/77
	Prior measurements, listed for comparison			
AV-1		44	1590	11/3/59
AV-7		45	1330	do
ER-1	(Originally Pan Am. 1 Federal	49	1860	do
ER-2	(Originally Pan Am. 2 Federal)	46	2460	do
ER-10	(Originally Pan Am. 10 Federal)	45	829	do

barrels or 3700 acre-feet of water having about 1500 ppm dissolved solids. In 1977 the yield was 34.6 million barrels or more than 4400 acre-feet. It would seem that so long as pumping continues in the field, water production will remain high; if pumping stops, water production would cease for a while, but artesian pressures would be restored and ultimately, perhaps in a year or less, the wells would begin to flow, although at a rate appreciably less than the present 4400 acre-feet a year. Richard Peterson, of Equity Oil Co., told me that the top-hole pressure on the discovery well, Equity #1AV, was between 500 and 600 pounds when the well was first put into production in 1948. Restoration of that pressure should produce appreciable flow.

By 1952, 30 wells were producing about 900,000 barrels of oil and 600,000 barrels of water. From 1952 to 1960 oil production averaged about 950,000 bbls a year and reached a peak of 1,400,000 bbls in 1960. During the same period, water production steadily increased to about 18,700,000 bbls in 1960. Since 1962, oil production has declined and water production has increased: in the year ending December 1977, about 180,000 bbls of oil and 34,634,000 bbls of water were produced by 28 wells.

In Table 18 are given water temperatures and conductances measured on some wells, a ditch, and a creek on December 6 and 7, 1977, and, where available, reasonably comparable measurements taken in 1959 and 1960 (all temperature measurements were made by Goode, the 1977 conductances were measured by Goode, and the 1959 and 1960 conductances were reported by laboratory personnel).

The 1977 temperatures of the Equity and Energy Reserves wells, although not comparable to the 1959-60 temperatures on a well-to-well basis, suggest that the water may be as much as 2 or 3°C higher now than it was in 1959-60. This rise could be the result of a greater volume of water moving through the plumbing system (34.6 million bbls vs 18.7 million) or it may be due to a general warming of the system by the long-term movement of the hot water through it.

As reported by Goode and Feltis (1962, p. 12) the water "is probably sustained by surface recharge in outcrop areas north and east of the field. Possibly the water comes not only from the oil-bearing strata (the Weber-Phosphoria) but also from a sequence of underlying limestones of Pennsylvanian and Mississippian age." The water probably moves up into the oil-bearing rocks along normal faults that are known to cut those rocks (Peterson, 1961, map).

Other Occurrences

About 7 miles southeast of the Ashley Valley oil field, in sec. 1, T.6 S., R.23 E., is an oil-test well that was reported as converted to a water well (Table 19-A). It was reported to yield 200 gpm of water containing about 2000 ppm total solids at temperatures of 43° - 46°C from a depth of 2650 feet. In December 1977 it appeared that this well was not longer being used.

In Split Mountain Canyon, one or more springs at (D-4-24)16cddS yield 2700 gpm of water containing 942 ppm total solids at 30°C. This water probably gains its heat from the geothermal gradient as it moves through the subsurface before rising near the center of the Split Mountain anticline.

About 3½ miles east of Ouray an oil-test well, Shell #1 State, (D-8-30)36baa, has recorded temperatures of 43°, 52°, and 57°C from depths of about 3390, 4550, and 4790 respectively. The water is briny and has chloride contents of 11,500, 20,000, and 31,000, respectively, at the above depths. The temperatures suggest a geothermal gradient of 1°C per hundred feet.

In the valley of the Duchesne River about 2 miles northwest of Hanna, a group of warm springs produces about 2250 gpm of water containing 454 ppm total solids at a temperature of 26°. This water evidently is controlled by a cluster of normal faults that trend generally east-west.

In the southeastern part of the Uinta Basin, the U.S. Geological Survey has been monitoring wells and springs as part of a special ground-water study. Information on wells that have reported temperatures of 17° to about 34° are included in Table 19-C. Most of the wells are gas wells or water wells converted from gas wells and are deeper than 5600 feet. Considering that the gas wells are 5600 to 7000 ft deep, the reported temperatures appear to be anomalously low.

OCCURRENCES of SLIGHTLY WARM WATER

Slightly warm water, 15.5 to 19.5°C is yielded by 13 springs and 7 shallow wells that are between 12 and 160 feet deep (Table 19-B). Four of the springs are in Dinosaur National Monument. Another, the one with the highest yield in the group (117 gpm), is just beyond the southern boundary of the monument. Two springs and a well are in the valley of the Duchesne River about 12 miles northwest of Duchesne. Two shallow wells are about a mile southwest of Roosevelt, another is about 9 miles southeast of Roosevelt, and a fourth is about 12 miles southwest of Roosevelt.

In the southern part of the basin, south of the Duchesne and White Rivers, are two very shallow wells, only 22 and 12 feet deep, whose waters likely were warmed to the reported 17° and 18° respectively by the heat of the sun. Similarly, a spring on Flat Rock Mesa, which apparently yields 0.2 gpm from flat-lying rocks, probably has its water warmed by the sun. Other temperature measurements at Flat Rock Mesa spring show among others 3°C on 2-11-75 and 12°C on 7-23-75 (Conroy and Fields, 1977, p. 211). Sulphur Spring was plotted by Hood, Mundorff, and Prince (1976, Plate 1B) about a quarter mile from a fault shown on the Geologic Map of Utah (Stokes and others, 1963, southeast quarter). Probably there is a relation between the fault and the spring.

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Utah and Goshen Valley

INTRODUCTION

Utah Valley and its neighbor to the southwest, Goshen Valley, encompass about 600 square miles between latitudes 39°50' and 40°30' north and between longitudes 111°32' and 112°01' west. Both valleys are wholly within Utah County (figure 8).

Northern Utah Valley sustains both heavy industry and agriculture whereas southern Utah Valley and Goshen Valley are principally agricultural areas. Provo, the principal city, is the home of Brigham Young University, the largest university in the State.

SUMMARY of OCCURRENCES, USES, and POTENTIAL for USE

Waters of temperatures from 15.5° to 46°C are yielded by springs and wells near Saratoga Springs in northern Utah Valley, and waters of temperatures from 15.5° to 34°C are yielded from wells and springs in southern Utah Valley and in Goshen Valley. In northern Utah Valley the warm and hot water in wells is confined to the area near Saratoga Hot Springs, but in southern Utah Valley water of 20° to 34°C apparently is related to a N-S fault in the Payson area and slightly warm (15.5°- 19.5°C) water has been measured in about 30 percent of the wells in the low valley floor.

In other areas outside Utah, waters in these temperature ranges and of the low salinity of most of the waters of these two valleys are used for space heating, for heating greenhouses, and for extending the growing seasons of certain crops. At present, the only known use of the thermal properties of the waters of the Utah Valley and Goshen Valley is at Saratoga Springs where the moderately saline (1050 to 1600 ppm dissolved solids) warm water from the springs and wells is used to supply swimming pools at the resort.

Some of the wells near Saratoga Springs supply irrigation water, but apparently no attempt is made to use the heat of the water to extend the growing season or to heat greenhouses, a use for which this water would seem to be ideally suited. This water could also be used for space heating, for its fairly low salinity should cause few problems with such use.

With the exception of the springs at Bird Island and at Lincoln Point, whose waters contain 6140 and 6650 ppm total solids, essentially all the warm water so far reported from wells and springs in southern Utah Valley and in Goshen Valley might be used for space heating, for heating greenhouses, or for extending the growing season.

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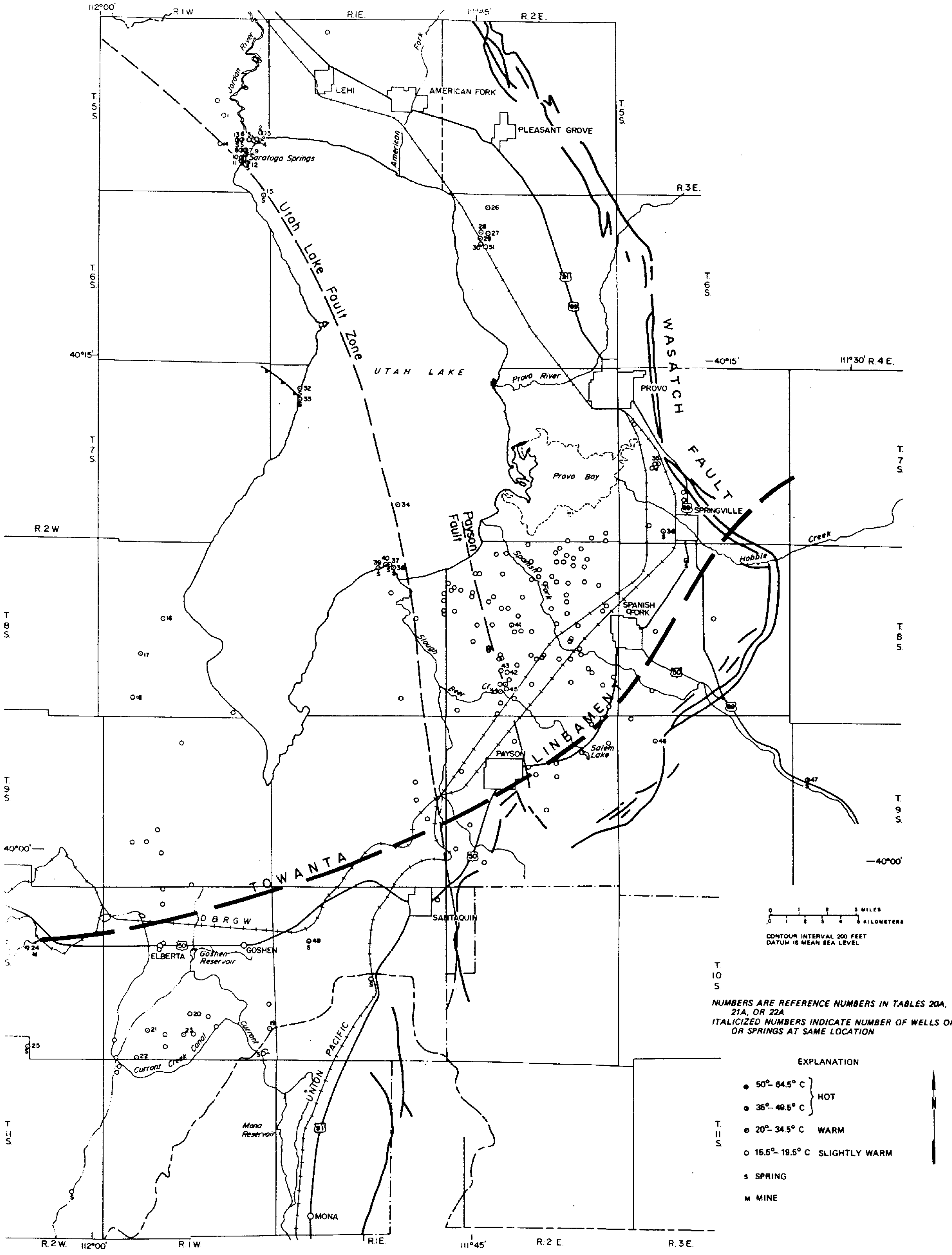

Figure 8. Map of Utah Valley, Utah, showing wells and springs that yield hot, warm, and slightly warm water.

In Utah Valley, neither the chemistry of the warm waters nor the geophysical studies, which provide information to help in the interpretation of the sources of heat, suggest that any source is capable of providing water or steam hot enough to generate electricity.

In Goshen Valley, however, recent studies of the Na-K-Ca and SiO_2 content of the waters of wells and springs by Parry and Cleary (1978) lead them to conclude that hot water as high as 180°C may exist at depth, and therefore the area is worthy of further investigation.

The findings of Parry and Cleary in Goshen Valley may relate that area to the nearby East Tintic district, whose Burgin mine yields saline water of about 60°C. In 1965, Lovering and Morris, after comprehensive studies of geothermal gradients in the Latite Ridge area of the East Tintic mining district suggested that the area "should be explored as a possible source of geothermal power" (p. F-1).

GEOLOGIC and HYDROLOGIC ENVIRONMENT

The major structure of Utah Valley is a NNW-trending graben, bounded on the east by the Wasatch fault zone and on the west by the Utah Lake fault zone (Cook and Berg, 1961, plate 13). The northern end of the graben is marked by faults along the southern margin of the Traverse Range, and the southern end by NE-trending splinter faults of the Wasatch fault zone.

Southern Utah Valley is characterized structurally not only as the southern termination of the Utah Valley graben, but also, as Ritzma (1976, p. 119) points out, Southern Utah Valley is the place where the Wasatch fault is offset to the southwest and his W 72°W-trending Towanta lineament bends to the south and crosses from Utah Valley to Goshen Valley in the gap between West Mountain and Long Ridge. Perhaps the bending of the Towanta lineament between Santaquin and Goshen Valley is the reason for the southwestward-trending magnetic nose that is shown on the aeromagnetic map of north-central Utah (Mabey and others, 1964). Certainly southern Utah Valley is disturbed enough to provide conduits for water to circulate deeply enough to become moderately warm.

Goshen Valley is shaped like an arrowhead that points to the SSW and which is bounded on the southeast by a series of NE-trending faults and on the west side by probable faults that separate the valley from the East Tintic Mountains to the west. Northeastward, Goshen Valley merges into Utah Valley.

Utah Lake occupies about 150 square miles in parts of both valleys, and the other parts of the valleys are underlain at the surface by unconsolidated fluvial and lacustrine deposits of Quaternary age. In most of Utah Valley the Quaternary deposits are about 250 to 600 feet in thickness, but are nearly 900 feet thick just east of Long Ridge, and are about 1300 feet thick at West Mountain; in Goshen Valley the Quaternary deposits are 300 feet to more than 500 feet thick (Cordova, 1970, figs. 4 to 11). Below the Quaternary deposits is an unknown thickness of Tertiary deposits. Cook and Berg (1961, p. 82) believe that the Tertiary and Quaternary rocks in the center of the Utah Valley graben "extend to a depth of at least several thousand feet."

The rocks of the mountains surrounding Utah and Goshen Valleys are principally Paleozoic marine sediments with early Tertiary volcanics surrounding the southern tip of the arrowhead of Goshen Valley. Presumably the bedrock underneath the Cenozic deposits of both valleys is of Paleozoic age.

The interbedding of the alluvial sands and gravels from the mountains with the silt and clay deposits that were laid down during the lake cycles provides an artesian environment that is typical of the graben valleys along the Wasatch Front. Thomas (Hunt, Varnes, and Thomas, 1953) identified three artesian (confined) aquifers in northern Utah Valley: A Tertiary(?), a deep Pleistocene, and a shallow Pleistocene. They underlie deposits of the Lake Bonneville Group which contain ground water under water-table or unconfined conditions. Cordova (1970) recognized the same three artesian aquifers in southern Utah Valley, but only the shallow and deep Pleistocene aquifers in Goshen Valley.

OCCURRENCE of THERMAL WATER

Thermal water is reported in several areas in the two valleys (Tables 20-A and B, 21-A and B, 22-A and B), grouped here according to their presumed geologic control, which for each is a fault or fault zone.

Utah Lake Fault Zone

The Utah Lake fault zone parallels the northern portion of the west shore of Utah Lake, probably about a quarter mile offshore. Northward, it passes through Saratoga Springs and probably continues northwestward beneath the volcanics of the Traverse Range. Southward it goes near Bird Island and then east of Lincoln Point at the north end of West Mountain. From there it goes through Holladay Springs and meets the main Wasatch fault zone about one mile northeast of Santaquin. In the vicinity of Lake Mountain and West Mountain, the west side of the fault is up, and near Santaquin the east side is up, which "suggests either a hinge action or east-west cross faulting" north of Santaquin (Cook and Berg, 1961, p. 82).

Along this fault zone in the vicinity of Saratoga Springs are shallow wells 90 to 198 feet deep that produce water from 21° to 46°C. In the same area are two springs at 43.5°C. In the lake southeast of Saratoga Springs are springs that have been measured at 41.5° and 32°C.

"In the summer of 1904, during the survey of Utah Lake by G.L. Swendsen of the Reclamation Service, three groups of springs were found beneath the water of the lake. Their existence was shown by the presence of depressions occupying areas of 100 square feet to 3 acres in extent and having depths of 20 to 80 feet. Since the prevailing depth of the lake is much less and the bottom is composed of slimy mud, a considerable discharge is thus indicated"(Richardson, 1906, p. 49). During the winter when most of Utah Lake freezes over a band of open water marks the location of these springs in the lake.

Farther south, a spring on Bird Island yields water of 21°, and springs on the tip of Lincoln Point have been measured at 31.5°C. About ten miles south of Lincoln Point, east of West Mountain are shallow wells, 55 to 125 feet deep, that yield water of 16.5° to 18.5°. Finally, about two miles west of Spring Lake are the Holladay Springs, which are described as having "warm waters" by Cook and Berg (1961, p.28). I measured the temperature of one of the Holladay Springs at 11° on December 9, 1972.

Chemical Quality and Source of the Warm Water

The warm waters that come from springs and wells along the Utah Lake fault zone can be separated into three groups based on the concentration of dissolved solids. Springs and wells in the northern reach of the Utah Lake fault zone near Saratoga Springs range in total dissolved solids from about 1050 to 1600 ppm. The springs on Lincoln Point and the one on Bird Island range from 6140 to 6650 ppm in total solids. The slightly warm (about 15.5°C) waters in some of the wells that are near the south end of the east face of West Mountain contain less than 500 ppm total solids.

It thus appears that although the Utah Lake fault zone probably is the main conduit by which the water comes to the surface, it is likely that the sources of water, the sources of heat, or both are different in the different parts of the fault zone. Therefore they should be examined separately.

The springs that rise in the lake near Saratoga Springs and the nearby warm springs and warm-water wells are similar chemically and probably therefore are all supplied by a common source. Likely that source is Cedar Valley, west of Lake Mountain, where there are sinks and no surface drainage out of the valley. Feltis (1967, p. 13), in his report on Cedar Valley, suggested that ground water from Cedar Valley might discharge in the bottom of Utah Lake. The principal structure of Lake Mountain is a syncline which, according to cross sections by Bullock (1951, p. 24), would drop the tops of two possible aquifers, the Great Blue Limestone and the Pinyon Peak Limestone, to about 500 feet above sea level and about 3000 feet below sea level, respectively. Either or both of these aquifers could bring water to the fault zone. Probably the normal geothermal gradient is more than sufficient to warm the waters to the 32° to 46° that are reported near Saratoga Springs.

The highly mineralized waters of Bird Island and Lincoln Point must be derived from a different source from the one that supplies the warm water at Saratoga Springs. The salinity of these waters suggests that they are supplied by some deep-seated heat source such as has been postulated for many of the warm and hot springs of Utah that rise along faults or near volcanic area. No known volcanic rocks are close enough to be the source of heat, and the aeromagnetic map that includes the area of the springs (Mabey and others, 1944) shows no anomaly in the area, so it is likely that water penetrates the fault zone to a great depth and then rises to supply the springs.

In contrast to the saline waters of Bird Island and Lincoln Point the warm waters in the wells east of West Mountain are fresh and therefore they probably derive their heat from the normal geothermal gradient, and at rather shallow depth.

<u>Payson Fault</u>

Cook and Berg (1961, p. 82) recognize a "second concealed northward-striking fault, 2 to 3 miles east of" the Utah Lake fault zone, which "apparently begins near Payson and extends north past the mouth of Spanish Fork." Aligned along or close to that fault in the vicinity of Benjamin are five wells, 117 to 675 feet deep, that yield water of 20°, 20°, 26.5°, 31.5° and 34°, including the warmest water in southern Utah Valley. Chemical analyses of the water from two of the wells show 450 or less total solids, so it is likely that the other wells yield water of good quality. Likely the fault is the conduit for the heat, but it is likely that heat rather than hot water is rising from the fault, for the quality of the water is better than it would be if rising from great depth. Futhermore, wells nearly everywhere in southern Utah Valley yield warmer-than-normal water, so it is likely that there is horizontal spreading of warm water through the confined aquifers.

One way to evaluate the occurrence of warm water in southern Utah is to compare temperature measurements of well water in northern Utah Valley with those of southern Utah Valley, as below:

	Northern Utah Valley	Southern Utah Valley
Total wells measured	262	392
$15.5^{\circ}C$ or higher (warm)	23	136
$11^{\circ}C$ or less (cool)	98	38

When we recognize that 11 of the wells of 15.5° or higher water temperature in northern Utah Valley are near the Saratoga Hot Springs and that only one of those in southern Utah Valley is near a warm spring, and when we see that 6 of the wells in the north are ones at Geneva that go more than 800 feet to reach 20.5° and 21° water, whereas most wells in the south are much shallower, the high proportion (more than one third of the total) of warm-water wells in southern Utah Valley becomes significant. Evidently, expectable temperatures are 2°C higher in southern than in northern Utah Valley - except for the hot spring areas.

Certainly the Payson fault is a control for some of the heat in southern Utah Valley, but perhaps also the crossing of the Wasatch fault zone by the Towanta lineament has caused an even larger region of disturbance that may permit more water to circulate to great depths. Whatever the control, it is likely that the heat rises and then spreads laterally through the confined aquifers, with the result that pin-pointing the control becomes difficult.

Other areas in southern Utah Valley

Several wells at scattered places in the southeast portion of Utah Valley yield slightly warm water, apparently of good quality.

Coordinates	Location	Temp°C	Depth	Total Solids in mg/l	Cl in mg/l
(D-7-3)20bda	Ironton	22	337	259	12
(D-8-2)2cda	NW of Spanish Fork	16	140		
11adb	"	17	204		
12bdc	"	17	199	404	49
26cac	SW of Spanish Fork	18.5	357		
36dbd	South of Spanish Fork	16.5	38		
(D-9-3)19ddb	East of Salem	16.5	112		

Southern Goshen Valley

The springs and principal wells that produce warm water of 18.5° to 22° in southern Goshen Valley line up as a band that trends about N45°E along the southeast flank of the vlley. The wells range in depth from 335 feet to 862 feet and yield waters that contain 491 to 1780 ppm total solids. Warm Springs yield 21°-22° water with 1320 ppm total solids, and the spring in the canyon of Currant Creek yields 19° water with 1017 ppm total solids.

The volcanic rocks in the vicinity are of Eocene age and therefore probably too old to be the source of heat. It appears more likely that heat for these moderately warm waters is related to a NE-SW-trending fault system, which may be an expression of the Towanta lineament of Ritzma (1976, p. 119).

Northern Goshen Valley

In northern Goshen Valley, in Township 8 South, Range 1 West, warm water, up to 20.5°C, is reported from four wells 205 to 392 feet deep, but in three of those wells temperatures of 14° and 14.5° have also been reported. There are also inconsistencies in chemical analyses of water collected at different times from two of the wells, (C-8-1)32bdb-1 and (C-8-1)35dcb-1 (B-D 16, p. 25), so it is difficult to speculate on the origin of the water or the source of the heat in these waters.

Springs south of Pelican Point

Two springs on the west shore of Utah Lake about two miles south of Pelican Point yield water of 24° to 25°C. The water contains 1430 to 1570 ppm total solids of which about 500 ppm is chloride. These springs appear to be on line with a northwest-trending thrust fault mapped by Bullock (1951, p. 12) in the Great Blue Limestone on the east side of Lake Mountain. Probably meteoric water sinks deep enough along the fault to be heated to the observed temperatures.

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Central Virgin River Basin

INTRODUCTION

The drainage area of the Central Virgin River includes most of Washington County, and one of the Virgin's tributaries, Ash Creek, heads in Iron County just south of Cedar City. The two principal tributaries, the Santa Clara River and Ash Creek, drain most of the Pine Valley Mountains, and the mainstem of the Virgin comes into the area by breaching the Hurricane Cliffs on the eastern margin of the area.

St. George, in the south-central part of the area, is the Hub of "Utah's Dixie," a recreation area that capitalizes on the warm climate in the southwest corner of Utah; in St. George the average annual temperature is 61°F (16°C) (Cordova and others, 1972, p. 6).

SUMMARY of OCCURRENCES and POTENTIAL FOR USE

The mean annual air temperature in the vicinity of St. George, in the central Virgin River valley, is 16°C, thus many springs and wells yield slightly warm or warm water of 15.5°C to 24°C. Out of 69 wells and springs whose water temperatures were measured, 23 had temperatures of 15.5°C to 19.5°C and 23 had temperatures of 20°C or higher.

The waters of two spring areas, Veyo Warm Springs, 32°C, and LaVerkin Hot Springs, 38°- 42°C, have been used for bathing but only Veyo continues to be so used. The water at Veyo is of good quality, about 400 mg/l dissolved solids, and may owe its heat to the young basalt from which it issues. The water of LaVerkin Hot Springs, on the other hand, is highly mineralized, about 9,500 mg/l dissolved solids, which makes it unsuitable for most uses; and its high rate of discharge, about 4500 gpm, results in excessive contamination of the Virgin River. The spring probably derives its heat from the geothermal gradient.

GEOLOGIC and HYDROLOGIC ENVIRONMENT

The central Virgin River and its tributaries drain an area west of the Hurricane Fault, hence most authorities, such as Hunt (1974), would put the area in the Basin and Range Physiographic Province, but Stokes (1977, p. 13) puts the St. George Basin, which includes most of the area considered here, in the Colorado Plateau Province. Probably the area should be considered transitional between the two provinces.

The topographically lower, southern portions of the area are underlain by gently northward-dipping Mesozoic rocks capped over wide areas by Quaternary and Tertiary volcanics. The northern part of the area is dominated by the laccolith of the Pine Valley Mountains. Lateral spreading by the laccolith intruded the Tertiary Claron Formation, and later erosion has removed whatever sediments may have overlain the Claron (Cook, 1960, map).

The hydrology of such a geologically complex area must also be complex. The river valleys and adjacent low areas, comprising about 20 percent of the total area, are underlain by unconsolidated deposits of variable thickness that are saturated enough to supply 80 percent of the water withdrawn by wells. The other 20 percent of water withdrawn by wells comes from aquifers in consolidated rocks, principally the Navajo Sandstone (Cordova and others, 1972, p. 8).

OCCURRENCES of HOT and WARM WATER

As might be expected in an area where the mean annual air temperature is as high as 16°C, water obtained from many wells and springs is also slightly warm to warm, as is shown in the attached tables (Tables 23-A and B). Most of the slightly warm to warm springs rise along faults and thus owe some or all of their heat to the normal geothermal gradient at moderate depths.

Two spring areas, Veyo Warm Spring at 32°C and LaVerkin Hot Springs at 38°- 42°C, are worthy of the discussion given them by Mundorff (1970, p. 44 and 46).

"Veyo Hot Spring, (C-40-16)6cb-S1, is about 18 miles north-northwest of St. George in Washington County. This spring is no longer accessible to direct observation; a swimming pool has been constructed over the spring. In July 1967, the owner reported that the spring discharge was 120 gpm and the water temperature was 90°F (32°C). He also reported that when he started to develop the spring, it discharged horizonatally from sand and gravel. The spring issues along the base of a nearly vertical canyon incised in basalts of Quaternary age and in sedimentary rocks of Cretaceous age that underlie the basalt. The vicinity of the spring is nearly surrounded by basalt flows of Quaternary age...

"The source of the spring discharge may be meteoric water that infiltrates the intensely fractured and thus permeable basalt. The water may be heated by the residual heat of the basalt as it descends to the contact of the basalt with underlying rocks of Cretaceous age. The source of the water also could be meteoric water that infiltrates the Cretaceous rocks beyond the area of basalt flow. The water may be heated as it moves from the Cretaceous rocks through the Quaternary basalt from which it ultimately discharges.

"In 1966 and 1967, two samples of water were obtained that are believed to represent actual spring discharge; the dissolved-solids content was only about 400 ppm, and the water was calcium magnesium bicarbonate in type.

"LaVerkin (Dixie) Hot Springs, (C-42-12)25-S, are about 18 miles east-northeast of St. George in Washington County. These springs issue from the bed and banks of the Virgin River near the mouth of a canyon. The springs issue from the limestone of Paleozoic age along the Hurricane fault... Basalt flows of Quaternary age are exposed over an area of several square miles west, southwest and southeast of the springs... Gregory (1950, p. 197) reports that LaVerkin Hot Springs 'are related genetically to the nearby Hurricane fault and possibly also to the concealed igneous masses that gave rise to the lavas on the adjoining cliffs. These springs issue from cavities in the Kaibab limestone in the canyon wall and in the stream bed of the Virgin River at places where strong joints and faults of small throw provide outlet for deep-seated water. The water from the several springs ranges in temperature from 108° to 132°F (42° to 55.5°C) and flows at the rate of about 1,000 gallons per minute.' The water probably is meteoric in origin.

"On August 1, 1963, the Virgin River was dry immediately upstream from the springs; U.S. Geological Survey personnel measured the water discharge of the Virgin River immediately downstream from the short reach in which the springs issue at 10.2 cfs or about 4,600 gpm. Survey personnel reported discharges of 10.0 cfs in September 1956. Miligan and others (1966, Table 1) reported a discharge of 11.6 cfs on August 21, 1964. The discharge of the springs apparently is much greater than that reported by Gregory (1950).

"Measured temperatures during the period 1960-66 ranged from 100° to 108°F (38°- 42°C). Gregory (1950) reported a temperature range of 108°- 132° (42°- 55.5°C). Thus the minimum temperature reported by Gregory is the maximum temperature observed during 1960-66. The source of the temperature range reported by Gregory is not known, but that range is the same as that reported by Stearns and others (1937, p. 183). The observations that resulted in a reported temperature of 132°F (55.5°C) may have been made as early as the 1880's. Either the original temperature observations were inaccurate or the springs have cooled significantly during the past 80 years. If the interest in the springs were assumed to be restricted to the potential for generation of electric power, however, the difference between 100° and 132°F (38°- 55.5°C) is of no significance. The large discharge (10 cfs or more), the high dissolved-solids content (9,000-10,000 ppm), and the very low silica content (about 10-30 ppm) indicate a poor potential for geothermal development despite the presence of basalt flows within a few miles of the springs. The source of the heat that warms the water probably is an abnormally high geothermal gradient that resulted from volcanic activity during Quaternary time.

"The major significance of the springs is their adverse effect on the quality of water in the Virgin River, especially during periods of low flow in the stream. The spring discharge has a high dissolved-solids content, is of the sodium chloride type, and has a fairly high boron concentration (about 5 ppm); the source of the dissolved solids is not known. In equivalents per million, calcium and magnesium combined are less than half that of sodium, and sulfate is less than half that of chloride. At the gaging station on the Virgin River at Virgin, which is about five miles upstream from LaVerkin Hot Springs, the average discharge during a 57-year period of record is about 200 cfs; during many years, daily mean discharges of less than 100 cfs are common. Data on the chemical quality of the Virgin River at Virgin indicate that the annual weighted-average dissolved-solids content is in the 400-600 ppm range. If LaVerkin Hot Springs contribute about 10 cfs of water having a dissolved-solids content of about 10,000 ppm to the Virgin River when the stream has a discharge of 100 cfs and a dissolved-solids content of 500 ppm, the dissolved-solids content of the stream is almost tripled. The average annual dissolved-solids discharge of LaVerkin Hot Springs is about the same as that for the entire Virgin River basin upstream from the springs (a drainge area of about 950 square miles)."

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Areas That Have Warm and Slightly Warm Water

Fifteen areas, all in western or central Utah, yield warm and slightly warm water to wells or springs. One well, more than 5200 feet deep, in Cache Valley, yields 15 gpm of hot water at 49°C. But it is not likely that such a small yield from such a great depth represents an economic resource or an unusual heat source so Cache Valley has been put into this lower category, for the highest temperature recorded for any other well is 28°C, and that from a well 1473 feet deep. Descriptions of these 15 areas follow.

Beaver Valley

Beaver Valley lies wholly within the eastern part of Beaver County. Surface water, principally from the Beaver River, supplies most of the agricultural water in the valley, so that only about 4000 to 5000 acre-feet of water is pumped from wells (Sandberg, 1966, p. 22).

Two wells, both in or near Greenville, (C-29-8)25cac2 and (C-29-8)36aab, report water of 20° and 23.5°C respectively (Table 24). The chemical analysis for (C-29-8)25cac2 shows 69 mg/l silica, but only 254 mg/l dissolved solids.

Five other wells have reported water temperatures of 15.5° to 18°C.

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Blue Creek Valley

Blue Creek Valley is in eastern Box Elder County and it heads at the north border of Utah; it drains southward toward Bear River Bay of Great Salt Lake. The drainage area of the valley includes about 250 square miles and is sparsely populated. Most of the land is used for livestock grazing and the growing of small grains and alfalfa. "The only community center in the area is Howell, which had a population of about 200 in 1970. A chemical and rocket-motor plant of the Thiokol Chemical Corp. is located in the southern part of the area" (Bolke and Price, 1972, p. 3).

Three springs and two wells yield warm water of 20°- 28°C (Table 25-A). Both wells and two of the springs yield fresh water of less than 1000 mg/l; but the warmest (28°) spring, Blue Springs, yields about 10 cfs of water containing about 1900 mg/l. "Blue springs is the largest source of irrigation water in the Valley" (Bolke and Price, 1972, p. 16) but apparently no direct use is made of its warmth.

Fifteen additional wells and springs yield fresh to moderately saline water (405 to 4860 mg/l dissolved solids)(Table 25-B).

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Cache Valley

INTRODUCTION

The Utah portion of Cache Valley occupies about 365 square miles of the total 1175 square miles of Cache County in northeastern Utah. Nearly all of the total population of 48,500 (1975 estimate) of Cache County live in the valley. "Agriculture, the principal industry, is devoted mostly to livestock, poultry, dairy products, alfalfa, small grains, corn, sugar beets, potatoes, fruits, and garden vegetables" (Bjorklund and McGreevy, 1971, p. 7). Logan, the principal city, is also the site of Utah State University.

SUMMARY of OCCURRENCES, USES and POTENTIAL

In the Utah portion of Cache Valley, temperatures of 20° to 28° are reported from 24 wells, 48 to 1473 feet deep, that have been drilled in three areas: 1) northwest of Logan, 2) west of Benson and Riverside, and 3) south of Amalga (Table 26-A). One oil and gas test well is reported to have water of 49°C from a depth of 5208 feet, a rather low temperature for such a depth. In addition, temperatures of 16° to 19°C are reported from about 50 wells in the same general areas as 1 and 2 mentioned above, and also between Lewiston and Cornish (Table 26-B).

Two wells, (A-12-1)28baa3 and 28baa5, about 24-25°C, apparently supply water for a swimming pool, for their owner is listed as Logana Plunge. That appears to be the only use made of the warmth of waters in the valley.

Presumably the heat for the warm water comes form the major N-S faults in the valley, but the low temperatures suggest that these sources have but little potential. Probably some of the water could be used in heat pumps, or for water supply in greenhouses, as well as for swimming pools.

GEOLOGIC and HYDROLOGIC ENVIRONMENT

Cache Valley is a north-trending complex graben, the easternmost valley in its part of the Basin and Range physiographic province. The valley floor is underlain by alluvial deposits from the mountains to the east and west, and by lacustrine deposits laid down in Pleistocene Lake Bonneville. Underlying the Quaternary surficial deposits are Tertiary sedimentary rocks and, at depths of about 5000 feet, are pre-Cenozoic rocks of probable Precambrian, Paleozoic, and Mesozoic age.

"Uplifted blocks [of Precambrian and Paleozoic rocks] surrounding the valley form mountain ranges. Maximum vertical displacement probably exceeds 10,000 feet in parts of the valley. The Bear River Range [to the east] contains large folds that predate the block faulting. Thrust faults that also predate the block faulting lie east and south of the area, and possibly underlie the area at great depth. Faults with minor displacement are common in the mountain ranges and probably exist in the blocks underlying the valley" (Bjorklund and McGreevey, 1971, p. 12).

"Deposits related to Lake Bonneville and earlier lakes play an important role in the occurrence of ground water in Cache Valley. The major aquifers are composed of sand and gravel in fans and deltas; interbedded layers of lake-bottom clays and silts confine the aquifers and cause widespread artesian conditions" (Bjorklund and McGreevy, 1971, p. 14).

"Most wells in the area derive water from units of Quaternary age; a few wells tap the Salt Lake Formation of Tertiary age... Most of the Salt Lake

Formation is fine grained and well indurated and yields little water; however, some sandstone, conglomerate, and fanglomerate are water bearing." The few wells and springs that tap the formation are mostly in or near outcrops along the margins of the valley (Bjorklund and McGreevy, 1971, p. 15).

Cache Valley is well watered. The water budget of Bjorklund and McGreevy (1971, p. 54) for 1960-68 indicates that each year 1,700,000 acre-feet moves into the valley and 1,700,000 moves out. Ground water in the amount of 280,000 acre-feet per year is discharged by wells, springs, seeps, and drains, and by evapotranspiration. The ground-water discharge that is not consumed in the valley leaves the valley as surface water.

OCCURRENCE of HOT and WARM WATER

The only hot water in the Utah portion of Cache Valley was reported from an oil and gas test well (B-13-1)10acb, "which was drilled to a depth of 5,208 feet and yielded water with a temperature of 49°C (120°F)" (Bjorklund and McGreevy, 1971, p. 43). Warm water between 20° and 28°C or slightly warm water between 16° and 19°C is reached by wells, generally at depths of 150 to 200 feet, in four areas: 1) northwest of Logan, 2) west of Benson and Riverside, 3) south of Amalga, and 4) between Lewiston and Cornish. The warm water of the areas near Logan and Benson may be related to the major faults in the valley but, if so, it is disseminated horizontally from the faults, for in those three areas no warm springs rise along the faults. The only warm spring, (B-14-1)33acaS, 31°C, rises along the Dayton fault zone about one mile southwest of Trenton.

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Peterson, Wm., 1946, Ground water supply in Cache Valley, Utah, available for domestic use and irrigation: Utah State Agr. Coll. Ext. Service N.S. 133, 101 p.

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Canyon Lands

INTRODUCTION

The Canyon Lands Section of the Colorado Plateau includes all of southeastern Utah south of the Uinta Basin. The section encompasses about 25,000 square miles including all of Grand and San Juan Counties, more than half of Emery, Wayne, Garfield, and Kane Counties, as well as parts of Carbon and Sevier Counties.

SUMMARY of OCCURRENCES of WARM WATER

Examination of the 137 plots of warm waters on the map of Canyon Lands shows that 100 plots are in the 15.5° to 19.5°C range and only 37 are in the 20° to 31°C range. It also shows that most plots are in bunches: near Moab, near Loa, in the Henry Mountains, and in the Navajo Indian Reservation principally south of the San Juan River. The moderate temperatures are probably due to the fact that most temperatures were measured during the summer when near-surface water is warmed by the sun; the bunching is due to the fact that the areas named above are the principal areas where spring and well temperatures have been measured: by the U.S. Geological Survey near Moab and in the Indian Reservation and by me in the Henry Mountains and in the Indian Reservation. The absence of water warmer than 31°C is probably due to the fact that in the whole of the Canyon Lands so far investigated there are no discernable sources of anomalous subsurface heat.

Probably there is only limited use for the heat reported in waters in the Canyon Lands. The springs and shallow wells that yield water whose temperature fluctuates with the seasons are certainly not dependable sources of heat. The few reported wells that are deep enough to yield water of reasonably uniform temperature are in the Indian Reservation and near the Henry Mountains. Although it is not likely that these waters will be used in heat pumps, the temperatures of 15.5°C to 24°C from moderate depths of 500 to 800 feet suggest that similar temperatures might be reached at moderate depths elsewhere in the Canyon Lands.

GEOLOGIC ENVIRONMENT

As befits its name, the Canyon Lands Section of the Colorado Plateau is characterized by deep canyons cut into generally flat-lying sedimentary rocks of Mesozoic age. But these generally flat-lying Mesozoic rocks have been upwarped in Utah by the San Rafael Swell, the Monument Upwarp, and the Circle Cliffs Upwarp so that now the Mesozoic rocks that were in the centers of the upwarps have been removed and Paleozoic rocks are exposed. Furthermore, in some places, the originally flat-lying rocks have been domed up by the now well-exposed laccolithic intrusions of the LaSal (24 M.Y.B.P.), Henry (44 M.Y.), and Abajo Mountains (28 M.Y.) (radiometric ages from Hintze, 1973, p. 81), as well as by the unexposed intrusion that presumably underlies Navajo Mountain. Probably partly as a result of the igneous activity but mostly as a result of epeirogenic uplift, the whole area has been raised as much as 3 miles since Cretaceous time, so that now the Canyon Lands Section is a highland with plateau surfaces at about 5,000 feet and with several peaks above 11,000 feet (Hunt, 1974, p. 425).

The generally high altitude of the Canyon Lands Section has promoted the extensive erosion that has resulted in deep dissection by the Colorado River and its many tributaries. Most of the debris removed from the uplands has been carried away by those streams, but surrounding the LaSal, Henry, and Abajo Mountains are vast pedimented areas that are covered by gravels close to the mountains and by finer alluvial and colluvial deposits away from the mountains. Except for the generally narrow flood plains that fill many valleys, these pedimented areas are the only ones that have unconsolidated surficial materials that can be cultivated.

No water so far reported in the Canyon Lands Section is warmer than 31°C and there is nothing in the geologic environment to suggest that there is any appreciably warmer water that has not been reported. The principal igneous activities occurred about 25 or more million years before present (M.Y.B.P.), and, although there must be residual heat at depth, no surface manifestation of hot or warm water around the intrusions has been reported.

OCCURRENCES of WARM WATER

The attached tables (Tables 27-A and B) list 143 reported occurrences of warm or slightly warm water in the Canyon Lands:

39 springs	20°- 31°C
8 wells	20°- 28°C
58 springs	15.5°- 19.5°C
42 wells	15.5°- 19.5°C

Of the 29 springs with reported temperatures of 20°- 31° I measured 20; of the 58 springs with reported temperatures of 15.5°- 19.5°, I measured 41. Most of my reported temperatures were measured during the months of July and August, some of them tens or hundreds of feet below the actual places of issuance. Where water seeps from rocks, temperatures normally are measured where there is concentrated flow, commonly at the points where samples are measured for conductance and/or are collected for analyses. This water is warmed by the sun. In addition, springs that rise from thin near-surface aquifers may yield warm water right at the points of issuance, for the aquifers and their contained water are also warmed by the sun. Even the water that comes from high-yield springs such as the one that yields 7300 gpm near Loa may show fluctuations of temperatue; it has been measured 11° to 16.5°C.

To test the idea that many of the reported water temperatures are the result of warming of the water by the sun before or after it issues from the ground, I rechecked on December 8, 1977, ten springs and seeps that I had measured in the summers of 1975, 76, or 77. The comparative temperatures for these springs show that all are cold-water springs.

Spring name	Date	Temp °C	Conductance mmho	Flow*
Cow Wash - fed by return flow from irrigation	8-3-76	21	680	100M
	12-8-77			Dry
Little Meadow	7-11-75	16	595	2E
	12-8-77	13	540	2E
Poison	8-1-75	15.5	1000	Drip
	12-8-77	8	980	Drip
Poison Trib	8-1-75	19	1500	1-2E
	12-8-77	3	2300	1-2E

Spring name	Date	Temp °C	Conductance mmho	Flow*
Drinking Cup	8-9-76	23	625	3E
	12-8-77			Frozen
Maidenwater	7-25-76	19	580	
	12-8-77	8	590	1-2E
South Hog	7-6-77	19	625	5E
	12-8-77	11.5	670	15-20E
Middle Hog	7-6-77	31	620	seep
	12-8-77	Couldn't recover seepage area-too much flow in channel		
Saleratus	8-19-75	20	2100	1E
	12-8-77	6.5	1700	1E
Mill Race	8-17-75	25	4000	5E
	12-8-77			Dry

*Flow in gallons per minute; E = estimated, M = measured

On the basis of these remeasurements of temperature and of personal knowledge of more than half of the springs, I feel that all the temperatures of the warm spring waters recorded in the table are the result of warming by the sun of thin alluvial, colluvial, pediment, and even some sandstone aquifers, or are the result of the temperature being measured at a point other than the point of actual issue of the water from the rock. In summary, then, it is not likely that any of these spring temperatures are indicators of perennially warm subsurface water.

The Garkane Power well that yields 3110 gpm of 24°C water from the Navajo Sandstone at a depth of 761 feet would seem to be getting heat because the Navajo Sandstone probably plunges several thousand feet between its recharge area west of the Waterpocket Fold and the well site on the Caineville Anticline, yet two other wells that get water from the Navajo on the Caineville Anticline from depths of 1250 and 1350 feet produce water that is only 18°C. There is no ready answer for the difference in temperatures.

The well that produces the warmest water, 28°C, the Roadside Geyser, is probably driven by CO_2 gas, but the source of the heat is unknown.

A group of four flowing wells in the Navajo Sandstone north of Hovenweep National Monument produce water of 16.5° to 18° from depths of about 300 feet. The wells penetrate a small dome on the eastern edge of the Blanding Basin (Goode, 1958, fig. 8).

Three springs and eight wells a few miles north and west of Loa yield water of 15.5° to 17°C from Tertiary volcanic rocks. The water is of excellent quality, generally about 150 mg/l or less of dissolved solids, and yields are abundant: two wells flow 1150 and 1750 gpm and the largest warm-water spring yields 7300 gpm. But even such large yields are no guarantee of constant temperatures for temperatures of 15°, 16°, and 16.5° have been measured at an even higher volume spring, Pine Creek Spring, which flows 7900 gpm.

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Sumsion, C. T., 1971, Geology and water resources of the Spanish Valley area, Grand and San Juan Counties, Utah: Utah Dept. Nat. Resources Tech. Pub. No. 32, 40 p.

Cedar City and Parowan Valleys

Cedar City and Parowan Valleys are in the eastern part of Iron County at the foot of the Hurricane Cliffs. Both valleys are largely agricultural and depend largely on ground water for their irrigation supplies. Cedar City is the largest community and is also the home of Southern Utah State University.

In Cedar City Valley, two wells yield warm water: (C-37-12)11aaa (21°C) and (C-23-13)36abb (20°C). Seven other wells yield slightly warm water at 15.5° - 19.5°C (Table 28).

In Parowan Valley, one well, (C-32-8)12bac, yields water of 20°C, and 13 wells yield water of 15.5° - 18.5°C (Table 29).

REFERENCES

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Thomas, H. E., and G. H. Taylor, 1946, Geology and ground-water resources of Cedar City and Parowan Valleys, Iron County, Utah: U.S. Geol. Survey Water-Supply Paper 993, 210 p.

Cedar Valley

Cedar Valley is in a small structural intermontane basin in the northwest corner of Utah County, southeast of the Oquirrh Mountains. The valley portion occupies about 140 square miles of the 300-square-mile basin. The basin is topographically closed except in the northern portion where there is drainage to Utah Valley to the east (Feltis, 1967, p. 6).

One well produced fresh warm water of 27°C, and four others produce fresh or slightly saline water of 15.5° to 18°C (Table 30).

REFERENCE

Feltis, R. D., 1967, Ground-water conditions in Cedar Valley, Utah County, Utah: Utah State Engineer Tech. Pub. No. 16, 31 p.

Northern Juab Valley

Northern Juab Valley lies wholly within the eastern part of Juab County in Central Utah. Northern Juab Valley occupies about 120 square miles of Juab Valley north of Levan. The valley is a structural trough bounded on the east by the Wasatch fault at the base of Mt. Nebo, the southernmost mountain of the Wasatch Range, and at the base of the San Pitch Mountains south of Mt. Nebo. The west side of the valley is bounded by an inferred fault at the base of the West Hills and Long Ridge. The valley fill, consisting of detritus from the mountains and lake deposits of Pleistocene Lake Bonneville, is probably more than 2000 feet thick (Cook and Berg, 1961, p. 82).

One spring in Juab Valley about 2 miles southwest of Mona yields 1.3 gpm of fresh water at 20°C (Table 31). One well near the western margin of the valley about 4 miles southwest of Nephi yields fresh water at 15.5°C. All other springs and wells yield cooler water.

REFERENCES

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Cook, K. L., and J. W. Berg, Jr., 1961, Regional gravity survey along the central and southern Wasatch Front, Utah: U.S. Geol. Survey Prof. Paper 316E, p. 75-89.

Park Valley

The Park Valley area is in northwestern Box Elder County, in the northernmost part of the Great Salt Lake Desert. The drainage basin occupies about 1050 square miles and is the home of about 250 people, principally in the communities of Park Valley and Rosette (Hood, 1971, p. 3).

Five springs yield small quantities of fresh water in the 21° to 23°C range from the south flank of the Raft River Range, and two others, Warm Spring No. 1, 26.5°C and Warm Spring No. 2, 20°, yield 340 and 385 gpm of fresh water from the east flank of the Grouse Creek Mountains (Table 32). Five other springs yield slightly warm water, 16° to 19.5°, from the same general areas.

No temperatures have been reported from the few wells in the valley. Potential for any development of warm water appears small.

REFERENCE

Hood, J. W., 1971, Hydrologic reconnaissance of the Park Valley area, Box Elder County, Utah: Utah Dept. Nat. Resources Tech. Pub. No. 30, 46 p.

Promontory Mountains Area

The Promontory Mountains area of Box Elder County occupies the peninsula between Bear River Bay and the north arm of Great Salt Lake. The land includes about 357 square miles and is used principally for grazing and some dryland agriculture. Few people live in the area, but Thiokol Chemical Corp. withdraws water from wells for use in the plant in Blue Springs Valley to the northeast.

Four springs on the east side of the Promontory range yield saline or slightly saline warm water in the 20°- 25°C range (Table 33). They probably are controlled by faults.

Ten saline springs yield slightly warm water (15.5°- 19.5°C) along the east side of the Promontory Range in T.7 N. Nine of these springs are near or on a concealed fault (Hood, 1972, plate 1). Two other saline springs yield water of 16.5° and 17.0°C in T.7 N. on the west side of the range.

One well at Promontory yields fresh water of 21.5° or 22.5°C from a depth of 423 feet.

The springs along the mountains probably are fed by water that moves through fractures in the carbonate rocks, is heated by the geothermal gradient, and returns to the surface through the faults.

REFERENCE

Hood, J. W., 1972, Hydrologic reconnaissance of the Promontory Mountains area, Box Elder County, Utah: Utah Dept. Nat. Resources Tech. Pub. No. 38, 35 p.

Rush Valley

Rush Valley is a large (about 400 square miles) complex structural valley in eastern Tooele County that apparently has very little warm water.

The warmest water comes from Morgans Warm Spring (24°- 26.5°C) and from Russels Warm Spring (21.5°C), both of which issue from alluvium near an inselberge of Paleozoic rock in the northern part of the valley (Table 34). As Mundorff (1970, p. 36) reports, "a fault buried beneath the valley fill in the vicinity of the springs probably is the channel through which the water moves upward into the fill." Morgan Warm Spring yields as much as 1000 gpm of water containing 594 mg/l dissolved solids and Russels Warm Spring yields about 450 gpm of water with about 440 mg/l dissolved solids. Another spring, in the valley of Faust Creek, yields about 600 gpm of fresh water at 20°C. And a well about 2 miles southwest of the latter spring yields 4100 gpm of fresh water at 16°C from a depth of 534 feet.

REFERENCES

Hood, J. W., Don Price, and K. M. Waddell, 1969, Hydrologic reconnaissance of Rush Valle, Tooele County, Utah: Utah Dept. Nat. Resources Tech. Pub. No. 23, 58 p.

Mundorff, J. C., Major thermal springs of Utah: Utah Geol. and Mineralog. Survey Water-Resources Bull. 13, 60 p.

Skull Valley

INTRODUCTION

Skull Valley is in the eastern portion of Tooele County, southwest of Great Salt Lake and west of Tooele Valley. The valley includes about 400 square miles of the total 880 square miles that is in the Skull Valley drainage basin. The Dugway Proving Grounds, a U.S. Army facility, is in the southwest corner of the valley. Except for those stationed at the Proving Grounds, few people live in the valley. Those who do live there are engaged in agriculture, principally raising livestock.

SUMMARY of OCCURRENCES, USE, and POTENTIAL

Warm and slightly warm water, mostly moderately saline, rises as springs along a fault on the northwest flank of the Stansbury Range or along a presumed fault on the north end of the range. The salinity of much of the warm water is too high for use for agriculture but the water probably is useful for wildlife. The temperature at the surface, generally less than 24°C, is too low to provide heat but it probably indicates that higher temperatures would be encountered by drilling.

GEOLOGIC and HYDROLOGIC ENVIRONMENT

Skull Valley is a complex graben that is boomerang-shaped, with the north arm trending about N 20° E and with the south arm trending about N 35-40 W. The graben is flanked on each side by at least two sub-parallel faults that not only separate the valley from the low Cedar Mountains on the west and from the high Stansbury Mountains on the east but also, to some degree, shatter the rocks of the mountains.

The rocks of the bounding mountains include a Paleozoic sedimentary sequence of quartzite, limestone, sandstone, and shale and a few exposures of Tertiary volcanics. Probably the Paleozoic rocks also underlie the valley at depths of 1200 or more feet in the southern part of the valley and to 6000 or 7000 feet in the northern portion (Hood and Waddell, 1968, p. 17). The valley fill consists of thick Tertiary sedimentary and volcanic rocks overlain by thin Quaternary alluvial deposits from the mountains and lacustrine deposits laid down in Pleistocene Lake Bonneville. The Quaternary alluvium provides the principal aquifers of the valley.

Above the valley and covering the bedrock at the base of the flanking mountains are extensive stony alluvial and colluvial deposits that act as a recharge area for the alluvial aquifers in the valley. Faults along the northwestern and northern flanks of the Stansbury Mountains provide conduits for warm saline springs that presumably derive their recharge from the bedrock of the mountains and, to some degree, from the stony alluvium-colluvium.

OCCURRENCES of WARM WATER

About 11 springs or spring areas yield water of temperatures from 20° to 24°C (Table 35-A). All but two of these rise from a fault along the northwest flank of the Stansbury Range or along a presumed fault at the north end of the Stansburys. Most of the water along the northwest flank is moderately saline (about 3500 to 6000 mg/l dissolved solids), but one spring, (C-3-8)21ddbS yields about 10 gpm of 24° water that contains only 137 mg/l dissolved solids. The three warm springs that rise along the north end of the range are probably very saline (more than 10,000 mg/l) but there are only partial chemical analyses to verify this.

About ten slightly warm springs (15.5° to $19.5^{\circ}C$) also rise along the fault on the northwest flank of the Stansburys and these too are moderately or slightly saline (Table 35-B).

Two wells, both near Delle, have water temperatures of 24° and $26.5^{\circ}C$. The water of both is saline but there is no obvious source for the warmth of the water.

In contrast to the moderate temperatures measured at the surface in Skull Valley, Parry and Cleary (1978, p. 26) have computed for 28 wells and springs Na-K-Ca temperatures that range from $12^{\circ}C$ to $179^{\circ}C$, with the highest 20 temperatures averaging $150^{\circ}C$. From their mixing models they concluded, however, that probable "cold water fractions of 90%...prevent accurate estimate of the temperature of any hot water component present."

REFERENCE

Hood, J. W., and K. M. Waddell, 1968, Hydrologic reconnaissance of Skull Valley, Tooele County, Utah: Utah Dept. Nat. Resources Tech. Pub. No. 18, 54 p.

Snake Valley

Snake Valley is a long (about 135 miles) north-trending well-watered intermontane valley that straddles the Nevada-Utah border. It includes parts of the western portions of Tooele, Juab, Millard, Beaver, and Iron Counties. The unconsolidated valley-fill deposits underlie about 1.2 million acres and form the principal ground-water reservoir, which has an estimated 12 million acre-feet of recoverable water in the upper most 100 feet of saturated alluvium (Hood and Rush, 1965, p. 1).

Many springs rise from the valley floor and three areas, Warm Springs, Twin Springs, and Knoll Springs, produce water of 19.5° to $27^{\circ}C$ (Table 36). Two wells on the west side of the valley produce water of 22°. Although the generalized map of Hood and Rush does not show faults directly related to these areas of warm water it is likely that the warming comes from the geothermal gradient along faults.

REFERENCES

Hood, J. W., and F. E. Rush, 1965, Water-resources appraisal of the Snake Valley area, Utah and Nevada: Utah State Engineer Tech. Pub. No. 14, 40 p.

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Tooele Valley

INTRODUCTION

"Tooele Valley is at the eastern edge of Tooele County in northwestern Utah...and is about 30 miles southwest of Salt Lake City. The valley proper includes approximately 250 square miles bounded by Great Salt Lake" on the north, the Oquirrh Mountains on the east, South Mountain to the south, and the Stansbury Mountains and Stansbury Island on the west (Gates, 1965, p. 10). Tooele Valley is the site of the Tooele Army Depot which occupies about 37 square miles in the southern part of the valley. Most of the rest of the valley is devoted to agriculture. Probably about 25,000 people were living in the valley in 1975.

SUMMARY of OCCURRENCES and POTENTIAL for USE

One well, 687 feet deep, produces slightly saline water, 2780 ppm dissolved solids, at 30°C, near Mills Junction. Grantsville Warm Springs produces highly saline water, about 25,000 ppm dissolved solids, at 24° to 32°C. Four other wells produce water of 20° to 23°C (Table 37-A).

With only two occurrences of significantly warm water it is not likely that there is a source of high heat at moderate depths, yet a concentration of wells with water of nearly 20° between Grantsville and Erda suggests that in that area there may be heat that is spread laterally through the principal aquifer.

This slightly warm water of good quality could be used in heat pumps.

GEOLOGIC and HYDROLOGIC ENVIRONMENT

The mountains that border Tooele Valley on the east, south, and west "are formed by Paleozoic rocks ranging in age from Lower Cambrian to Pennsylvanian (and Permian) but with the Ordovician and Silurian periods unrepresented. There is no sedimentary record of the interval between Pennsylvanian (Permian) and Tertiary times, and the Tertiary, Quaternary, and Recent sediments are of continental origin. These continental deposits play the dominant role in the groundwater hydrology of the basin,...and give rise to the conditions which yield water by artesian flow in the lower part of the valley" (Thomas, 1945, p. 97).

The topographic axis through the center of Tooele Valley is nearly south to north with a slight turn to the northeast near Great Salt Lake, but the structural axis of the Tooele Valley graben is about N35E through Grantsville. (Cook and others, 1966, fig. 2). "As a result of step faulting of great magnitude, the central part of the (three-step) graben (near the south shore of Great Salt Lake) forms a deep trench whose bottom lies many thousands of feet below the shallower flanks of the graben, so that the total thickness of the Cenozoic rocks is at least 8000 feet" (Cook and others, 1966, p. 65). To emphasize the minimum of 8000 feet, Cook and others (1966, fig. 3) show a cross section in which the deepest part of the graben, about 3 miles wide, is about 12,000 feet below the surface. Possibly the deep inner fault on the southeast side of the central graben is the Box Elder Canyon Fault of Thomas, which is projected from the mouth of Box Elder Canyon in the southwest corner of the valley about N40E (Thomas, 1946, p. 150 and Plate 1). The Box Elder Canyon Fault of Thomas may be an extension of the Sixmile Creek fault which Gates (1965, fig. 5) has plotted from the same deep well information that Cook and others used to confirm their geophysical evidence for the boundary of the deep inner graben. At any rate the center part of the graben is very deep and the overall pattern of faulting is very complex.

Superposed on these deep faults are thick Tertiary deposits and thin Quaternary alluvium and lake deposits. Some of the deep faults have had movement since the Quaternary deposits were laid down, for springs rise along them - Fishing Creek fault, Warm Springs fault, and Mill Pond fault - or there is a discernable scarp - Occidental(?) fault.

The intertonguing of coarse alluvial and fine lacustrine deposits has produced artesian (confined) conditions in most of the valley, and there are flowing wells in the lower parts of the valley, below about 4400 feet. "A zone of coarse sediments 60 to 125 feet thick, encountered at depths of 90 to 210 feet in the western and 180 to 300 feet in the eastern part of the Grantsville district and at depths of 170 to 230 feet in the western and 100 to 160 feet in the eastern part of the Erda district, constitutes the principal aquifer in the valley. Several flowing wells yield water from strata above this principal aquifer and some wells reach deeper aquifers. In all cases the deeper wells have a greater head than the shallow wells and some differential head has been observed in wells reaching different parts of the principal aquifer" (Thomas, 1946, p. 98).

OCCURRENCE of WARM WATER

Water in the warm range (20° to 34.5°C) has been reported from six wells (out of 142) and one spring, Grantsville Warm Spring, in Tooele Valley (Table 37-A), and water in the slightly warm range (15.5° to 19.5°C) has been reported from 44 wells (Table 37-B); and the median temperature from all 142 wells whose temperatures have been recorded is 14.5°C, appreciably above the mean annual air temperature of 11°C at Tooele (Gates, 1965, p. 12).

The warmest water of 30°C comes from a well 687 feet deep in sec. 9, T.2 S., R.3 W. Four other wells produce warm water from moderate depths: two east of Grantsville, 21° and 23° from depths of 380 and 320 respectively, one northwest of Grantsville, 20° from 210 feet, and one near Tooele, 21.5° from 710 feet. An oil test well, (C-2-5)13bca, 3540 feet deep, produces 23° water.

The water of Grantsville Warm Springs is highly saline with 25,800 ppm dissolved solids. Its temperature "ranges from about 75° to about 90°F (24°-32°C). Volcanic rocks of Tertiary age crop out about five miles southwest of the springs but probably are not directly related to the source of heat for the water; the source of heat probably is the geothermal gradient. A buried fault in the vicinity of the springs probably is the escape route of water that infiltrates the faulted rocks of Paleozoic age at altitudes of 5,000 - 8,000 feet in the Stansbury mountains. If the water descends to depths of 3,000 - 5,000 feet below the upland surface before moving upward along a fault, the observed temperatures would result" (Mundorff, 1970, p. 34).

Slightly warm water (15.5° - 19.5°C) is common in wells between Grantsville and Erda, and nearly all the other wells in that area record temperatures of 14°- 15°C. Although only two wells in this area report temperatures of 21° and 23°, the virtual absence of water below 14° and the abundance of slightly warm water suggest that there may be a source of moderate heat that is warming the water of the principal aquifer.

REFERENCES

Cook, K. L., and others, 1966, Some Cenozoic structural basins in the Great Salt Lake area, Utah, indicated by regional studies in The Great Salt Lake: Utah Geol. Soc. Guidebook No. 20, p. 57-75.

Gates, J. S., 1962, Geohydrologic evidence of a buried fault in the Erda area, Tooele Valley, Utah: U.S. Geological Survey Research 1962, Prof. Paper 450D, p. D78-D80.

__________, 1963, Selected hydrologic data, Tooele Valley, Tooele County, Utah: U.S. Geol. Survey Basic-Data Report No. 7, 23 p.

__________, 1965, Reevaluation of the ground-water resources of Tooele Valley, Utah: Utah State Engineer Tech. Pub. No. 12, 65 p.

Thomas, H. E., 1946, Ground water in Tooele Valley, Tooele County, Utah: Utah State Engineer Tech. Pub. No. 4, 241 p.

Tule Valley

INTRODUCTION

Tule Valley and its tributary drainage area include about 940 square miles in western Juab and Millard Counties, Utah. The valley has no permanent inhabitants and "the land is used mainly for seasonal livestock grazing... About 530,000 acres...or 88 percent of the land is Federally owned. About 68,000 acres...or 11 percent is owned by the State of Utah. About 1,1000 acres ...or less than 1 percent is privately owned" (Stephens, 1977, p. 2).

GEOLOGIC and HYDROLOGIC ENVIRONMENT

"The Tule Valley drainage basin is a topographically closed basin bounded in part by drainage divides in the House and Fish Springs Ranges on the east and the Confusion Range on the west... The northern boundary is a broad, low divide connecting the Fish Springs and Middle Ranges, Granite Mountain, and the Confusion Range. The southern boundary is likewise a broad, low divide that connects the House and Confusion Ranges" (Stephens, 1977, p. 2).

Tule Valley is a structural basin that is the result of block faulting on the east and eastward tilting and faulting on the west. A rather sinuous fault or fault zone separates the valley from the House Range on the east and a major fault separates the southern part of the valley from the Confusion Range on the west. A branch of this fault trends northward through the middle of the broad northern portion of the valley and is the conduit by which major springs rise.

The valley floor is underlain by alluvium from the adjacent mountains and by lacustrine deposits laid down in Pleistocene Lake Bonneville. These deposits are probably only a few hundred feet thick but are saturated essentially to the surface of the land in the central portion of the valley. Stephens has estimated that the annual recharge from precipitation is about 7,600 acre-feet (1977, p. 10), but he has also estimated that annual discharge by evapotranspiration is 40,000 acre-feet. He believes that the difference between discharge and recharge from precipitation is made up by interbasin underflow, principally from Wah Wah Valley to the south but perhaps also from other sources (1977, p.21). He also feels that some water may move northward out of the valley through the subsurface in Sand Pass (1977, p. 16).

OCCURRENCE of WARM WATER

All springs that discharge on the valley floor - Coyote Spring, Tule Spring, and others - have water temperatures of 19.5° to 28°C (Table 38), or about 8.5 - 17°C higher than the mean annual air temperature of 11°C on the valley floor (Stephens, 1977, p. 22). These springs undoubtedly gain their heat from the geothermal gradient. Probably recharge from the Confusion Range goes several thousand feet below the surface and then rises along the fault in the middle of the valley.

In addition, a well, (C-17-15)25cbb, and a nearby spring also yield warm water a mile or so east of the fault mentioned above. This warm water probably rises along an as yet unidentified fault.

There are few discharge measurements for the warm springs but the abundant evapotranspiration suggests that wells in the vicinity of the springs could pump large quantities of warm water, probably containing less than 1500 mg/l dissolved solds.

REFERENCE

Stephens, J. C., 1977, Hydrologic reconnaissance of the Tule Valley drainage basin, Juab and Millard Counties, Utah: Utah Dept. Nat. Resources Tech. Pub. No. 56, 26 p.

Wah Wah Valley

INTRODUCTION

Wah Wah Valley and its tributary drainage area encompass "about 600 square miles in Millard and Beaver Counties in southwestern Utah... Except for a small tract of irrigated land at Wah Wah Ranch, the land in the drainage basin is used mainly for livestock grazing. More than 87 percent -- about 332,000 acres... -- of the land is in Federal ownership, about 11 percent -- 43,000 acres...-- is owned by the State of Utah, and the remainder -- about 9,000 acres...-- is privately owned" (Stephens, 1974, p. 2).

GEOLOGIC and HYDROLOGIC ENVIRONMENT

"The Wah Wah Valley drainage basin is a closed basin bounded by drainage divides in the Wah Wah Mountains on the west and southwest, the Confusion and House Ranges on the north, and the San Francisco Mountains on the east. The northeastern boundary of the basin is a broad, low ridge, which connects the northern end of the San Francisco Mountains with the southern end of the House Range. The ridge rises about 25 feet (7.6m) above the floor of the Wah Wah Valley hardpan and divides the surface drainage of Wah Wah Valley from that of the Sevier Lake basin" (Stephens, 1974, p.5).

"Wah Wah Valley is part of an eastward-tilted fault block that is bounded on the west by a fault along the western side of the Wah Wah Mountains and on the east by a series of faults along the western side of the San Francisco Mountains... In addition to the major structural features, minor folding and extensive faulting, fracturing, and brecciation have accompanied the emplacement of igneous intrusives, especially in the San Francisco Mountains" (Stephens, 1974, p.7).

The alluvial fill in the Wah Wah Valley is estimated to be more than 2000 feet thick, but the water table is more than 200 feet below the surface. Although there is no surface discharge from the valley, subsurface discharge, perhaps toward Tule Valley to the north, is apparently able to remove the estimated annual recharge of 7,000 acre-feet (Stephens, 1974, p. 12,18,19).

The principal source of water in the valley is Wah Wah Springs which discharges about 500 gpm of cool and slightly warm water from many openings. The source of this water is Paleozoic rocks in the Wah Wah Mountains.

OCCURRENCES of WARM and SLIGHTLY WARM WATER

Warm water, at 24.5°C, has been reported from only one source, a test well, (C-28-14)11abb, which was deepened to 1472 feet after the original drilling failed to reach water at 660 feet (Table 39). A temperature log run on this well after deepening showed a nearly straight-line increase in temperature from about 22.3°C at 700 feet to about 28.8°C at 1480 feet, for a geothermal gradient of about .75°C/100 feet (Stephens, 1974, p. 17). This gradient is perhaps lower than the general geothermal gradient of 40° - 50°C/Km in the Basin and Range Province as reported by Chapman (oral commun. 1978).

Slightly warm water of 16.5°C to 19.5°C is reported for Wah Wah Springs, a group of springs that has produced extensive calcareous tufa deposits about 3 miles west of Wah Wah Ranch. The water discharges through the tufa from the limestone of the underlying Orr Formation. Recharge is undoubtedly from the crest of the Wah Wah Mountains and, according to Stephens (1974, p. 22), the water is directed to the discharge area by a northeast-plunging flexure in the limestone.

REFERENCE

Stephens, J. C., 1974, Hydrologic reconnaissance of the Wah Wah Valley drainage basin, Millard and Beaver Counties, Utah: Utah Dept. Nat. Resources Tech. Pub. No. 47, 45 p.

Areas That Have Slightly Warm Water

Six areas of Utah have springs and wells that yield water that is no hotter than slightly warm, 15.5° to 19.5°C. Such water can be used in heat pumps for space heating, so brief descriptions of these areas follow.

Grand Staircase

The Grand Staircase includes all the area from the Pink Cliffs south to the Arizona border. The western boundary is the Hurricane Fault and the eastern boundary is the Coxcomb, the northern extension of the East Kaibab Monocline. The area encompasses most of western Kane County, a part of eastern Washington County, and a small part of Garfield County.

The rocks of the Grand Staircase consist of a great thickness of Mesozoic marine and non-marine shales, sandstones, limestones, and conglomerates exposed as treads and risers of a "staircase" that dips 2° to 3° to the north-northeast. Capping the Mesozoic sequence is the Eocene Wasatch Formation whose pink cliffs form the northern boundary of the area. The treads of the staircase are formed of the more resistant sandstones or limestones and the risers are commonly shales or soft sandstone or siltstone. The treads are generally rather porous so that they absorb an appreciable portion of the moderate rainfall of 12 to 25 inches. This water tends to move downward until it reaches a less permeable bed where it begins to move downdip toward the north. Presumably the down-dip storage areas are now essentially saturated so that some part of the recharge is rejected and returns to the surface as springs that rise above many slightly permeable horizons, such as clay or siltstone. The springs supply water for the mainstems and tributaries of the Virgin River and Kanab Creek that flow southward toward the Colorado.

The water that issues from the springs normally penetrates only to shallow depths so the only warming of the water is from the heat of the sun (Table 40). Although several spring temperatures are recorded as higher than 20°C, all were measured as discharge from pipes, in a pond, or in a shallow seep. None represents heating by deep circulation.

REFERENCES

Goode, H. D., 1964, Reconnaissance of water resources of a part of western Kane County, Utah: Utah Geol. and Mineralog. Survey Water-Resources Bull. 5, 62 p.

Goode, H. D., 1966, Second reconnaissance of water resources in western Kane County, Utah: Utah Geol. and Mineralog. Survey Water Resources Bull. 8, 44 p.

Hansel Valley

Hansel Valley is in northeastern Box Elder County and its drainage area of about 240 square miles drains southward into the north arm of Great Salt Lake. The valley is used for grazing and dryland cultivation of small grains, principally by farmers who commute from nearby towns (Hood, 1971, p. 2).

Two wells, 125 and 286 feet deep, produce saline water with 1630 and 7060 mg/l dissolves solids, at temperatures of 16° and 18°C respectively (Table 41).

One spring at Monument Point produces about 45 gpm of brine, about 52,000 mg/l dissolves solids, at 17.5°C from the Oquirrh Formation.

REFERENCE

Hood, J. W., 1971, Hydrologic reconnaissance of Hansel Valley and northern Rozel Flat, Box Elder County, Utah: Utah Dept. Nat. Resources Tech. Pub. No. 33, 35 p.

Pilot Valley

The Utah portion of Pilot Valley (which extends across the border into Nevada) is an area of about 420 square miles in southwestern Box Elder County and northwestern Tooele County. Pilot Valley is bordered on the west by the Pilot Range and on the east and south by the Silver Island Range. About 85,000 acres of the valley bottom is covered with salt deposits, and less than 300 acres of the valley is cultivated. "The present population of the valley consists of a single family" (Stephens and Hood, 1973, p. 3 and 7).

Four springs and one well yield slightly warm water (15.5° and 16.0°C) in the NE ¼ sec. 36, T.4 N., R.19 W. (Table 42). One of the springs, Donner spring, yields about 200 gpm of water that contains about 370 mg/l dissolved solids, and the well also yields fresh water. The other three springs yield slightly saline water.

In 1976 the U.S. Geological Survey put in 14 four-foot test wells along three east-west lines across the floor of Pilot Valley. These wells were spaced 1 to 2 miles apart and water temperatures were measured on September 30 and October 1, 1976. The lowest temperature measured was 18°C at 4.57 ft (or more) below land surface (in a 4-ft well), and the highest temperature, 21.5°C, was measured in two wells at 0.69 and 1.34 ft (or more) below land surface. Obviously all temperatures were the result of warming by the sun during the previous summer.

REFERENCES

Lines, G. C., 1978, Selected ground-water data, Bonneville Salt Flats and Pilot Valley, western Utah: U.S. Geol. Survey Basic-Data Release No. 30, 14 p.

Stephens, J. C., and J. W. Hood, 1973, Hydrologic reconnaissance of Pilot Valley, Utah and Nevada: Utah Dept. Nat. Resources Tech. Pub. No. 41, 33 p.

Pine Valley

Pine Valley is a topographically closed basin principally in western Millard and Beaver Counties. One well in the northern part of the valley, (C-15-16)18bdd, yields water of 204 mg/l dissolved solids at a temperature of 16°C from a depth of about 340 feet (Stephens, 1976)(Table 43). All other wells and springs yield appreciably cooler water.

REFERENCE

Stephens, J. C., 1976, Hydrologic reconnaissance of the Pine Valley drainage basin, Millard, Beaver, and Iron Counties, Utah: Utah Dept. Nat. Resources Tech. Pub. No. 51, 31 p.

The Sink Valley Area

The Sink Valley area lies west of Great Salt Lake in Tooele and Box Elder Counties. The area occupies about 330 square miles and includes not only Sink Valley but also a portion of the west shore of Great Salt Lake that is separated from Sink Valley by the Lakeside Mountains. "Most of the land in the Sink Valley area is owned by the Federal Government and is used partly as a military reservation (Hill Air Force Range) and partly as a winter range for sheep. The only residents are the families of several railroad workers at Lakeside and a small detachment of civilian and U.S. Air Force personnel (generally less than 100 men) at the Hill Range test facility about 12 miles southwest of Lakeside" (Price and Bolke, 1970, p. 3-4).

Five wells scattered on the valley floor encountered water of 16°- 17°C at depths from about 125 to 400 feet (Table 44). This water was slightly to moderately saline, about 1750 to 4500 mg/l dissolved solids. One of these wells, (B-4-10)25bac, had been drilled to 739 feet and sampled during drilling. It reached very saline water below 400 feet and near-brine (29,900 mg/l dissolved solids) at 600 feet.

REFERENCE

Price, Don, and E. L. Bolke, 1970, Hydrologic reconnaissance of the Sink Valley area, Tooele and Box Elder Counties, Utah: Utah Dept. Nat. Resources Tech. Pub. No. 26, 28 p.

Yuba Dam-Leamington Canyon

Including Southern Juab, Scipio, Round, and Mill Valleys.

No warm water has been reported from wells or springs between Yuba Dam and Leamington Canyon. However, three prominent springs in Mills Valley yield slightly warm water of 17°C (Table 45). Blue Springs and Molten Springs yield waters of good quality that contain 334 mg/l and 410 mg/l dissolved solids respectively. Chase Springs yields about 3 cfs of 16°C water that contains 1190 mg/l dissolved solids.

REFERENCE

Bjorklund, L. J., and G. B. Robinson, Jr., 1968, Ground-water resources of the Sevier River basin betweenYuba Dam and Leamington Canyon, Utah: U.S. Geol. Survey Water-Supply Paper 1848, 79 p.

Other Occurrences of Hot and Warm Water

Castilla Hot Springs

Castilla Hot Springs, (D-9-4)18baaS, in Spanish Fork Canyon two miles below Diamond Fork, yields moderately saline water of 6360 ppm dissolved solids at a temperature of 40°C. The springs rise near a fault that cuts sandstone of Paleozoic age. Because the spring area is flanked by mountains that rise about 5000 feet above the 4900-foot altitude of the spring, Mundorff (1970, p. 49) believes that water descending "from altitudes of 7,000 to 10,000 feet could be heated (by the geothermal gradient) to the observed temperatures at the altitude of the springs."

A concrete shelter has been built over the orifices of the springs, but its appearance in 1977 suggested that the waters were seldom used.

Como Warm Springs

Como Warm Springs is the only source of warm water in Morgan Valley. According to Mundorff (1970, p. 9, 11):

"Como Warm Spring, (A-4-3)31cab-S1, rise along a concealed fault that crosses Weber River valley about one mile east of Morgan, Morgan County... The fault cuts limestones of Middle Paleozoic age, and the springs issue from near the base of carbonate rocks of Mississippian age. The source of the water is not known, but the relatively low temperature of the water (25°C), the low dissolved-solids content (about 600 ppm), and the point of discharge suggest that the water is of meteoric origin and is brought to the surface along a conduit formed by the fault.

"The water is calcium sulfate bicarbonate in type; spectrographic analysis for 17 minor elements indicates no high concentrations of any of these elements.

"Part of the water is temporarily used in a swimming pool near the springs, but all the water ultimately enters the Weber River in the vicinity of the springs. Discharges ranging from about 2 to 20 cfs (900 to 9,000 gpm) have been measured or estimated at different times.

"The source of the heat probably is the normal geothermal gradient. Circulation of water to a depth of 1,500-2,000 feet could result in temperatures that are 20°F (10°C) higher than temperatures of shallow ground water in the area. These warm springs, like most other thermal springs in Utah, have no potential for geothermal development for power generation."

Diamond Fork Warm Springs

Mundorff (1970, p. 49) reports:

"Diamond Fork Warm Springs, (D-8-5)14d-S, are about 17 miles east of Spanish Fork in Utah County. These springs issue from conglomerates of Mesozoic age along Diamond Fork... Temperature of the water was 68°F (20°C) and dissolved-solids content was about 837 ppm on October 20, 1967. The water is of the calcium sodium sulfate type; the odor of hydrogen sulfide is noticeable. The relatively low temperature and dissolved-solids content of these springs suggest that meteoric water enters the surface in the mountains at altitudes 2,000-3,000 feet higher than that of the springs, descends through fractures or voids to about the altitude of the springs, and issues from fissures in the conglomerate along Diamond Fork. The normal geothermal gradient causes the temperature of the spring discharge to be 10°-15°F (5°- 8°C) warmer than that of shallow ground water in the vicinity.

"Reported discharge of the springs has ranged from about 350 to 700 gpm. On October 20, 1967, the discharge of the largest spring was about 450 gpm."

Patio Spring

Patio Spring, (A-7-1)22caaS, is described as rising from Quaternary lake beds 12 miles northeast of Ogden (Waring, 1965, p. 42). Actually the spring is in Ogden Valley about 10 miles northeast of Ogden, and it probably rises from alluvium above exposures of lake beds. The spring "discharges about 220 acre-feet of water per year. Some of the water is used for the swimming pool in the Patio Springs Lodge and the rest is diverted for irrigation" (Doyuran, 1972, p. 71).

Keller Corp. Well #2

The Keller well, (B-5-13)31acd, yields moderately saline water of 4050 mg/l dissolved solids at a temperature of 22°C. The well taps water that is fresher than the surrounding brine of the Great Salt Lake Desert. Probably the freshness is due to recharge that comes from the nearby Newfoundland Mountains.

REFERENCES

Cordova, R. M., 1969, Selected hydrologic data, southern Utah and Goshen Valleys, Utah: U.S. Geol. Survey Basic-Data Release No. 16, 35 p.

Doyuran, Vedat, 1972, Geology and ground-water resources of Ogden Valley, Utah: Univ. of Utah PhD Dissertation, 134 p.

Mundorff, J. C., 1970, Major thermal springs of Utah: Utah Geol. and Mineralog. Survey Water-Resources Bull. 13, 60 p.

Saxon, F. C., 1972, Water-resouce evaluation of Morgan Valley, Morgan County, Utah: Unpub. M.S. Thesis, Univ. Of Utah, 116 p.

Stephens, J. C., 1973, Hydrologic reconnaissance of the northern Great Salt Lake Desert and summary hydrologic reconnaissance of northwestern Utah: Utah Dept. Natural Resources Tech. Pub. No. 42, 48 p.

Waring, G. A. (Revised by R. R. Blankenship and Ray Bentall), 1965, Thermal springs of the United States and other countries of the world: U.S. Geol. Survey Prof. Paper 492, 383 p.

RECORDS OF THERMAL SPRINGS AND WELLS

The tables of records of thermal springs and wells are presented here in the same order as the discussions of the areas in the text: tables of areas that have hot, warm, and slightly warm water are presented first, followed by those that have warm and slightly warm water and then by those that have only slightly warm water. For most areas the records of wells and springs that have hot and warm water (above 20°C) are combined in a table whose number is followed by the letter A, and the records of slightly warm water (15.5° to 19.5°C) are in tables whose numbers are followed by the letter B.

Explanation for Tables in This Report

COORDINATES

The system of numbering springs and wells in this report is based on the cadastral land-survey system of the United States. By this system, Utah is divided into four quadrants by the Salt Lake base line and meridian and these quadrants are designated by the upper case 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 - (10 acres); 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 in the 10-acre tract; the letter S preceding the serial number denotes a spring. Thus (B-13-3)23acbS, indicates the first spring in the northwest quarter of the southwest quarter of the northeast quarter of section 23, T13W, R3N, Salt Lake base and meridian. In the Uinta Basin a Uinta baseline and meridian is used (see fig. 1) and these coordinates are preceded by U in this report.

SOURCE

G - gas well	M - mine
O - oil well	S - spring
O/W - oil and water well	W - water well

GEOLOGIC FORMATION

110 PTOD	Quaternary pediment, terrace, or outwash deposit
111 ALVM	Holocene alluvium
111 CLVM	Holocene colluvium
111 LCST	Holocene Lacustrine deposits
112 PLCM	Pleistocene series
112 PVNT	Pleistocene Pavant Flow
120 TRTR	Tertiary system
121 SLIK	Pliocene Salt Lake Formation
200 MNCS	Mesozoic Mancos Shale

200 SGCF	Mesozoic Straight Cliffs Sandstone
210 DKOT	Cretaceous Dakota Sandstone
211 EMRY	Cretaceous Emery Sandstone Member of Mancos Shale
211 FRRN	Cretaceous Ferron Sandstone Member of Mancos Shale
211 KPRS	Cretaceous Kaiparowits Formation
217 BRCN	Lower Cretaceous Burro Canyon Formation
220 GLCN	Jurassic-Triassic Glen Canyon Formation or Group
220 NVJO	Jurassic-Triassic Navajo Sandstone
221 BLFF	Upper Jurassic Bluff Sandstone of San Rafael Group
221 CRML	Upper Jurassic Carmel Formation of San Rafael Group
221 ENRD	Upper Jurassic Entrada Sandstone of San Rafael Group
221 SMVL	Upper Jurassic Summerville Formation of San Rafael Group
230 MNKP	Triassic Moenkopi Formation
231 CHNL	Upper Triassic Chinle Formation
231 KYNT	Upper Triassic Kayenta Formation of Glen Canyon Group
231 MONV	Upper Triassic Moenave Formation of Glen Canyon Group
231 SRMP	Upper Triassic Shinarump Member of Chinle Formation
231 WNGT	Upper Triassic Wingate Sandstone of Glen Canyon Group
300 PLZC	Paleozoic Erathem
310 CDRM	Permian Cedar Mesa Sandstone Member of Cutler Formation
310 HLGT	Permian Halgaito Tongue of Cutler Formation
310 KIBB	Permian Kaibab Limestone
310 OGRK	Permian Organ Rock Tongue of Cutler Formation
310 OQRR	Perm.-Penna-Miss. Oquirrh Group
310 PRKC	Permian Park City Formation
310 WEBR	Perm-Penna. Weber Quartzite or Sandstone
324 HRMS	Middle Pennsylvanian Hermosa Formation
370 CMBR	Cambrian System
400 ABRG	Precambrian Albion Range Group
400 PCMB	Precambrian Eratherm

YIELD

d - Reported by driller
E - estimated
R - reported
M - measured

REFERENCE

Entries under reference give names of authors and abbreviations such as HG for the author of this report, IWM for I.W. Marine, WSP-277 for Water-Supply Paper 277, WRB-8 for Water-Resources Bulletin 8, BD-1 for Basic-Data Report No.1, TP-3 for Technical Publication No.3, and UP&L for Utah Power and Light Co. These references can be found in the lists of references that follow each discussion in the text.

ANALYSIS

Where the Na value is given and no K value appears then the Na value represents the sum of Na plus K.

TABLE 1-A. Lower Bear River Area. Springs and Wells with Water Temperatures of 20° to 105° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(B-09-03) 27cba$_1$	Chesapeake Duck Club	W	111 ALVM	74.0	502	40d	8-21-53	BD-23			56	62	1,000	110	1,620	0	14	1,100			3,350	5,300		Plugged; produced gas
27cba$_2$	Chesapeake Duck Club	W	111 ALVM	42.0	500	50E	8-06-71	BD-23														5,500		Sampled from pool; produces gas
(B-10-03) 4ddd	S. Jepperson	W	111 ALVM	25.5	510		9-25-70	BD-23	80		94	45	3,900	160	452	0	170	6,200	1.2	.1	10,800	17,100	7.7	B 0.60
(B-10-03) 30bbd S	Stinking Hot Spring	S	300 PLZC	48.0 47.5		45E	4-05-58 10-27-51	BD-23	54	.02	920	360	11,000	670	528	0	59	21,000	0		34,600	53,900 48,900	6.4	B 4.6 Other analyses available
(B-10-03) 33dac	L. Anderson	W		28.0	300	20	3-07-36	BD-23																Well probably destroyed. Produced gas.
(B-10-04) 23dad S		S	300 PLZC	24.5		15E	9-13-71	BD-23														46,800		
23dda		S	300 PLZC	26.0		2E	9-13-71	BD-23														17,400		
24ccc	Little Mtn. Hot Spring	S	Fault	42.0		450E	12-28-71 5-11-71	BD-23	28	.80	630	230	13,000	450	400	0	500	22,000	1.5	1.6	37,000	51,000	7.0	B 4.5
(B-11-02) 29dad S	Crystal Hot Spring	S	Fault	53.5 55.5		1600E	12-08-70 10-27-51	BD-23	32		830	230	15,000	790	479		480	26,000	0		43,500	61,800 58,600		Other analyses available
(B-11-04) 34dbd S		S	310 OQRR	21.0			8-31-71	BD-23														5,500		
34dca S		S	310 OQRR	22.0		10E	8-31-71	BD-23														7,400		
(B-12-03) 15cdc	Louis King	W	300 PLZC	20.0	277	800E	7-20-71	BD-23														1,600		
(B-13-02) 27dbd S	Cutler Warm Spring	S	300 PLZC	23.0		10E	2-02-68	BD-23	17		84	43	620	22	320	0	65	1,000	1.0	2.1	2,120	3,670	7.6	B 0.22
(B-13-03) 11dac	Town of Plymouth	W	120 TRTR	29.0	600	52R	9-09-70	BD-23																Date of yield. Abandoned
(B-13-03) 23abc S	River Pools	S		46.0		5000R	9-08-71	BD-23														9,640		
23acb S$_1$	Indian Pool	S		43.0		450R	9-08-71	BD-23														15,000		
(B-13-03) 23acb S$_2$	Morning Glory Pool	S		51.0		200R	9-08-71	BD-23	29	.22	220	70	2,900	120	360	0	98	4,800	.4	4.9	8,420	15,000	7.2	B 1.10
23bad S	Udy Hot Springs	S		43.0 43.0		900R	9-08-71 11-01-66	BD-23	26	.05	210	55	2,700	120	366		90	4,500	1.5	2.6	7,850	13,100 13,600	7.9	B 0.69
(B-10-02) 16bcc		W		105.0	11,005	5-7F	June 1974	UP&L													85,000			Water level dropped to 40 ft. below LSD by Aug. 74. P & A
(B-08-02) 21aab	Willard Bay Gun Club	W		20.0	567	12	9-13-65	BD-23	53	.01	200	72	340	65	681	1	.5	730	.2	.5	1,980	3,120	7.2	

TABLE 1-B. Lower Bear River Area. Springs and Wells with Water Temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER															
(B-09-02) 11cda	D. L. Bunderson	W	111 ALVM	16.5	626	10E	9-17-70	BD-23														900		Amber water.
15daa	Harold Reeder	W	111 ALVM	16.5	465	10	7-30-70 5-17-71	BD-23	19	.28	2	1.2	150	1.8	351	22	5.5	16	.7	.1	395	620 593	8.7	Amber water; lowest hardness in area: 10 mg/l.
26aab$_2$	I. O. Jensen	W	111 ALVM	15.5	330	350d	8-28-70	BD-23														400		
26adb	P. R. Parker	W	111 ALVM	15.5	400	1000d	8-04-70	BD-23														420		
26add	Norman Nelson	W	111 ALVM	15.5	353	250d	9-04-70	BD-23														400		
35bad	Earl Francis	W	111 ALVM	16.5	363	23	5-26-70	BD-23														420		
35cdb S	Porter Spring	S	111 ALVM	16.0		900E	5-03-72	BD-23														660		
(B-10-03) 32aaa	B. E. Stallings	W	111 ALVM	18.0			8-06-71	BD-23														1,400		
(B-10-04) 11bab S		S	300 PLZC	18.5		2E	9-18-70	BD-23														10,300		
(B-10-05) 11daa S		S	310 OQRR	18.0		180E	4-21-71	BD-23														8,930		
(B-11-02) 5dcb	Jess Earl	W	111 ALVM	16.0	25	25R	8-30-71	BD-23														790		
29dac S	Crystal Cold Springs	S	111 ALVM	16.5 17.0		1600E	12-08-70 9-11-64	BD-23		1.1	76	46	420	31	253	0	57	660			1,920	2,900	7.5	B.2
(B-11-03) 1cbc	Calvin Kay	W		15.5	12	20	8-12-71	BD-23																
(B-11-03) 5bbb$_2$	John Laws	W	111 ALVM	15.5	238	10d	6-18-71	BD-23														600		
(B-11-03) 6acb	B. Y. Westmoreland	W	300 PLZC	16.0	198	10d	9-03-36	BD-23																Date of report of yield.
6dbd	B. Y. Westmoreland	W	300 PLZC	15.5	92		6-19-71	BD-23														1,100		
(B-11-03) 6dcc	Salt Creek Springs	S	310 OQRR	19.5		10,000M	6-25-71	BD-23	20	.07	52	21	660	29	350		67	960	.2	5.8	1,990	3,700	8.1	
(B-11-03) 20daa	Keith Barfuss	W	111 ALVM	16.0	410	1	9-15-70	BD-23														5,400		
(B-11-04) 4ddd	Town of Bothwell	W	111 ALVM	15.5	166	30d	12-10-53	BD-23	42		130	57	170		255	0	280	370	.2	6.0	1,310	2,200E	7.6	
23bcc	D. Woodward	W	111 ALVM	16.5	393	2	9-17-70	BD-23														1,300		
34bdb S		S	310 OQRR	18.0		10E	8-31-71	BD-23														4,100		
34cdd S		S	310 OQRR	18.5		2E	8-31-71	BD-23														14,700		
34dcc S		S	310 OQRR	18.5		200E	5-14-71	BD-23	37	.01	130	74	1,700	67	329	0	250	2,800	.5	8.4	5,[illegible]0	8,840	7.8	
(B-12-02) 7dbb S		S		15.5			8-27-71	BD-23														1,400		
(B-12-02) 12cbc	D. D. Erickson	W	111 ALVM	16.5	65	20d	8-15-71	BD-23																Date of yield.
(B-12-04) 22aac	Ralph Udy	W	300 PLZC	16.5	680	1450d	3-31-71 7-20-71	BD-23	23	.05	78	35	110	3.6	209	0	52	240	.1	8.0	653	1,100 1,120	8.0	B.06
27add	K. H. Fridal	W	111 ALVM	15.5	500	1350d	8-09-71	BD-23														1,400		
33dbb	R. Anderson	W	300 PLZC	16.5	460	4d	8-31-53	BD-23																Date of yield.
36dca	R. Holdaway	W	300 PLZC	18.0	118	10d	9-15-70	BD-23														1,700		
(B-13-02) 33add	Don Stubbs	W	300 PLZC	18.0	85	4d	7-21-70	BD-23														1,000		
(B-13-03) 35dda	L D S Belmont Ward	W	111 ALVM	15.5 13.5	237 130 S	470d	8-25-64 2- -63	BD-23	47	.18	66	35	440 700	28 65	485 1,240	2	220	470 510	.9	2.2	1,560	2,390R 3,020	7.8 8.0	B.44 S=Sample depth.

TABLE 1-B. Lower Bear River Area. Springs and Wells with Water Temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(B-14-03) 4dac	Glen Ward	W	111 ALVM	15.5	50	100d	3-12-39	BD-23																Date of yield.

TABLE 2. Bonneville Salt Flats. Wells and one spring with water temperatures of 20° to 88° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(B-01-18) 29ccc	Bonneville Ltd. #24	W	111 ALVM	28	167	25EF	3-29-72	TP-42	41	.03	91	71	2,200	130	180	0	240	3,400	1.4	0	6,260	11,000	7.7	B.96, Mn.01
(C-01-19) 2adb	Bonneville Ltd. #13	W	111 ALVM	24.5	225	24.5M	3-29-72	TP-42	42	.01	79	63	2,000	120	212	0	190	3,100	1.8	0	5,700	10,200	7.5	Mn.02
10bac	Bonneville Ltd. #5	W	111 ALVM	31	216	24	9-08-67	TP-42			100	80	2,100	100			300	3,700						Li 1.2
	Kaiser FW 5			24	216	500F	2-27-48	BD-30																
23cbc	Bonneville Ltd. DBW 13	W	120 TRTR	24.5	1,496	24.5	9-13-67	TP-42			1,650	1,540	50,800	2,210			6,840	80,300						Li 8.8
34bdc	Bonneville Ltd. DBW 7	W	120 TRTR	25	1,045	1,270	1951	BD-30																Turk: p. 50, DBW7; p. 55, DBW8
(C-02-19) 14ada	Bonneville Ltd. DBW 1	W	120 TRTR	43	1,200		1-30-48	Turk																
24cba	Bonneville Ltd. DBW 3	W	120 TRTR	88	2,068			Turk																Temp depth 1536
(C-04-19) 6dcd S	Blue Lake Spr 1.	S	FAULT	29			9-14-67	Turk			200	50	1,400	100			300	3,700						Li 1.4
31acc	BLM (Kaiser well FW 20)	W	111 ALVM	24	295	150F	12-16-47	BD-30																Water level at land surface 3-29-72.
(C-01-19) 3ddc	Kaiser well FW7A	W	111 ALVM	24	171	1,000F	5-16-49	BD-30																
35bed	Kaiser DBW 9	W	120 TRTR	30	1,418	1,200	1-14-51	BD-30																
(C-02-17) 4aac	BLM (Kaiser K65)	W	111 ALVM	21	19	4.1	9-28-76	BD-30			1,200	980	70,000	1,900	37		3,600	110,000			196,000			Br 8.4, B1.5 Li 16.
(C-02-19) 3bcd	Kaiser DBW 8	W	120 TRTR	28	1,070		11-12-76	BD-30			1,600	1,500	47,000	2,100	135		5,600	77,000			136,000			Br 33., B 13., Li 21., Li 17.6 Turk: p. 50, DBW8 p. 56, DBW 7 Analysis shifted from sec. 34 to sec. 3.
		W		28			9-13-67	TP-42			1,700	1,540	45,400	1,980			6,590	76,800						

TABLE 4-A. Southern Curlew Valley. Springs and wells with water temperatures of 20° to 43° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(B-13-12) 30caa S	L. G. Carter	S		25		5E	6-17-66	TP-45	10		39	11	44	.6	156	0	19	65	.2	1.4	274	482	8.0	B.01
(B-14-03) 4bbb	C. Taylor	W	112 PLCN	22	350		5-24-56	TP-45	61		146	35	123		186	0	34	426		3.6	921	1,680	7.2	
4ccc	Gary Hanna	W	112 PLCN	20.5	360	2,000M	1970-72	TP-45																This well apparently shown as 9bbb in TP-25
(B-14-10) 33bcc S	Coyote Spr.	S		43		20R		TP-45																
				43.5			5-28-68	TP-45	29		87	19	1,070	56	352	0	70	1,620	2.7	4.8	3,240	5,590	7.6	B.8
(B-15-09) 28cbb	J. E. Lee	W			400	2,340	8-08-67	TP-45	77		369	92	452	32	144	0	35	1,500	.5	12	2,640	4,700	7.3	
				24			8-12-70	TP-45										1,550				4,730		
29dbc	C. Taylor	W	112 PLCN	20	480	1,585	1970-72	TP-45																
31abc	Ethel Taylor	W		21.5	407	2,300	9-69	TP-45																
				16			9-30-69	TP-45	63		70	17	31		181	0	20	99		1.6	432	626	7.8	

TABLE 4-B. Southern Curlew Valley. Springs and wells with water temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(B-11-11) 6dbb S	Black Butte	S		19		18R	9-23-60	TP-30	14		520	124	6,670	276	206	0	224	11,600		15	20,300	30,400	7.2	
(B-12-09) 30cda	Test hole 3	W	112 PLCN	14			7-07-72	TP-45			200	120	660	1.8	223	0	170	1,500			2,760	5,190	7.4	
				15.5	162		9-25-72	TP-45			120	66	740	46	173	0	100	1,500			2,660	4,890	7.5	
(B-12-11) 5abb	A. Fehlman	W		17	230	250	4-29-72	TP-45			150	76	460	30	206	0	160	960			1,940	3,540	7.3	
(B-12-11) 5bba	A. Fehlman	W	111 ALVM	15.5	300	1,610	7-12-67	TP-45	40		72	39	112	14	222	0	51	255	.4	2.6	756	1,210	7.6	B.09 Reported drilled to 700
				15			3-14-72	TP-45			130	58	150	18	231	0	54	450			974	1,870	7.5	plugged back to about 300.
8cda	Jerry Morgan	W	111 ALVM		195		4-03-53	TP-45			51	23	69	32	171	0	58	151			468	760		Warm salty water at 510 ft.
							7-11-72	TP-45			68	19	42	4.7	205	0	31	110			375	713	7.6	plugged back.
(B-13-08) 10dcc	E. Deakin	W	111 ALVM	15.5	408		9-25-72	TP-45			210	70	260	15	167	0	50	890			1,580	3,000	7.8	
(B-13-09) 35bbd	Don Rigby	W	112 PLCN	19.5	428	550	12-11-70	TP-45	37	.09	180	140	3,300	180	164	0	460	5,800	.5	.4	10,000	15,600	7.7	B1.07
(B-13-10) 11dcd	Test hole 1	W	112 PLCN	15.5	128		6-16-72	TP-45			72	31	590	.0	255	0	93	970			1,880	3,540	7.5	
34ddc	Test hole 2	W	112 PLCN	19.5	95		6-28-72	TP-45	47	.02	76	48	980	66	193	0	120	1,600	.6	.9	3,040	5,420	7.7	
(B-13-11) 10cdc	Test hole 4	W	111 ALVM	17	283		9-25-72	TP-45			56	28	74	11	222	0	31	150			459	901	7.5	
(B-14-07) 7aaa	Bert Eliason	W	111 ALVM	15.5	100		2- -69	TP-45																
(B-14-08) 5dcc	Chas Taylor	W	300 PLZC	17.5	400	2,050	10- -65	TP-45																
(B-14-09) 5bbb	Gary Hanna	W	111 ALVM	16.5	300	1,520	7-27-55	TP-45	64	.00	66	16	27	8	174	0	22	90	.2	4.4	436	608	7.4	B.02 Other temps 15.5-17.5.
				16.5			7-27-64	TP-45	50		63	16	35		176	0	23	94	.7		422	608	7.4	
5ccd	Chas Taylor	W	111 ALVM	16	400	2,420	7-13-67	TP-45	51		85	20	53	11	176	0	24	180	.3	3.1	587	889	7.4	B.04
7bbb	LDS Church	W		19	608	2,530		TP-45																
							10-15-58	TP-45	65		77	20	45		174	0	22	145		2.2	462		7.9	
(B-14-10) 1bbb	Chas Taylor	W	111 ALVM	18	420	1,435	5-24-56	TP-45	60		46	24	28		194	0	31	66		.9	352	558	7.6	
				15.5			8-08-67	TP-45	52		65	15	28	6.8	188	0	27	82	.4	.3	391	583	7.4	B.03
(B-15-10) 36bbb	Peter Mayo	W	112 PLCN	16.5	5.3	2,140	5-24-56	TP-45	56		59	17	18		198	0	23	51		2.2	324	502	7.4	
				10.5			5- -56	TP-45																

TABLE 5-A. East Shore Area. Springs and Wells with Water Temperatures of 20° to 60° C.

(*Numbers refer to figure 3)

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
1* (B-2-1) 2bcdd3	F. Thalman	W	111 ALVM	20.0	425	2,250	8-21-61	TP-35			194	61	451	7.8	144	0	112	1,060			2,200	3,640	7.9	B.310 Temps. of 15° - 19° reported at shallower depth
2 (B-2-1) 27ddd4	A. Thalman	W	111 ALVM	20.0	500		2-21-62	TP-35													375	661	7.7	
3 (B-3-1) 4cdb4	L. Roueche	W	111 ALVM	20.0	657	50	8-20-68	TP-35	19		27	6.8	46		192	0	1.2	23		6.4	222	368	7.8	
4 (B-3-1) 5ddal	C. D. Smith	W	111 ALVM	24.0	918	300	11-14-68	TP-35	30		25	7.3	32		161	0	3.2	18		.5	195	301	7.8	
5 (B-3-1) 9aad3	W. Hartis	W	111 ALVM	20.0	648		9-08-69	TP-35														350		
6 (B-3-1) 14abb3		W	111 ALVM	20.0	640		9-09-54	PP-518	27		17	4.6	88	2.0	240	6.3	4.3	30		.8	282	486	8.4	B.43
7 (B-3-1) 15bacl	Cen. Davis Co.	W	111 ALVM	22.0 24.0	985	25	11-14-68 9-09-69	TP-35	26		30	3.4	60		232	0	.5	20		.2	267	400 394	7.9	
8 (B-3-1) 27adal	Wheeler Mach. Co	W	111 ALVM	21.0	850	38	12-11-68	TP-35	26		20	3.9	111		301	0	2.0	40		3.2	354	570	7.8	
9 (B-3-1) 35abal	Farmington Bay Refuge	W	111 ALVM	33.0 29.0	1,220		10-10-58 11-28-60	TP-35	36 32	.48	30 26	1.0 4.4	256 250	2.1	88 79	0 0	26 22	380 370	4.4	.9 1.2	773 752	1,400 1,390	7.9 7.6	
10 (B-4-1) 6dcdl	Hill AFB No. 5	W	111 ALVM	11.0 22.0	805	1,000	1-04-56 7-22-69	TP-35 TP-35	21 18	1.1	43 41	15 17	33 36	6.7	274 269	0	1.5 1.0	21 21	.2 .2	.0 .5	278 272	470 460	7.4 7.2	12 analyses over 13 yr. period show increase in Temperature
11 (B-4-3) 19caa3	GSL Authority	W	111 ALVM	24.0 24.0 23.0 21.0	481 150	280M	7-30-69 9-05-69 8-01-69 8-02-69	TP-35	35	.34 .25	51	21	202	4.8	187 216 221	0 0 0	12	350 315 61 53	.5 .4	.6	783 758	1,360 1,260 516 509	7.6 8.0 7.7 7.6	B.16 Shallow Water from this Well is appreciably better in quality - slightly lower in temperature
12 (B-5-1) 17cbcl	Washington Terr.	W	111 ALVM	21.0	910	2,500	4-20-61	TP-35			53	14	16	2.0	202	5	25	19			259	429		B.10 Other similar analyses available
13 (B-5-1) 18abbl	WBWCD Riverdale	W	111 ALVM	21.0	730	2,500	11-15-60	TP-35			47	10	44	2.0	173	7	54	35			287	478	8.3	Other similar analyses available
14 (B-5-1) 29bdc	Hill AFB No. 2	W	111 ALVM	13.0 20.0	627	750	5-13-48 7-15-66	TP-35	14 11	.03 .03	79 75	20 21	21 15		310 296	0 0	37 38	20 17	.1 .2	4.2 2.5	348 325	587 564	7.4 7.6	18 analyses in 20 yrs. show fluctuations in temp. 13° - 20°; 2 nearby wells 900 ft. deep show consistent temps of 11° - 14° & 11° - 13°
15 (B-5-2) 5acb2	C. C. Hawkes	W	111 ALVM	22.0	914	30M	8-30-68	TP-35	24		46	2.4	139	7.6	190	0	1.5	205	.4	.5	509	939	7.7	B.24
16 (B-5-2) 7dab	E. Penman		111 ALVM	22.0	1,005	17M	8-29-68	TP-35	18		12	3.9	74	1.5	208	0	1.5	26	.3	.2	238	391	8.0	B.10
17 (B-5-3) 11dad2	H. J. Byington		111 ALVM	20.0	525	4M	5-14-69	TP-35	18		39	11	21	2.0	193	0	11	16	.2	.2	216	360	8.0	B.06
18 (B-5-3) 15aaal	R. F. Parker		111 ALVM	24.0	657	40	5-14-69	TP-35							133	0		30				397	7.5	
19 (B-5-3) 15ddal	T. W. Rhead		111 ALVM	24.0 22.0	649	26M	5-14-69	TP-35 PP-518	25		18	6.2	56	3.1	163 178	11	1.0	29 25		2.4	226	382 386	7.7 8.5	B.31
20 (B-5-3) 27c S	Hooper Hot Springs	S	111 ALVM	60.0			9-15-53	WRB-13	35		535	92	2,520	285	234		36	4,370	.7	2.0	9,310	14,900		Five other analyses available: Temp. 118-140
21 (B-5-3) 28d S	Southwest Hooper Warm Springs	S	111 ALVM	32.0			9-15-53	WRB-13	48		536	458	8,290	803	304		219	14,400	1.6		27,800	39,400		
22 (B-5-4) 21cbb2	H. Richards	W	111 ALVM	20.0	172	2	11-2-64	TP-35	7.8		146	68	990	56	132	0	.0	1,930	1.1	8.1	3,600	5,710	7.4	Adjacent well 140 ft. deep draws water of 19° C
23 (B-6-1) 23ccd S	Ogden Hot Springs	S	400 PCMB	57.0		75E	11-2-66	WRB-13	47		356	4.9	2,730	359	192		106	4,940	3.7	.4	8,650	15,000	7.7	B2.6 L.5.5 I.3 Many Minor Other analyses available: Temps 134-137
24 (B-6-1) 29cbbl	Utah Byproducts		111 ALVM	24.0	842	300	12-27-60	TP-35			96	31	476	41	150	5	8.2	897			1,760	3,150		

TABLE 5-A. East Shore Area. Springs and Wells with Water Temperatures of 20° to 60° C.

(*Numbers refer to figure 3)

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER															
25* (B-6-2) 25ccc1	G. E. Stratford		111 ALVM	22.0 20.0	690		5-13-43 11-18-59	TP-35 BD-1	 18		178 180	43 42	233 231	172 163			.0 3.7	700 700		.2 .3	1,240 1,260	2,400	 7.3	Two similar analyses show temperatures of 20°
26 (B-2-2) 27dcd2	L. Defries		111 ALVM	20.0	625		11-18-59	TP-35	19		42	10	41		193	0	9.1	48		.4	266	459	7.8	Four similar analyses show temperatures 18° - 22°
27 (B-6-2) 33ddc2	D. Prevedel		111 ALVM	20.0	682		5-07-69	TP-35	17		42	12	20		197	0	9.5	18		.0	216	377	7.7	
28 (B-6-3) 4dab1	E. J. Wayment		111 ALVM	21.0	540	6M	10-9-68	TP-35	25		4.0	3.4	197	4.8	502	0	4.2	28	2.0	.9	531	816	8.0	B.70
29 (B-6-3) 5ccc1	R.M. Jacob		111 ALVM	25.0	510	8M	5-14-69	TP-35							196	0		44				648	7.7	
30 (B-6-3) 10acb2	R. M. Jacob		111 ALVM	22.0	752	14M	5-14-69	TP-35	19		8.0	2.9	159	2.7	324	0	1.2	84	.6	.4	453	741	8.0	B.40
31 (B-6-3) 19aab1	Marguardt ACFT		111 ALVM	22.0	229	150	11-05-59	TP-35	35		96	18	340		146	0	18	645		10	1,230	2,290	7.5	Similar analysis a year later shows temp of 19°
32 (B-7-2) 10dbd1	Wells & Larkin		111 ALVM	24.0	782	943	11-20-68	TP-35	16		75	10	216		169	0	8.5	390		.3	866	1,480	7.9	
33 (B-7-2) 14dca S	Utah Hot Springs		370 CMBR	58.5			11-13-66	WRB-13	35		1,020	39	6,580	935	182		201	12,700	4.3	.8	21,600	34800	7.5	B.3.1, Li7.9 I.24 Many Minor Other analyses available: Temps 135
34 (B-7-2) 16dad1	LDS Church	W	111 ALVM	24.0	1,021		5-07-69	TP-35	61		18	1.5	90		279	0	.8	12		.2	327	460	7.8	
35 (B-7-2) 16dcd2	R. G. Penton	W	111 ALVM	25.0	1,176	42M	5-07-69	TP-35	28		21	4.4	49	6.8	193	0	4.5	10	.5	.2	221	333	7.8	B.08 A similar analysis available
36 (B-7-3) 31aac1	GSLM & C Corp. No. 14	W	111 ALVM	39.0	806	56M	9-27-68	TP-35	24		15	4.4	148	9.4	305	0	1.0	104	.7	.3	462	785	8.1	B.20
37 (B-7-3) 31aac2	GSLM & C Corp. No. 15	W	111 ALVM	38.0	920	180M	9-10-69	TP-35	67		27	5.4	323		571	0	.5	230		.2	980	1,490	8.2	Bottomed in Bedrock
38 (B-7-3) 31adc1	GSLM & C Corp. No. 11	W	111 ALVM	34.0	712	53M	9-05-68	TP-35													650			
39 (B-7-3) 31daa1	GSLM & C Corp. No. 3	W	111 ALVM	25.0	412	29M	9-05-68	TP-35													580			
40 (B-7-3) 31daa2	GSLM & C Corp. No. 4	W	111 ALVM	25.0	415	30M	9-05-68	TP-35													500			
41 (B-7-3) 31daa3	GSLM & C Corp. No. 5	W	111 ALVM	30.0	575	40M	9-05-68	TP-35													725			
42 (B-7-3) 31daa4	GSLM & C Corp. No. 12	W	111 ALVM	34.0	717	69M	9-05-68	TP-35													650			
43 (B-7-3) 31dab1	GSLM & C Corp. No. 6	W	111 ALVM	30.0	590	29M	9-05-68 12-17-69	TP-35	 44		 14	 1.9	 157	 7.6	 339	 0	 .0	 89	 .9	 .2	 491	710 772	 7.7	 B.19
44 (B-7-3) 31dab2	GSLM & C Corp. No. 7	W	111 ALVM	34.0	710	72M	9-05-68															690		
45 (B-7-3) 31dab3	GSLM & C Corp. No. 10	W	111 ALVM	34.0	705	65M	9-05-68	TP-35														680		
46 (B-7-3) 31dac1	GSLM & C Corp. No. 8	W	111 ALVM	30.0	621	28M	9-05-68	TP-35														750		
47 (B-7-3) 31dda1	GSLM & C Corp. No. 9	W	111 ALVM	30.0 29.0	597	28M	9-05-68 9-10-69	TP-35	 33		 14	 8.8	 147		 310	 0	 .8	 96		 .0	 478	925 750	 7.9	
48 (B-7-3) 32cbb1	GSLM & C Corp. No. 13	W	111 ALVM	34.0	717	90M	9-4-68	TP-35	36		8.0	5.8	145	6.5	308	0	1.2	87	.8	.3	458	713		B.06
49 (B-7-3) 33cdd	George East #1	W	111 ALVM	20.0	399	18M	12-2-60	BD-1	24	.05	10	3.9	76	8	228		1.4	23	.4	.3	259	409	7.5	Two Other Analyses Available

TABLE 5-B. East Shore Area. Springs and wells with water temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(A-02-01) 7aba 4	J. Bradshaw	W		18	450		10-15-64	TP-35	20		16	7.9	31		129	0	12	14		2.3	162	264	7.4	
7aba 4	J. Bradshaw	W		18	450		10-01-68	TP-35							126	0		17				272	7.5	
(B-01-01) 10aac	D. B. Holbrook	W		16	231	14M	12-20-65	TP-35	50		51	17	577		429	0	1.2	778		1.3	1,720	3,080	7.7	
10aac	D. B. Holbrook	W		16	231	14M	11-13-68	TP-35	48		45	20	570		433	0	6.2	760		.7	1,700	2,970	8.0	
(B-02-01) 13aab	L. Napoli	W		16	264		10-10-58	TP-35	21		9.6	2.9	80		192	0	9.5	30		.5	248	395	7.8	
13aab	L. Napoli	W		15	264		5-05-69	TP-35	19		9.6	1.9	80		193	0	8.2	28		.2	236	393	7.7	
(B-02-01) 23add 6	A. V. Eldredge	W		17	331	68M	8-20-68	TP-35														464		
23bdd	L. Hepworth	W		18	600	60M	8-29-68	TP-35							220	12		48				522	8.5	
24bad 3	C. Jeppson	W		16	386	50M	8-20-68	TP-35							186	5		32				415	8.4	
25baa 15	Phillips Pet.	W		16	570	650	12-12-58	TP-35	15		55	16	34		208	0	38	42		7.2	309	542	7.8	
26abb 2	D. C. Winegar	W		19	273	20M	8-21-68	TP-35	15		18	6.3	113		218	0	32	72		5.7	373	622	8.1	
26bab 8	W. R. Smith	W		16	584	65	4-17-62	TP-35			23	7.7	119	2.0	145	11	62	103			388	696	8.9	B=.07
26cdd 4	F. Thalman	W		18	84		5-07-63	TP-35					73		292	0	49	72				753	7.5	
26cdd 4	F. Thalman	W		17	200		5-07-63	TP-35					88		282	0	147	131				1,120	7.4	
26dcb	P. E. Burnham	W		17	400	120M	8-20-68	TP-35							222	0		121				820	7.9	
34ada 3	D. Hart	W		16	270		5-09-47	TP-35	8.9		30	10	161		264	0	55	141		10	552	958		
34ada 3	D. Hart	W		17	270		10-10-64	TP-35	17		42	27	242		213	0	88	334		5.3	859	1,510	7.8	
34add 2	D. M. Hunter	W		19	410	71M	8-20-68	TP-35	15		143	47	456		136	0	36	988		.3	1,910	3,130	7.7	
34add 2	D. M. Hunter	W		19	410	71M	9-08-69	TP-35							140	0		925				3,100	7.9	
36bbc 2	Petro Flex	W		16	501		10-10-58	TP-35	17		93	27	96		314	0	86	140		11	624	1,070	7.5	
36bbc 2	Petro Flex	W		15	501		11-10-60	TP-35	15	0	87	29	105	3.3	310	0	91	152	.1	11	645	1,100	8.0	
(B-03-01) 4bca 2	G. W. Webster	W		16	250	15M	8-20-68	TP-35														341		
4ddb 5	E. W. Bradley	W		18	485	14M	11-14-68	TP-35														332		
15acd 1	L.D.S. Church	W		16	260	3M	9-11-69	TP-35	41		36	18	68		320	0	.5	33		1.8	349	571	7.4	
24bca	F. Richards	W		16	176		10-10-58	TP-35	21		67	15	120		510	0	2.3	48		.5	509	872	7.6	
24bca	F. Richards	W		12	176		11-09-60	TP-35	20	20	30	14	123	1.3	380	8	2.1	48	.2	.3	434	711	8.3	
(B-04-01) 32abb	P. D. Robins	W		17	770	18M	11-14-68	TP-35							194	0		31				345	7.7	
(B-04-02) 6baa 2	B. Thurgood	W		16	609	30M	9-08-69	TP-35							233	0		20				428	7.8	
17cdd	D. H. Wilcox	W		16	583	10M	8-21-68	TP-35							222	0		22				385	8.2	
(B-05-01) 29bdb 3	Hill AFB	W		18	800	740	11-19-51	TP-35	13	.03	71	18	18	2.4	278	0	32	18	.1	4.7	314	521	7.7	
29bdb 3	Hill AFB	W		12	800	740	4-14-52	TP-35	12	.03	73	19	20	1.7	296	0	30	18	.1	2.2	322	556	7.5	
29bdb 3	Hill AFB	W		19	800	740	7-15-66	TP-35	10	.02	68	21	14		274	0	33	17	.2	2.9	305	525	7.8	
29bdb 3	Hill AFB	W		16	800	740	7-24-69	TP-35	11		71	27	2.5		286	0	31	30	.3	.4	314	535	7.7	
33cda	Hill AFB	W		11	730	1,080	10-04-51	TP-35	22	.16	51	16	36	8.2	298	0	1.6	22	.1	.1	304	500	7.6	

TABLE 5-B. East Shore Area. Springs and wells with water temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER															
(B-05-01) 33cda	Hill AFB	W		19	730	1,080	7-23-69	TP-35	22		60	22	38		348	0	2.2	26	.2	.8	347	586	7.7	
(B-05-02) 6bdd	J. V. Stoddard	W		16	304		12-10-58	TP-35	33	.28	38	16	45		282	0	.0	18	.2	.1	289	471	7.8	
6bdd	J. V. Stoddard	W		16	304		11-16-60	TP-35	29	.04	38	15	36	6.7	268	0	2.7	19	.3	.2	279	462	7.9	
6bdd 3	J. V. Stoddard	W		19	609	25M	8-29-68	TP-35	16		36	9.7	23	3.1	190	0	8.2	18	.3	.8	206	359	8.1	B=.04
6bdd 3	J. V. Stoddard	W		19	609	25M	9-09-69	TP-35							192	0		17			134	362	7.8	
6bdd 4	J. V. Stoddard	W		16	303	70M	8-29-68	TP-35							254	0		20				455	7.8	
6bdd 4	J. V. Stoddard	W		16	303	70M	9-09-68	TP-35							262	0		18				444	7.8	
(B-05-03) 25adc 2	J. J. Frew	W		16	616		5-14-69	TP-35	15		45	14	16	1.7	203	0	17	18	.2	.4	240	389	8.0	B=.05
36dad 2	C. W. Stoddard	W		17	785	200M	7-05-69	TP-35	19		40	12	2!	2.3	202	0	8.5	18						
(B-05-04) 21cbb	H. Richards	W		19	140	2	11- -64	TP-35	12		184	80	1140	60	112	0	.2	2,240	.7	17	4,360	6,870	7.5	
(B-06-01) 4bbd 5	WBWCD	W		15	1,133	750	9-19-67	TP-35			9.4	4.6	25	6.6	75	5	19	12			138	194	8.5	
4bbd 5	WBWCD	W		16	1,133	750	8-26-68	TP-35							148	0						243	7.8	
5cdb	H. R. Parker	W		18	1,000	400M	8-30-68	TP-35	16		30	11	9.6	1.6	160	0	6.5	8.5	.1	.7	154	265	7.9	B=.03
(B-06-01) 6caa	M. Harris	W		16	640		10-08-58	TP-35	20		34	8.5	13		159	0	6.6	7.5		.6	168	269	7.8	
6caa	M. Harris	W		15	640		10-16-64	TP-35	19		31	9.1	15		161	0	5.4	6.6		.0	156	266	7.7	
(B-06-02) 5acb 2	T. Knight	W		16	850	12M	11-04-59	TP-35	20		19	5.8	92		270	0	2.3	28		1.5	300	493	8.1	
5acb 2	T. Knight	W		20	850	12M	9-29-66	TP-35							266	0		29				495	7.8	
20cdd 3	A. Segna	W		16	540	4M	11-21-68	TP-35	21		33	8.3	36		195	0	3.2	21		1.0	215	352	7.9	
25ccc 3	G. E. Stratfor	W		16	302		11-04-58	TP-35	20		36	17	68		336	0	.6	24		.3	331	558	7.7	
27bba 2	D. Lucia	W		17	536	8M	11-04-58	TP-35	24		95	22	105		193	0	3.3	278		3.4	626	1,180	7.6	
27bba 2	D. Lucia	W		19	536	8M	9-09-69	TP-35	19						200	0		275				1,190	7.8	
(B-06-03) 12bcc	Warren Cemetary	W		18	550		5-14-69	TP-35	20		14	5.8	79	3.4	240	0	1.8	28	.3	.3	275	446	7.9	B=.21
14dcc 2	L.D.S. Church	W		17	604	8M	8-28-68	TP-35	19		20	9.2	47		198	0	.2	20		.1	220	351	7.9	
19aab	Marquart ACFT	W		17	229	150	12-10-58	TP-35	40	10	104	17	332		146	0	.0	660	.4	1.5	1,230	2,330	7.3	
19abc	Marquart ACFT	W		19	220	1	10-09-58	TP-35	23		9.6	3.9	123		284	0	1.4	52		.4	353	588	7.8	
19abc	Marquart ACFT	W		16	220	1	10-21-66	TP-35	24		7.0	4.9	114		285	0	.4	35		3.0	321	517	7.7	
19abc 2	Marquart ACFT	W		19	295	25	10-09-58	TP-35	32		42	7.8	210		182	0	3.7	310		1.9	696	1,270	7.5	
19abc 2	Marquart ACFT	W		18	295	25	11-16-60	TP-35	33	.01	41	9.2	207	5.5	172	0	3.3	310	.7	5.1	700	1,270	7.5	
26bbb	D. Wilson	W		18	512	8M	8-28-68	TP-35	18		19	9.2	47	3.0	190	0	.8	22	.4	.4	210	354	7.8	B=.11
(B-07-01) 31bdb	Ranch Inn	W		18	482	4M	10-07-58	TP-35	19		41	6.8	11		164	0	7.6	8.0		1.3	176	288	7.8	
31bdb	Ranch Inn	W		13	482	4M	11-08-60	TP-35	18	.01	39	8.8	10	1.5	168	0	7.6	7.5	.1	1.9	177	283	7.6	
(B-07-02) 16cbb		W		16		5M	5-06-69	TP-35	34		19	10	840		452	0	8.2	1,090		.7	2,220	3,900	7.6	
23dbd	V. Hough	W		17	315	20M	10-02-68	TP-35	22		34	10	35	4.5	193	0	22	24	.5	.1	245	404	8.0	B=.03
26dac	J. W. Randall	W		18	510		10-19-64	TP-35	50		30	7.9	52		248	0	5.1	8.2		.3	256	379	8.0	

TABLE 5-B. East Shore Area. Springs and wells with water temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(B-07-02) 26dac	J. W. Randall	W		18	510		8-12-65	TP-35	51		35	7.1	45		242	0	6.4	7.3		.1	262	384	8.0	
28abb	J. Maw	W		16		6M		TP-35														4,670		
31dac 2	C. Hadley	W		17	524		10-09-58	TP-35	28		99	38	208		158	0	5.8	510		1.4	958	1,860	7.5	
31dac 2	C. Hadley	W		14	524		11-04-59	TP-35	28		93	41	207		158	0	.0	510		.8	958	1,860	7.5	
32bbb	E. Q. Taylor	W		18	546	8M	11-20-68	TP-35	28		66	45	335		128	0	1.5	680		13	1,440	2,360	7.5	
32bbb	E. Q. Taylor	W		19	546	8M	9-09-69	TP-35							136	0		690				2,350	7.8	
(B-07-02) 32bbb 2	L.D.S. Church	W		16	840	4	11-20-68	TP-35														1,290		
34bbb 2	L. Keyes	W		19	517	20M	10-02-68	TP-35	18		89	31	167	4.7	200	0	.5	398	.3	.1	914	1,560	7.9	B=.13
34bbb 2	L. Keyes	W		19	517	20M	5-07-69	TP-35	21		87	30	174	5.0	200	0	.0	395	.3	.3	948	1,570	7.7	B=.14
(B-04-03) 33bcc 1		S		17			11-10-64	TP-35	25		71	22	182	7.5	191	0	16	329	.4	2.5	837	1,350	7.6	
33bcc 2		S		17			11-10-64	TP-35	31		143	24	332	11	160	0	37	708	.5	.8	1,600	2,490	7.6	

TABLE 6. Escalante Desert (Beryl, Lund, Newcastle). Selected wells with water temperatures of 15.5° to 149° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(C-34-13) 16ccc	D. Schoppman	W	111 ALVM	18	172		8-09-62	BD-6	30	.12	108	22	32		199	0	212	31	.2	6.4	540	790	7.8	
(C-35-15) 33cdc	Columbia Iron Mining Co.	W	111 ALVM	19	200	980		BD-6																
(C-35-17) 7daa	W. W. Adams	W	111 ALVM	15.5	200	495		BD-6																
14ccc	H. Randall	W	111 ALVM	15.5	300	235		BD-6																
(C-36-15) 7dcc	V. Pickerell	W	111 ALVM	18.5		1,580	5-05-59	BD-6	81	.0	71	10	315		96		624	118		11	1,280	1,740	7.5	
(C-36-17) 2d	Escalante Mining Co.	W	111 ALVM	18	195		5-05-59	BD-6	104	.0	150	27	28		238		71	187		17	701	1,100	7.5	Mine Shaft
2d 2	Escalante Mining Co.	W	111 ALVM	17	600		10-20-61	BD-6	46	.0	49	4.6	26		168		16	29		3.3	257	381	7.5	Mine Shaft
(C-34-16) 18cdc	De Armand #1	W		149	7,000 TD 12,295	1,000F	1976	UP&L														<4,000		
(C-36-15) 4dcd	Columbia Iron Mining Co.	W	111 ALVM	20	235	925		BD-6																
7dba	S. Tullis	W	111 ALVM	30.5	250		7-07-59	BD-6	76	.01	53	3.4	267		91		492	93		12	1,040	1,580	7.7	
18acb	V. Pickerell	W	111 ALVM	23.5	400	950		BD-6																
20bbd	Christensen Bros	W	111 ALVM	95.5	500	1,700	12- -75	Rush	99	.01	58	.4	270	21	64	0	580	52	7.3	.22	1,120	1,550	7.6	B.71, Max temp between 280 & Li.46, 320 feet - 107° C. Mn,7, Sr1.1, Zn.02

TABLE 7-A. Escalante Valley. Springs and wells with water temperatures of 20° to 99° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER															
(C-26-09) 34bd S	Salt	S	111 ALVM	24.5			11-08-55	TP-43							264	0		3,200				9,640	7.7	
(C-26-09) 34dcb 1S	McKean, P. B. (Roosevelt)	S		99		10	1906?	WSP-217	101	5	31	9.7	102		30		90	87		1.83	645			Geothermal test wells have
				85		1	11-04-50	WRB-13	405		19	3.3	2,080	472	158		65	3,810	7.1	1.9	7,040	11,500		reached temps of 269° C.
				56			9-11-57	WRB-13	313		22	0	2,500	488	156		73	4,240	7.5	11	7,800	12,700	7.9	B-38., Li.27, Br3.3, I.3
(C-27-10) 31dcb	Sullivan Land & Livestock	W	111 ALVM	27	700	770	9-17-70	TP-43	70		20	6.4	74	8.4	220	0	31	17	1.2	.1	316	452	7.9	B.23
(C-27-09) 16abb	Steam Well	W	111 ALVM	133	275			Petersen																
(C-28-10) 5dc	E. Tanner	W		21.5	286	8		WSP-217		0					101		<35	38						
(C-28-10) 7adb	Town of Milford	W	111 ALVM	25.5	533	615	2-07-52	TP-43	35		13	5.8	62	2.8	160	0	40	16	.6	.5	253	390	8.2	
14bba	Hanson Land & Livestock	W	111 ALVM	20.5	255		5-20-71	TP-43	27		33	5.7	29	2.2	134	0	25	33	.6	.7	224	340	8.0	
(C-28-10) 18ab	John Forgie	W		25.5	357	25		WSP-217							141		Tr.	14						
18aca 2	G. C. Goodwin	W	111 ALVM	21	452		4-03-50	TP-43	34				56		164	0	37	10	1.0			364		
19abc	T. E. Walker	W	111 ALVM	25.5	260	6	11-03-50	TP-43	32	.09	14	7.0	45	3.0	132	8		9.5	.7	.1	211	328	7.8	B.08
	A. B. Lewis	W		26.5	750	2		WSP-217		0					283		0	35						Two wells in one 4" to 450', 2"
				26.5	300	37		WSP-217		0					145		0	17						0-750. Total depth 750. Sulphur water from bottom.
	J. D. McCanley	W		20	280	7		WSP-217																
	Milford Town	W		22	425	30		WSP-217		0					162		Tr.	13						Hardness 69. 117 gpm pumped.
								WSP-217	35	.1	11.2	6.6	66		190		53	13		.5	248			
	S.P., LA, & SL RR	W		21.5	310	30		WSP-217		0					160		Tr.	12						Hardness 49. 270 gpm pumped.
	A. W. Winberg	W		20	326	9		WSP-217		0					130		<35	24						
(C-28-11) 12abb	Province of the Holy Name	W	111 ALVM	20	440	590	5-06-71	TP-43	45		64	23	72	4.9	200	0	130	86	.9	8.3	561	842	7.9	B.23
(C-28-12) 29dcc S	Woodhouse	S	120 TRTR	22			9-06-63	TP-43	61	.60	80	47	76	1.0	265	0	40	220	.6	1.7	720	1,110	7.7	B.16
(C-30-09) 7aca S	Dotsons (Radium)	S		32.5			8-21-63	TP-43	31	.02	110	24	170	18	220	3	480	65	9.8	.2	1,030	1,420	8.3	B.31
				31.5			7-11-67	TP-43	32		88	35	170	17	228	0	440	63	4.5	.0	1,020	1,390	7.4	B.47
(C-30-09) 7adb *	Town of Minersville	W	120 TRTR	33.5	72		6-27-62	TP-43	32	.00	110	23	190		230	0	480	65	3.3	.5	1,030	1,460	7.7	B.42 BD-6 gives location as 7acc
(C-30-09) 19bdc S	US BLM	S	120 TRTR	33			8-24-63	TP-43	10	.19	12	4.1	170	17	228	0	440	63	4.5	.0	1,020	1,390	7.4	B.47
31daa	Willow	S	120 TRTR	21.5			8-22-63	TP-43	40	.01	79	13	160	.5	251	3	69	90	1.4	.8	475	793	8.3	B.18
(C-30-10) 19abd 2	Neb Craw	W	111 ALVM	21	293	1,000	8-08-60	TP-43	47	.01	34	8.8	38	5	144	0	50	25	.3	4.8	291	400	7.5	B.09 19abd$_1$ in BD-6.
				21	293		7-06-61	TP-43	60	.03	40	8.5	43		147	0	54	34		5.2	309	438	7.7	
(C-30-11) 22ddc	US BLM	W	111 ALVM	22.5	165	9	9-02-71	TP-43	46		7.3	1.2	65	2.3	117	0	34	36	.9	.6	253	360	8.2	B.16
(C-30-12) 21add S	Thermo	S		85		5-9-71 10.8	10-23-39	TP-43							370	0	460	220		.0				Hardness 220. Discharge
							8-21-63	TP-43	110	.13	83	9.7	360	49	384	0	480	210	14	1.0	1,500	2,120	8.1	B.64 total for 45 openings.
28acb S	Thermo	S		82.5		5-9-71 19.3	11-03-50	TP-43	120	.05	72	9.8	360	61	360	0	470	220	6.7	.1	1,490	2,170	7.8	B.30 Discharge total for 49 open-
				78			5-25-66	TP-43	100		75	9.7	360	52	359	0	460	210	4.7	.1	1,480	2,100	8.6	B.60 ings. *Probably should be
				76.5			7-11-67	TP-43	10*		76	12	360	47	374	0	460	210	6.7	.0	1,470	2,130	7.7	B.05 100.
(C-31-09) 3cba	Big Maple	S	120 TRTR	21			8-22-63	TP-43	35	.09	57	6.8	21	2.6	206	0	14	30	.5	.4	268	414	8.2	B.05

Table 7-B. Escalante Valley. Springs and Wells with Water Temperatures 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER															
(C-28-10) $8aad_2$	Sullivan L & L	W	111 ALVM	16.0	185	960	9-18-70	TP-43	38		71	22	36	3.2	133	0	110	80	.9	1.5	449	682	7.4	B=.04
(C-28-10) 16cda	J. Mayer	W	111 ALVM	19.0	440	900	5-09-71	TP-43	26		65	23	50	2.6	158	0	160	59	.6	2.7	476	712	7.9	B=.01
(C-28-10) $19bcd_2$	D. M. Yardley	W	111 ALVM	17.0	210	1,200	5-07-71	TP-43	42		160	60	51	6.0	147	0	370	190	.4	.6	954	1,350	7.9	B=.04
(C-28-10) $19ccd_4$	D. M. Yardley	W	111 ALVM	15.5	102	1,120	5-07-71	TP-43	49		260	75	66	8.9	170	0	560	290	.3	3.2	1,410	2,100	7.9	B=.11
(C-28-10) 20ddd	C. R. Wiseman	W	111 ALVM	16.5	410	837		BD-6																
(C-28-10) $28cdd_1$	Mayer Bros.	W	111 ALVM	16.0	355	800	8-26-69	TP-43	34		99	39	51		192	0	190	110		4.2	673	990	7.7	
				16.0	355		5-15-71	TP-43			120	67	63	3.9	186	0	330	170				1,300	8.0	
(C-28-10) $29bcd_2$	O. R. Williams	W	111 ALVM	17.5	143		5-20-65	TP-43	38		56	17	51		158	0	100	56	.9	1.9	414	616	7.2	
(C-28-10) $30bdc_3$	J. Baldwin	W	111 ALVM	19.0	290	1,100	8-08-68	TP-43	38		120	39	48		132	0	230	150		4.6	773	1,080	7.6	
		W	111 ALVM	16.0	290		6-25-70	TP-43										83				731		
		W	111 ALVM	16.5	290		6-10-71	TP-43	42		91	24	33	4.4	137	0	160	92	.6	1.6	522	779	7.7	B=.01
(C-28-10) $30bdd_2$	J. Baldwin	W	111 ALVM	16.0	186		5-19-65	TP-43	39		44	11	18		122	0	35	38	.8	2.3	263	385	7.5	
(C-28-11) 10acd	U.S.B.L.M.	W	111 ALVM	16.5	227	1	11-03-50	TP-43	48	.05	54	40	99	4.2	285	0	170	82	.3	.1	642	988	8.0	B=.09
(C-28-11) 12dbc	M. Persons	W	111 ALVM	17.0	460	784		BD-6																
(C-28-11) 13dca	F. Brinkman	W	111 ALVM	15.5	600	1	4-03-50	TP-43							152	0		30				466		
(C-28-11) $25dcd_1$	Green Diamond	W	111 ALVM	17.0	431	2,500	9-04-57	TP-43	40		100	24	36		154	0	160	100		1.5	538	872	7.4	
				20.5	431		5-02-59	TP-43	38	.00	27	9	40		144	0	44	19		.6	249	373	7.7	
(C-28-10) 20ddd	C. R. Wiseman	W		16.5	410	837		BD-6																
(C-28-11) $25dcd_1$	Green Diamond Ranch	W	111 ALVM	19.5	431		5-18-62	TP-43	36	.12	71	16	36	4.0	144	0	120	60	.3	.4	445	668	7.7	B=.08
			111 ALVM	17.5	431		8-10-67	TP-43			220	48	70		186	0	460	190			1,230	1,540	7.6	
(C-28-10) $35cad_1$	H. Cook	W	111 ALVM	15.5		1	5-14-71	TP-43	54		30	8.8	16	3.9	131	0	25	19	.7	.8	226	310	7.8	B=.02
(C-29-10) $6baa_2$	J. A. Mayer	W	111 ALVM	16.8	190	560	5-20-65	TP-43	37		34	6.1	19		123	0	21	19	.7	.7	195	283	7.5	
(C-29-10) 8add	Milford Farms	W	111 ALVM	15.5				BD-6																
(C-29-11) 4baa	W. H. Child	W	111 ALVM	15.5	68		6-27-62	BD-6	17	.01	120	81	356		169		712	372	1.4	3.2	1,750	2,710	7.4	B=.63
(C-29-11) 11acc	T. R. Rimpav	W	111 ALVM	16.0	53		5-19-65	TP-43	41		34	9.7	19		118	0	27	23	.7	9.4	240	329	7.6	
(C-29-11) $19caa_2$	Cook Bros.	W	111 ALVM	16.0	75		6-10-70	TP-43	60		45	28	120	4.4	215	0	160	110	.7	3.8	651	949	8.0	B=.23
(C-30-13) 8caa	J. Guymon	W	111 ALVM	18.0	263	7	6-09-71	TP-43	43		32	11	47	I.8	158	0	59	36	.6	2.3	318	444	7.5	B=.08
(C-25-12) 35cca	Armstrong	S	120 TRTR	17.5			9-07-63	TP-43	58	.13	43	9.0	100	7.2	154	0	51	140	.4	3.8	496	797	7.8	B=.21
(C-26-11) 19dbb	West	S	120 TRTR	17.0			9-07-63	TP-43	13	.29	42	28	120	8.7	207	0	50	190	.9	.5	547	987	8.0	B=.25
(C-26-11) 29aac	Smith	S	120 TRTR	17.5		1	9-07-63	TP-43	30	.31	66	23	80	11	219	0	57	150	.7	1.6	545	907	7.8	B=.18
(C-26-12) 10bdb	Three Kilns	S	120 TRTR	17.0		.83	9-07-63	TP-43	41	.08	120	50	69	3.0	197	0	79	290	.4	2.3	948	1,330	7.3	B=.10
(C-26-12) 30dab	South Seep	S	120 TRTR	17.5			9-09-63	TP-43	53	.53	110	25	84	1.7	364	12	51	150	.4	.6	671	1,100	8.4	B=.16
(C-27-12) 6cac	Coyote	S	120 TRTR	18.5			9-09-63	TP-43	25	.22	190	67	97	6.2	150	0	460	250	.3	1.5	1,290	1,720	7.8	B=.17

Table 7-B. Escalante Valley. Springs and Wells with Water Temperatures 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(C-29-9) 17bcb	Guyo	S		17.5			8-23-63	TP-43	23	.07	100	58	39	2.0	388	0	200	46	.2	1.8	673	996	7.9	B=.09
(C-29-9) 19bbb	Oak	S		17.0			8-23-63	TP-43	21	.04	67	29	18	2.6	284	0	45	37	.3	.7	352	592	8.0	B=.05
(C-29-13) 2bdc			120 TRTR	18.5			8-31-63	TP-43	18	.82	440	110	98	7.4	256	0	1,200	260	.5	.8	2,480	2,760	7.8	B=.22
(C-31-9) 5bba	Wire Grass	S	120 TRTR	19.5			8-22-63	TP-43	39	.52	7.2	.2	125	1.1	256	0	17	42	.3	.7	337	514	8.0	B=.08
(C-31-10) 8bda	Dry Willow	S	120 TRTR	17.5			8-22-63	TP-43	50	.61	73	14	35	16	244	0	24	74	.5	2.7	430	635	7.7	B=.11

TABLE 8. Fish Springs Group. Three Springs with water temperatures of 17.5° to 38° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(C-10-14) 33 S (C-11-14) 4	Wilson Hot Springs	S	Fault	60.5		38	7-12-67	WRB-13	33		741	224	7,090	18	178		1,560	11,900	4.0	0	21,800	31,200	7.4	B 6, Li 2.1, Br 23., I.36 Meinzer says near boiling, PP492 says 74°-78° F.
(C-11-14) 3d S	Big Sprs	S	Fault			17.5		WRB-13 WSP-277																PP492 says 85° F.
(C-11-14) 23 S 26 S	Fish Sprs	S	Fault	28		24	7-12-67	WRB-13	20		136	26	470	36	312		340	630	2.0	0	1,820	3,050	7.7	B.79, Li.33, Br1.3, I.02 Other orifices range 65°-72°, comparable quality.

TABLE 9. Grouse Creek Valley. Springs and wells with water temperatures of 16° to 42° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(B-10-18) 16dac	J. B. & D. Kitt	W		18	60		9-01-56	TP-29																
21aab	Merlin Tanner	W	111 ALVM	20	62	350M	9-05-56	TP-29																
30bad S	Kimber (Rose) Spring	S	120 TRTR	20		215M	4-11-68	TP-29	47		50	8.3	25	5.7	154	0	18	50	.4	2.5	304	441	7.6	B.02
33aba	B. C. Kimber	W		20	92	1,130M	9-20-56	TP-29																
(B-11-18) 2ccd 2	H. Paskett	W	120 TRTR	16	605	25R	4-12-68	TP-29	55		37	5.8	36		192	0	22	10		.4	263	367	7.7	Perf 280-310.
33bdc	R. D. Warburton	W	120 TRTR	16	232	220-705M	5-17-68	TP-29	64		128	37	61	17	321	0	152	141		.3	844	1,170	7.5	Perf 60-225.
(B-11-19) 11dad S	M. Warburton	S	300 PLZC	42		225R	5-16-68	TP-29	24		44	14	13		184	0	29	9.1		.2	248	373	7.5	

TABLE 10. Heber Valley. Springs and wells with water temperatures of 16° to 45° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(D-01-04) 33aaa S		S	120 TRTR	21		50E	6- -68	TP-27																
(D-03-04) 26cca S	Eugene Payne	S		39		50E	9-28-66	TP-27	23		331	68	114	25	674	0	661	108	2.2	.1	1,730	2,200	7.3	B.67
27baa S		S		45		3M	9-13-67	TP-27	27		345	83	148	16	644	0	742	132	2.5	.4	1,910	2,410	7.5	B.64
27bad S		S		39		150E	9-28-66	TP-27	28		389	73	151	31	728	0	820	138	2.5	.1	2,040	2,560	7.3	B.79
				40			5-16-67	TP-27	28		361	88	152	32	696	0	853	140	3.1	.0	2,060	2,490	7.8	B.83
27cbd S1		S		29			9-28-66	TP-27	21		353	72	125	28	716	0	702	115	2.1	.1	1,840	2,330	7.4	B.70
				29			5-16-67	TP-27	22		228	95	130	28	476	0	719	115	2.3	.1	1,650	2,280	7.8	B.71
				30			5-23-67	TP-27														2,280		
27cbd S2		S		29			9-28-66	TP-27	19		329	70	111	25	686	0	643	103	2.2	.1	1,710	2,180	7.7	B.64
				32			5-15-67	TP-27	17		279	74	114	26	572	0	611	105	2.4	.0	1,630	2,120	7.9	B.64
27cbd S3		S		28		1E	5-16-67	TP-27	21		329	88	163	33	584	0	805	150	2.7	.0	1,980	2,610	7.7	B.80
(D-03-05) 6bab 2	Howard Jensen	W	111 ALVM	16	53		8-15-67	TP-27	14		42	9.7	4.4	1.5	128	0	44	5.2	.3	.1	187	303	7.1	B.03
(D-04-05) 14aac 1	Robert Clyde	W	111 ALVM	16	104	20R	8-17-67	TP-27	43		89	26	31	1.7	376	0	38	35	.5	4.0	446	705	7.9	B.05

TABLE 11-A. Jordan Valley. Springs and wells with water temperatures of 20° to 58.5° C.

*Numbers refer to figure 6

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER: SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(B-1-1) 5ddd 1	C. F. & E. L. Gillmore	W	111 ALVM	28.5	1,000	120	9-27-32	IWM	64	.04	62	14			214		1.6	535	1.3	0	1,155			1* Same as well 5ddd3 in WSP-1029. Methane gas.
						150	8-26-58		63		59	11	328		220		3.7	510		.7	1,080	1,980	7.4	
6cca	Rudy Gun Club	W	111 ALVM	22	315	12	8-26-58	IWM	28	.15	11	5.4	208		452		1.6	91		.5	567	926	7.6	2 Methane gas.
19baa 5	E. J. Jeremy	W	111 ALVM	22.5	645	17	11-13-31	IWM							308		2	345						4 Methane gas.
				20		1.6M	9-08-65	BD-12														1,460		
19bab	E. J. Jeremy	W	111 ALVM	23	645	58	11-13-31	IWM							282		2	405						5 Methane gas. Other temps: 23, 24.5, 26.
				24.5		20 M	2-18-65	BD-12	25		32	18	274		256	0	3.3	382		0	890	1,590	7.4	
(B-1-2) 36baa	E. J. Jeremy	W	111 ALVM	28.5	464	29	10-18-57	IWM	41		200	58	1,020		180		57	1,950		1.2	3,420	6,040	7.1	21 Methane gas. Other analysis in BD-11.
				28			8-19-58		48		205	56	1,060		166		52	2,020		8.4	3,530	6,290	7.2	
(B-1-3) 34bcb	Morton Salt	W	111 ALVM	26	860	350	2-28-36	IWM																22
				25.5	884	28 M	9-12-67	BD-15	39		1,070	688	3,950		52	0	327	9,730		.7	15,800	24,300	7.3	
(B-2-2) 35cdc	Lakefront Gun Club	W	111 ALVM	22		9	5-19-33	IWM			13		188		226		2.0	194		0				23
				26.5		35	8- -58		27	.02	14	3.6	171		270		2.9	140		.9	492		7.8	
(C-1-1) 18bba	State of Utah	W	111 ALVM	20	315		6-02-41	IWM							156		64	455			345			24
							10-15-41								180		40	595			318			
18ddd 1	L. W. Sudbury	W	111 ALVM	22	400	60	8-04-58	IWM	52		62	35	135		164		44	290		.4	699	1,270	7.6	25
18ddd 2	L. W. Sudbury	W	111 ALVM	21.5	577	30	10-08-57	IWM	37		56	24	169		144		73	290		.9	721	1,280	7.1	26 H_2S odor. Another analysis in BD-11.
				22			8-04-58		37		58	26	164		144		75	290		.6	722	1,290	7.6	
27dda 8	Granger-Hunter Improvement Dist.	W	111 ALVM	21	775	427	5-13-58	IWM	25		55	15	84		175		131	74		.2	470	736	7.4	29
							8-18-58		23		57	17	73		173		134	63		.1	452	721	7.7	
(C-1-2) 6aaa 3	Morton Salt	W	111 ALVM	21	825	150	7- -56	IWM																36
6aaa 4	Morton Salt	W	111 ALVM	22	1,150	100	8-15-58	IWM	24		98	62	531		113		44	1,070		10	1,900	3,530	7.6	37
12daa 1	L. Fox	W	111 ALVM	21.5	411	21	10-08-31	IWM																
				25.5				WSP-1029																
12daa 2	LDS Church Pioneer Stake	W	111 ALVM	21.5	432	20	3- -47	IWM																39
				24	385-395		8-28-58		8.0		52	24	164		148		106	250		.6	678	1,220	7.3	
(C-1-1) 35caa 2	S. L. Co. Water Conserv. Dist.	W	111 ALVM	21	750	490	5-26-58	IWM	25		51	17	50		195		88	38		.1	365	578	7.5	30
				23		390 M	9-18-64	BD-11	24		35	15	57		182	0	72	50		.3	372	554	7.4	
(C-3-1) 12ccb	A. W. Harrison	W	111 ALVM			2.4	9-11-31	WSP-1029																
				20.5	118?		10-11-57	IWM	31		63	8.0	126		287		98	120		1.2	564	909	7.2	52 Another analysis in BD-12
				20.5		8.6M	7-08-64	BD-11	32		62	32	86		234	0	106	120		.3	578	905	7.7	Temp. 18.5 plus anal. BD-13
(C-4-1) 2ddb	State Prison	W	111 ALVM	28.5	825	60	3-25-54	IWM	35	.08	76	25	191	16	264		191	226	.8	1.0	890	1,490	7.5	54 Mn.86, B.41,
				26.5		25	3-25-54		35	.11	76	23	187	15	266		182	218	.8	1.2	870	1,440	7.6	Mn. 88, B.40
(C-3-1) 23bcc S	East Jordan Canal Co.	S	111 ALVM	23			7-30-58	IWM	23		64	25	40		249		52	66		.8	393	696	7.5	53
(D-3-1) 18cbb 1	Sandy City Corp.	W	111 ALVM	27.5	1,150	1280	1-15-59	IWM	27		116	26	352		203		115	620		1.0	1,360	2,470	7.7	60 Other temps 500-30.5 1093-35 Surface to 600-32 21 ft.-70 800-32 30.5 ft.-87 1025-35
							1-17-59		31		96	21	221		232		64	390		.5	938	1,690	7.7	
(C-2-1) 4dbc S	Gravel pit	S	111 ALVM	20		60	9-10-58	IWM	23		123	71	276		409		401	312		5.5	1,410	2,200	7.8	49
(C-2-2) 5aac S	Bacchus Gravel pit	S	111 ALVM	20		30	8-04-58	IWM	57		363	105	195		409		284	310		856	2,370	3,320	7.5	50 High nitrate from powder plant 1 mi. upslope. Lower nitrate 12, 28, 34 reported in BD-12 & BD-13.
				9			1-07-59		47		297	90	207		348		251	290		750	2,100	2,860	7.8	
(C-4-1) 22add S	Camp Williams R. R.	S	111 ALVM	21		30	7-30-58	IWM	24		65	23	32		250		40	57		.8	365	639	7.6	56

TABLE 11-A. Jordan Valley. Springs and wells with water temperatures of 20° to 58.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH		OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS				
(C-1-2) 23cdd 8	K. W. Young	W	111 ALVM	21	105		8-05-58	IWM	82		30	17	354		284		224	312		13	1,170	1,890	7.9	41	
23 cdd 17	K. W. Young	W	111 ALVM	21.5	140	60	8-05-58	IWM	81	.01	29	15	347		281		220	300		8.0	1,140	1,880	7.8	42	
(B-1-2) 25cad S		S	111 ALVM	29			8-19-58	IWM	6.5	.03	1,120	601	10,200		55		953	18,800		52	31,800	46,400	8.4	16	
(C-1-3) 17dcb	ASARCO	W	111 ALVM	29.5	502	3000	6-17-55	IWM	17	.10	321	103	3,670	89	325		148	6,280	.6	8.7	10,800	17,600	6.9	48	
				31			6-06-55		18	.04	303	98	3,490	89	319		152	6,000	.6	6.4	10,300	16,900	6.9		
(B-1-2) 2dac 2	R. L. Irvine	W	111 ALVM	26	541		2-26-64	BD-11					166		261	0	1.9	144			485	830	7.9	9	Other temps 79°F, 79°F
				26.5			7-07-64	BD-11					169		260	0	12	138		0.1	478	836	7.9		Other analysis BD-13
36baa	E. J. Jeremy	W	111 ALVM	27	464	4.3M	2-26-64	BD-11					1,070		168	0	53	2,050		7.2	3,320	6,160	7.3	21	Another analysis in BD-12
				27			7-07-64	BD-11					1,120		172	0	36	2,150	.	5.1	4,110	6,220	7.4		Other temps 80°F, 81°F 82°F.
(C-1-1) 18ddd 2	S. A. Sudbury	W	111 ALVM	21	557	1.8M	7-07-64	BD-11					169		144	0	75	288		.7	766	1,260	8.1	26	Other temps 69°F, 70°F
				20.5			2-19-65	BD-12	37		51	28	169		144	0	86	285		1.0	771	1,250	7.5		BD-12
19caa	Kennecott Copper	W	111 ALVM		1,200		6-16-64	BD-11		0.37	42	13			162	2		254			790	1,290	8.3	27	Other temps 77°F, 75°F,
				24.5			7-14-64		41		43	17	252		164	0	150	308		.5	906	1,500	7.7		77°F plus anal. BD-13
(C-1-2) 24dba	Kennecott Copper	W	111 ALVM	23	840	3120 M	8-18-64	BD-11	53		72	29	450		168	0	205	658		.1	1,550	2,630	7.8	44	
(C-1-3) 15bca 2	Kennecott Copper	W	111 ALVM	28	886	3550 M	8-15-64	BD-11	18		435	195	4,330		273	0	254	7,650		16	13,800	20,600	7.5	45	
				27.5			2-03-67	BD-15	19		398	166	3,560		275	0	247	6,330		1.7	10,900	18,100	7.9		
(D-3-1) 29cbc	Draper Irrigation	W	111 ALVM	25.5	277	350 R	11-25-64	BD-11	27		51	11	105	15	226	0	68	107	.7	6.0	486	810	7.6	64	B.13
(B-1-1 23bdd 1	SCL	W	111 ALVM	30.5	30	100 E	11-10-65	BD-12	29		668	157	3,660		265	0	919	6,440		2.8	12,000	19,500	7.8	6	
(B-1-2) 2dac	R. L. Irvine	W	111 ALVM	20	440	.4M	9-10-65	BD-12														855		8	
25cda 1	C. F. Gillmore	W	111 ALVM	25		1 E	8-31-64	BD-12														1,890		17	
25cda 5	C. F. Gillmore	W	111 ALVM	25.5		1.2M	2-17-65	BD-12	23		49	29	297		184	0	3.3	518		.2	1,010	1,890	7.7	18	
25cdd 1	C. F. Gillmore	W	111 ALVM	20		.3M	9-03-65	BD-12																19	
				18.5			8-31-64	BD-12														1,350			
(C-1-1) 20bdd	Granger-Hunter Improvement Dist.	W	111 ALVM	23.5	916	1400 M	4-08-65	BD-12	29		32	13	84		146	0	103	63	.5	.1	393	628	7.8	28	B.08
(B-1-2) 16caa	Bonneville-on-the-Hill	W	111 ALVM	24	636	27 M	6-08-66	BD-13	42		59	18	416		200	0	23	664		.1	1,320	2,430	7.7	10	Sampled at 626 ft.
21abb	Bonneville-on-the-Hill	W	111 ALVM	22	747	7.2M	5-16-66	BD-13	34		247	64	873		124	0	101	1,820		6.4	3,210	5,840	7.3	11	
				20			5-13-66	BD-13	22		18	7.3	172		280	6	6.5	140		5.6	514	888	8.3		Sampled from 420 ft.
21acd	Bonneville-on-the-Hill	W	111 ALVM	24	600	28 M	5-16-66	BD-13	26		17	5.7	204		275	0	2.3	200		.2	635	1,080	7.9	12	Sampled from 590 ft.
21bbb 2	Bonneville-on-the-Hill	W	111 ALVM	23	577	26 M	4-13-66	BD-13	30		36	17	315		234	0	1.7	460		1.1	984	1,810	8.0	13	Sampled from 567 ft.
21dcd	Bonneville-on-the-Hill	W	111 ALVM	22	561	22 M	4-13-66	BD-13	46		22	15	228		271	0	.7	275		.8	738	1,280	7.8	14	
22bdb	Bonneville-on-the-Hill	W	111 ALVM	23	560	34 M	6-08-66	BD-13	42		16	5.8	193		297	0	6.7	164		.4	572	977	8.0	15	Sampled from 550 ft.
27cca	Bonneville-on-the-Hill	W	111 ALVM	25	618	29 M	8-31-66	BD-13	28		218	100	1,320		112	0	95	2,580		.9	4,400	8,030	7.2	20	Sampled from 608 ft.
(C-1-2) 1ddd	Utah P & L Co.	W	111 ALVM	20	612	12 M	11-28-66	BD-13	38		55	26	199		158	0	58	345		2.2	831	1,450	7.6	32	
2aba 2	Bonneville-on-the-Hill	W	111 ALVM	25	500	3.3M	4-13-66	BD-13	38		36	23	263		192	0	12	415		2.4	902	1,650	7.8	33	Sampled from 393 ft.

TABLE 11-A. Jordan Valley. Springs and wells with water temperatures of 20° to 58.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER: SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(C-1-2) 24aaa 2	F. G. Klein	W	111 ALVM	23	450	45M	10-27-66	BD-13	51		196	98	924		112	0	233	1,820		.2	3,380	5,970	7.8	43
(C-3-1) 1cab 2	S.L. Co. Water Conserv. Dist.	W	111 ALVM	24.5	800	728 R	1-25-66	BD-13	14	.78	15	7.3	100	2.8	160	0	1.5	113	.6	.0	343	627	7.5	51 B.14
(D-3-1) 20baa	Barros Inc.	W	111 ALVM	23.5	568	349 R		BD-13																61
20cdd	Draper Irrigation Co	W	111 ALVM	21	510		6-03-66	BD-13	18		42	22	238		243	0	147	254		2.8	855	1,470	81	62
29abc	S. B. Logan	W	111 ALVM	22	168	55M	6-03-66	BD-13	17		53	12	16		212	0	33	5.8		.1	240	400	7.8	63
(C-1-2) 17adc	Kennecott Copper	W	111 ALVM	21	854	350 R	4-26-66	BD-13	29		311	170	1,340		196	0	230	2,820		2.8	5,000	8,900	7.7	40
(C-1-2) 1bed	Bonneville-on-the-Hill	W	111 ALVM	26	415	20M	5-11-67	BD-15	27		104	55	604		122	0	94	1,250		1.7	2,240	4,040	8.0	31
2adc	Bonneville-on-the-Hill	W	111 ALVM	26.5	454	20M	5-11-67	BD-15	47		224	88	945		104	0	133	1,950		.5	3,440	6,070	7.3	34
6aaa 4	Morton Salt Co.	W	111 ALVM	22	835	34M	2-24-67	BD-15	25		95	52	544		114	0	42	1,060		.6	1,870	3,480	7.9	35 See 6aaa 4 by IWM.
(C-1-3) 15bda 2	Kennecott Copper	W	111 ALVM	21.5	699	3,400 R	4-17-67	BD-15	16		280	152	2,150		315	0	380	3,790	1.7	2.2	6,930	11,600	7.5	46 B.44
15cbb 2	Kennecott Copper	W	111 ALVM	26	575	3,000 R	4-17-67	BD-15	16		312	139	2,660		292	0	238	4,700	1.5	4.1	8,220	13,900	7.5	47 B.60
(D-1-1) 19bac 4	M. Schmidt	W	111 ALVM	25.5	105		6-29-67	BD-15	13		111	32	48		304	0	199	38		.7	609	890	7.8	58
(D-2-1) 7dcd 7	H. A. Towers	W	111 ALVM	20	485		6-28-67	BD-15	13		34	18	67		154	0	146	20		.2	369	577	7.6	59
(B-1-1) 14dcb S	Becks Hot Spring	S	Fault	54.5			11-09-66	BD-13	32		738	135	4,120	198	229	0	927	7,310	3.2	.6	13,600	21,600	7.6	3 B2.0
				55.5			7-26-67	BD-15	32		746	131	4,250	156	221	0	985	7,470	3.3	.7	13,900	20,800	7.4	B1.2
(B-1-1) 25dbd S	Wasatch Plunge Inc	S	Fault	42			11-03-66	BD-13	18		565	109	2,410	111	220	0	1090	4,170	1.9	.9	8,590	13,700	8.0	7 B1.2
				40.5			7-26-67	BD-15	16		433	90	1,620	70	244	0	818	2,820	2.8	7.3	6,000	9,540	7.9	B.9
(C-4-1) 11ad S	Crystal Hot Spring	S	Fault?	58.5			5-22-34	BD-4	60		106	75	304		285	-	97	598	-	-	1,665		7.6	55
				33			5-27-58	BD-4	50		142	31	330		340	-	72	595	-	4.7	1,390	2,470	7.2	
(C-4-1) 23cbb S		S		23			4-08-66	BD-13	21		63	25	24		248	0	30	57		.0	373	629	7.7	57

TABLE 11-B. Jordan Valley. Springs and wells with water temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(B-1-1) 9aba	E. J. Jeremy	W	111 ALVM	19.5	300	3	8-26-58	IWM	37	.32	138	39	467		305		.8	898		1.6	1,730	3,160	7.2	
19baa 3	E. J. Jeremy	W	111 ALVM	19 18.5	490	8 2.7M	11-13-31 9-08-65	IWM BD-12							433		2	266				 1,500		Methane
21dba 2	A. B. Nebecker	W	111 ALVM	18	300	10	8-26-58	IWM	35	.16	142	105	1,050		446		.8	1,920		4.2	3,480	6,300	7.2	Same as 21dba 1 in WSP 1029 -- Temp. there 60°F
27cdd 3	L. W. Allsop	W	111 ALVM	16	500		3-13-33	IWM			58	39	825		700		2	1,080		0	2,349			60° F in WSP 1029
(B-1-2) 15bcb 2 bcd 2	C. Gillmore	W	111 ALVM	19.5 19.5	300	5	8-19-58 8-04-66	IWM BD-13	26 23	.13	12 13	8.0 6.8	175 164	 2.4	308 290	 0	.4 2.1	136 128	 1.9	.3 .3	509 489	874 849	7.6 7.7	BD-13 indicates all reports are on same well.
31aad	E. J. Jeremy	W	111 ALVM	17 20	400	23	 8-26-58	IWM	 39		 73	 43	 721		 231		 97	 1,160		 2.3	 2,250	 4,120	 7.8	Cond. 4230; BD-12
(C-1-1) 21dcb 2	Zions Savings	W	111 ALVM	18			8-19-58	IWM	58	.04	38	15	61		195		74	38		.5	381	558	7.5	
27dac 2	G. H. Fisher	W	111 ALVM	16	600		3-10-58	IWM																
34dda	E. Tomasini	W	111 ALVM	15.5	435	60	4-25-58	IWM	46		36	8.8	36		156		56	13		.4	273	401	7.6	
(C-1-2) 5bbb	Morton Salt Co.	W	111 ALVM	18	601	48	11-12-31	IWM			188	116	1,032		152		65	2,125			3,600			
8ddd	Utah Copper	W	111 ALVM	15.5	120	7	8-22-58	IWM	50	.04	56	41	735		338		209	1,000		1.9	2,260	3,890	7.6	
21adb	Kennecott Copper	W	111 ALVM	18 20	524	919	8- -49 4-26-66	IWM BD-13	 44		 64	 51	 621		 262	 0	 347	 808		 6.5	 2,070	 3,300	 7.7	
(C-1-1) 28dbb 2	N. K. Johnson	W	111 ALVM	19 15	400		8-18-58 3-10-58	IWM	32		36	14	48		192		58	24		1.4	307	483	7.8	Another temp of 61°F 10-10-57
33abb	W. D. Hill	W	111 ALVM	15.5 14.5	425		8-18-58 10-08-57	IWM	47 46		40 40	24 22	56 60		195 200		49 46	74 74		4.1 3.8	390 390	632 635	7.5	
(C-2-1) 2bcc 2	J. C. Phillips	W	111 ALVM	15.5 12.5	355		5-27-58 4-03-58	IWM	24		40	12	23		148		58	14		.2	244	394	7.9	
(C-1-1) 13adc	SLC Corp.	W	111 ALVM	15.5	500	6	12-21-31	IWM			109	36	45		263		258	24		.1	602			
13dac	Utah Poultry Producers	W	111 ALVM	17	864	25	3-30-32	IWM			73	18	77		264		148	34		5.4	485			
14dba 4	Lu To Co., Inc.	W	111 ALVM	15.5	168		10-08-57	IWM	25		27	9.7	78		312		2.2	14		0	309	499		H_2S odor
24bbb 4	D & RG RR	W	111 ALVM	16.5	660		4-01-32	IWM			135	46	24		236		338	23		.1	682			
25caa 2	Granite Sch. Dist.	W	111 ALVM	17	641	300 F	5-14-58	IWM	20		55	16	38		199		102	12		.4	341	541		
(C-1-2) 29bca 3	Cyprus School	W	111 ALVM	15.5	127	32	8- -41	IWM																
(D-1-1) 6cbb	Paris Co. Supply Well	W	111 ALVM	16.5	700	300		IWM																
6cbb	Paris Co. return well	W	111 ALVM	15.5	670	350		IWM																
20bab	Snelgrove Ice Cream	W	111 ALVM	16.5 18	482	120 F 100 F	4-01-58 6-29-67	IWM BD-15	16 17		109 104	42 40	42 53		244 240	 0	277 282	32 36		1.1 .1	639 681	958 932	7.3 7.8	
30ccd 10 30cda 10	E. Pinchin	W	111 ALVM	16 16	644		10-16-57 5-03-66	IWM BD-13	14 13		59 60	22 19	25 29		198 198	 0	103 104	14 14		.2 .3	334 359	545 545	7.4 7.6	H_2S odor Another similar analysis BD-13
(D-2-1) 14bbc 1	M. S. Sorenson	W	111 ALVM	16.5	132	300	4-14-58	IWM																Drilled well inside dug well

TABLE 11-B. Jordan Valley. Springs and wells with water temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(D-2-1) 6dbb 10	SL Co. Water Conserv. Dist.	W	111 ALVM	17	865	250 M	9-18-64	BD-11	22		44	16	32		156	0	90	17		.1	315	469	7.7	
32cbb 2	SL Co. Water Conserv. Dist.	W	111 ALVM	18	1,007	900 M	9-18-64	BD-11	11		21	9.2	14		100	0	20	11		1.7	152	236	7.6	
(B-1-1) 16ccc	C. F. Gillmore	W	111 ALVM	15.5	240	1.2M		BD-12	50		28	22	601		584	0	6.6	695		.6	1,680	3,100	7.7	
19baa 2	C. F. Gillmore	W	111 ALVM	16		.4M	9-08-65	BD-12														1,060		
19baa 3	C. F. Gillmore	W	111 ALVM		490	2.7M	9-08-65	BD-12														1,500		
20bab	S.L.C.	W	111 ALVM	15.5	274	.5M	2-18-65	BD-12	20		5.6	3.9	309		545	0	96	108		3.2	822	1,300	7.8	Other temps 60°F, 60°F
23bdd 2	S.L.C.	W	111 ALVM	18	30	75 E		BD-12	26		587	127	2,570		313	0	1,150	4,340		1.7	8,960	14,800	7.9	
(B-1-2) 7ccc	S. T. Gillmore	W	111 ALVM	16.5 16.5	389	2.9M	9-02-65 7-26-65	BD-12 BD-12	20		84	72	1,530		215	0	312	2,360		.2	4,480	7,980 8,060	7.3	Other temp, and analysis in BD-13.
7dcb	C. F. Gillmore	W	111 ALVM	16.5	735	4.1M	9-02-65	BD-12	20		108	100	995		201	0	108	1,820		.3	3,250	6,000	7.7	
11dca 4	Harrison Duck Club	W	111 ALVM	19 19	607	3 M	2-17-65 9-17-65	BD-12 BD-12	23		11	11	210		408	0	1.0	138		.7	612	1,020 1,040	7.7	
13cca	Harrison Duck Club	W	111 ALVM	19		9.1M	9-07-65	BD-12														1,240		
15daa	C. F. Gillmore	W	111 ALVM	16		1.0M	9-10-65	BD-12														973		
19aca	E. J. Jeremy	W	111 ALVM	17 18	450	11.5M	2-11-65 9-01-64	BD-12 BD-12	21		13	5.8	471		408	20	107	425		.3	1,260	2,200 2,190	8.7	Other temp and analysis BD-13.
22cdb	C. F. & E. L. Gillmore	W	111 ALVM	15.5 17		2 E	9-03-65 2-02-66	BD-12 BD-13	22		14	11	224		291	0	.3	232		.9	666	1,600 1,200	7.8	
23bbd	C. F. & E. L. Gillmore	W	111 ALVM	16 15.5		1.5M	9-09-65 2-10-65	BD-12 BD-12	22		14	11	339		388	0	3.3	350		1.4	952	1,600 1,200	7.8	BD-13 temp 61°F plus chem Other temp & analysis BD-13.
29daa 1	Bonneville-on-the-Hill	W	111 ALVM	19.5	420	4 E	9-03-65	BD-12														1,710		
29daa 2	Bonneville-on-the-Hill	W	111 ALVM	19	456	2.2M	9-03-65	BD-12														2,190		
30abc	E. J. Jeremy	W	111 ALVM	18 18.5	450	7.3M	2-11-65 9-01-64	BD-12 BD-12	34		38	29	626		236	0	108	900		.4	1,850	3,270 3,260	7.8	
(B-1-3) 24bdd	Morton Salt	W	111 ALVM	19.5 20	502	27 M	9-03-65 2-02-66	BD-12 BD-13	28		174	116	1,320		162	0	206	2,440		.9	4,340	7,670 7,790	8.1	Other temp. and analysis BD-13.
(C-1-1) 24bbd 2	So. S.L.C.	W	111 ALVM	16	772	420 M	6-08-65	BD-12	19		82	25	51		243	0	177	22		.5	496	758	7.8	
(C-1-2) 1ccc	F. C. Bueter	W	111 ALVM	15.5	170	1.1M	9-16-65	BD-12																
24acd	F. C. Bueter	W	111 ALVM	17		3.8M	7-14-64	BD-12														1,630		
24bdc	F. C. Bueter	W	111 ALVM	18 18	280	.6M	7-16-64 9-09-65	BD-12														2,360 2,380		
24dad	Kennecott Copper	W	111 ALVM	17	204	9.7M	9-09-65	BD-12														1,970		
32aab	E. G. Whitaker	W	111 ALVM	16	52		9-07-65	BD-12	36		63	115	238		458	0	388	258		4.1	1,330	2,090	7.9	

TABLE 11-B. Jordan Valley. Springs and wells with water temperatures of 15.5 to 19.5 C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(C-1-2) 36abb S	Sarah Day	W	111 ALVM	15.5 14	255		8-18-58 10-08-57	IWM	42 18		111 110	68 65	146 76		296 300		215 37	280 286		14 12	1,020 762	1,680 1,700	7.4 7.1	H_2S odor
36abc 1	Martin Perry	W	111 ALVM	15.5	153		8-18-58	IWM BD-04	44		116	67	169		294		243	298		14	1,100	1,810	7.3	
36abc 6	W. Smith	W	111 ALVM	15.5	125		10-29-58	IWM																
36acd	Ezra Day	W	111 ALVM	18.5	150		10-29-58	IWM																
(C-2-1) 7ccc 1	U.S. Army Kearns Well	W	111 ALVM	16.5	912	375	3-22-48	IWM	46		58	41	84		218		46	184	.4	9.8	577	979		Other analysis available.
34acb	West Jordan Sewer Trench	W	111 ALVM	15.5	12	30	8-21-58	IWM	27		160	79	260		488		402	330		7.1	1,510	2,300	7.4	
(C-4-1) 6acb	E. R. Hamilton	W	111 ALVM	15.5	577	600	8-12-58	IWM	58		92	3.6	91		278		33	127		1.4	543	874	7.7	
26cba S	Lower Beef Hollow	S	111 ALVM	15.5		30	8-15-58	IWM	57	.09	89	28	72		296		91	110		1.8	595	954	7.2	
(C-1-2) 23ddb 2	A. King	W	111 ALVM	17	150	3	8-05-58	IWM	75	.08	38	17	277		241		163	280		7.0	976	1,640	7.9	
23ddc 1	J. Courtright	W	111 ALVM	18.5	107	30	8-05-58	IWM	75	.01	35	17	298		280		181	270		8.6	1,020	1,660	7.7	
26bab 1	F. Schroeder	W	111 ALVM	18.5	156		8-05-58	IWM	81		24	13	384		270		240	323		11	1,220	1,970	8.4	
(C-1-1) 13bba 1	Eitel-McCullough	W	111 ALVM	15.5	815		6-08-43	BD-04	22	.10	59	21			200		171	38	1.2	0	500			
(C-1-2) 22bcd 4	J. Vagenas	W	111 ALVM	16.5 14.5	183	60	8-04-58 3-10-58	IWM	54	.01	30	14	260		260		95	270		4.6	856	1,480	7.5	Another temp. 61°F 10-8-57
22cbb 1	F. Fowler	W	111 ALVM	16 14.5	110	25	8-04-58 3-10-58	IWM	54		27	12	279		272		103	277		4.5	890	1,510	8.2	Temp. 60°F plus Chem BD-12.
(D-1-1) 19dbc	So. SLC	W	111 ALVM	17	955	630	8- -56	BD-04																
(C-1-3) 15bdc	Kennecott Copper #4	W	111 ALVM	16.5	524	2700	12-15-37	BD-04	19		287	214	3,230	78	283		147	6,000			10,120		7.3	
15cbd	Kennecott Copper #3	W	111 ALVM	16	193	1540	12-15-37	BD-04	12		110	48	760	13	304		60	1,330			2,485		7.5	
15dbb	Kennecott Copper #2	W	111 ALVM	18	520	3000	11-15-37	BD-04	14		250	108	2,380	69	336		110	4,290			7,389			
15dbd	Kennecott Copper #1	W	111 ALVM	18	437	3000	12-15-37	BD-04	14		147	67	1,060	21	290		231	1,830			3,515		7.4	
(B-1-2) 8abd	C. F. Gillmore	W	111 ALVM	19 19	300	5 M	7-14-64 9-15-65	BD-11 BD-12	24 21		27 11	17 18	291 292		190 57	0 51	1.9 3.9	435 425		.5 .2	906 890	1,670 1,690	7.5 9.6	Other analysis in BD-12, BD-13, Questionable pH.
15bcb 2	C. F. Gillmore	W	111 ALVM	19 19.5	300	5.2M	7-07-64 2-17-65	BD-11 BD-12	22 23		11 11	7.3 8.3	168 165	1.8	298 290	0 0	7.4 1.4	131 128	2.0	.1 1.0	482 495	849 841	7.8 7.6	
33cca	Hogle Investment	W	111 ALVM	19 19	450	20 M	2-26-64 2-18-65	BD-11 BD-12	50		25	16	562		264	0	56	760		.2	1,600	2,850	7.8	
(C-1-2) 22cbc	F. E. Fowler	W	111 ALVM	15.5	110	8.6M	9-03-64	BD-11																
(C-3-1) 9bcc	J. G. Schmidt	W	111 ALVM	19.5	350	3135 R	4- -61	BD-11																
(C-4-1) 15bdc 1	W. M. Webb	W	111 ALVM	18 18	505	320 M	8-06-64 7-12-65	BD-11 BD-12	62 62		114 150	49 84	112 64		184 208	0 0	127 206	310 332		12 6.1	1,060 1,010	1,470 1,740	7.8 7.4	Temp. 62°F plus analyses BD-13.
15bdc 2	W. M. Webb	W	111 ALVM	18 19	607	560 M	8-06-64 7-12-65	BD-11 BD-12	64 63		99 104	38 37	101 77		176 181	0 0	72 85	280 238		7.4 9.6	902 807	1,280 1,240	7.6 7.5	Temp. 69°F and 65°F; analyses BD-13.

TABLE 11-B. Jordan Valley. Springs and wells with water temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER: SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(C-2-1) 24bcd	S.L. Co. Water Conserv. Dist.	W	111 ALVM	18	1,000	1865 R	8-05-65	BD-12	11		28	11	61		95	0	69	68		1.5	296	531	7.0	
(C-4-1) 23dbb	S. L. Valley Sand & Gravel	W	111 ALVM	15.5	262	1310 M	11-08-65	BD-12	27		80	41	93		290	0	165	115		1.6	666	1,090	7.8	
(D-1-1) 1dbd 4	C. E. Penman	W	111 ALVM	15.5	129		9-10-65	BD-12	11		86	17	24		311	0	44	25		.3	381	611	7.7	
30acc 7	South S.L.C.	W	111 ALVM	16.5 16	955	510 M	6-08-65 2-26-64	BD-12 BD-12	15		72	23	48		222	0	158	23		.3	454	702 646	7.8	
(C-1-2) 21abc 2	Kennecott	W	111 ALVM	16.5	404	1190 R	7-14-68	BD-17																
(C-4-1) 14dcd	Mt. Jordan Corp.	W	111 ALVM	16 16	845	600 R	4-02-65 5-20-68	BD-17 BD-17	25		67	38	123		234	0	156	127		6.9	645	1,040	7.8	
(D-3-1) 7abb	Sandy City	W	111 ALVM	17	590	1350 R	11-15-68	BD-17																
(B-1-2) 7dbb 1	C. F. Gillmore	W	111 ALVM	16.5 16.5	735	4.3 M	2-03-66 9-01-66	BD-13 BD-13	24		92	108	1,060		190	0	210	1,850		.5	3,410	6,100 6,000	8.2	Sample from 480 ft.
27acb	Bonneville-on-the-Hill	W	111 ALVM	17		.6 M	2-02-66	BD-13	23		77	.5	314		234	0	20	470		.0	1,020	1,850	8.0	
(C-2-1) 9ccc	S. L. Co. Water Conserv. Dist.	W	111 ALVM	18	795		3-14-66	BD-13	24		78	73	145		234	0	130	340		3.3	962	1,620	7.6	
14caa	E. F. Burkhardt	W	111 ALVM	18	63	3 E	5-31-66	BD-13	16		134	67	258		200	0	525	315		20	1,430	2,170	7.9	
26add	ASARCO	W	111 ALVM	15.5		76 M	10-20-66	BD-13	11		20	9.2	28		112	0	22	24		.5	160	291	7.5	
(C-3-1) 33abd	S. Stefanoff	W	111 ALVM	18	357	620 M	9-09-66	BD-13	30		152	103	190		342	0	385	375		8.5	1,410	2,270	7.7	
(D-1-1) 20ddd	S.L.C.	W	111 ALVM	15.5 15.5	500		7-21-66 7-02-68	BD-13 BD-17	15 17		122 120	40 39	31 40	2.9	254 268	0 0	289 243	27 34	.5 .4	5.0 6.1	691 641	936 911	7.7 8.0	B.09 B.05
29dba	Interstate Brick Co	W	111 ALVM	17	480			BD-13																
(D-4-1) 6bdd	A. G. Hill	W	111 ALVM	17	28		10-03-36	BD-13	18		64	43	104		210	0	176	138		13	659	1,080	7.3	
(C-1-2) 21aac 5	Kennecott Copper	W	111 ALVM	 18.5	420	400 R	12-15-60 4-26-66	BD-11 BD-13	48		136	68	822		246	0	215	1,400		9.1	2,820	4,970	7.7	Ownership from BD-11
(C-2-1) 9dcc	Namba & Sons	W	111 ALVM	 15.5	376		 9-08-66	BD-11 BD-13	43		116	116	288		428	0	422	412		35	1,630	2,420	7.7	
(C-4-1) 11cab S		S	111 ALVM	15.5			8-08-66	BD-13	34		102	68	227		382	0	333	260		2.0	1,210	1,930	7.9	
(C-1-1) 2bac 2	General Brewing Corp.	W	111 ALVM	17	870	1012 R	8-24-59	BD-15																
5aad 4	Utah Wool Pulling Co.	W	111 ALVM	18	660	61 M	2-24-67	BD-15	22		30	17	144		242	0	99	111		.3	527	888	7.7	
25bdb 1	South S.L.C.	W	111 ALVM	18 11.5	1,000	158 M	7-25-67 6-20-67	BD-15 BD-15	19 18		61 46	22 19	44 37		211 305	0 0	133 10	18 11	.4	.1 .1	399 285	611 497	8.0 7.6	
27bdd 3	G. C. Bills & Sons	W	111 ALVM	19.5	716	235 M	2-21-67	BD-15																
(C-1-3) 15bdc 3	Kennecott Copper	W	111 ALVM	18.5	536	2000 E	2-23-67	BD-15	19		347	142	1,750		300	0	449	3,220		1.7	6,080	10,300	7.8	
15dca	Kennecott Copper	W	111 ALVM	18.5	437	2500 R	2-23-67	BD-15	16		278	115	2,100		320	0	354	3,610		2.2	6,630	11,300	8.0	
(C-2-1) 1abc 1	B. T. Helm	W	111 ALVM	16	256	3 E	6-28-67	BD-15	14		38	14	19		162	0	44	12		0	222	357	7.9	
3cdd 4	Taylorsville-Bennion Imp. Dist.	W	111 ALVM	19	641	1530 R	2-04-67	BD-15	42		52	33	116		128	0	130	194		2.5	661	1,060	7.7	

TABLE 11-B. Jordan Valley. Springs and wells with water temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(C-3-1) 5dcb	S. G. Dimond	W	111 ALVM	15.5	373	1425 M	8-08-67	BD-15	23		110	34	63		222	0	193	118		.5	687	1,010	7.9	
13bab	D. H. Greenwood	W	111 ALVM	19	114		2-08-67	BD-15	21		120	46	99		252	0	246	172		.2	908	1,370	7.9	
(C-4-1) 5ccb 2	T. A. Gardiner	W	111 ALVM	16.5	158		9-27-67	BD-15			45	14	94		332	0	64	26		7.8	480	709	7.7	
6dad	G. Gardiner	W	111 ALVM	16.5	168		9-27-67	BD-15	53		122	37	153		380	0	319	99		8.2	978	1,380	7.8	
(D-1-1) 28cbb 2	Coombs Enterprises	W	111 ALVM	16	363		9-15-67	BD-15	15		120	46	44		236	0	339	26		0	742	978	7.6	
(D-2-1) 4bcc	D. O. Wright	W	111 ALVM	15.5	650		9-12-67	BD-15	16		90	44	48		212	0	284	28		.2	642	882	7.9	

Table 12-A. Pavant Valley - Black Rock Desert. Springs and Wells With Water Temperatures of 20° to 67° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(C-19-5) 21cbb	Frank Badger	W	111 ALVM	22.0	300	80M	3-02-43	BD-5																
(C-19-5) 31cbd	U.S.B.L.M.	W	111 ALVM	29.5	375	4.2M	2-15-60	BD-5																
(C-20-5) 21dcc	E. V. Wilson	W	111 ALVM	20.0	420	24M	2-15-60	BD-5																
(C-20-5) 32cbb	Christensen Bros.	W	111 ALVM	22.0	942	12M	3-8-60	BD-5																
(C-20-5) 33bda	N. McBride	W	111 ALVM	20.0	360	6.5M	11-16-44	BD-5			55	48	77		228		139	121		1.0	553	985		
(C-20-8) 29aad (From AMS Map	Neels RR Well	W	111 ALVM	"Hot"	1,382 1,974	260	1906	WSP-217 WSP-217	48* 39*		284 239	3 6	293 552				658 458	1,065 863			3,336 2,888			Total Depth 1998 *"Siliceous Matter"
(C-21-5) 30dad2	Utley & Starley	W	111 ALVM	20.0	900	1,700M	3-24-61	BD-5																
(C-21-6) 9cad2	W.A. Paxton	W	111 ALVM	20.5	527	1,600M	3-16-60	BD-5																
(C-22-6) 25cbb		S	111 ALVM	22.0			Summer 76	Rush Rpt.																
(C-22-6) 27ddc 27ddd 26ccc	Meadow Hot Springs	S	111 ALVM	30.0 41.0	<1		Summer 76 5-22-67	Rush Rpt. WRB-13	47		433	114	1,020	13.8	408		1,130	1,800	5.5	1.6	4,900	7,130	7.5	B 4.0, Li3.2, Br4.0, I.45
(C-22-6) 27ddc	Warm Spring	S	111 ALVM	35.0		35	4-08-43	TP-3			464	95	1,152		392		1,045	1,830		2.0	4,810			$BO_2$15
(C-22-6) 34abc (From Thomas Map)	Devils Ridge Spring	S	111 ALVM	13.0 61.5		0-150		TP-3 WSP-1794			720	169	1,946		316		1,951	3,120		1.0	8,080			$BO_2$20 Temp. of 61.5 from WSP 1794 probably meas. at Hatton H. S.
(C-22-6) 35 ddc	Hatton Hot Spring	S		36.0 38.0	<1		Summer 76 6-19-57	Rush Rpt. WRB-13	44		465	89	1,090		427		985	1,780		2.4	4,670	7,270	6.7	Yield 25 gpm 8/27/58
(C-22-6) 35dd		W		67.0	90		Summer 76	Rush Rpt.																

Table 12-8. Pavant Valley. Black Rock Desert. Springs and Wells with Water Temperatures of 15.5° to 19.5°C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(C-18-5) 27bab	R. T. Knight	W	111 ALVM	17.0	397	1,250M	2-04-60	BD-5																
(C-18-5) 27cba	C. Nielson	W	111 ALVM	16.0	495	1,150M	2-04-60	BD-5																
(C-18-5) 28dda	D. Andersen	W	111 ALVM	17.0	550	2,350M	6-07-61	BD-5																
(C-18-5) 34adb	H. Hurst	W	111 ALVM	15.5	354	650M	2-04-60	BD-5																
(C-18-5) 34baa	L. C. Callister	W	111 ALVM	16.5	667	1,750M	6-02-61	BD-5	24	.00	136	22	47	1.5	358		76	116		6.5	605	1,010	7.7	B=.11
(C-18-5) 34bba	McCornik Well	W	111 ALVM	16.0	502	1,300M	2-04-60	BD-5																
(C-18-5) 34bca	McCornik Well	W	111 ALVM	16.0	400	1,000M	2-04-60	BD-5																
(C-19-5) 28aaa	H. F. Stevens	W	111 ALVM	18.5	200	15E	2-18-60	BD-5																
(C-19-5) 28bda	C. C. Nixon	W	111 ALVM	19.0	220	17M	2-18-60	BD-5																
(C-20-5) 1bcb	O. T. Hunter	W	111 ALVM	16.5	430	160M	2-16-60	BD-5																
(C-20-5) $1bcb_2$	O. T. Hunter	W	111 ALVM	16.0	500	150M	2-16-60	BD-5																
(C-20-5) 2ddd	G. V. Kennedy	W	111 ALVM	15.5	197	7M	2-18-60	BD-5																
(C-20-5) 9daa	W. E. Turner	W	111 ALVM	16.0	330	225M		BD-5																
(C-20-5) 10abb	A. Stevens	W	111 ALVM	16.0	35	2.7M	3-10-60	BD-5																
(C-18-5) 27dba	A. Stephenson	W	111 ALVM	16.5	520	1,450M	2-04-60	BD-5																
(C-20-5) 10dbd	J. Wood	W	111 ALVM	16.0	196	1.M	3-04-60	BD-5																
(C-20-5) 11aaa	L. D. Anderson	W	111 ALVM	16.0	198	8M	2-18-60	BD-5																
(C-20-5) 11aad	L. D. Anderson	W	111 ALVM	16.0	213	18M	2-18-60	BD-5																
(C-20-5) 11baa	C. Wade	W	111 ALVM	16.5	595	1,550M	3-04-60	BD-5																
(C-20-5) $12bba_2$	C. Johnson	W	111 ALVM	16.5	203	1E	8-30-60	BD-5																
(C-20-5) 16dad	B. Stephenson	W	111 ALVM	18.0		2.2M	3-04-60	BD-5																
(C-20-5) 21dbd	R. Fuller	W	111 ALVM	19.5	330	23M	3-04-60	BD-5																
(C-20-5) 22bcc	J. C. Rowley	W	111 ALVM	18.5	400	6M	10-23-57	BD-5	27		111	82	85		251		430	102		3.1	963	1,460	7.1	
(C-20-5) 22cbb	D. D. Hogan	W	111 ALVM	18.5	352	4.5M	3-04-60	BD-5																
(C-20-5) 27bac	Pavant Dev. Co.	W	111 ALVM	16.5	480	1,600M	3-19-62	BD-5																
(C-20-5) 27bcb	Rowley	W	111 ALVM	19.5	601	52M	11-04-43	BD-5			178	130	79		248		687	162	.4	2.6	7,360	1,850		B=.09
(C-20-5) 27bda	Pavant Dev. Co.	W	111 ALVM	15.5	475	1,200M	3-19-62	BD-5																
(C-20-5) 27cbb	H. S. Armstrong	W	111 ALVM	17.0	286	2.3M	11-16-44	BD-5			45	42	22		230		70	50		.4	343	633		
(C-20-5) 28acb	E. V. Wilson	W	111 ALVM	17.0	380	4.1M	2-15-60	BD-5																
(C-20-5) 28cdd	A. Graff	W	111 ALVM	18.0	354	11M	2-12-60	BD-5																
(C-20-5) 29abd	E. V. Wilson	W	111 ALVM	16.0	500	1.4M	3-10-61	BD-5																
(C-20-5) 31dcd	Christensen	W	111 ALVM	18.0	508	.7M	11-16-44	BD-5			92	657	60		235		189	145		1.5	660	1,130		
(C-20-5) 32aaa	Nelson Bros.	W	111 ALVM	18.5	490	10M	4-08-43	BD-5			34	34	85		158		52	160	.2	.2	443	800		B=.05

Table 12-B. Pavant Valley. Black Rock Desert. Springs and Wells with Water Temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(C-20-5) 33bba	L. Stott	W	111 ALVM	19.0	325	6M	11-16-44	BD-5			32	29	78		166		55	123		1.0	400	746		
(C-21-5) 5dbc	H. J. Mitchell	W	111 ALVM	18.0	565	800M	3-19-62	BD-5																
(C-21-5) 6dba	J. Robison	W	111 ALVM	16.0	400		10-23-57	BD-5	18		48	23	21		233		24	32		2.9	284	506	7.3	
(C-21-5) 8bdc$_2$	Swallow	W	111 ALVM	16.5	407	1,650M	5-21-61	BD-5	20	.01	73	20	32	1.3	261		47	52	.2	3.8	377	642	7.8	B=.08
(C-21-5) 8dbb$_2$	J. C. Moore	W	111 ALVM	16.0	400	1,900M		BD-5																
(C-21-5) 18ada	F. G. Johnson	W	111 ALVM	16.0	453		5-31-43	BD-5			58	28	26		234		37	59		2.0	325	605		B=.04
(C-21-5) 18ddd	N. Jackson	W	111 ALVM	16.0	493	35M	10-11-57	BD-5	16		77	30	108		295		121	127		6.9	631	942	7.2	
(C-21-5) 19ada	M. J. Palmer	W	111 ALVM	16.5			11-21-44	BD-5			76	38	64		242		120	112		4.8	534	1,010		
(C-21-5) 19add	M. J. Palmer	W	111 ALVM	18.0	670	1,050M	6-01-55	BD-5	22	.04	214	101	183	7.2	290		561	368	.0	2.1	1,600	2,420	6.9	B=.51
(C-21-5) 18add	F. G. Johnson	W	111 ALVM	16.5	508		11-21-44	BD-5			61	30	31		234		60	60		4.2	362	704		
(C-21-5) 19daa	M. J. Palmer	W	111 ALVM	17.0	403	200E	5-31-43	BD-5			84	46	104		212		209	164		2.5	714	1,210		B=.27
(C-21-5) 19daa$_2$	M. J. Palmer	W	111 ALVM	16.5	232		5-31-43	BD-5			90	45	90		256		182	145		1.5	680	1,160		B=.18
(C-21-5) 19daa$_3$	M. J. Palmer	W	111 ALVM	18.0	650	2,100M	3-27-62	BD-5																
(C-21-5) 19dcd	H. H. Hatton	W	111 ALVM	16.0	330		5-31-43	BD-5			76	40	88		286		149	110		1.5	605	1,020		B=.27
(C-21-5) 19dcd$_2$	W. C. Utley	W	111 ALVM	15.5	334		3-11-60	BD-5																
(C-21-5) 19dcd$_3$	H. H. Hatton	W	111 ALVM	18.5	615	220M	12-54	BD-5	19	.13	138	67	135	5.9	314		270	268		3.0	1,060	1,750	7.2	B=.40
(C-21-5) 20bba	J. A. Johnson	W	111 ALVM	15.5	445		11-21-44	BD-5			52	22	32		262		35	23		9.0	303	536		
20bba$_2$				17.0	480		12-23-53	BD-5	17	.48	104	45	91	4.6	292		223	121	.2	5.6	755	1,220	7.3	
(C-21-5) 20bdd$_2$	Mace & Bushwell	W	111 ALVM	16.0	615	950M	3-11-60	BD-5																
(C-21-5) 20cbd	Christensen Bros	W	111 ALVM	15.5	350		3-26-54	BD-5																
(C-21-5) 20cca	Christensen Bros	W	111 ALVM	18.0	488		5-31-43	BD-5			126	55	150		234		316	244		2.5	1,010	1,550		B=.18
(C-21-5) 20cca$_2$	Christensen Bros	W	111 ALVM	19.0	631	600M	12-21-53	BD-5	19	.05	202	86	180	10	306		455	370	.1	3.4	1,480	2,310	7.2	
(C-21-5) 29aac	W. C. Utley	W	111 ALVM	16.0	315	150M	11-20-44	BD-5			54	24	24		226		44	36		3.9	297	630		
(C-21-5) 29aad$_2$	W. C. Utley	W	111 ALVM	15.5	300	65M	11-20-44	BD-5			54	20	27		253		31	22		6.9	286	530		
(C-21-5) 29aad$_3$	W. C. Utley	W	111 ALVM	18.0	598	1,820M	1-55	BD-5	18	.62	146	60	137	7.9	298		377	182	0	4.6	1,080	1,650	7.1	B=.41
(C-21-5) 29baa	W. C. Utley	W	111 ALVM	16.0	224	85M	9-05-60	BD-5																
(C-21-5) 29bdd	L. Rasmussen	W	111 ALVM	16.5	207		11-18-44	BD-5			63	23	36		265		48	44		.6	345	647		
(C-21-5) 29bdd$_2$	L. Rasmussen	W	111 ALVM	19.0	632	1,350M	6-27-58	BD-5	17		305	89	321		332		756	540		2.2	2,190	3,210	7.0	
(C-21-5) 29caa	L. Rasmussen	W	111 ALVM	15.5	314	80M	3-11-60	BD-5																
(C-21-5) 29cad	L. Rasmussen	W	111 ALVM	17.0	440	100M	5-31-43	BD-5			109	44	115		252		228	182		2.5	805	1,350		B=.14
(C-21-5) 29cdd	Christiansen Bros	W	111 ALVM	16.5	366		5-31-43	BD-5			126	42	124		280		235	200		2.0	867	1,430		B=.14
(C-21-5) 29cdd$_2$	Christiansen Bros	W	111 ALVM	18.0	580	2,100M	3-29-54	BD-5	17	.13	170	54	132	18	288		293	280	.6	4.1	1,110	1,800	7.2	B=.55
(C-21-5) 29cdd$_3$	Rasmussen Bros.	W	111 ALVM	16.5	357	1,000M	3-24-61	BD-5																
(C-21-5) 29dca	J. F. Kelly	W	111 ALVM	16.5	380	135M	4-08-43	BD-5			181	51	171		302		362	287	.1	3.0	1,200	1,780		B=.45

Table 12-B. Pavant Valley. Black Rock Desert. Springs and Wells with Water Temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER: SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(C-21-5) 29dcd	J. F. Kelly	W	111 ALVM	15.5	266	200M	9-05-60	BD-5																
(C-21-5) 29ddd	J. F. Kelly	W	111 ALVM	15.5	277	9M	5-31-43	BD-5			56	20	47		234		51	57		4.2	352	632		B=.14
(C-21-5) 30ada	W. R. Starley	W	111 ALVM	16.5	470		5-31-43	BD-5			80	46	101		230		181	163		1.5	686	1,170		B=.14
(C-21-5) 30bad	Christensen Bros	W	111 ALVM	15.5	365		11-21-44	BD-5			105	45	118		274		221	175		1.9	801	1,340		
(C-21-5) 30daa	W. C. Utley	W	111 ALVM	16.5	437		11-18-43	BD-5																
(C-21-5) 30dad	W. C. Utley	W	111 ALVM	17.0	420	50M	5-31-43	BD-5			114	52	110		282		208	205		1.0	829	1,400		B=.14
(C-21-5) 30dbc	Christensen Bros	W	111 ALVM	16.0	304			BD-5																
(C-21-5) 30dbc$_3$	Christensen Bros	W	111 ALVM	19.5	787	700M	5-27-60	BD-5	16		141	67	164		229		344	311		1.0	1,160	1,860	7.6	B=.47
(C-21-5) 31cdd$_2$	J. N. Rogers	W	111 ALVM	17.0	800	1,150M	3-24-59	BD-5	15		79	23	75		305		80	85		3.1	510	873	7.5	
(C-21-5) 32aad	J. F. Kelly	W	111 ALVM	15.5	296		3-11-60	BD-5																
(C-21-5) 32acb	J. F. Kelly	W	111 ALVM	15.5	266		5-31-43	BD-5			108	35	63		212		78	208		2.5	599	1,120		B=.13
(C-21-5) 32bba	L. Rasmussen	W	111 ALVM	18.0	600	1,100M	4-01-60	BD-5																
(C-21-5) 32bcb	L. Rasmussen	W	111 ALVM	15.5	285		5-31-43	BD-5			76	32	72		190		98	154		2.5	528	980		B=.11
(C-21-5) 32bcd$_2$	W. C. Utley	W	111 ALVM	15.5	254		11-18-44	BD-5			124	46	130		238		212	258		2.7	890	1,490		
(C-21-5) 32bcd$_2$	J. F. Kelly	W	111 ALVM	16.0	318		5-31-43	BD-5			78	23	70		226		107	102		1.5	493	876		B=.05
(C-22-5) 4cbd	F. P. Robison	W	111 ALVM	15.5	276	850M	5-03-60	BD-5																
(C-22-5) 4ccd	F. P. Robison	W	111 ALVM	16.5	284			BD-5																
(C-22-5) 8aad	W. W. Watts	W	111 ALVM	15.5	325		5-31-43	BD-5			126	36	76		256		118	208		1.5	692	1,240		B=.05
(C-22-5) 17abd	G. Stott	W	111 ALVM	15.5	422	290M	3-16-60	BD-5																
(C-21-5) 30dbd	Christensen Bros	W	111 ALVM	16.0	350		4-11-43	BD-5			111	40	107		296		172	178	.1	2.5	756	1,230		
(C-22-6) 3add$_2$	Edwards & Harding	W	112 PVNT	17.0	339	700M	7-10-57	BD-5	48		114	41	134		276		148	258		2.3	881	1,460	7.3	
(C-23-6) 9bca	K. Pace	W	112 PVNT	16.5	170	3,350M	8-27-58	BD-5	54		405	114	1,050		486		924	1,700		5.4	4,490	6,750	6.9	
(C-23-6) 10ccc	C. A. Kimball	W	112 PVNT	15.5	96	2,550M	6-05-58	BD-5	38		265	69	523		379		495	885		10	2,470	3,940	7.3	
(C-23-6) 15 bbd$_2$	G. D. Staples	W	112 PVNT	15.5	141	3,100M	5-25-61	BD-5	62		268	59	563	24	262		577	995	1.1	3.4	2,680	4,380	7.5	B=2.5
(C-23-6) 17cdc	L. Bradshaw	W	111 ALVM	16.0	440	1,700M	6-04-58	BD-5	37		146	74	525		287		314	880		11	2,130	3,560	7.5	
(C-23-6) 20cbb	N. L. Nielson	W	111 ALVM	16.0	430		8-27-58	BD-5	37		257	136	1,140		362		533	2,000		7.8	4,290	6,970	7.2	
(C-20-5) 28daa		W	111 ALVM	16.5	330		11-16-44	TP-3			54	44	14		244		70	52		.4	355			
(C-20-5) 28ddd		W	111 ALVM	16.5	309		11-16-44	TP-3			49	38	28		247		72	43		.8	352			
(C-21-5) 8bab		W	111 ALVM	17.0	455		11-22-44	TP-3			61	28	43		260		74	49		.6	384			
(C-21-5) 8bdc		W	111 ALVM	16.5	320		5-31-43	TP-3			48	25	28		248		32	32		1.0	288			
(C-21-5) 18add		W	111 ALVM	16.5	508		11-21-44	TP-3			61	30	31		234		60	60		4.2	362			
(C-21-5) 18dad$_2$		W	111 ALVM	15.5	400		11-20-44	TP-3									61							
(C-21-5) 18dda		W	111 ALVM	16.5	448		11-21-44	TP-3									147							

Table 12-B. Pavant Valley. Black Rock Desert. Springs and Wells with Water Temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(C-21-5) 18ddd		W	111 ALVM	16.0	376		11-22-44	TP-3			74	34	69		252		146	80		3.1	530			
(C-21-5) 19aad		W	111 ALVM	17.0	455		11-21-44	TP-3			50	24	32		236		47	32		7.8	309			
(C-21-5) 20bab		W	111 ALVM	15.5	445		11-21-44	TP-3			52	22	32		262		35	23		9.6	303			
(C-21-5) 29aad		W	111 ALVM	16.0	290		11-20-44	TP-3			54	20	27		253		31	22		6.9	286			
(C-21-5) 30caa		W	111 ALVM	15.5	350		11-21-44	TP-3			105	45	118		274		221	175		1.9	801			
(C-21-5) 30dbd		W	111 ALVM	16.0	350		4-11-43	TP-3			111	40	107		296		172	178		2.5	756			
(C-21-5) 31acb		W	111 ALVM	15.5	390		11-18-44	TP-3			116	37	121		253		188	212		3.9	802			
(C-21-5) 31cda		W	111 ALVM	15.5	330		11-20-44	TP-3									496							
(C-22-5) 8cdd		W	111 ALVM	15.5	460		5-31-43	TP-3			62	23	106		280		63	131		1.0	524			
(C-20-5) 11bdd	C. Wade	W	111 ALVM	16.5	387	15M	3-04-60	BD-5																

Table 13-A. Sevier Desert. Wells That Yield Water of 20° to 29° C and One Spring At 82°C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(C-14-8) 10S, 15S	Abraham (Crater) Hot Spring	S	111 ALVM	82.0		250	7-13-67	WRB-13	59		345	68	816	48	160	0	756	1,450	4.1	.0	3,630	5,570	7.3	B .83, Li .63, I .09, Br 1.8 Other Constituents also given in WRB-13
(C-15-5) 33dcb	DMAD Irr. Co.	W	112 PLCN	21.0	825	2,940M	9-27-61	BD-9	30	.01	31	16	41		166	0	37	39		3.7	280	451	7.8	
				21.5			8-21-62	BD-9	26	.00	31	20	42	2.3	152	0	56	52	.3	3.1	308	513	7.5	B .07
(C-16-5) 18caa	DMAD Irr. Co.	W	112 PLCN	20.0	935	3,200M	7-08-61	BD-9	29	.00	32	14	22		178	0	10	20		2.6	209	349	7.7	B .26
(C-16-5) 19cbd	DMAD Irr. Co.	W	112 PLCN	20.0	830	2,000M	10-03-60	BD-9	24	.03	24	18	19	1.8	154	0	13	24	.2	1.8	202	322	7.5	B .04
				20.0			6-02-61	BD-9	25	.00	26	18	19	1.7	158	0	13	24	.2	2.9	208	325	7.9	Mn .12 B .08
(C-16-7) 23dad	D. L. Hansen	W	112 PLCN	21.0	300		4-13-55	BD-9	32		11	5.4	154		192	0	82	112		.2	492	824	7.8	
(C-16-7) 24bca	J. R. Jones	W	112 PLCN	23.5	855	1,370M	5-23-60	BD-9	32		14	4.1	71		153	0	30	36		.3	262	404	8.2	
				23.0			6-28-62	BD-9	27		16	8.0	67		149	0	38	40		.0	269	439	7.9	
(C-16-8) $12ddd_2$	L. C. Peck	W	111 PLCN	26.5	954	1,730M	6-22-62	BD-9	32		11	1.9	119		210	0	39	57		.0	363	601	7.9	
(C-16-8) 21bcb	L. B. Ellsworth	W	111 PLCN	24.5	996	1,045R	12-03-47	BD-9	41		28	11	510		188	14	173	615		.2	1,480	2,520		
				29.0			11-15-57	BD-9	41		35	13	605		208	0	192	770		1.8	1,760	3,110	8.0	
(C-16-8) $26bdb_2$	Golden Harvest Irr. Company	W	111 PLCN	26.5	844	1,390M	8-22-59	BD-9	30		9.6	2.9	176		230	7	54	115		.3	508	841	8.5	Perf. 502-842
				26.0			4-23-63	BD-9	29		10	6.8	206		242	0	77	158		1.1	607	1,050	7.8	Other analyses BD-9
(C-17-6) 17aaa	R.M. & J.F. Gardner	W	111 PLCN	28.0	840	2,000M	5-03-63	BD-9	29		15	9.2	51		141	0	22	33		1.4	230	379	7.3	B .06
(C-17-6) 18bda	R. D. Moody	W	111 PLCN	26.0	820		11-15-57	BD-9	34		14	4.9	80		154	0	40	43		.1	292	448	8.1	
(C-17-6) 21bdb	T. Larsen	W	111 PLCN	20.5	420	9M	3-03-64	BD-9																
(C-17-6) $26daa_3$	L. B. Ellsworth	W	111 PLCN	24.0	720	1,150M	6-20-62	BD-9	42		22	12	80		253	0	27	32		.1	339	549	7.8	
(C-17-6) 28acb	P. Theobald	W	111 PLCN	25.0	895	1,590M	5-08-63	BD-9	30		8.0	4.4	75		183	0	16	24		.4	248	400	7.8	B .07
(C-17-6) 33bcc	C. K. Ross	W	111 PLCN	20.0	360	2M	3-04-63	BD-9																
(C-17-7) $1ddd_4$	Town of Delta	W	111 PLCN	26.5	865	590M	8-17-61	BD-9	35	.00	21	2.7	77		160	0	37	42		.2	281	448	8.2	Other analyses BD-9
				26.5			8-20-63	BD-9	13		17	7.1	75		156	0	44	43		.5	277	456	8.0	
(C-17-7) $22adb_3$	D. Crafts	W	111 PLCN	20.5	450		3-06-63	BD-9																
(C-17-7) $34cbd_2$	G. M. Peterson	W	111 PLCN	21.5	598	5M	6-27-63	BD-9																
				18.0			5-23-60	BD-9	30		4.4	.2	177		364	23	18	29		.8	461	722	8.7	Other analyses BD-9
(C-18-5) 6bba	Union Pacific RR	W	111 PLCN	21.0	547	3E	9-05-61	BD-9	32	.01	60	22	222		326	0	57	280		1.3	834	1,500	7.7	
(C-18-6) 6aba	C. D. Hart	W	111 PLCN	21.5	565	60 M	7-03-62	BD-9																
(C-18-8) $24ada_2$	W. Robison	W	111 PLCN	25.5	601	9M	8-21-61	BD-9	36	.22	22	16	791		288	0	387	850		2.7	2,250	3,820	8.0	

Table 13-B. Sevier Desert. Wells With Water Temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(C-11-8) 33ccc	G. C. Bennion	W	111 ALVM	16.5	376	1,250M	6-24-63	BD-9																
(C-11-9) 1bca	G. C. Bennion	W	111 ALVM	16.0	448	640M	6-25-63	BD-9																
(C-11-9) 1cdb	G. C. Bennion	W	111 ALVM	16.0	445	800E	6-24-63	BD-9																
(C-12-8) 9baa	W. H. Peterson	W	111 ALVM	18.0	272	470M	5-02-63	BD-9	41		68	27	80		194	0	36	182		.7	530	964	7.2	B-.08
(C-13-6) 26bac	U.S.B.L.M.	W	111 ALVM	16.0	175	20R	8-23-61	BD-9	61	.00	134	113	424		238	0	547	675		5.9	2,080	3,280	7.7	
(C-14-5) 35cdc	J. M. Nelson	W	111 ALVM	15.5	305	2,040M	8-23-61	BD-9										805				3,520		
(C-14-6) $9bab_2$	D. Christensen	W	111 ALVM	16.0	185	4M	8-23-61	BD-9																
(C-14-6) 9dda	D. Christensen	W	111 ALVM	16.5	143	2M	8-23-61	BD-9																
(C-14-6) $21ccc_2$	E. A. Lyman	W	111 ALVM	15.5	185	4M	8-23-61	BD-9																
(C-14-6) 21ddd	E. A. Lyman	W	111 ALVM	16.0	126			BD-9																
(C-14-7) 20ccc	U.S.B.L.M.	W	111 ALVM	16.5	194		4-25-63	BD-9	23		82	51	322		90	0	268	540		2.1	1,330	2,340	7.0	
(C-15-4) 17dab	C. Nielson	W	111 ALVM	16.0	350	1,710M	6-26-63	BD-9																
(C-15-4) 18daa	J. Nielson	W	111 ALVM	17.0	406	1,510M	6-23-58	BD-9	28		134	68	75		224	0	144	308		11	878	1,540	7.7	
(C-15-4) 26dcc	Fool Creek	W	111 ALVM	15.5	520	1,040M	9-01-61	BD-9	15	.00	97	25	21		194	0	76	81		46	456	776	7.7	
(C-15-5) 2ddc	J. Nielson	W	111 ALVM	15.5	303	1,840M	9-23-58	BD-9	26		76	42	68		223	0	70	180		1.0	573	1,020	7.7	
(C-15-5) 26baa	DMAD	W	111 ALVM	18.0 18.0	860	2,520M	10-28-58 11-03-	BD-9 BD-9	32 25		34 35	17 19	23 26		178 182	0 0	18 26	27 31		1.8 2.6	241 254	382 420	7.8 7.8	
(C-15-5) 36abb	Taylor Flat	W	111 ALVM	18.0	935	1,280M	8-22-63	BD-9																
(C-15-6) 7ddb	U.S.B.L.M.	W	111 ALVM	15.5	336	3M	8-23-61	BD-9																
(C-15-7) 18caa	W. B. Davis	W	111 ALVM	18.0	795	690M	8-24-62	BD-9																
(C-15-7) 27cab	O. W. Hunsaker	W	111 ALVM	16.0	668	90M	9-28-61	BD-9																
(C-15-7) 30bdd	R. J. Jensen	W	111 ALVM	15.5	170	1M	9-06-43	BD-9	22		12	6	123		137	0	76	91			396			
(C-15-7) $31abb_2$	Roy Losee	W	111 ALVM	16.0	380	12M	3-07-63	BD-9																
(C-15-7) 31bad	A. M. Smith	W	111 ALVM	16.5	405	4M	9-26-61	BD-9										104				714		
(C-15-7) 31ddd	E. D. Losee	W	111 ALVM	16.0		1M	9-26-61	BD-9																
(C-15-7) 36cbb	Chesley & Black	W	111 ALVM	15.5	420		9-27-61	BD-9	38	.00	30	13	62		150		55	58		.4	330	524	8.2	
(C-16-4) 18bda	Sinks Irr.	W	111 ALVM	16.5	375	790M	8-01-61	BD-9	40	.00	103	45	89		212	0	129	227		8.9	849	1,290	7.7	
(C-16-6) 18bad	J. A. DeLapp	W	111 ALVM	16.0	225	7M	3-20-63	BD-9																
(C-16-7) 10bad	H. Done	W	111 ALVM	17.0	919	1,920M	11-14-62	BD-9	23		17	6.3	68		142	0	41	39	.5	.5	265	434	7.8	
(C-16-7) 12ccd	A. Barney	W	111 ALVM	16.0	582	170M	4-23-63	BD-9																
(C-16-7) 12dcd	W. E. Black	W	111 ALVM	17.0	704	270M	5-20-63	BD-9																
(C-16-7) 13cad	J. A. DeLapp	W	111 ALVM	15.5	288		4-13-65	BD-9	25		28	20	31		132	0	44	45		1.0	259	438	7.5	
(C-16-7) $33bba_2$	L. E. Abbott	W	111 ALVM	16.5	245		8-16-62	BD-9	22		8.4	4.4	113		168	0	51	66		.4	348	594	7.8	
(C-16-7) 36acb	E. A. Lyman	W	111 ALVM	16.5	125	4M	3-20-63	BD-9																

Table 13-B. Sevier Desert. Wells With Water Temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(C-16-7) 36cac	E. A. Lyman	W	111 ALVM	16.5	145	6M	3-20-63	BD-9																
(C-16-7) 36cba	M. D. Jones	W	111 ALVM	16.5	135	2M	11-16-61	BD-9																
(C-16-8) 21cbb	L. B. Elsworth	W	111 ALVM	19.0	640	1,130M	6-28-62	BD-9	26		6.4	1.9	145		251	0	40	65		.1	407	685	8.0	
(C-17-6) 6cbd	Delta	W	111 ALVM	19.0	737	300M	8-17-61	BD-9	30	.00	19	8.5	56		151	0	24	38	.2	1.1	241	394	7.7	
(C-17-6) 12dad	U.S.B.L.M.	W	111 ALVM	15.5			11-27-62	BD-9	56		34	56	108		335	0	51	151		13	634	1,090	7.3	
(C-17-6) 22ddc	H. Farnsworth	W	111 ALVM	18.5		7M	3-04-63	BD-9																
(C-17-6) 27baa	P. Theobald	W	111 ALVM	17.0		4M	3-04-63	BD-9																
(C-17-6) 28dcb	F. S. Teeples	W	111 ALVM	16.5	425	24M	8-30-62	BD-9																
(C-17-6) $29aca_2$	K. C. Ross	W	111 ALVM	18.0	470	2M	3-05-63	BD-9																
(C-17-6) 32bda	R. M. Ross	W	111 ALVM	19.5		1M	3-04-63	BD-9																
(C-17-6) 32daa	D. G. Brush	W	111 ALVM	18.0	333	1M	3-04-63	BD-9																
(C-17-6) 33abb	L. S. Teeples	W	111 ALVM	19.5		3M	8-30-62	BD-9																
(C-17-6) 34cda	C. S. Teeples	W	111 ALVM	17.0	370	3M	3-04-63	BD-9																
(C-17-7) 20cbb	D. S. Webb	W	111 ALVM	17.0	356	1M	4-15-55	BD-9	29		7.0	4.6	144		314	14	21	23		.3	407	662	8.4	
(C-17-7) 25cbb	O. Walsh	W	111 ALVM	16.0		5M	8-03-62	BD-9																
(C-17-7) 26dcd	S. J. Dewsnup	W	111 ALVM	17.0	220	2M	8-03-62	BD-9																
(C-17-7) 29dcd	W. L. Crafts	W	111 ALVM	15.5	220	1M	3-07-63	BD-9																
(C-17-7) 30bcb	B. R. Jackson	W	111 ALVM	18.0	388	2M	3-06-63	BD-9																
(C-17-7) 36bbb	E. M. Stanworth	W	111 ALVM	16.5	240	5M	9-04-62	BD-9																
(C-18-6) $2bbb_2$	L. S. Teeples	W	111 ALVM	16.5	246	9M	3-05-63	BD-9																
(C-18-6) 3bbb	Styler Investment	W	111 ALVM	16.5		2M	3-05-63	BD-9																
(C-18-6) 4bcb	J. M. Webb	W	111 ALVM	16.5		2M	3-05-63	BD-9																
(C-18-6) 4dba	J. M. Webb	W	111 ALVM	16.5		5M	3-05-63	BD-9																
(C-18-6) 6acd	C. D. Hart	W	111 ALVM	17.0	180	2M	3-05-63	BD-9																
(C-18-6) 6cab	E. S. Gillen	W	111 ALVM	18.0	160	7M	7-03-62	BD-9																
(C-18-6) 8bcb	E. G. Gardner	W	111 ALVM	17.0	160	1M	3-05-63	BD-9																
(C-18-6) 8cbb	J. M. Webb	W	111 ALVM	17.0	260	2M	8-21-61	BD-9	25	.02	18	4.4	76		224	0	15	20	0	.6	269	440	7.9	
(C-18-6) 9dbb		W	111 ALVM	16.5		3M	3-05-63	BD-9																
(C-18-6) 18bcb	L. Eliason	W	111 ALVM	15.5	200	5M	3-05-63	BD-9																
(C-18-7) 1cba	A. Jensen	W	111 ALVM	16.0	290	1M	3-08-63	BD-9																
(C-18-7) 1dcd	Eliason Bros.	W	111 ALVM	16.5		1M	3-08-63	BD-9																
(C-18-7) 2cca	L. Adams	W	111 ALVM	16.5	150	6M	8-15-62	BD-9																
(C-18-7) 2cdb	L. Adams	W	111 ALVM	16.0	150	1M	8-15-62	BD-9																
(C-18-7) 11bba	Styler Investment	W	111 ALVM	17.0	150	1M	8-15-62	BD-9																

Table 13-B. Sevier Desert. Wells With Water Temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER															
(C-18-7) 11daa	Styler Investment	W	111 ALVM	16.5				BD-9																
(C-18-7) $12aab_2$	P. E. Ellason	W	111 ALVM	15.5	173	2M	3-08-63	BD-9																
(C-18-7) 12bbb	P. E. Ellason	W	111 ALVM	17.0	255	1M	3-08-63	BD-9																
(C-18-7) 12cbb	M. E. Howell	W	111 ALVM	15.5	170	4M	3-08-63	BD-9																
(C-18-7) 17ccd	W. J. Black	W	111 ALVM	17.0	463			BD-9																
(C-18-7) 20abb	R. C. Skeem	W	111 ALVM	19.0	540	1M	4-15-55	BD-9	28		5.5	7.4	341		468	12	146	181		.6	952	1,590	8.3	
							12-04-57	BD-9	24		5.2	2.9	359		487	4	140	180		.5	955	1,600	8.3	
(C-18-8) 13aba	A. Jensen	W	111 ALVM	19.0	330	1M	4-15-55	BD-9	29		119	58	2,130		114	0	820	3,150		1.3	6,360	10,400	7.8	

Table 14. Upper Sevier River Valley. Wells and Springs with Water Temperatures of 15.5° to 32° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(C-27-1) 21cab2	A. Sorensen	W	111 ALVM	15.5	79	5R	1-11-43	BD-8																
(C-27-1) 29dba	D. Bagley	W	112 PLCN	15.5	155	5R	2-05-43	BD-8																
(C-30-1) 5b	Petes 1#	S	120 TRTR	16.0		225M	10-63	BD-8																
(C-30-3) 16bbb	P. J. Jensen	W	120 TRTR	15.5 13.0	407	50R	5-13-59 7-27-57	BD-8 BD-8	113		38	8.5	36		113	0	93	14		0	358	409	7.8	L12.0
(C-30-4) 3b	Oak Basin	S	120 TRTR	18.0		15M	5-62	BD-8																
(C-30-4) 26dcb	Town of Circleville	W	112 PLCN	15.5 15.5	325	300M	5-13-59 5-09-60	BD-8	117 76		39 41	10 9.5	25 23		155 154	0 0	55 53	7.5 6.0		.4 .7	330 285	360 380	7.9 7.7	L11.9
(C-31-2) 23bcd	Antimony Lions Club	W	124 WSTC	15.5 14.5	90	25R	5-28-62 5-23-61	BD-8 BD-8	34		85	8.5	17		288	0	31	8.0		6.4	332	509	7.6	
(C-32-2) 11ba	Ant Creek Spring	S	124 WSTC	15.5		340M	8-62	BD-8																
(C-32-2) 11cd	Gleave	S	124 WSTC	15.5		300M	8-62	BD-8																
(C-33-5) 3bda	E.V. Goff	W	112 PLCN	15.5	66	5R	6-42	BD-8																
(C-33-5) 17ac	P. LeFevre	S	Fault	26-32		15M	7-62	BD-8																
(C-33-5) 16cdc	Tebbs	S	111 ALVM	20.0		280M	5-03-62	BD-8	50	.00	35	6.3	35		186	0	14	16	.3	.9	218	346	8.2	B = .06
(C-33-6) 5ccb	Bear Creek	S	120 TRTR	18.0		10E	6-28-62	BD-8	31		17	3.6	27	1.8	116	0	4.5	11	.2	.6	154	221	7.8	B = .02
(C-36-4 1/2)7cbb	Calvin Wilson	W		15.5		5M	8-61	BD-8																

Table 15-A. Central Sevier River Valley. Wells and Springs with Water Temperatures of 20°C to 76.5°C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(C-22-1) 32da	Std. Oil of Calif.	OT W	220 NVJO	65.5	9,638			BD-3																Navajo 8999-9638 + Water Saline, Plugged & abd.
(C-23-3) 26acaS	City of Richfield	S	111 ALVM	20.0		1,400R	7-30-57	BD-3	14	.04	45	38	12	4.0	298		27	20	.2	.8	310	548	7.9	Mn .01, Li .5 Crazy Hollow Fm.,
				22.0		700E	6-06-66	WRB-13	11		51	35	15	3.2	280	4	29	20	.3	.1	307	551	8.3	Li .5 near fault zone
(C-25-3) 10ddaS	Monroe Hot Springs	S	120 TRTR	76.0		40E	7-23-57	BD-3	54	.07	282	34	562	63	354		898	630	2.6	.0	2,700	4,100	7.6	Mn .02, Li4.8 Temp. range 80°-
				76.0			9-10-57	BD-3	54	.38	288	33	555	67	416		833	660	3.0	.0	2,860	4,020	6.4	Mn .1, Li1.1 180°F Sevier Fault
(C-25-3) 11cacS	Red Hill Hot Springs	S					9-11-57	WRB-13	83		240	34	618	53	256		965	660				4,070	7.5	B3.4, Li .9
				76.5		40E	5-02-66	WRB-13	51		200	34	597	66	158		928	665	2.8	.3	2,630	4,100	7.8	B2.7, Li .57, Br .3
(C-25-3) 10ddaS	Monroe (Cooper) Hot Springs	S		42.0		6E	5-77-66	WRB-13	52		257	17	578	62	309		932	625	2.8	.7	2,680	4,000	7.6	B2.6, Li .51, Br .4 WSP199, 1906 ?60 gpm
15aS				36.0			5-03-67	WRB-13	51		281	49	553	49	386		924	600	1.8	.2	2,700	3,900	7.9	B2.3, Li .4, Br1.6 144°-156°F
(C-25-3) 27abaS	Johnson Warm Springs	S		25.0		10E	4-19-67	WRB-13	32		70	15	44	1.5	175		163	14	1.8	.0	428	623	7.4	B .08, Li .01, Br .1
				26.5		180	1906?	WSP-199																
(C-25-4) 13cbc	Edna Mecham	W	111 ALVM	20.0	73	5R	7-23-56	BD-3																
(C-25-4) 23aacS	Joseph Hot Springs	S	120 TRTR	64.0		100E	9-11-57	BD-3	84		264	44	1,380	45	412		1,250	1,690	6.0	.0	4,970	7,520	6.6	Li1.5 Dry Wash Fault
				54.4			7-23-57	BD-3	85	.56	282	36	1,440	68	426		1,270	1,750	2.7	.0	5,150	7,790	6.9	Mn .16, Li8.0

Table 15-B. Central Sevier River Valley. Wells and Springs with Water Temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(C-17-1) 34bca	Sanpete Fish & Game	W	111 ALVM	15.5	60	15E		BD-3																
(C-17-1) $34bdb_1$	Sanpete Fish & Game	W	111 ALVM	15.5	60	15E	9-17-58	BD-3																
(C-17-1) $34bdb_2$	Sanpete Fish & Game	W	111 ALVM	15.5	60	30E		BD-3																
(C-17-1) $34bdb_3$	Sanpete Fish & Game	W	111 ALVM	15.5	60	2E	9-17-58	BD-3																
(C-17-1) $34bdb_4$	Sanpete Fish & Game	W	111 ALVM	15.5	60	2E	9-17-58	BD-3																
(C-17-1) 34cdb	Sanpete Fish & Game	W	111 ALVM	15.5 12.0	60	2E	8-06-56 9-03-57	BD-3 BD-3	34	.46	51	44	143	8.7	227		48	282	.5	2.5	731	1,440	81	Li .6
(C-18-1) $35aba_3$	Wesley Johnson	W		16.5		1E	8-25-58	BD-3																Saline Taste
(C-19-1) 27dcd	Marlin Sorensen	W		15.5				BD-3										120						
(C-19-1) 35aba	L. E. Nielson	W		18.5	295	5R		BD-3										135						Perf. 55-58, 75-80
(C-19-1) 35bda	J. Stanfield	W		18.5	274	8R	1940	BD-3																
(D-20-1) 5dab	Roy Caldwell	W		16.0	93	5R	7-16-58	BD-3																
(C-21-1) $11aba_1$	Town of Redmond	W	111 ALVM	19.0 21.0	41	12R	8-22-57	BD-3 BD-3	40	.03	34	19	144	6.5	158		95	181	.5	.7	599	1,040	8.0	Li .6
(C-21-1) $11ada_2$	Town of Redmond	W		19.0	40	1E		BD-3																
(C-21-1) 13abd	R. E. Noyes	W	111 ALVM	19.0	291	50M	8-20-58	BD-3	51		35	15	104		147		94	112		.7	484	758	7.9	
(C-21-1) 26bdb	United Devel. Co.	OT W	120 TRTR	15.5	722	4M	7-02-58	BD-3	35	.03	34	18	86		134		92	98		1.2	430	715	7.6	
(C-21-1) 33acc	Roland Crane	W		15.5	200		8-08-56	BD-3																
(C-22-1) 9add	F. J. Gurney	W		15.5	300		2-28-58	BD-3																Water highly mineralized
(C-23-2) 19aac	Al Helquist	W		15.5	190		8-16-57	BD-3										25						
(C-23-2) 19dcc	Owen Ogden	W		16.5	88	.8M	8-14-57	BD-3																
(C-23-2) 23bdb	Venice Pumping Company	W		15.5	124	50E	2-25-58	BD-3										260						Developed Spring
(C-23-2) 26bcb	Verdon Oldroyd	W		15.5	60	1E		BD-3										80						
(C-23-3) 25bab	City of Richfield	W		16.0	781		7-06-60	BD-3	12		52	35	27		313		37	29		.4	341	576	7.7	Perf. 212-270, 332-398 420-462
(C-25-4) 13bdb	W. Wayland	W		16.0	70	5R	7-25-56	BD-3																
(C-25-4) 14add	Leon Taylor	W		19.5	65	5R	1936	BD-3																
(D-22-2) 15aac	Salina Irr. Co.	G W		19.0	2,000	675E	8-27-57	BD-3	11	.28	26	10	47	5.1	196		43	6.0	.4	.1	245	409	8.0	Li .4 Plugged below 620 Perf. at 425 & 600 ft.
(D-18-1) 19dabS	Fayette Spring	S	124 FLGF	18.0		1900M	8-27-57	BD-3	13	.0	49	43	99	1.9	305		43	152	.3	1.2	553	1,020	7.6	Li .3
(D-19-2) 4daaS	City of Gunnison	S	124 GRRV	19.5		450R		BD-3																
(C-21-1) 11aS 12b & cS	Town of Redmond	S	111 ALVM	19.0 21.0		6,000M 13 1/2 cfs	Aug. 1959 1906	BD-3 WSP-199																

Table 15-B. Central Sevier River Valley. Wells and Springs with Water Temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER												DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3				
(C-25-3) 34ccdS	Mrs. E. Woodbury Olsen Spring	S	111 ALVM	18.0		14E	4-10-57	BD-3	33		56	15	17		168		84	10		.3	298	475	7.6	Near Sevier fault
(D-21-1) 17cS	Salt	S		22.0		1 1/2	1906?	WSP-199																
(C-23-2) 25cS	Parcel Creek	S		15.5		60±	1906?	WSP-199																
(C-23-2) 25bS	Indian	S		15.5		75±	1906?	WSP-199																
(C-23-2) 27cS	Cove	S		15.5		9cfs	1906?	WSP-199																
(C-22-2) 1bS	Oak	S		16.0		3±	1906?	WSP-199																
(C-23-2) 23bS	Herrins Hole	S		17.0		450±	1906?	WSP-199																
(C-22-1) 5bac	Town of Aurora	W	111 ALVM	15.5 11.5	490	 200R	8-27-57 1952	BD-3 BD-3	34	.34	37	33	37	6.1	223		63	51 51	.3	2.9	375	631	7.9	Li .4
(C-23-2) 19dab	Wm. Hallows	W	111 ALVM	16.5 13.0	310		7-15-57 8-29-56	BD-3 BD-3	18	.0	51	33	15	3.2	294		26	21	.0	1.3	315	545	7.8	Li .4
(C-25-3) 28cad	E. Woodbury	W	111 ALVM	17.0 12.0	137	20R	7-30-57 7-21-56	BD-3 BD-3	22	.02	44	41	20	3.4	260	17	60	8	.8	6.8	343	593	8.7	
(C-25-4) 12abd	Ivan Mills	W	111 ALVM	15.5 12.0	25		7-31-57	BD-3 BD-3	51	.02	120	50	65	3.9	452	13	118	57 35	1.1	55	763	1,160	8.4	
(C-27-4 1/2) 36ccaS	Town of Marysvale	S	120 TRTR	16.0		200R	7-22-57	BD-3	12	.03	111	13	4.1	2.1	144		206	3.4	4.6	.1	429	638	7.8	Li 1.8
(C-25-3) 6cS	Jericho	S		18.5		670	1906?	WSP-199																
(D-19-1) 18dS	Gunn Ison	S		16.0		8±	1906?	WSP-199																

Table 16-A. San Pitch Valley. One Well and Two Springs with Water Temperatures of 20° to 55° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER															
(D-14-5) 16bdd	FBC Irr.	W	211 EMRY	55.0	9,108	293M	1-20-62	BD-14	17	.06	27	13	69	6.0	229	2	10	5	.7	1.1	302	471	8.0	H_2S B=.16 Cased to 5588. Plugged 5800-5900. Flow between plug & casing
(D-18-2) 13cadS	Crystal Livingston Warm	S	124 FLGF				2-06-41	BD-14	5.6	.05	26	15	129		421		86	55	.7	3.0	635		7.7	H_2S
							1-23-62	BD-14	11	.03	25	13	175	6.5	410	4	82	49	1.0	.6	587	893	8.3	Mn .01, B .26
				22.0		425M	10-20-65	BD-14														860		
				22.0		374M	1-27-66	BD-14														860		
				22.5		382M	4-27-66	BD-14														880		
				22.5		360M	8-03-66	BD-14														900		
				22.5		414M	11-04-66	BD-14														850		
(D-19-2) 4dca	Peacock (Nine Mile Warm)		124 FLGF	22.0			6-18-64	BD-14	12	.02	37	23	81	1.7	316	22	75	42	.0	.2	466	780	8.1	H_2S B=.21
				22.0		1,260M	8-19-65	BD-14														690		
				22.0		490M	12-06-65	BD-14																
				22.0		460M	2-03-66	BD-14														620		
				22.0		346M	4-26-66	BD-14														710		
				22.0		428M	7-28-66	BD-14														660		
				22.0		418M	11-04-66	BD-14														650		
				19.5			8-27-57	WRB-13	13		38	19	94	3.8	310		71	34	1.1	.1	429	711	8.3	

Table 16-B. San Pitch Valley. Wells and Springs with Water Temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER															
(D-15-3) 16dca	Rock Dam Irr.	W		17-19.0	648	1,070	7-26-66	BD-14														730		H_2S
(D-15-5) 10ba	B. E. Peterson	W		17.0	1,183	3E	10-25-66	BD-14														570		
(D-16-3) 20bad2	N. I. Olsen	W		15.5	120	10M	12-12-66	BD-14														520		
(D-16-3) 23cbc	T. Aagaard	W		16.0	208	5R	3-13-43	BD-14																
(D-16-3) 26ccb	P. C. Peterson	W		15.5	800	4M	12-13-66	BD-14														810		H_2S
(D-16-3) 27bac	N. Hansen	W		15.5	103	5R	3-16-43	BD-14																
(D-15-2) 13bbc	Brewers		Fault	15.5-17		207M	11-07-66	BD-14														420		Yield 190-234 in 1966 Conductance 390-430
(D-18-2) 35d	Morrison Coal Mine Tunnel			16-16.5		1,130M	8-02-66	BD-14														660		H_2S Yield 1830 10-15-65; yield 930, cond. 600 on 11-4-66
				16.0		5.64cfs	1906?	WSP-199																
(D-18-2) 23aS	Lowry	S	Fault	16.5		20	1906?	WSP-199																
(D-18-2) 13cS	Livingston Sulphur	S		14-16.5		10±	1906	WSP-199																
(D-18-3) 17bS	Manti Silver	S		18.5		12	1906	WSP-199																

Table 17. Uinta Basin-Ashley Valley. Temperatures of Water from Oil Wells, an Irrigation Ditch, and Ashley Creek.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(D-5-22) 22dca	Pan-Am Petrol ER10	O W	310-PSPR WEBR	44.5	4,330	53	11-03-59	WRB-1	19		85	27	52		238	0	227	4		.5	532	829	8.1	
(D-5-22) 23cca	Pan-Am Petrol ER1	O W	310-WEBR	49.0	4,278	90	11-03-59	WRB-1	20		155	38	198		340	0	519	108		3.3	1,210	1,860	7.9	
(D-5-22) 26abb	Pan Am Petrol ER2	O W	310-WEBR	46.0	4,251	55	11-03-59	WRB-1	22		242	56	261		317	0	874	162		4.1	1,780	2,460	8.0	
(D-5-22) 26bab	Pan Am Petrol	O W	310-WEBR	49.0	4,287	195	11-04-60	WRB-1	20	.05	192	43	171	27	270	0	681	116		.2	1,380	1,830	7.4	B .44
(D-5-22) 26aab	Composite ER 1, 2, 4, 5, 6, 8	O W		50.0			12-6-77	HG														1,800		
(D-5-22) 23cba	Equity AV-1	O W	310-PSPR WEBR	43.5	4,152	41	11-03-59	WRB-1	20		93	27	253		291	23	362	170		.5	1,090	1,590	8.6	
(D-5-22) 23bdc	Equity AV-7	O W	310-WEBR	44.5	4,230		11-03-59	WRB-1	21		112	30	158		260	20	379	76		.6	925	1,330	8.5	
(D-5-22) 23	Composite AV 1 to 9	O W					11-03-59	WRB-1	19		116	36	152		263	10	399	86		.0	947	1,350	8.4	
(D-5-22) 23cbc 23dba	Composite AV 2, 3, 4, 5, 7	O W		49.0 16.0			12-07-77 12-07-77	HG HG														1,580 1,150		Meas. at settling tank Meas. below settling ponds
(D-5-22) 23dcb	Hollandsworth & Travis	O W	310-WEBR	 56.0	4,130	4	11-03-59 12-07-77	WRB-1 HG	27		109	31	547		518	0	615	372		.5	1,960	2,560 2,400		
(D-5-22) 22acd	Pan Am Petrol #1 Gentry	O W	310-PSPR WEBR	46.0			11-04-60	WRB-I		.34	103	28	38	20	386	0	244	104		3.2	731	975	7.8	B .28
(D-5-22) 24ddd	Polumbus Corp. #1	O W		45.0			12-07-77	HG														2,500		
(D-5-22) 23cda	Thos. E. Hall #5S	O W		47.0			12-07-77	HG														1,620		
(D-5-22) 23cdb	Crain Griffith T. E. Hall #1	O W		50.0			12-07-77															1,600		
(D-5-22) 23ddb	Composite R. Lacy 3 & 4	O W		53.0			12-07-77	HG														2,700		
(D-5-22) 25bdb	Union Irr. Co.	D		 20.0		1900E 1000E	11-04-60 12-07-77	WRB-1 HG	10	.01	293	172	263	9.3	322	0	1,590	72		19	2,590	2,940 2,900	8.0	B .57 Checked at irrigation ditch
(D-5-22) 25adb	Ashley Creek	C		2.0			12-07-77	HG														3,700		Checked where road crosses stream

Table 19-A. Uinta Basin. Wells and Springs with Water Temperatures of 20° to 57.5°

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(D-6-23) 1bad	U.S.B.L.M. (Orig. Oil Test)	W	310-WEBR	43.5	2,650	200	6-25-57	BD-26	24	0	367	69	91	23	139	0	1,150	78	1.8	1.1	2,000	2,200	7.6	
				46.0			7-13-58	BD-26	9.7		357	75	104		141	0	1,150	80		.4	1,990	2,250	7.1	
(D-4-24) 16cddS	Split Mtn. Warm Spring	S	330-MSSP	30.0		2700E	9-19-48	BD-26	18		97	32	193		198	0	212	291		1.2	942	1,570		
U(B-1-8) 30ddbS	Warm Spring	S	310-WEBR	26.0		200E		BD-26	16	.02	85	27	23	4.4	190	0	180	24	.9	.08	454	704	7.4	
(D-8-20) 36baa	Shell Oil #1 State	W	124-PCCK	43.5	3,385		6-13-66	BD-26										11,500				53,700		Conductances don't agree with Cl content
			124-DGCK	57.5	4,783		6-21-66	BD-26										31,000				65,100		
(D-9-20) 36ddc	WOSCO Test Hole	W	124-GRRV	27.5	1,900-2,822		7-31-69	BD-26	9.2		2.8	.8	28,500	102	5,910	1,230	464	37,500	70	<.1	72,700	85,000	8.9	B 620
				23.5	1,900-3,234		7-31-69	BD-26	12		2.0	1.2	16,600	62	5,940	319	400	21,500	46	<.1	41,800	54,000	8.6	B 360
(D-13-19) 8aaS	U.S.B.L.M.	S	124-PCCK 124-EVCK	20.0		.3E	8-08-72	BD-26														2,200	E8.0	

Table 19-B. Uinta Basin. Wells and Springs with Water Temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER: SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(D-3-21) 30ddc$_1$	L. Hullinger	W	310-WEBR	17.0	2,715	250	10-22-57	BD-26	9.1		88	29	13		224	0	174	2.0		.2	425	653	7.3	
				16.5			10-08-58	BD-26	10		95	28	9		224	0	176	3.5		.1	432	654	7.7	
(D-3-21) 30ddc$_2$	L. Hullinger	W	310-WEBR	17.0	1,230		5-01-73	BD-26	9.7	0.13	81	31	6.5	3.1	220	0	170	1.5	1.2		413	648	7.5	
(D-6-25) 36cab	State of Utah	W	210-CRCS	17.0	1,420	0.5	9-26-56	BD-26	7.1		491	26	37	7.4	135	0	1,240	12		.00	1,890	2,050	7.6	
(D-11-21) 31bdd	Golden Hatch	W	124-GRRV	16.5	711	2	8-31-71	BD-26	15	.03	0.7	0.7	370	.9	562	65	220	9.3	.9		959	1,490	8.7	
U(C-2-1) 16bbb	L. E. Allred	W	123-DCRV	16.5	685	10	7-06-58	BD-26		<0.5					360	34		106						
U(C-3-2) 30cdd	Herbert Murphy	W	124-UINT	15.5	72		5-11-72	BD-26														1,950		
U(C-4-2) 1aaa	Chas. Cox	W	124-UINT	15.5			5-09-72	BD-26														3,500		
U(C-4-4) 1daa	D. W. Covington	W	112-OTSH	16.0	43	10	5-09-72	BD-26														720		
(D-11-21) 31bdd	Golden Hatch	W	124-GRRV	18.0	711	2.0	8-20-74	BD-29	17	.02	1.5	.3	340	1	534	62	210	5.8			951	1,450	9.3	Many trace elements
				15.0		1.4	12-24-74	BD-29																
(D-4-23) 23ddaS	Dinosaur NM	S	310-PRKC	15.5		4 M	11-18-58	BD-26	11		140	53	15		284	0	345	6		2.1	712	1,000	7.5	
(D-4-23) 26cabS	Dinosaur NM	S	221-ENRD	17.0			5-04-50	BD-26	10	0	78	37	13		272	0	124	13	.0	.3	409	752	7.8	
(D-4-23) 27bbaS	Dinosaur NM	S	220-NVJO	16.0		15 M	10-01-58	BD-26	11		67	26	11		223	0	102	5.0		.6	333	529	7.8	
(D-4-23) 27cbdS	Dinosaur NM	S	211-FRNR	15.5			7-12-58	BD-26	16		221	125	426		230		1,700	20	.3	2.5	2,770	3,100		
(D-4-25) 31ccaS	Near Dinosaur	S	310-WEBR	19.0			7-31-68	BD-26	11		51	29	3.9	1.2	248	0	44	2.7	.1	2.7	268	454	7.7	
(D-5-24) 32 S	Morris Ranch	S	310-WEBR	17.0		10 E	.	TP-15	13								1,220	80			1,960	2,410		
(D-6-24) 5acdS	Musket Shot Sp.	S	310-PRKC	16.5		.1E	5-11-73	BD-26	16	.03	240	64	88	27	108	0	910	192	1.2		1,420	1,810	7.4	
(D-6-24) 5S	Morris Ranch	S	310-WEBR	18.0		10 E		TP-15	13								485	51			911	1,260		
(D-7-20) 25bdS	SE of Leota	S	111-ALVM	15.5		40 E	10-06-48	BD-26	24		76	35	89		342	0	166	46		10	614	939		
(D-9-17) 21dca	U.S.B.L.M. Southern Basin	W	124-UINT	17.5	22	3	9-03-71	BD-26	11	.06	20	16	510	2.2	467		720	91	.2		1,600	2,350	8.3	Shallow Well. Water probably warmed by sun
(D-10-24) 2acd	U.S.B.L.M. Southern Basin	W	111-ALVM	18.5	12		7-13-58	BD-26	13		57	19	44		219		93	30		.8	365	635	7.5	
(D-12-21)19bddS	Sulphur Sp.	S	124-PCCK	19.5		20 E	8-30-71	BD-26	15	.02	1.6	.6	230	.8	352	32	150	6.3	.2		613	968	8.5	Probably related to nearby faults
(D-15-20)15bbdS	Flat Rock Mesa	S	124-PCCK	17.0		.2M	8-31-71	BD-26	16	.01	57	16	24	.4	242	0	57	7.9	.1		301	478	7.6	Probably warmed by sun; BDR-29 Reports Temps. of 3 to 12.5° flows .75 to 3 gpm
U(C-2-1) 27bcb	So. of Roosevelt	W	123-DCRV	18.5	160	2	7-06-58	BD-26							462	51		3,184						
U(C-2-1) 27dbb	So. of Roosevelt	W	112-OTSH	18.5	42	7	7-06-58	BD-26	9		4.0	1.5	147		246	0	77	37		2.3	383	639		
U(C-2-6) 14dbdS	Duchesne River	S	123-DCRV	18.0		5 E	7-04-58	BD-26	11		119	107	16		186	0	524	51		.2	1,004	1,274		
U(C-2-6) 14dbc	Duchesne River	W	112-OTSH	17.5	95	20	7-04-58	BD-26	13		90	64	24		457	0	138	16		.2	570	921		
U(C-2-6) 14dbcS	Duchesne River	S	123-DCRV	17.5			7-04-58	BD-26		<0.5					325			56						
U(C-3-2) 31bac	SW of Roosevelt	W	112-OTSH	15.5	48		5-09-72	BD-26														1,400		Shallow Well. Water probably warmed by sun
U(D-3-2) 7dda	At Randlett	W	112-OTSH	15.5	40		7-07-58		15		128	71	260		460	0	652	78		11	1,470	2,010		

Table 19-C. Uinta Basin. Gas and Water Wells with Temperatures of 17° to 34° C. (Monitored by USGS).

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER: SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(D-10-21) 16add	Gas Producing	G	124 GRRV	27.0	5,604	10	8-21-74	BD-29	17	.1	1.5	.2	900	3.6	1,590	0	110	380		.08	2,310	3,750	8.3	Many Trace Nitrate + Nitrite as N
	Enterprises			21.5			6-25-75	BD-29	16	.13	3.8	.5	1,000	2.8	1,500	73	130	500	27	.01	2,510	4,060	8.6	Elements Other Temps 21°-31°
(D-10-21) 2aca	Depco Inc.	G	124 GRRV	17.0	6,479		6-25-75	BD-29	11	.05	1.1	.5	3,400	11	4,140	963	58	1,700	120		8,380	12,000	8.5	
(D-10-22) 17aad	U.S.B.L.M.	G	124 GRRV	21.5	7,005	3.2	8-21-74	BD-29	15	.09	2.1	1.2	2,400	11	779	0	140	3,200		.03	6,190	>8,000	8.3	Many Trace Nitrate + Nitrate as N
				22.5		3.0	6-25-75	BD-29	15	.06	4.0	1.0	3,100	11	1,950	307	100	3,300	25	.01	7,880	11,900	8.5	Elements Other temps 20.5°-33.5°
(D-11-23) 13dcd	Shamrock Oil & Gas Corp.	G	124 GRRV	26.0	5,857	10 E	6-25-75	BD-29	14	.04	5.8	.7	420	1	602	51	310	36	2.8		1,140	1,770	8.8	Many Trace Elements Other temps 23.5°-27.5° Yields 34 - 7.1
(D-11-24) 6dbc	U.S.B.L.M.	G, W	124 GRRV	28.5	5,950	40	9-10-74	BD-29	15	.02	1.9	.8	400	1.1	568	0	360	33	2.0		1,100	1,600	8.3	Many Trace Other temps 25° - 29°
				28.0		50	6-26-75	BD-29	16	.02	1.7	.5	410	.9	510	34	390	31	2.0		1,150	1,720	9.0	Elements Yields 36-60 *
(D-11-24) 7cac	U.S.B.L.M.	G, W	124 GRRV	26.5	5,840	36	9-10-74	BD-29	14	.02	3.4	.4	420	1.1	742	0	290	23	3.8		1,130	1,700	8.3	Many Trace Other temps 24.5°-27.5°
				26.5		37	6-28-75	BD-29	13	.04	1.9	.7	430	1.0	693	30	300	22	4.7		1,150	1,770	8.8	Elements Yields 30-39**
(D-11-24) 8caa	Shamrock Oil	G	124 GRRV	26.5	6,569	18	9-10-74	BD-29	14	.02	1.9	.2	390	1.1	574	0	350	27	2.0		1,070	1,700	8.3	Many Trace Other temps 24°-27°
	& Gas Corp.			26.0		17	6-26-75	BD-29	14	.03	3.0	.2	390	.9	498	40	380	25	2.1		1,110	1,770	8.9	Elements Yields 16-21
(D-10-20) 35bbc	U.S.B.L.M.	G, W	124 GRRV	31.0	5,672	18	8-20-74	BD-29	16		1.6	.8	900	3.4	1,480	165	16	300			2,150	3,250	8.6	Many Trace Elements Perf. at 2,500 ft. Plugged below 4,650

*Perf. 1072-77; Plugged below 2200

**Perf. 1158-1160; 1138-1540 Plugged below 2396

Table 20-A. Northern Utah Valley. Wells and Springs with Water Temperatures of 20° to 46° C.

*Numbers refer to figure 8

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER: SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH		OTHER CONSTITUENTS OR REMARKS
(C-5-1) 23bda	S. J. Shelley	W	112 PLCN	21.0	106		5-05-58	BD-2	26		182	55	213		233		438	352		.6	1,380	2,300	6.9	1*	
(C-5-1) 24dcd	V. V. Stake LDS Church	W	112 PLCN	23.0	90		6-05-57	BD-2	36		128	44	156		255		266	218		.0	1,060		7.5	2	
(C-5-1) 24ddc	W. D. Ennis	W	112 PLCN	21.0	90			BD-2																3	
(C-5-1) $25abc_3$	Board of Canal Presidents	W	112 PLCN	24.0	198	50	4-21-58	BD-2	34		180	51	204		330		386	302		1.7	1,320	2,080	7.0	4	
(C-5-1) 25bad	Board of Canal Presidents	W	112 PLCN	22.0	100		4-21-58	BD-2			167	54			328		385					2,080	7.2	5	
(C-5-1) 25bbcS		S	111 ALVM	43.5			6-04-58	BD-2	28		191	52	235		320		441	338		2.5	1,440	2,230	7.3	6	
(C-5-1) 25cba	Sugarhouse Stake LDS	W	112 PLCN	35.0	100		4-25-58	BD-2	33		192	51	277		322		422	338		1.4	1,420	2,240	7.7	7	
(C-5-1) 25cbb	Sugarhouse Stake LDS	W	112 PLCN	35.0	147	150	8-09-55	BD-2	27	2.8	192	50	246		339		448	338		.0	1,568		7.2	8	
(C-5-1) $25cbd_1$	Sugarhouse Stake LDS	W	112 PLCN	35.0	93		4-25-58	BD-2			192	53			352		420				2,280		7.2	9	
(C-5-1) $25ccb_2$	Wilford Stake LDS	W	112 PLCN	35.0	147	100	4-29-58	BD-2	30		188	52	229		316		426	338		1.1	1,420	2,230	7.3	10	
(C-5-1) $25ccc_4$	F. Eastmond	W	112 PLCN	46.0	105	125	5-28-53	BD-2	21	.29	179	55	229		317		413	343	1.8	.5	1,506		7.1	11	
(C-5-1) 25cdcS		S	111 LCST	41.5			5-27-58	BD-2	27		180	49	232		320		425	318		1.3	1,390	2,140	7.3	12	
(C-5-1) 26aadS		S	111 ALVM	43.5				BD-2																13	
(C-5-1) 26bdb	M. Shiba	W	112 PLCN	30.0	500		4-29-58	BD-2	29		158	52	197		310		328	312		1.4	1,230	1,990	7.2	14	
(C-6-1) 1aabS	Fault-Zone Sprg.	S	Fault	32.0			5-04-40	BD-2	25	6.0	124	61	202	12			509	440			1,668		7.8	15	Fe includes Al_2O_3
(D-6-2) $5acc_4$	U.S. Steel	W	120 TRTR	20.5	1,063	2,000	6-29-55	BD-2	11	.24	29	8.9	19		146		21	6.0	.25	.0	157		7.9	26	
(D-6-2) 8acb	U. S. Steel	W	120 TRTR	20.5	1,192	3,700		BD-2																27	
(D-6-2) $8bca_6$	U. S. Steel	W	120 TRTR	20.5	1,066	2,800		BD-2																28	
(D-6-2) $8bdd_4$	U. S. Steel	W	120 TRTR	21.0	830	2,200	12-07-48	BD-2	15	.3	25	9.4	7.8		168		8.2	14	.25	0	141		8.0	29	
(D-6-2) $8cac_5$	U. S. Steel	W	120 TRTR	20.5	1,190	2,850		BD-2																30	
(D-6-2) 8cda	U.S. Steel	W	120 TRTR	20.5	1,090	3,900		BD-2																31	
(D-7-1) 5ccb S		S		25.0			9-11-58	BD-2	15		144	58	342		348		325	510		.8	1,570	2,570	6.9	32	
(D-7-1) 8bbc S		S	111 ALVM	24.0			9-11-58	BD-2	16		88	59	342		196		314	510		.8	1,430	2,430	7.5	33	
(D-8-1) 2ccb S		S	111 ALVM	30.5				BD-2																37	
(D-8-1) 2ccd S		S	111 ALVM	30.5				BD-2																38	
(D-8-1) 3dcd S		S	111 ALVM	30.5				BD-2																39	

Table 20-B. Northern Utah Valley. Wells with Water Temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(C-5-1)14caa	O. Godfrey	W	112 PLCN	15.5	250		5-05-58	BD-2	34		58	28	127		206		110	176		4.8	639	1040	7.8	
(C-5-1)25abc	Utah P & L Co.	W	112 PLCN	16.5	90		4-21-58	BD-2			100	31			206		167					1180	7.4	
(D-5-1)4bcc	Lehi Irrigation Co.	W	112 PLCN	15.5	655	1200	7-01-58	BD-2	24		42	18	28		188		16	49		1.8	271	468	7.9	
(D-6-1)29dab	R. Cederstrom	W	112 PLCN	15.5	165		4-24-58	BD-2	41		29	15	44		263		3	7.5		.2	269	436	7.6	
(D-7-3)7dcc	LA & SL RR Co.	W	112 PLCN	18.0	270	200	4-21	BD-2																
(D-7-3)32bcc	Wood Springs Irr. Co.	W	120 TRTR	16.5	414		2-11-59	BD-2	15		43	15	24		246		3.1	10		1.6	233	403	8.2	
							9-15-60	BD-16	15		44	13	24	1.6	245		4.5	12	.2	1.2	224	387	8.0	

Table 21-A. Southern Utah and Goshen Valleys. Wells with Water Temperatures of 20° to 34° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER: SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(C-8-1)16cbb	Del Chipman	W	111 ALVM	20.0	392		6-49	BD-16																16 Abandoned
(C-8-1)20cdb	L.W.Fitzgerald	W	111 ALVM	20.0	205	15R	11-11-45	BD-16																17
				14.0			5-06-66	BD-16			77	34	133	18	311	0	96	205			762	1270	8.2	
(C-8-1)32bcb	J.H. Allen	W	111 ALVM	20.0	265	15R	12-05-45	BD-16																18 Other appreciably different analyses in BD-16
				14.5			5-02-66	BD-16			45	21	155	15	229	0	96	188			647	1040	7.6	
(C-10-1)24ddc	Kearns Stake LDS	W	111 ALVM	22.0	530	216R	9-10-65	BD-16																19
(C-10-1)28ada	Elberta Land & Water Co.	W	111 ALVM	20.0	335	50R	11-23-51	BD-16																20
				20.0			8-07-64				81	34	125	18	285	0	126	269			800	1490	8.1	
(C-10-1)29cdd	Lazy S Cattle Co.	W	111 ALVM	22.0	862	1642	6-14-66	BD-16																21 Other analyses available BD-16
				22.5			8-07-64	BD-16			62	16	26	9.8	198	0	46	58			373	585	8.0	
(C-10-1)32ccc	Lazy S Cattle Co.	W	111 ALVM	20.0	515	2210	8-07-64	BD-16			65	23	38	10	177	0	83	87			484	702	8.0	22
				20.0			6-15-66	BD-16	62		73	24	36	9.9	190	0	55	86	.5	29	491	736	8.0	B.02
(C-10-1)33aba	Max Thomas	W	111 ALVM	20.0	425		8-07-64	BD-16			180	85	185	32	120	11	155	686			1780	2570	8.4	23
(D-7-3)20bda	Reilly Tar & Chem Co.	W	111 ALVM	22.0	337	<1E	6-10-64	BD-16			3.0	.2	39	2.0	73	2.7	15	12			115	203	9.6	35 It is not likely that these samples were from same well. H.G.
				22.0			6-21-65	BD-16			36	10	50	3.5	237	4	26	12			259	431	8.6	
(D-8-2)16ccd	Mark Hall	W	120 TRTR	20.0	675	3	7-09-65	BD-16			29	24	35	15	188	6	51	33			331	480	8.3	41
				19.5			5-19-64	BD-16			36	22	34	15	198	8	48	36			345	516	8.6	
(D-8-2)28ccc	Oral Bartholomew	W	111 ALVM	34.0	276	200R	5-28-64	BD-16	85		35	14	83		196		43	84		.1	441	625	7.7	42
				33.0			6-16-66	BD-16	77		42	16	65	2.4	201		48	79	.6	2.8	451	668	8.0	B.08
(D-8-2)29ada	Newland Hansen	W	111 ALVM	20.0	500	27	3-27-67	BD-16																43
(D-8-2)32aad	Ken Young	W	111 ALVM	26.5	117	1.5	9-28-64	BD-16																44
(D-8-2)33bbb	R.T. Herbert	W	111 ALVM	31.5	220		1-20-67	BD-16																45
(D-9-3)5cdc	John Koyle	W	111 ALVM	20.0	105	10R	10-11-45	BD-16																46

Table 21-B. Southern Utah Valley. Wells with Water Temperatures of 15.5° to 19.5°C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER															
(D-7-2) $35ccd_2$	Angus Hales	S	111 ALVM	16.0	420	90 R	5-12-64	BD-16			50	17	18	4.7	268	0	7.2	9.9			258	436	8.1	
(D-7-2) 36ccb	W. J. Money	W	111 ALVM	18.5	504	170	7-27-64	BD-16																
(D-7-2) $36dbc_3$	Kolob Farms	W	111 ALVM	15.5	450	4.3	3-23-67	BD-16																
(D-7-2) $36dcc_4$	C. A. Spafford	W	111 ALVM	16.5	522	587	10-27-65	BD-16																
(D-7-3) 20acb	Utah Co. Packing Co.	W	111 ALVM	15.5	315	2 R	5-19-64	BD-16			54	16	35	3.1	267	4.2	19	24			310	534	8.4	
				15.5			6-21-65	BD-16			21	17	38	3.5	171	8	19	27			228	425	8.6	
(D-7-3) $20bcd_1$	Pacific States Cast Iron Pipe	W	111 ALVM	16.0	325	80 R	6-10-64	BD-16	3.4		46	11	38	3.1	273	0	3.4	15			253	476	8.0	
(D-7-3) $20bcd_2$	Pacific States Cast Iron Pipe	W	111 ALVM	16.5	308	80 R	1-22-47	BD-16																
(D-7-3) $20bcd_3$	Pacific States Cast Iron Pipe	W	111 ALVM	16.5	635	70 R	1-15-47	BD-16																
(D-7-3) $20bcd_4$	Pacific States Cast Iron Pipe	W	111 ALVM	16.5	478	75 R	1-11-47	BD-16																
(D-7-3) 20bdb	Reilly Tar & Chemical Co.	W	111 ALVM	15.5	560	<1 E	6-10-64	BD-16			32	12	51	3.5	210	15	28	13			266	445	8.5	
				14.0			4-20-66	BD-16			46	11	52	3.1	322	0	0	13			314	528	8.0	
(D-7-3) 28bdb	U.S. Fish & Wildlife	W	112 PLCN	17.0	338	1200 R	6-21-63	BD-16	14		188	63	69		258	0	537	78		.6	1,080	1,490	7.5	
				18.0			5-11-64	BD-16			191	68	60	5.1	234	0	562	82			1,140	1,470	8.0	
(D-7-3) 28cab	Park Ro She Corp	W	111 ALVM	15.5	290	30 R	9-15-64	BD-16																
(D-8-1) 11cbd	W. J. McClain	W	111 PLCN	16.5	151	.14	5-19-64	BD-16			56	17	48	16	128	5.4	48	122			435	876	8.4	
				16.0			6-25-65	BD-16			49	20	48	15	151	0	36	121			424	669	8.2	
(D-8-1) 12dda	W. A. Cornaby	W	111 ALVM	15.5	196	.6	7-06-64	BD-16																
(D-8-1) 13aaa	R. G. Francis	W	111 ALVM	16.0	358	7.5	7-06-64	BD-16																
(D-8-1) $13daa_3$	D. F. Meecham	W	111 ALVM	19.0	460	48	5-18-64	BD-16			40	22	18	11	181	9.0	51	17			313	431	8.6	
				19.0			6-25-65	BD-16			20	23	19	10	154	5	40	16			268	375	8.4	
(D-8-2) 3ccd	L. M. Banks	W	111 ALVM	15.5	420	40 R	7-19-65	BD-16			17	18	23	5.5	154	14	13	8.2			195	310	8.5	
				13.0			12-07-61	BD-16																
(D-8-2) 4bcb or 4bcc	Lakeside Irr. Co.	W	120 TRTR	16.5	544	36	5-12-64	BD-16			24	10	51	3.5	215	8	14	9.2			240	396	8.4	
				16.5			4-20-66	BD-16			20	11	50	3.1	246	0	0	8.5			246	381	8.0	
(D-8-2) 4dad	W. M. Sorensen	W	120 TRTR	18.0	634	70 R	5-19-64	BD-16			31	13	37	3.9	204	13	15	7.8			220	371	8.6	
				18.0			8-19-64	BD-16	34		29	12	41		234	0	2.5	12		.3	230	354	8.1	
(D-8-2) 7bcc	I. E. Carlson	W	111 ALVM	17.0	370	30 E	6-10-64	BD-16			35	28	27	9.4	200	19	51	16			316	480	8.8	
(D-8-2) 7cab	H. L. Brooks	W	111 ALVM	17.0	263	30	8-20-64	BD-16																
(D-8-2) 7cbd	J. R. Nelson	W	111 ALVM	18.0	167	30	8-20-64	BD-16																
(D-8-2) 7dbc	Mark Hall	W	111 ALVM	15.5	550	4	10-10-62	BD-16			28	29	25	9.0	212	12	31	20			300	483	8.4	B.07
(D-8-2) 7dda	M. E. Hall	W	111 ALVM	16.0	276	6 R	6-03-64	BD-16			26	24	19	5.9	184	9	26	13			247	391	8.5	
(D-8-2) 7ddd	M. E. Hall	W	111 ALVM	16.0	520	5	4-12-40	BD-16																
(D-8-2) 8aaa	Elliot Sabey	W	111 ALVM	16.5	131	1	10-10-62	BD-16			28	30	70	7.4	326	29	0	37			355	641	8.7	B.18
(D-8-2) 8bba	Richard Hunter	W	111 ALVM	15.5	400	10	10-10-62	BD-16			24	19	27	4.7	203	11	2.5	12			209	340	8.6	

Table 21-B. Southern Utah Valley. Wells with Water Temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(D-8-2) 8bbb$_2$	E. L. Ottesen	W	111 ALVM	18.0	361	14	5-19-64	BD-16			34	21	23	7.0	220	5	20	14			249	414	8.5	
(D-8-2) 8dcc	J. C. Bellows	W	111 ALVM	16.0	294	3	5-19-64	BD-16			35	21	21	6.3	223	0	23	14			254	414	8.0	
(D-8-1) 13aad	J. A. Sorensen	W	111 ALVM	16.5	300	5 E	7-06-64	BD-16																
(D-8-1) 13add	Jess Shepherd	W	111 ALVM	16.5	291	15	5-19-64	BD-16			34	25	15	8.6	196	9.3	40	11			288	415	8.5	
(D-8-1) 14dad	C. B. Turkey Inc.	W	111 ALVM	16.0	347	25	1-03-67	BD-16																
(D-8-1) 35bdd	Erma Schramm	W	111 ALVM	16.0	300			BD-16																
(D-8-2) 2abd	L. M. Banks	W	111 ALVM	16.5	350		7-19-65	BD-16			18	20	18	3.5	145	10	21	11			183	308	8.5	
(D-8-2) 2bcd	M. F. Nilsen	W	111 ALVM	16.0	235	15	3-17-65	BD-16																
(D-8-2) 2caa	G. Thomas	W	111 ALVM	15.5	377	30	7-19-65	BD-16			19	20	17	3.9	156	7	9.1	15			181	307	8.5	
(D-8-2) 2cbc	A. E. Evans	W	111 ALVM	15.5 14.5	425	10	 6-23-65	BD-16			 14	 20	 19	 4.3	 156	 5	 15	 8.9			 185	 299	 8.5	
(D-8-2) 2cda	T. D. Roach	W	111 ALVM	16.0	140	15	8-06-64	BD-16																
(D-8-2) 2daa	R. D. Williams	W	111 ALVM	16.0	356	72	8-06-64	BD-16	25		51	21	22		276	0	17	12			275	454	7.7	
(D-8-2) 2ddb	Henry Prior	W	111 ALVM	16.0	380	15	8-06-64	BD-16																
(D-8-2) 3aad	Banks Monk	W	111 ALVM	16.0	413	30	3-17-65	BD-16																
(D-8-2) 3adb	J. H. Monk	W	111 ALVM	16.5	515	1 R	7-19-65	BD-16			20	15	39	2.0	191	9	11	10			205	348	8.6	
(D-8-2) 3dac	Alvin Crump	W	111 ALVM	16.0	440	10	8-06-64	BD-16																
(D-8-2) 4aab	A. T. Banks	W	111 ALVM	15.5	408	33	4-03-67	BD-16																
(D-8-2) 5acd	Dell Argyle	W	111 ALVM	16.5 14.0	245	3	7-09-65 8-20-64	BD-16 BD-16			17	14	64	3.5	228	18	12	11			274	436	8.7	
(D-8-2) 9aad	A. T. Banks	W	111 ALVM	15.5	385	35	8-24-64	BD-16																
(D-8-2) 9dcc	H. E. Anderson	W	111 ALVM	15.5	280			BD-16																
(D-8-2) 10adb	Hyrum Ottesen	W	111 ALVM	17.0	586	80	5-31-66	BD-16																
(D-8-2) 10bbd$_2$	Leo Banks	W	111 ALVM	15.5	480	15	8-24-64	BD-16																
(D-8-2) 10bdd	F. L. Sorenson	W	111 ALVM	16.0	411	40 R	2-19-55	BD-16																
(D-8-2) 11adb	F. R. Hansen	W	111 ALVM	17.0	204	<1 E	8-25-64	BD-16																
(D-8-2) 11bcd$_2$	R. R. Hansen	W	111 ALVM	16.0	420	4	8-25-64	BD-16																
(D-8-2) 11cca$_3$	Neldon Nash	W	111 ALVM	16.0	492	20 E	6-11-64	BD-16			36	20	18	3.5	228	0	15	11			219	401	8.2	
(D-8-2) 12bdc	Nathan Hales	W	111 ALVM	17.0 11.5	199	<1 E	 5-13-64	BD-16 BD-16			 46	 28	 72	 7.8	 318	 7	 52	 49			 404	 697	 8.3	
(D-8-2) 13abc	K. L. Johns	W	112 PLCN	15.5 14.0	378	88	 5-13-64	BD-16 BD-16			 49	 25	 12	 2.3	 220	 4	 40	 17			 266	 448	 8.3	
(D-8-2) 13bdd	R. P. Pace	W	112 PLCN	16.0 18.0	378	135 E	5-20-64 6-22-65	BD-16 BD-16			46 20	23 25	12 13	2.0 7.0	221 140	1 7	24 31	18 16			261 208	433 337	8.3 8.4	
(D-8-2) 14bba$_3$	W. E. Hansen	W	111 ALVM	16.0	570	10.5	4-21-64	BD-16																

Table 21-B. Southern Utah Valley. Wells with Water Temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(D-8-2) 10abd$_2$	Palmyra Ward LDS	W	111 ALVM	13.5	445	25 R	11-25-53	BD-16																
				15.5			7-19-65	BD-16			15	20	18	4.7	138	10	19	9.9			185	294	8.6	
(D-8-2) 14bcd	Everett Hansen	W	111 ALVM	15.5	424	7 R		BD-16																
				17.0			7-20-65	BD-16			20	20	17	3.1	150	12	15	11			192	315	8.7	
(D-8-2) 14dcc	W. G. Johns	W	111 ALVM	15.0	377	10	5-19-64	BD-16			53	21	14	2.3	253	2	24	11			263	447	8.3	
				15.5			7-09-65	BD-16			50	22	15	2.0	262	0	20	9.9			264	434	7.9	
(D-8-2) 15aca	M. J. Hansen	W	111 ALVM	15.5	403	25 R	5-01-46	BD-16																
(D-8-2) 15ddb	P. A. Johnson	W	111 ALVM	16.5	468	20	5-19-64	BD-16			40	14	30	2.7	227	8	12	9.9			243	393	8.5	
				16.5			4-19-66	BD-16			37	14	29	2.3	256	0	0	9.9			239	404	7.8	
(D-8-2) 16bcb	Florence Barney	W	111 ALVM	16.5	459	3	5-19-64	BD-16			31	23	26	7.0	223	9	21	12			254	412	8.6	
(D-8-2) 16caa	W. G. Foster	W	111 ALVM	16.5	640	142	9-02-64	BD-16																
(D-8-2) 17ada	Bert Hansen	W	111 ALVM	18.5	466	4	9-03-64	BD-16																
(D-8-2) 17baa	J. W. Bingham	W	111 ALVM	15.5	380	5.6	4-05-67	BD-16																
(D-8-2) 17ccc$_2$	Allen Clayson	W	111 ALVM	17.0	363	60		BD-16																
				18.0			5-19-64	BD-16			37	21	22	7.0	234	0	26	12			278	429	8.2	
(D-8-2) 17dcc	B. Shepherd	W	111 ALVM	17.0	340	20		BD-16																
				18.0			6-03-64	BD-16			35	21	29	7.4	211	12	33	13			278	434	8.4	
(D-8-2) 18bdc	Louis Then	W	111 ALVM	18.0	365	12	9-03-64	BD-16																
(D-8-2) 19add	A. Beckstrom	W	111 ALVM	18.0	480	20	9-03-64	BD-16																
(D-8-2) 20cad$_1$	Ivan Hawkins	W	111 ALVM	16.5	450	8.8	3-28-67	BD-16																
(D-8-2) 20cad$_2$	C. E. Hawkins	W	111 ALVM	16.5	420	2	3-28-67	BD-16																
(D-8-2) 20ddd$_2$	A. Beckstrom	W	111 ALVM	18.5	412	5	5-26-64	BD-16			39	11	38	8.6	206	13	28	11			286	434	8.6	16.5° BD-16
				19.5			6-25-65	BD-16			18	16	39	8.2	154	9	44	12			264	361	8.5	
(D-8-2) 21aaa	J. M. Argyle	W	111 ALVM	16.5	498	90 R	7-20-65	BD-16			17	18	29	3.5	168	6	16	9.6			187	306	8.5	
(D-8-2) 21abb	Fay Huff	W	111 ALVM	15.5	161	<1 E	9-22-64	BD-16																
(D-8-2) 21bab$_2$	Lynn Argyle	W	111 ALVM	16.0	346	6	9-14-64	BD-16																
(D-8-2) 21ddd	B. Anderson	W	111 ALVM	16.5	347	30	5-18-64	BD-16			37	15	28	3.5	218	5	15	9.9			216	383	8.4	
				16.0			6-24-65	BD-16			15	16	29	3.5	156	7	17	9.2			189	287	8.6	
(D-8-2) 22cdc	Utah Hide & Tallow Co.	W	111 ALVM	18.5	620	60 R	5-22-35	BD-16																
				16.5			5-19-64	BD-16			38	14	28	4.3	209	9	16	9.6			203	378	8.6	
(D-8-2) 22cdc$_2$	Utah Hide & Tallow Co.	W	111 ALVM	17.0	385	100 R	5-17-57	BD-16																
(D-8-2) 23bdc	C. Marcuson	W	111 ALVM	16.5	370	24 R	9-15-64	BD-16																
23bdc$_2$				17.0			5-20-64	BD-16			46	19	12	1.6	228	0	24	8			202	400	8.2	14° 4-19-66 BD-16
(D-8-2) 23dbd$_2$	U & I Sugar Co.	W	111 ALVM	16.5	390	275	5-18-64	BD-16			44	22	13	2.0	223	3	27	11			239	409	8.3	
(D-8-2) 23dca$_2$	U & I Sugar Co.	W	120 TRTR	16.5	569	82	5-27-64	BD-16	25		46	20	25		266	0	16	14		.1	265	435	7.8	
(D-8-2) 25bcc	E. H. Davis	W	111 ALVM	16.0	309	4.7	9-22-64	BD-16																
(D-8-2) 25cdd$_2$	H. C. Snell	W	111 ALVM	15.5	212	20 R	2-26-62	BD-16																

Table 21-B. Southern Utah Valley. Wells with Water Temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER															
(D-8-2) 25dac$_3$	California Packing	W	111 ALVM	16.0	620	513		BD-16																
				16.5			9-14-64	BD-16	24		51	25	8.2		274	0	1.6	13		.3	282	452	8.1	
(D-8-2) 26aad$_3$	R. S. Creer	W	111 ALVM	16.5	223	10 R	10-13-61	BD-16																
(D-8-2) 26bab$_3$	H. J. Thomas	W	111 ALVM	15.5	388	2	7-20-65	BD-16			49	20	14	2.3	249	0	20	11			253	435	8.0	
(D-8-2) 26cac	Roy Creer	W	111 ALVM	18.5	357	14.1	3-06-36	BD-16																
(D-8-2) 27aaa$_2$	I. D. Beck	W	111 ALVM	16.0	348	1 E	9-28-64	BD-16																
(D-8-2) 27bba$_2$	R. Anderson	W	111 ALVM	15.5	275	1	9-23-64	BD-16																
(D-8-2) 28bad$_2$	T. L. Johnson	W	111 ALVM	18.0	500	4 R		BD-16																
				20.5				BD-16			21	16	44	1.3	210	13	9.1	18			285	420	8.6	
(D-8-2) 28bcc$_5$	A. G. Hone	W	111 ALVM	15.5	160	1.5	9-25-64	BD-16																
(D-8-2) 28cca$_2$	S. L. Thornton	W	111 ALVM	18.0	200	<1 E	9-25-64	BD-16																
(D-8-2) 28ddd	Ralphy Balzly	W	111 ALVM	16.0	242	.5	9-25-64	BD-16																
(D-8-2) 29aaa$_7$	R. L. Hickman	W	111 ALVM	15.5	390	5	9-25-64	BD-16																
(D-8-2) 29aaa$_8$	Rex Steele	W	111 ALVM	15.5	175	4	9-25-64	BD-16																
(D-8-2) 29ddd	H. Clayson	W	111 ALVM	17.0	171	6	9-28-64	BD-16																
(D-8-2) 31cdb$_2$	S. Scharrer & D. Tanner	W	111 ALVM	19.0	230	30	8-04-64	BD-16	63		34	17	40		230	0	29	15	0	.1	300	428	7.7	
(D-8-2) 32daa	Benjamin Cemetery	W	111 ALVM	15.5	247	50 E	9-23-64	BD-16																
(D-8-2) 32ddc	K. Dixon & A. B. Bayer	W	111 ALVM	19.0	341	2	10-20-64	BD-16																
(D-8-2) 33bdc	Ralph Balzly	W	111 ALVM	18.0	185	10		BD-16																
				17.0			5-03-65	BD-16	62		30	17	59		302	0	7.4	12		.1	331	485	8.0	
(D-8-2) 36dbd$_3$	B. E. Cloward	W	111 ALVM	16.5	38			BD-16																
(D-8-3) 17dda	Mark Hansen	W	111 ALVM	15.5	125	8 R	5-08-54	BD-16																
(D-8-3) 18bdc	J. E. Clark	W	112 PLCN	16.0	368	200 R	5-18-54	BD-16			48	25	11	2.3	234	5	28	16			239	446	8.4	
(D-8-3) 20bab	Neil Bona	W	111 ALVM	15.5	295	16	8-13-64	BD-16			55	21	53	5.5	326	16	26	19			349	609	8.3	
				15.5			7-29-65	BD-16			52	24	52	5.5	362	7	13	18			366	594	8.4	
(D-8-3) 22cac	J. H. Westwood	W	120 TRTR	15.5	541	1500	8-31-64	BD-16	21		69	23	49		268	0	84	48		.5	428	688	8.2	
				15.			7-15-64	BD-16			41	12	44	3.5	171	0	82	53			356	581	8.2	
(D-8-3) 32bba	J. C. Holt	W	111 ALVM	15.5	275	25 R	11-25-53	BD-16																
(D-9-1) 14ada	O. G. Stewart	W	111 ALVM	16.5	55	10 R	1-27-45	BD-16																
(D-9-1) 14ddd	C. W. Nay	W	111 ALVM	18.5	125	10 R	2-04-50	BD-16																
(D-9-1) 24cab	Bliss Hyatt	W	111 ALVM	16.5	71	10 R	10-19-61	BD-16																
(D-9-2) 1baa$_2$	E. A. Tiffany	W	111 ALVM	16.5	200	4 R	7-27-65	BD-16			66	44	48	11	417	0	70	36			470	808	8.1	Also temp. 15.5° BD-16
(D-9-2) 1bcb	Spanish Fork Stake, LDS	W	111 ALVM	17.0	740	480	8-13-66	BD-16			41	13	20	3.5	228	0	5.8	9.9			252	385	8.1	
				19.5			9-02-66	BD-16			29	13	39	3.5	236	4.6	5.8	5.7			220	390	8.4	

Table 21-B. Southern Utah Valley. Wells with Water Temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER: SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(D-9-2) 4cdc	Island Ranching Co.	W	111 ALVM	16.5	310	20 R	7-29-43	BD-16																
(D-9-2) 7dcc	S. L. Spencer	W	112 PLCN	16.5	310	45 R	6-03-64	BD-16			50	25	42	11	223	13	77	33			372	599	8.3	
(D-9-2) 9ddb	Jack Spencer	W	111 ALVM	15.5	200	20 R	9-19-64	BD-16																
(D-9-2) 10dac	D. Christensen	W	111 ALVM	16.5	360	41	8-31-66	BD-16	17		38	27	20		194	0	41	32		4.1	264	463	7.9	
(D-9-2) 11aca$_3$	D. C. Cole	W	111 ALVM	15.5	285	250 R	12-13-58	BD-16																
(D-9-2) 1dcd$_2$	D. L. Davis	W	111 ALVM	16.0	293		7-27-65	BD-16			45	23	19	2.3	238	7	22	15			244	446	8.5	
				15.0		18 R	4-10-62	BD-16																
(D-9-2) 15aac	J. D. Francom	W	111 ALVM	15.5	75			BD-16																
(D-9-2) 19ddb	Orlo Carson	W	111 ALVM	16.5	112	15 R	11-29-51	BD-16																
(D-9-2) 22bda	R. B. Allred	W	111 ALVM	19.0	814	40 R	4-19-58	BD-16																
(D-9-2) 32bac	C. Ashton	W	111 ALVM	16.0	367	325 R	11-12-53	BD-16																
				15.0			6-01-64	BD-16			61	33	13	1.6	289	0	61	13			313	563	7.8	
(D-9-3) 6baa	W. E. Hunt	W	111 ALVM	15.5	260	40 R	6-20-57	BD-16																1acd destroyed in 1965
(D-10-1) 1acd	East Santaquin Irr. Co.	W	111 ALVM	16.5	798	520 R	8-03-60	BD-16																
(D-9-2) 15bbb	F. A. Schramim	W	111 ALVM	16.5	132		7-27-65	BD-16			36	26	16	2.8	192	3	36	24			259	429	8.3	
(D-9-2) 31cdb	Jones Builders Service	W	111 ALVM	16.5	224	67 R	7-29-65	BD-16			16	24	100	5.9	212	15	111	36			418	686	8.6	

Table 22-A. Southern Utah and Goshen Valleys

Springs with Water Temperatures of 15.5° to 31.5° C., and a Mine with Water Temperature of 54.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER: SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(C-10-1)36dcbS	Goshen Town Spring	S	300 PLZC	19.0		490	4-27-65	BD-16	53		122	44	129		245	0	147	274		32	952	1440	7.5	
(C-10-2)15ddcM	Burgin Mine	M	300 PLZC	54.5		2700	6-16-66	BD-16	35		327	75	1930	180	646	0	404	3310	2.2	2.5	6610	10,900	8.0	24 B4.7
(C-11-2)3adS	Unnamed	S	111 ALVM	22.0		2	8-26-65	BD-16	39		73	14	27		252	0	35	38		0	380	571	7.6	25
(C-11-2)22badS	Unnamed	S	111 ALVM	16.0		1.2	8-26-65	BD-16																
(C-11-2)26daS	Unnamed	S	111 ALVM	19.0		25	8-26-65	BD-16	48		60	13	26		232	0	14	38		0	336	503	7.9	
(D-7-1)26cS	Bird Isl.	S	111 ALVM	30.0			1-27-60	BD-16			276	114	1840	159	610	15	700	2912			6644	10,452	7.8	34 B2.3
(D-7-3)32dbS	Wood Springs	S	111 ALVM	23.0 12.0		1640 1720	4-28-65 4-07-65	BD-16 BD-16	8.6		86	29	21		336	0	67	20		7.1	391	677	8.1	36
(D-8-1)3ddaS	Lincoln Pt	S		31.5			6-16-66	BD-16	21		451	136	1510	159	751	0	940	2530	2.8	2.4	6140	9340	7.6	40 B1.7
(D-8-3)4caS	Dry Creek Sprs	S	111 ALVM	15.5		1760	8-06-64	BD-16	18		103	28	27		378	0	57	22		34	477	756	7.5	
(D-10-1)8cS	Warm Sprs.	S	300 PLZC	21.0		4360	6-15-66	BD-16	17		87	40	343	19	314	0	115	540	1.2	2.1	1320	2320	7.8	48 B .2 Discharge ranges from 2800-5300 gpm

Table 22-B. Goshen Valley. Wells with Water Temperatures of 15.5° to 19.5°C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(C-8-1) 35dcb	S. O. Dixson	W	111 ALVM	19.5	212	12 R	6-15-64	BD-16																
				14.0			4-28-66	BD-16			126	43	171	27	248	0	124	400			1,130	1,590	7.3	
(C-9-1) 4ddc	Cooperative Security Corp.	W	111 ALVM	16.5	690	1240	5-28-64	BD-16			55	16	118	15	149	8	78	186			612	984	8.5	
				18.5			4-28-66	BD-16			55	21	126	17	175	0	95	198			662	1,070	7.6	
(C-9-1) 20dcc	Cooperative Security Corp.	W	111 ALVM	16.0	575	2500	8-19-64	BD-16	58		34	11	112		184	0	73	102		1.4	479	723	8.2	
				14.0			4-27-66	BD-16			34	11	108	8.2	170	0	84	105			462	727	7.5	
(C-9-1) 20ddd	Cooperative Security Corp.	W	111 ALVM	17.0	798	2460	6-23-65	BD-16			32	15	91	10	133	12	84	98			473	719	8.3	
				16.5			5-09-66	BD-16			37	14	90	10	184	0	73	94			475	736	8.0	
(C-9-1) 28ccb	Cooperative Security Corp.	W	111 ALVM	18.5	802	2540	6-09-64	BD-16			55	20	104	13	150	15	98	151			601	935	8.5	
				14.5			4-27-66	BD-16			64	20	107	15	168	0	118	166			645	956	7.5	
(C-9-1) 29acc	Cooperative Security Corp.	W	111 ALVM	15.5	700	2500	7-12-63	BD-16																
				15.0			4-27-66	BD-16			36	14	103	8.6	171	0	82	111			486	714	7.7	
(C-9-1) 29bcc	Cooperative Security Corp.	W	111 ALVM	17.0	800	210	6-19-65	BD-16			73	26	71	9	82	0	147	167			621	930	8.1	
				17.0			5-06-66	BD-16			89	32	71	9.0	138	0	169	165			680	855	7.5	
(C-9-1) 34ccc	Cooperative Security Corp.	W	111 ALVM	15.5	655		3-08-67	BD-16																
(C-10-1) 4bbb	Cooperative Security Corp.	W	111 ALVM	18.5	882	2853	6-16-65	BD-16			102	42	101	12	147	0	203	236			896	1,330	8.1	
				15.5			4-27-66	BD-16			100	41	108	14	159	0	199	238			895	1,340	7.4	
(C-10-1) 4cbb	LDS Church	W	111 ALVM	19.0	1,218	2800	6-09-64	BD-16			100	31	120	13	118	0	225	230			867	1,300	8.2	Other Analyses available BD-16
				19.5			4-27-66	BD-16			101	39	112	15	168	0	214	224			918	1,330	7.5	
(C-10-1) 9cbc	Henry Mataral	W	111 ALVM	16.5	474	1324	8-07-64	BD-16			230	107	101	16	146	0	579	376			1,650	2,280	8.0	Other Analyses available BD-16
				18.5			4-28-66	BD-16			212	94	106	18	143	3	512	368			1,640	2,200	7.4	
(C-10-1) 17aaa	Elberta Water Co.	W	111 ALVM	16.5	517	450 R		BD-16																
				19.5			4-27-65	BD-16	59		84	26	30		177	0	67	99		32	528	771	7.5	
(C-10-1) 25aab	Kearns Stake LDS	W	111 ALVM	18.0	645	1350 R		BD-16																Other Analyses available BD-16
				17.0			6-01-64	BD-16			64	61	192	18	223	0	162	355			990	1,700	8.1	
(C-10-1) 27dba	L & T. Penrod	W	111 ALVM	15.5	232	5 R	4-14-61	BD-16	54		125	53	400	56	382	0	115	748	1.1	.2	1,889	3,023	7.2	B .17
(C-10-1) 29ddd	Lazy S Cattle Co.	W	111 ALVM	20.0	702	760	7-24-64	BD-16			243	112	109	24	63	0	478	560			2,190	2,710	8.0	Other temps. 64, 66
				17.0			4-28-66	BD-16			410	166	126	27	112	0	950	662			2,940	3,650	7.1	Other analyses BD-16
(C-10-1) 31bdb	Earl Barney	W	111 ALVM	15.5	240	10 R	6-19-55	BD-16																
				16.0			8-07-64	BD-16			83	62	188	13	179	16	249	383			1,040	1,700	8.6	
(C-10-1) 31cdd	E. Jordan Stake LDS	W	111 ALVM	19.0	603	1890	10-08-64	BD-16			38	20	25	6.3	108	8	47	63			320	473	8.3	
				18.5			4-28-66	BD-16			59	21	26	5.9	191	0	44	67			399	582	8.0	
(C-10-1) 33bbb	Elberta Land & Water Co.	W	111 ALVM	18.5	430	28 R	8-20-49	BD-16																
(C-10-1) 33cbb	Lazy S Cattle Co.	W	111 ALVM	18.5	395	75 R	5-62	BD-16																
(C-10-1) 34bbb	Elberta Land & Water Co.	W	111 ALVM	16.5	342	13 R	10-01-49	BD-16																
(C-11-1) 6abc	Lazy S Cattle Co.	W	111 ALVM	18.0	682	2329	7-24-64	BD-16			42	18	33	7.4	135	3.3	50	65			367	519	8.3	
				18.5			6-10-65	BD-16			36	16	29	7.0	110	2	51	58			340	466	8.3	
(C-11-1) 6bdd	Lazy S Cattle Co.	W	111 ALVM	18.5	772	2510	8-31-64	BD-16	57		57	16	32		204	[illegible]	27	58		.8	357	516	7.6	
				19.0			6-11-65	BD-16			43	15	25	6.6	151	0	29	55			332	461	8.2	

Table 23-A. Central Virgin River Basin. Wells and Springs with Water Temperatures of 20° to 42°C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER: SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(C-39-16) 14dbaS	Irvine	S	124 CLRN	21.0		47	10-22-68	TP-40	26		51	16	13		222	0	17	14		1.0	246	405	7.6	B .04
(C-40-13) 27bdb2	Anderson Ranch	W	111 ALVM	21.0	300	21	10-29-68	TP-40	28		58	23	8		228	0	18	33		6.8	295	484	7.9	B .03
(C-40-16) 6cdbS	Veyo Warm Spring	S	112 PLCN	32.0 32.0		110	3-30-66 4-20-67	TP-40 TP-40	30 32		59 53	29 28	32 32	4.4 3.6	220 230	0 0	100 90	30 30	.6 .7	8.3 6.9	409 390	640 600	7.9 7.6	B .14 B .14
(C-41-13) 16bcd	Utah St. Land Bd.	W		21.5	1,128	94	3-05-70	TP-40	24		96	60	103	4.5	250	0	375	74	.7	1.7	998	1,270	8.0	B .56
(C-41-13) 25cac1 cdb cbc	LaVerkin (Dixie) Hot Springs	S	310 KIBB	 42.0		 4,500	6-03-40 2-05-51 3-25-66	WRB-13 WRB-13 WRB-13	10 30 28		787 825 643	165 169 128	2,300 2,340 2,530	167 175 220	1,270 1,300 721		1,960 1,970 1,990	3,440 3,600 3,620	 3.1 2.6	.2 3.2 .9	9,460 9,760 9,530	 13,800 14,200	 6.8 7.2	Gregory (1950, p. 197) Rpt. temps. 108° to 132° F. B5.3 Br1.5, I .32, Li2.0, B4.8
(C-41-16) 34bdaS	Snow	S	111 ALVM	21.0		26	8-28-68	TP-40										13				360		
(C-42-14) 1bcbS	Berry	S	112 PLCN	23.5		33 E	10-07-65	TP-40			200	72	80	9.8	182		667	64	.8		1,180	1,640	8.0	B .45
(C-42-14) 2ccaS	Virgin River	S	112 PLCN	21.0		100 E	10-10-68	TP-40										67				1,520		
(C-42-14) 2dabS		S	112 PLCN	21.0			8-20-68	TP-40	24		172	90	24		188	0	562	70		19	1,300	1,600	7.9	
(C-42-14) 12dcc	Dixie Sprs. Farm	W	220 NVJO	20.0	140	101	9-11-68	TP-40										27				383		
(C-42-14) 15cba	M. Fawcett	W	231 MONV	20.0	320	110	9-12-68	TP-40										35				1,500		
(C-42-14) 32abbS	Warner Valley	S	231 MONV	21.0			11-04-65	TP-40			424	175	363	9.8	92	0	2,310	71	2.5	1.6	3,400	3,610	7.9	B .98
(C-42-15) 14bbbS	Warm	S	220 NVJO	24.0		450 E	10-16-68	TP-40										8				487		
(C-42-15) 14bbcS	Myers	S	220 NVJO	20.0			10-16-68	TP-40	19		63	35	16		220	0	101	29		9.4	435	673	8.0	B .10
(C-42-15) 14dad	D. Nisson	W	231 CHNL	20.0	352	115	8-22-68	TP-40	13		92	81	204		366	0	616	47		.1	1,180	1,610	8.2	
(C-42-15) 15bbaS		S	220 NVJO	23.5 21.0			3-30-66 10-16-68	TP-40 TP-40			100	22	283	25	206	4	415	285 295	1.6		1,240	2,010 2,010		B .80
(C-42-15) 30caa2	E. Blackburn	W	231 KYNT	20.0	36		10-16-68	TP-40										100				3,990		
(C-42-15) 30cbd	E. Stringham	W	231 MONV	22.0	30		10-15-68	TP-40	96		521	195	402		388	0	2,320	125		79	4,030	4,110	7.8	B1.3
(C-42-15) 30dcd2	K. Empey	W	231 CHNL	22.0	25		10-15-68	TP-40	82		369	148	562		320	0	2,150	150		49	3,740	4,090	7.6	B2.0
(C-42-15) 33ddd	Schmutz Bros.	W	231 SRMP	21.0	45		10-15-68	TP-40	22		597	255	790		384	0	2,100	788		29	4,590	5,400	7.7	B .86
(C-42-16) 24aca	E. Earl	W	231 KYNT	21.0	134		10-18-68	TP-40										110				3,630		
(C-43-15) 10acc	W. Seegmiller	W	230 MNKP	20.5	100	60	10-18-68	TP-40	22		581	219	344		240	0	2,050	512		56	4,080	4,520	7.7	B .45
(C-43-16) 22dab	E. Jones	W	111 ALVM	21.0	45	10	10-08-68	TP-40	17		581	365	1,110		296	0	2,790	1,560		15	6,860	8,190	7.8	B1.6

155

Table 23-B. Central Virgin River Basin. Wells and Springs with Water Temperatures of 15.5° to 19.5°C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER: SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(C-40-13) 2daa1	Pintura	W	112 PLCN	18.0	345		2-20-64	TP-40	44	.03	64	27	16	2.6	224	1	109	16	.1	1.1	406	540		B=0
(C-40-16) 35dcc	E. Blake	W	221 CRML	18.0	40	50	10-16-68	TP-40										8.0				363		
(C-43-15) 16dcc	W. Seegmiller	W	111 ALVM	19.5	160	1,570	2-24-70	TP-40			593	141	17		136	0	1,760	68		72	3,200	3,100	7.6	
(C-43-15) 25ddd	G. Seegmiller	W	111 ALVM	19.0	144	1,572	8-22-68	TP-40	14		573	153	213		90	0	2,140	100		99	3,450	3,360	7.4	
(C-41-13) 4bab	W. Scheuber	W	220 NVJO	18.0	115		10-30-68	TP-40	26		35	24	10		232	0	9.2	8.1		.08	227	372	8.0	B=.02
(C-41-13) 5dbb	A. Howard	W	220 NVJO	18.0	48		10-30-68	TP-40										14				418		
(C-42-15) 19cac	R. Prince	W	231 KYNT	18.0	100		10-11-68	TP-40	19		160	63	206		404		660	60		7.7	1,410	1,850	7.8	B=.62
(C-42-16) 24ddd	C. Dean	W	231 KYNT	18.0	84		10-11-68	TP-40										115				3,430		
(C-39-16) 28dbb	Veyo C.W.A.	S	111 ALVM	17.0		20E	10-24-68	TP-40										19				435		
(C-42-16) 5bbb	W. Hafen	W	231 CHNL	18.0	110	55	10-31-68	TP-40	34		501	292	257		272	0	2,530	90		31	4,070	3,870		B=1.30
(C-42-16) 16bcc	St. G.C. Canal	W	111 ALVM	15.5	63		5-15-63	TP-40	12		194	45	36		438	0	308	48		5	904	1,240	7.6	
(C-42-16) 16 dcb	St. G. C. Canal	W	111 ALVM	17.0	63	300	10-17-68	TP-40										55				1,420		
(C-42-16) 22dca	L. Frei	W	111 ALVM	16.5	88		5-19-67	TP-40	33		204	83	148	5.0	352	0	706	92	1.1	25	1,530	1,920	7.7	
(C-42-16) 35add	R. Barrett	W	111 ALVM	18.0	47		10-17-68	TP-40	29		248	63	89		564	0	508	58		.6	1,310	1,680	7.8	B=.24
(C-42-16) 25dab		W	111 ALVM	19.0			10-18-68	TP-40										80				2,550		
(C-43-16) 1baa	C. Blake	W	111 ALVM	16.0	52	360	8-20-68	TP-40	37		345	185	222		450	0	1,450	158		1.1	2,620	2,950	7.9	
(C-43-15) 12ccd2	S. Stuki	W	230 MNKP	16.5	172	1,100	5-19-67	TP-40	17		409	207	143	10	96	0	1,930	52	1.8	7.0	3,100	3,090	7.3	
				19.0			8-22-68	TP-40	18		417	209	196		100	0	2,050	72		12	3,060	3,080	7.8	
(C-42-15) 34dba1	East Stake	W		17.0	194		10-18-68	TP-40	25		501	292	548		392	0	2,100	778		29	4,590	5,400	7.7	B=.86
(C-42-15) 35baa	C. Prisbrey	W	111 ALVM	18.0	45	-	10-15-68	TP-40										620				5,240		
(C-43-15) 2aaa	I. Andrus	W	111 ALVM	19.0	160		8-22-68	TP-40	17		467	198	141		120	0	1,900	100		87	3,200	3,150	7.3	
(C-41-17) 8cca	St. George	W	220 NVJO	17.0	500	700	5-05-65	TP-40	19	.05	66	14	6.0	.6	233	3	20	20	.3	.5	283	455	8.4	B=.2
(C-40-13) 35acd	Toquerville	S	112 PLCN	17.0			10-25-68	TP-40	36		78	32	22		220	0	159	18		3.1	474	682	7.7	B=.06
(C-41-13) 11cad	Toquerville	S	112 PLCN	17.0		2700	10-28-68	TP-40	36		84	43	27		274	0	180	20		6.8	544	773	7.7	B=.07
(C-40-16) 35dad	Moore	S	221 CRML	19.0		16E	10-16-68	TP-40										10				432		

Table 24. Beaver Valley. Wells and Springs with Water Temperatures of 15.5° to 23.5°C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(C-28-7) 16aad	L. Bradshaw	W	111 ALVM	15.5	370	707		BD-6																
(C-29-8) 9bad	O. & D. Harris	W	111 ALVM	18.0	150		8-9-62	BD-6	44	.11	248	30	63		253		250	292	.7	.7	1,050	1,700	7.3	
(C-29-8) 23cab	M. Smith	W	111 ALVM	17.0	440			BD-6																
(C-29-8) 24aaa	J. Morgan	W	111 ALVM	16.5		818		BD-6																
(C-29-8) 25cac$_2$	Greenville Ward LDS	W	111 ALVM	20.0	340		9-11-61	BD-6	69	.05	32	5.4	29		128		48	7		.7	254	298	7.9	Drilled in 1905
(C-29-8) 35bad	Abandare Canal Co.	W	111 ALVM	16.0	514			BD-6																
(C-29-9) 36dccS	Minersville Res. & Irr. Co.	S	111 ALVM	21.0 13.0			9-15-61	BD-6 BD-6	69	.01	107	39	84		498		93	75		.6	713	1,090	7.9	Spring in bottom of Minersville Reservoir.
(C-29-8) 36aab	S. R. Barton	W	111 ALVM	23.5	314	7	1906?	WSP-217		0							Tr	20						Hardness 56 Alkalinity 142
(C-29-8) 25cac	Greenville School	W	111 ALVM	20.0	244	11	1906?	WSP-217		0							Tr	10						Hardness 90 Alkalinity 242 This may be same well or next to 25cac$_2$ above
(C-27-8) 10S	Beaver Land & Livestock Co.	S	111 ALVM	16.5		6		WSP-217																
(C-28-6) 33S	C. D. White	S	111 ALVM	16.5		27		WSP-217																

Table 25-A. Blue Creek Valley. Wells and Springs with Water Temperatures of 20° to 28° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(B-12-5) 22dacS	Town of Howell	S	310 OQRR	20/0		1	7-70	TP-37														889		Temp. meas. at pipe 50 ft. below source
(B-12-6) 33dbaS		S	310 OQRR	20.5		<1	7-14-70	TP-37			81	12	54		250	0		100			477	751	8.2	Temp. meas. at pipe 500 ft. below source
(B-13-5) 29S	Blue Springs	S	310 OQRR	26.5		4,680	9-10-64	TP-37			83	24	540	32	268		68	886			1,923	3,580	8.0	B .2
29B				28.0			7-07-70	TP-37	19		56	24	636	22	329	0	84	895	.4	1.0	2,010	3,410	7.9	B .22
(B-13-5) 31daa	L. D. Nessen	W		20.5	405		7-13-70	TP-37			89	41	153		343	4		274			1,010	1,440	8.4	
(B-14-6) 9aab	Deloris Stokes	W		20.5	409		7-07-70	TP-37			67	25	213		258			341			870	1,530	8.3	
(B-15-6) 34ccc	R. W. Tolman	W		20.5	555		7-07-70	TP-37	41		60	25	247	5.7	259	0	40	375	1.0	.3	938	1,610	7.9	B .06

Table 25-B. Blue Creek Valley. Wells and Springs with Water Temperatures of 15.5° to 19.5°C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(B-11-5) 3cacS		S	310 OQRR	17.5		<1	7-70	TP-37														765		
(B-11-5) 12ccaS		S	310 OQRR	17.			7-70	TP-37														631		
(B-12-5) 10bca	H. C. Kotter	W		15.5	138		7-14-70	TP-37			66	37	129		254	3		226			708	1,220	8.5	
(B-12-5) 14baaS	North Spring	S	310 OQRR	17.0		<1	7-14-70	TP-37			79	15	90		243	4		140			543	909	8.5	
(B-12-5) 14ccc	Dan Douglas	S	310 OQRR	18.0		<1	7-14-70	TP-37														798		
(B-12-6) 36ada	O. M. Munk	W		16.5	212		7-14-70	TP-37	42		77	49	67	7.7	183	0	54	230	.7	2.9	644	1,100	8.2	B .05
(B-13-5) $6aaa_2$	I. M. Turley	W		19.0	235		7-08-70	TP-37			185	70	108		144	0		591			1,230	2,120	7.9	
(B-13-5) 16ccc	E. L. Nielson	W		18.5			7-07-70	TP-37			572	245	547		142	0		2,380			4,860	7,190	7.8	
(B-13-5) 22ccc	T. Roberts	W		16.5	180		7-08-70	TP-37			65	24	78		269	0		128			501	860	8.2	
(B-13-5) 33acc	L. Hawkes	W		19.0	180		7-14-70	TP-37			52	23	101		274	3		136			509	901	8.6	
(B-13-6) 1bdb	R. W. Henrie	W		16.5	195		7-06-70	TP-37			149	32	41		144	0		331			818	1,340	7.8	
(B-13-6) 1dbb	R. W. Henrie	W	111 ALVM	19.0	704	580 R	7-06-70	TP-37	47		71	19	31	10	160	0	16	127	.4	6.1	405	701	8.2	B .04
(B-13-6) 12aba	R. W. Henrie	W		16.5			7-07-70	TP-37			325	77	62		150	0		551			1,700	2,470	7.9	
(B-13-6) 36acc	A. Manning	W		17.5	300		7-13-70	TP-37			447	153	143		162	0		1,340			3,450	4,270	8.0	
(B-15-6) 35bdb	Deloris Stokes	W		18.5			7-07-70	TP-37			88	16	16		258	0		64			417	634	8.2	

Table 26-A. Cache Valley. Wells and One Spring with Water Temperatures of 20° to 49°C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(A-12-1) 16cac$_2$	Benson Irr. Co.	W	111 ALVM	21.0	180	19M	8-67	BD-21														570		
(A-12-1) 16cdb	Benson Irr. Co.	W	111 ALVM	21.0	48	23M	8-67	BD-21														590		
(A-12-1) 16dbc	Don Bodrero	W	111 ALVM	20.0	160	60R	6-68	BD-21														490		
(A-12-1) 16ddd	Chas. Taylor	W	111 ALVM	22.0	243	36M	4-17-68	BD-21	17		56	26	32		327	0	16	12		16	336	534	7.4	
(A-12-1) 17dab	Benson Irr. Co.	W	111 ALVM	21.0	160	58M	8-67	BD-21														480		
(A-12-1) 20bdd	C. Wennergren	W	111 ALVM	23.0	117	48M	5-68	BD-21														510		
(A-12-1) 20caa	C. Wennergren	W	111 ALVM	24.0	115		5-68	BD-21														460		
(A-12-1) 20cac	C. Wennergren	W	111 ALVM	23.0	118	118M	5-68	BD-21														470		
(A-12-1) 21caa	A. A. Beckstead	W	111 ALVM	24.0	132	31M	8-67	BD-21														560		
(A-12-1) 21cbd	W. Peart	W	111 ALVM	25.0	136	11M	8-67	BD-21														500		
(A-12-1) 22ccc$_2$	Fred Sears	W	111 ALVM	27.0	200	150R	11-65	BD-21																
(A-12-1) 27aab	F. V. Stetler	W	111 ALVM	26.0	197	16R	11-68	BD-21														450		
(A-12-1) 28baa$_3$	Logana Plunge	W	111 ALVM	24.0	147		8-67	BD-21														470		
(A-12-1) 28baa$_5$	Logana Plunge	W	111 ALVM	25.0	147		8-67	BD-21														470		
(A-12-1) 28bca	L.D.S. Welfare Farm	W	111 ALVM	23.0	135		8-67	BD-21														430		
(A-12-1) 28bdc	Leonard Kearl	W	111 ALVM	21.0	150	4M	6-68	BD-21														420		
(A-12-1) 28cab	C. Lisonbee	W	111 ALVM	21.0	163	75M	8-67	BD-21														430		
(A-12-1) 29acc	Gossner Cheese	W	111 ALVM	23.0	108	550R	8-67	BD-21														470		
(A-12-1) 29cdb	Ed Gossner	W	111 ALVM	20.0		94M	6-68	BD-21														420		
(A-13-1) 19cac	Cache Valley Dairy	W	120 TRTR	21.0	5,500	75R	7-09-57	BD-21	13	.67	42	36	204	4.9	286	0	1.2	342	.1	.3	789	1,480	6.8	B .4
(B-12-1) 2bcd	H. C. Cronquist	W	111 ALVM	21.0	764	24M	4-18-68	BD-21	24		128	53	107		250	0	.5	400		.0	1,010	1,600	7.9	
(B-12-1) 10dcd	J. L. Nuttall	W	111 ALVM	21.0	533	16M	8-67	BD-21														780		
(B-13-1) 10acb	N. Brown	W	300 PLZC	49.0	5,208	15M	4-17-68	BD-21	81		34	30	1,140	71	622	0	.8	1,690	4.5	1.3	3,280	5,820	8.1	B2.7
(B-13-1) 27cdd	N. B. Seamons	W	111 ALVM	23.0	930	43M	8-67	BD-21														1,200		
(B-13-1) 25bab	W. W. Toombs	W	120 TRTR	28.0 28.0	1,473	300M	8-14-51 6-29-52	BD-21 BD-21	24		44	31	182	6.1	358 357	0 0	1.1	255	.3	.3	720	1,310 1,320		B .8
(B-14-1) 33acaS	D. J. Gancheff	S	Fault	31.0			1-12-68	BD-21	23		132	46	1,400	110	548	0	71	2,280	3.2	5.3	4,380	7,230	7.6	B .71

Table 26-B. Cache Valley. Wells and One Spring with Water Temperatures of 16° to 19° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(A-10-1) 16dad		W	111 ALVM	19.0	16	80 M	9-68	BD-21														570		
(A-10-1) 16ddb		W	111 ALVM	16.0	18	80 E	9-68	BD-21														640		
(A-12-1) 5dac$_2$	G. Chambers	W	111 ALVM	16.0	235	4 M	3-68	BD-21														500		
(A-12-1) 7bbb	L. Reese	W	111 ALVM	16.0	475	7 M	8-67	BD-21														820		
(A-12-1) 8dca	R. Gittins	W	111 ALVM	16.0	189	150 M	6-68	BD-21														440		
(A-12-1) 10ccc	V. Nielsen	W	111 ALVM	16.0	210	120 R	4-11-63	BD-21	19	.01	38	16	44	5.3	245	2	13	17	.3	3.4	268	471	8.0	B.16
(A-12-1) 16ada	E. Olsen	W	111 ALVM	17.0	202	9 M	8-67	BD-21														500		
(A-12-1) 16cac	Benson Irr. Co.	W	111 ALVM	16.0	44		2-68	BD-21														540		
(A-12-1) 17ada	Logan Airport	W	111 ALVM	18.0	145	425 R	5-27-59 7-13-60	BD-21 BD-21	43 25	.03 .02	43 55	21 15	27' 23	8.0 9.2	288 281	1 1	10 6.6	11 15	.4 .4	4.4 .2	309 289	463 535	7.6 7.7	B.14 B.14
(A-12-1) 17daa	Benson Irr. Co.	W	111 ALVM	16.0	144	10 M	8-67	BD-21														560		
(A-12-1) 17dcc	S. Bodrero	W	111 ALVM	17.0	53	28 M	5-68	BD-21														540		
(A-12-1) 20dba	C. Wennergren	W	111 ALVM	17.0		20 M	5-68	BD-21																
(A-12-1) 20daa$_1$	J. W. Quale	W	111 ALVM	19.0		30 M	8-67	BD-21														570		
(A-12-1) 20daa$_2$	J. W. Quale	W	111 ALVM	19.0	55	14 M	8-67	BD-21														590		
(A-12-1) 20dcb	E. Wursten	W	111 ALVM	17.0	40	120 M	5-68	BD-21														440		
(A-12-1) 20dcd	Wm. Kroptle	W	111 ALVM	18.0	60	33 M	8-67	BD-21														490		
(A-12-1) 21aaa	L. R. Merrill	W	111 ALVM	19.0	50	1 M	8-67	BD-21														590		
(A-12-1) 21dca	L. Kearl	W	111 ALVM	17.0	57	11 R		BD-21																
(A-12-1) 27cab	Logan City	W	111 ALVM	18.0	800	4555 R	1-03-64	BD-21	10	.01	48	23	5.3	1.8	245	1	6.2	10	.1	.8	227	405	8.0	B.00
(A-12-1) 28bcb	S. Bodrero	W	111 ALVM	17.0	72	21 M	2-68	BD-21														480		
(A-12-1) 28cab$_2$	L. Andrews	W	111 ALVM	16.0	60	12 M	8-67	BD-21														510		
(A-12-1) 28cca$_1$	M. Bodrero	W	111 ALVM	16.0	68	100 M	8-67	BD-21														510		
(A-12-1) 28cca$_2$	M. Bodrero	W	111 ALVM	16.0	60	150 M	8-67	BD-21														500		
(A-12-1) 29aba$_1$	E. W. Heaton	W	111 ALVM	18.0	42	16 M	8-67	BD-21														500		
(A-12-1) 29aba$_2$	E. W. Heaton	W	111 ALVM	18.0	51	86 M	8-67	BD-21														500		
(A-12-1) 29cab	E. Gossner	W	111 ALVM	18.0	43		8-40	BD-21																
(A-12-1) 29cba$_1$	E. Gossner	W	111 ALVM	18.0		3 M	6-68	BD-21																
(A-12-1) 29cba$_2$	E. Gossner	W	111 ALVM	18.0	158	375 R	6-68	BD-21														440		
(A-12-1) 31dab	R.S. Painter	W	111 ALVM	17.0 12.0	132	273 M	4-04-61 8-31-62	BD-21 BD-21	14 7.7	.00 .07	51 54	20 20	11 4.5	2.0 .9	251 250	0 0	14 14	9.0 5.5	.4 .1	.1 1.9	238 220	427 411	7.7 7.7	B.1 B.02
(A-12-1) 32bba	G. I. Sorensen	W	111 ALVM	16.0	108	50 M	6-68	BD-21														380		
(A-13-1) 31ccc$_2$	A. C. Reese	W	111 ALVM	18.0	626	35 R	10-68	BD-21														930		
(A-14-1) 6ccc	Fred Karren	W	111 ALVM	18.0 7.0	20	3 M	 4-17-68	BD-21 BD-21	 13		 112	 112	 239		 722	 0	 239	 268		 50	 1,410	 2,220	 7.7	

Table 26-B. Cache Valley. Wells and One Spring with Water Temperatures of 16° to 19° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER: SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(B-12-1) $1ccc_2$	M. J. Ballard	W	111 ALVM	17.0	590	60 R	11-68	BD-21														1,500		
(B-12-1) 2add	Ricks	W	111 ALVM	17.0	-.587	40 R	11-68	BD-21														1,400		
(B-12-1) 3ccc	J. L. Watterson	W	111 ALVM	17.0		10 M	8-67	BD-21														830		
(B-12-1) 9ddd	Benson Recr. Area	W	111 ALVM	18.0	576	40 R	1-69	BD-21														920		
(B-12-1) $11bba_2$	O. J. Falslev	W	111 ALVM	19.0	437	11 M	5-68	BD-21														1,500		
(B-12-1) 11bcb	N. Johnson	W	111 ALVM	19.0	616	20 D	8-67	BD-21														1,100		
(B-12-1) $11ccc_3$	Wm. Izatt, Jr.	W	111 ALVM	18.0	400	15 M	8-67	BD-21														610		
(B-12-1) 11dda	F. B. Snow	W	111 ALVM	17.0	545	66 M	2-69	BD-21														1,500		
(B-12-1) $12bdc_5$	Benson Ward LDS	W	111 ALVM	18.0	569	120 R	12-10-57	BD-21	3.6	3.0	225	60	104		168	0	223	475	.0	.7	1,150		7.5	
							2-18-69	BD-21	12	.67	149	53	94	8.0	171	0	2.1	473	.3	.6	1,180	1,710	7.6	B.15
(B-12-1) 14aaa	Bert Riggs	W	111 ALVM	16.0	304	7 M	8-67	BD-21														510		
(B-12-1) 14aba	Devar Balls	W	111 ALVM	18.0	315	20 R	7-12-48	BD-21	32		43	16	43		279	0	3.5	21		5.8	302	481		
							10-27-49	BD-21	28				43		292	0	3.0	22	.4	0		489	7.3	B.02
(B-12-1) 15adc	Alex Ricks	W	111 ALVM	18.0	418	2 M	8-67	BD-21														820		
(A-12-1) $32cbb_1$	State Fish Dept.	W	111 ALVM	16.0	107	107 M	8-31-62	BD-21	11	.00	55	19	7.5	1.5	246	0	16	6.5	.1	1.5	227	418	7.7	B.01 Temp 14° 8-67 BD-21
				16.0			2-06-63	BD-21		.03					249	0		14		1.3		418	7.7	
(B-13-1) 10bba	L. Erickson	W	111 ALVM	18.0	258	100 M	10-67	BD-21														850		
(B-13-1) 17dad	O. G. Larsen	W	111 ALVM	16.0	215	5 R	9-67	BD-21														880		
(B-13-1) 28dab	J. W. Roundy	W	111 ALVM	17.0	400	9 M	8-67	BD-21														1,200		
(B-13-1) 13cdd	E. Cache Stake	W	111 ALVM	18.0	460	3 R		BD-21																
(B-13-1) 36cca	Paul Thain	W	111 ALVM	17.0	723	70 R	10-68	BD-21														1,500		
(B-13-1) 36ccd	George Thain	W	111 ALVM	17.0	693	50 R	10-68	BD-21														1,300		
(B-13-1) 36cdb	Marvin Thane	W	111 ALVM	16.0	684	20 R	10-68	BD-21														1,300		
(B-14-1) 2ddd	Westover Bros.	W	111 ALVM	16.0	8		9-67	BD-21														1,700		
(B-14-1) 3cdd	B. O. Hanson	W	111 ALVM	16.0	271		10-68	BD-21														1,500		
(A-13-1) 29acbS	Lynn Erickson	S	111 ALVM	16.0			7-68	BD-21														540		Group Discharge 1000 gpm

Table 27-A. Canyon Lands. Wells with Water Temperatures of 15.5° to 28° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER: SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(D-18-14) 9dcd	Roadside Geyser	W	200 MNCS	28.0	180		3-14-47	TP-15			908	288	360		2,840	0	1,540	215		.0	4,710	5,640		.4B Water warmed in long discharge pipe
(D-21-16) 34dda	G. Ruby Crystal Geyser	W	221 ENRD	18.0	487	1,200M	3-22-48	TP-15	13		1,000	225	4,070		4,400	0	2,410	4,370			14,300	19,400		Abandoned Oil Well-CO_2 Drive
(D-22-14) 28d	F. J. Hat	W	221 ENRD	16.0	200		10-28-58	TP-15	10		321	246	551		2,020	0	1,120	132	.00	.1	3,370	4,340	7.1	
(D-23-21) 27bcd	Natl. Park Svc.	W	231 WNGT	16.0	900	4E	10-31-62	TP-15	5		28	18	54		163	0	36	62		.3	283	530	7.3	
(D-25-12) 14c	J. Marsing	W	221 CRML	16.5			10-30-58	TP-15	13		481	642	339		408	0	3,900	105	.2	41	6,360		7.0	
(D-25-21) 20add	National Park	W	220 NVJO	19.5	124	8M	12-11-58	TP-15	12		55	21	75		218	0	133	49		1.6	454	762	7.4	
(D-25-21) 26dcc	Suburban Gas	W	111 ALVM	16.0	55	25	9-05-68	TP-32	14	.04	46	23	13	2.3	220	0	38	14	.5	1.3	256	440	8.0	B = .04
(D-26-22) 7bad	Hecla	W	111 ALVM	16.0	80	36	9-05-68	TP-32	19	.00	112	57	41	2.4	312	0	300	20	.8	9.0	749	714	7.8	B = .07
(D-26-22) 17dbc	Garrett Freight	W	111 ALVM	16.0	153	14	7-09-68	TP-32	10	1.3	98	51	44	2.1	168	0	370	17	.6	2.8	701	961	7.5	B = .00
(D-26-22) 22dcd	G. M. White	W	111 ALVM	16.0	130	90	7-09-68	TP-32	14	.02	107	38	48	2.2	218	0	303	16	.5	12	664	930	7.6	B = .00
(D-27-2) 26cda	B. Chapple	W	120 TRTR	16.5	192	450E	9-20-66	TP-22														200		
(D-27-2) 33dda	Loa Water Works	W	120 TRTR	16.5	255	143M	9-20-66	TP-22	39	.01	22	6.3	12		114	0	39	56		1.3	141	211	7.6	Mn=.00
(D-27-2) 34ccb	W. G. Taylor	W	111 ALVM	16.5		5E	10-06-66	TP-22														190		Highest Head in Valley
(D-27-2) 34ccc	W. G. Taylor	W	111 ALVM	16.5		15M	9-21-66	TP-22														190		
(D-28-2) 3cbc	S. Rees	W	120 TRTR	17.0	198	1,150M	8-04-66	TP-22														200		
(D-28-2) 3ccb	Roads Creek Water Works	W	120 TRTR	17.0	333	1,750M	8-04-66	TP-22	38		24	6.1	12		124	0	37	36		.9	152	215	7.5	Largest flowing well in area
(D-28-2) $3ccc_1$	S. Rees	W	120 TRTR	17.0	276	352M	8-04-66	TP-22														200		
(D-28-2) $3ccc_2$	S. Rees	W	120 TRTR	17.0	286	386M	8-04-66	TP-22														210		
(D-28-8) 29dcb	Garkane Power	W	220 NVJO	24.0	761	3,110	10-04-74	H. Mtn.	13		284	88	494	4.4			1,070	625	.4		3,746	4,200	7.8	
(D-28-8) 33bbb	IPP - Test	W	220 NVJO	17.5	1,685	2,800	8-30-75	H. Mtn.	9.3		95	28	760	3.7	289		660	800	.7	.01	2,500	4,050	7.0	B=53
(D-28-8) 33cdd	IPP - Colt	W	220 NVJO	17.5	1,400	200	1975	H. Mtn.	9.6		110	52	130	5.6	225		380	130	.2	.01	933	1,400	7.0	B=60
(D-28-11)16aca	Old CCC Well	W	221 ENRD	16.0	320		3-16-47	TP-15			15	14	115		238	0	130	8	.7	.1	400	617		
(D-28-11) 16ddb	E. E. Stone	W	221 ENRD	18.0	340	13	6-05-59	TP-15	14		17	6.1	137		230	10	144	45	.3	1.8	448	688	8.6	.22 ppm B
(D-29-12) $33acd_2$	U.S.B.L.M. #3	W	220 NVJO	16.5	510	200	8-09-76	H. Mtn.	11		59	31	26	7.5	239		110	15	.2	.06	378	640	7.5	P=.00 PO4=.00 B=.04, Pb=.01 Zn=.02
(D-31-7) 36dad	R. Weaver	W	220 NVJO	17.5	6,648	55	8-29-75	H. Mtn.	9.6		32	20	6.5	2.0	175		27	2.8	.1	.27	188	350	7.1	P=.01 PO4=.03 B=.03
(D-31-13) 9		W	231 WNGT	18.0		3R	6-20-57	TP-15	9.1	.01	25	28	46	8.5	275	0	44	12	.3	3.7	312	528	7.4	B.06
(D-33-16) 19		W	324 HRMS	16.0		450R	10-03-48	TP-15	8.6		84	28	12		181	0	163	8		1.0	414	621		
(D-33-24) 19dbd	Hall 1	W	221 ENRD	15.5	1,085-1,256	40R	10-30-55	TP-15	21		62	2.6	301	5.1	500	80	130	7.5	1.5	.5	801	1,260	8.8	
			220 NVJO	20.0	1,313-1,673	50R	11-22-55	TP-15	28		19	19	54		199	14	46	5.5		.3	284	451	8.4	
(D-35-11) 16cdd	Shitamaring Mine	W	221 ENRD	20.0	560	35	1969	H. Mtn.	15		21	12	83	5.5	177		130	8.1	.3	.78	369	610	8.4	B=.07 As=.005 Pb=.004 Li=.1

Table 27-A. Canyon Lands. Wells with Water Temperatures of 15.5° to 28° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(D-35-11) 16dcd	Shitamaring Mine	W	220 NVJO	21.0	1,000	75	1976	H Mtn	15		13	11	55	4.6	153		60	8.0	.2	.73	250	400	8.5	P=.01 PO4=.03 B=.07 As=.005 Pb=.004 Li=.08 Zn=.11
(D-38-25) 33bcd		W	220 NVJO	17.0		28M	8-06-69	HG	9.0	.04	16	2.6	180	19	406		52	16		0	543		8.5	
(D-38-25) 35bda		W	220 NVJO	18.0		17M	8-06-69	HG																
(D-38-26) 28aca		W	220 NVJO	18.0		80E	8-07-69	HG	9.2	.06	21	3.3	110	18	281		44	12		0	408		8.2	
(D-39-24) 13dac	Hatch Trading	W	220 NVJO	17.0	556		8-06-69	HG	3.0	.04	41	21	47	22	281		49	6	.5	0	359		8.3	
(D-39-25) 5aca		W	220 NVJO	16.5		15M	8-06-69	HG	9.9	.07	20	7.8	150	28	385		65	10		0	544		7.8	
(D-39-26) 21bdb		W	221 ENRD 220 NVJO	21.0	1,150-1,200 1,275-1,425	29	3-10-64	TP-15	9.7		13	7.5	386		644	15	299	28		.2	1,070	1,630	8.4	
(D-40-22) 30aac	F. A. Nielson	W	220 GLNC	18.5	1,200	100E	10-21-59	TP-15	11		4	1.5	87		165	11	47	2		.2	245	382	8.7	
(D-40-22) 30bbb	Bluff Irr. Co.	W		20.0	1,200	22R	10-06-64	TP-15	11		3.2	1.5	148		326	0	53	10		.3	387	591	8.0	
(D-40-24) 11abd	B.I.A. 12T-327	W	221 MRSN 221 BLFF	17.0	30-370 370-520	150R	3-02-56	TP-15	13		33	18	115		426	0	41	8.5	.8	.2	438	728	7.6	
(D-40-25) 1bcc	B.I.A. 12T-312	W	220 NVJO	21.5	1,402	2R	8-07-52	TP-15	16		54	20	1,350		2,300		286	685	.4	4.1	3,550	5,390		
(D-41-21) 22	B.I.A. 9T-220	W	220 NVJO	16.5	275	3E	1-06-54	TP-15	17		17	4.6	64		194	0	31	6	.2	.1	235	364		
(D-41-22) 33	B.I.A. 9K-209	W	220 NVJO	18.0	775	3R	10-27-54	TP-15	11		7.1	3.3	67		148	0	38	9	.5	1.6	210	329		
(D-41-25) 16ccc	B.I.A. 12K-308	W	221 ENRD 220-NVJO 231-WNGT	18.5	1,163	75R	3-10-55	TP-15	10	.13	105	74	2,940	28	680	0	1,640	3,490	.1	2.5	8,640	12,000	7.9	
(D-41-25) 17ddd	Shot Hole	W	111 ALVM	18.5		<1E	8-11-69	HG	27	.005	17	4.2	966	16	718		1,200	156		0	2,820		8.4	
(D-41-25) 21bbb	Aneth School	W	111 ALVM	18.5		20-25R	8-11-69	HG	22	.005	105	15	113	10	239		300	26	.6	0	754		7.9	
(D-42-22) 14	B.I.A. 9T-214	W	220 NVJO	16.0	590	2R	12-03-53	TP-15	14		2.0	.5	129	1.9	177	29	50	26	.8	.4	341	565		
(D-42-23 2bdb	Shell Oil #1	W	220 NVJO	16.5	460	35R	3-11-55	TP-15	14	.11	1.3	.7	195	.8	341	45	52	21	.8	.5	500	846	9.0	
(D-43-3) 32dcc	L. Taylor	W	220 NVJO	19.0		25M	10-09-63	TP-15	9.3	1.4	15	15	71		190	0	71	16		.3	292	477	7.4	
(D-43-14) 16dcd	B.I.A. 8K432	W	310 CDRM	18.0	451	2E	5-21-55	TP-15	11		44	27	151		306	0	228	37	1.0	7.4	656	1,030	7.6	
(D-43-24) 9	B.I.A. 9Y32	W	231 WNGT	19.0	735	2R	8-30-49	TP-15	17		2.0	1.3	161		242	83	9.5	5.0	1.0	4.9	404	662		

Table 27-B. Canyon Lands. Springs with Temperatures of 15.5° to 31° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(D-24-13) 29bS	Red Rock Spring	S	221 CRML	16.5		2E	10-28-58	TP-15	9.8		54	50	35		336	16	94	14	.2	2.1	340	700	7.5	
(D-25-17) S	Undine																							Mentioned by Gilbert in Wheeler report (1875) and in PP492. no further records.
(D-25-21) 26bdS	Moab Bridge	S	231 WNGT	16.5		5R	10-09-58	TP-15	11		33	10	18		132	0	36	12		.8	186	298	8.1	
26bdc	Lions Club	S	231 WNGT	17.0		7M	10-08-58	TP-32	11		33	10	18		132	0	36	12		.8	186	298	8.1	
(D-27-2) 25baaS	Fremont	S	120 TRTR	16.5		7300M	10-10-66	TP-22	35		20	7.3	12		110	0	3.4	7.8		.9	136	203	7.4	
(D-27-2) 33dadS	West Spring	S	120 TRTR	17.0		450E	10-20-54	TP-22	38		22	5.1	13	3.6	115	0	3.1	5.5	.2	2.1	152	212	7.8	
(D-28-2) 10bbaS	South Spring	S	120 TRTR	17.0		545M	8-04-66	TP-22	38		24	6.1	12		124	0	3.7	3.6		.9	152	215	7.5	
(D-28-22) 1cS	Kane Spring	S		18.5			8-14-69	HG	14	.005	31	15	80	17	177		151	10		0	452		8.2	
(D-26-22) 7ccaS	Jackson Res.	S	231 WNGT	16.0		24	3-07-68	TP-32	11	.03	102	47	46	2.1	168	0	370	18	.7	4.6	448	954	7.9	B=.03
(D-26-22) 14accS	Deep Cut	S	220 NVJO	16.0		90	11-19-68	TP-32	8.9		35	16	5.3	1.2	184	0	11	2.7	.1	.4	152	306	7.6	B=.04
(D-29-10) 22cccS	Bert Avery	S	221 FRRN	23.0			7-25-75	H.Mtn														610		End of Collection Pipe
(D-30-10) 12ddbS	Sidehill	S	110-PTOD	18.0			7-11-75	H.Mtn														690		From thin Pediment Gravel
(D-30-10) 13bcb	Dugout Bench	S	110-PTOD	18.0		<1E	8-02-76	H.Mtn														630		From thin Pediment Gravel
(D-30-10) 32dac	Spring on Flat	S	111 CLVM	18.0		4-5E	7-26-75	H.Mtn														850		From thin coluvium over shale
(D-30-11) 5dbc	Cow Wash	S	110 PTOD	21.0		100M	8-03-76	H.Mtn	21		89	18	39	1.1	210		180	6.1	.9	.01	459	680		P=.00 PO4=.0 B=100 AS=.001 Pb=0 Li=.02 Zn=0 Fed by return flow from irrigation; dry on Dec. 8, 77.
(D-30-11) 19ddb	Little Meadow	S	111 CLVM	16.0		2E	7-11-75	H.Mtn														595		13° on Dec 8, 1977
(D-30-12) 4caa	Granite Wash	S	111 ALVM	17.0		2E	7-28-75	H.Mtn														2,300		seeps in stream channel
(D-31-8) 13bcc	Poison Wash	S	211 EMRY	19.0		1E	8-05-76	H.Mtn														4,400		seeps warmed by sun
(D-31-8) 27dab	Blind Trail	S	211 EMRY	19.0		Drip	8-22-75	H.Mtn	10		160	160	240	6.6	383		1,200	19	.2	.02	1,990	2,500		P=.00 PO4=.00 B=.21 AS=0 Pb=.002 Li=.08 Zn=.35 At discharge end of collecting pipe
(D-31-9) 7aca	Up.Dry Wash	S	111 ALVM	19.0		5M	8-04-76	H.Mtn														2,200		Rises in stream channel
(D-31-9) 15bab	Mud	S	110 PTOD	15.5		2E	8-04-76	H.Mtn														1,275		From thin pediment gravel
(D-31-9) 17cba	Dead Cows	S	200 MNCS	25.0		8-10E	7-31-75	H.Mtn	19		150	67	62	.8	248		520	29	.5	.01	971	1,350		P=.01 PO4=.03 B=.11 AS=0 Pb=.003 Li=.03 Zn=0 From stream channel underflow?
(D-31-11) 1cab	Poison	S	221 MRSN	16.0		2-3E	8-01-75	H.Mtn	12		170	37	21	2.9	194		420	10	.3	.00	769	1,025		P=.01 PO4=.03 B=.07 As=.007 Pb=.003 Li=.02 Zn=.01 6.5° on Dec 8, 77
(D-31-11) 1ccd	Poison Trib	S	221 MRSN	19.0		1-2E	8-01-75	H.Mtn														1,500		3° on Dec 8, 1977
(D-31-13) 9bcd		S	231 WNGT	19.0		3R	7-26-76	H.Mtn	8.9		25	30	47	9.4	274		50	12	.4	1.2	323	550	7.6	P=00 PO4=.00
				17.5			6-20-57	TP-15	9.1	.01	25	28	46	8.5	275		44	12	.3	3.7	312	528	7.4	B=.09
(D-31-13) 33bad	Arches No.	S	221 CRML	17.		.1E	8-29-76	H.Mtn																
(D-31-13) $33bad_2$	Arches So.	S	221 CRML	15.5		.1E	8-29-76	H.Mtn																

Table 27-B. Canyon Lands. Springs with Temperatures of 15.5° to 31° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER: SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(D-35-9) 13cbc	Thompson	S	210 DKOT	21.0		<1 E	8-19-75	H.Mtn														850		Thin sandstone warmed by sun
(D-35-10) 7cbb	Buck	S	210 DKOT	17.0		<1 E	8-19-75	H.Mtn														2,500		
(D-35-10) 20aac	Salt	S	210 DKOT	20.0		<1 E	8-19-75	H.Mtn														4,600		No flow on 12/8/77
(D-35-10) 21bcc	Saleratus	S	210 DKOT	20.0		<1 E	8-19-75	H.Mtn														1,700		7°, 2100 mmho on 12/8/77
(D-35-10) 33dbc	Four Mile	S	221 MRSN	19.0		1 E	8-31-76	H.Mtn	19	8.3	26	23	280	4.0	371		440	12	.6	.13	978	1,460	8.2	P=.00 PO4=.00 B=.13 AS=.009 Pb=0 Li=.19 Zn=0 Issues from cracks in rock in stream
(D-35-11) 21abb	Shitmaring	S S	221 SMVL	22.0		<1 E	8-30-76	H.Mtn														3,600		
(D-35-12) 9cdd	Four Mile	S	220 NVJO	17.0		.1E	8-30-76	H.Mtn														500		
(D-35-14) 30		S	230 MNKP	25.5		50 E	6-9-63	TP-15	11		150	97	342		259	0	770	356		3.2	1,860	2,710	7.5	From large joint with some gas issuing from bottom of wash - flow on 5-13-60 400 gpm
(D-36-11) 6aca	Honey Pot	S	221 MRSN	23.0		2 E	8-17-75	H.Mtn	11		190	260	300	13	405		1800	15	.4	1.4	2,790	3,000		P=.00 PO4=.00 B=.12 AS=.001 Pb=.001 Li=.17 Zn=.01
(D-36-11) 32cad	Mill Race	S	111 ALVM	25.0		5 E	8-17-75	H.Mtn	16		360	130	520	11	152		2200	45	.6	3.4	3,380	4,000		P=.00 PO4=.00 B=.12 AS=.001 Pb=.002 Li=.18 Zn=.01 From valley fill Dry on 12/8/77
(D-35 1/2-12)27cca	Tic A Boo	S	221 CRML	28.0		<1 E	8-18-75	H.Mtn	17		36	28	20	2.9	197		38	24	.4	1.1	268	480		
(D-36-12) 8aaa	Mule	S	221 CRML	23.0		<.1E	8-18-75	H.Mtn														475		
(D-39-26) 33	12R-163 (BIA)	S	210 DKOT	23.0		<.1	9-08-54	TP-15	15		25	41	556		822	0	673	44	1.1	1.1	1,760	2,500		
(D-40-25) 5bbb	12R-173 (BIA)	S	217 BRCN	20.0		.1R	9-08-54	TP-15	13		27	12	927		380	0	1670	54	1.7	1.5	2,890	3,930		
(D-41-21) 36	94-25 (BIA)	S	221 BLFF	16.5		.8R	11-03-54	TP-15	16		29	3.1	58		221	0	17	7	.8	.8	241	388		
(D-41-22) 13	94-61 (BIA)	S	221 MRSN	19.0		.2R	10-27-54	TP-15	17		46	17	37		249	0	21	12	.1	25	298	506		
(D-41-23) 24	94-40 (BIA)	S	221 MRSN	16.5		.2R	10-21-54	TP-15	15		34	7.6	113		261	0	86	33	1.2	11	429	679		
(D-41-24) 18	94-42 (BIA)	S	221 MRSN	17.0		.2R	10-21-54	TP-15	14		9.5	10	58		195	0	16	6	.4	6.5	216	354		
(D-41-24) 31	94-41 (BIA)	S	221 MRSN	17.0		.2R	10-21-54	TP-15	15		70	22	134		199	0	361	11	.5	.6	712	1,030		
(D-41-25) 23	12R-184A (BIA)	S	221 MRSN	19.5		.2R	9-09-54	TP-15	17		64	13	77		190	0	186	19	.6	3.1	473	721		
(D-42-9) 35	2A-104 (BIA)	S	220 NVJO	21.0		10.5R	9-11-53	TP-15	29		62	17	6.4		527	0	15	8	.2	.9	264	433		
(D-42-10) 32	2A-101 (BIA)	S	220 NVJO	18.5		2.5R	9-10-53	TP-15	24		84	22	6.9		366	0	54	6	.2	.8	329	329		
(D-42-12) 19aba	2A-28 (BIA)	S	231 KYNT	17.0		<.1	7-29-54	TP-15	14		30	9.5	6.4		128	0	11	5	.4	4.2	114	240		
(D-42-16) 19	8A-293 (BIA)	S	310 CDRM	25.0		.2E	9-18-54	TP-15	16		84	13	58		238	0	126	42	.4	3.1	460	712		
(D-42-16) 30	8A-294 (BIA)	S	310 CDRM	19.5		.2E	9-18-54	TP-15	16		64	9.0	26		182	0	75	15	.4	4.2	298	450		
(D-42-17) 4	8A-193 (BIA)	S	310 CDRM	19.0		.2E	9-17-54	TP-15	23		69	16	23		252	0	47	19	.4	6.2	328	538		
(D-42-17) 14	8A-281 (BIA)	S	310 HLGT	23.5		2 E	9-17-54	TP-15	19		421	147	119		174	0	1670	20	.7	2.5	2,490	2,760		
(D-42-21) 1	94-27 (BIA)	S	221 ENRD	18.0		1 E	11-03-58	TP-15	18		40	11	44		172	0	65	19	.7	4.3	287	467		

Table 27-B. Canyon Lands. Springs with Temperatures of 15.5° to 31° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER															
(D-32-8) 21dba	Spring Canyon	S	211 EMRY	20.0		2E	9-01-76	H.Mtn	13		220	150	270	8.5	479		1400	22	.4	.02	2,320	2,975	7.1	P=.01 P04=.03 B=.12 AS=.002 Pb=0 Li=.13 Zn=.01. Water may come from contact with Masuk, warmed by sun
(D-32-10) 4bcd	South Fork-B	S	111 CLVM	19.0		1/4E	9-11-75	H.Mtn														410		10°C on 7/10/76
(D-32-10) 18cba	D + DA	S		15.5		1/4E	8-14-75	H.Mtn	8.1		430	460	1000	26	423		4600	40	.3	.06	6,780	6,500		P=.01 P04=.03 B=.41 AS=0 Pb=.002 Li=1.3 Zn=.02
(D-32-10) 29bba	Stockseep	S	111 CLVM	17.0		<1M	8-14-75	H.Mtn														1,350		From thin colluvium
(D-32-10) 30aaa	Roadside	S	111 CLVM	18.0		10E	8-14-75	H.Mtn	25		120	42	53	.9	305		240	43	.9	.01	675	1,000		P=.00 PO4=.00 B=.15 AS=.001 Pb=.001 Li=.04 Zn=.01
(D-32-10) 30bba	Buffalo	S	111 CLVM	21.0		2E	8-14-75	H.Mtn														1,600		
(D-32-11) 24aaa	Cottonwood	S	221 MRSN	16.0		2E	8-01-75	H.Mtn	11		62	36	24	3.2	293		88	10	.3	.3	380	610		P=.01 P04=.03 B=.06 Pb=.003 Zn=.03. From valley fill on Morrison
(D-32-12) 1cda	Turkey	S	221 CRML	19.0		no flow	8-29-76	H.Mtn														750		
(D-32-12) 3abd	Death Canyon	S	221 ENRD	17.0		<1E	8-29-76	H.Mtn														455		Water seeps from sandstone in Box Canyon.
(D-32-12) 16bdb	Drinking Cup	S	221 ENRD	22.5		3E	8-29-76	H.Mtn														625		Frozen on Dec. 8, 1977
(D-33-8) 25dcd	Swap A	S	211 EMRY	22.5		<1E	8-20-75	H.Mtn														1,500		Thin sandstone warmed by sun
(D-33-9) 17ccd	Footbath	S	211 EMRY	25.0		2E	7-28-76	H.Mtn														1,300		Warmed by sun
(D-33-9) 17ccc	Muley V	S	211 EMRY	20.0		<1E	7-28-76	H.Mtn														1,800		
(D-33-12) 27bdb	Maidenwater	S	221 ENRD	19.0		1E	7-25-76	H.Mtn														580		16° on Dec. 8 '77
(D-33-13) 4cbc	South Hog ·	S	231 WNGT	19.0		5	7-06-77	H.Mtn	10		44	42	40	9.9	315		94	10	.4	.00	406	689		P=.03 P04=09 B=.09. 11° on Dec. 8 '77
(D-33-13) 5dbc	Middle Hog	S	231 WNGT	31.0		2-6M	7-06-77	H.Mtn														680		Variable from measured down-stream from seeps
(D-34-2) 10da	Skull	S	111 ALVM	20.5		1-2E	8-10-67	WRB-11																From valley fill on Morrison
(D-34-3) 13dc	D. H. Spurter	S	220 NVJO	16.5		10E	8-16-67	WRB11	12	.11	34	4.1	39	95			62	20			231		8.2	
(D-34-3) $13dc_2$	D. H. Bubbler	S	220 NVJO	15.5		8-10E	8-16-67	WRB11	14	.16	42	6.4	40		125		63	20			257		8.4	
(D-34-10) 24bca	Cow Seeps	S	110 PTOD	17.0 19.0		1M 5 qtsM	8-03-75 7-05-77	H.Mtn														610		Measured at discharge pipe.
(D-34-11) 7dbc	Indian	S	111 CLVM	17.0		<1E	8-02-75	H.Mtn														470		
(D-34-11) 8cca	Squaw	S	111 CLVM	16.0 27.0		15M 18M	8-03-75 7-09-76	H.Mtn														320		From thin pediment. Warmed by sun. Dry in July, Oct. 1977
(D-34-11) 16ccb	Copper	S	111 CLVM	16.0		2E	8-03-75	H.Mtn														760		
(D-34-11) 18ccb	Papoose W	S	110 PTOD	17.0		.1E	7-09-76	H.Mtn														420		From thin pediment
(D-34-11) 18ccd	Papoose E	S	110 PTOD	19.0		1E	7-09-76	H.Mtn														430		From thin pediment

Table 27-B. Canyon Lands. Springs with Temperatures of 15.5° to 31° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(D-43-9) 7	2A-111 (BIA)	S	220 NVJO	22.0		5.5R	9-11-53	TP-15	17		43	23	13		232	0	22	11	.2	.4	244	418		
(D-43-14) 11	8A-213 (BIA)	S	310 DCLL	18.5		<.1	9-30-54	TP-15	11		16	13			124	0		6.0		3.2		213		
(D-43-14) 13	8K-550 (BIA)	S	310 DCLL	18.0		.2E	9-30-54	TP-15	11		16	14			182	0		10		3.4		315		
(D-43-16) 23	8A-229 (BIA)	S	310 OGRK	21.0		<.1	9-09-54	TP-15	17		20	14	313		466	0	230	110	1.2	10	944	1,470		
(D-43-19) 29	8A-260 (BIA)	S	310 DCLL	22.0		4 E	9-09-54	TP-15	14		33	13	166		327	0	181	26	.6	2.8	597	941		
(D-43-20) 23	94-21 (BIA)	S	220 NVJO	16.0		10 E	11-04-54	TP-15	17		24	4.3	19		107	0	12	10	.6	3.5	143	220		
(D-43-23) 32	94-57 (BIA)	S	231 WNGT	20.0		.5E	10-20-54	TP-15							130	0		5.5		3.0		228		

Table 28. Cedar City Valley. Wells with Water Temperatures of 15.5° to 21° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER: SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(C-34-10) 31caa	I. Jones	W	111 ALVM	16.0	365	300	5-23-74	BD-28	34	.01	55	38	57	6.4	284	0	67	81	.1	2.6	490	800	7.9	B.09
(C-34-11) 36cdd2	D. Clark	W	111 ALVM	19.5	128	450	8-05-60	BD-6	37	.01	46	28	26	5.1	234		67	20	.4	1.8	346	522	7.9	B.11
(C-34-12) 36abb	L. C. Jones	W	111 ALVM	19.0																				
				20.0			9-10-74	BD-28	26	.04	80	52	50	4.3	139		330	40	.2	.35	653	1,000	7.9	B.12
(C-35-10) 7abc	H. Gibson	W	111 ALVM	15.5	300	850	8-27-74	BD-28														500		
(C-35-11) 24aab	E. Union Irr. Co.	W	111 ALVM	15.5		1,100	8-15-74	BD-28														650		
(C-37-12) 9acc	J. A. Watson	W	111 ALVM	15.5	186			BD-28																
				16.0			9-11-74	BD-28	54	.02	48	5.8	14	3.8	166		12	21	.2	.88	245	360	7.8	B.04
(C-37-12) 11aab	G. Vandenburge	W	111 ALVM	21.0	365		7-13-59	BD-6	54	.02	47	28	34		178		137	12		3.0	403	586	7.7	BD-28 indicates these records are same well 11aaa
11aaa				21.0	365		6-14-74	BD-28	51	.02	47	30	31	4.1	180	0	140	12	.3	.9	408	566	7.8	B.14
(C-37-12) 11ddb	Graff Bros.	W	111 ALVM	19.5		1,200 R	7-24-74	BD-28														550		
(C-37-12) 14abc	A. L. Graff	W	111 ALVM	18.0	264	600		BD-6																
				16.5			7-23-74	BD-28														650		

Table 29. Parowan. Spring and Wells with Water Temperatures of 14.5° to 20° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER: SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(C-31-7) 10dcd	William Cox	W	111 ALVM	15.5	323		10-24-73	BD-28														300		
(C-31-8) 36ccb		W	112 PLCN	17.0	162		11-14-73	BD-28														370		
(C-32-8) 12adb	Buckhorn Corp.	W	112 PLCN	18.5	425	2000 E	8-30-73	BD-28														270		
(C-32-8) 12bac	Buckhorn Corp.	W	112 PLCN	20.0	440	3490	5-21-74	BD-28	58	0	31	6.8	15	5.3	130	0	11	15	.2	.75	210	260	8.0	B.04
(C-32-8) 14adb	Wallace Limb	W	111 ALVM	15.5			5-21-74	BD-28	56	.02	30	6.7	14	4.5	132	0	9.5	15	.1	.83	205	260	8.1	B.04
						58	5-06-74	BD-28														330		Cond. 9-07-73
(C-32-8) 14adc	W. Limb	W	111 ALVM	15.5				BD-6																
(C-32-8) 24adb	Buckhorn Corp.	W	112 PLCN	16.5	535		9-30-74	BD-28	54	.02	28	8.6	20	4.2	138		8.1	16	.3	.51	210	280	8.0	B.73
(C-33-8) 11bbb	Patrick Fenton	W	111 ALVM	16.5			10-12-73	BD-28														310		
(C-33-8) 11bda	Patrick Fenton	W	111 ALVM	17.0	304	1350 E	10-12-73	BD-28														360		
(C-33-8) 22bcd	S. Brinkhurst	W	111 ALVM	15.5	511		9-11-74	BD-28														730		
(C-33-8) 28cda	F. K. Williamson	W	111 ALVM	15.5	288	815 R	7-06-73	BD-28														460		
(C-33-8) 36b S	"Warm" Spring	S	124 WSTC	14.5		900	5-01-74	BD-28														380		
(C-33-9) 1dad	Bonneville Inv. Company	W	111 ALVM	15.5	270	15	9-17-73	BD-28	46	.0	11	3.2	30	3.2	108	1	8.1	12	.3	.61	171	234		B.05
(C-33-9) 24cdd	D. W. Adams	W	111 ALVM	16.0	47		3-08-74	BD-28														390		
(C-34-10) 35acb	Sawyers Bros.	W		15.5	250		5-22-74	BD-28	31	.02	76	42	27	5.7	445	0	47	16	.2	2.0	473	730	7.9	B.07
							10-02-73	BD-28														837		

TABLE 30. Cedar Valley. Wells with Water Temperatures of 15.5° to 27° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER															
(C-6-1) 18dca	Cooperative Security Corp.	W	111 ALVM	27.0	235 - 264	12 M	7-01-65	TP-16	21		75	25	35		240	0	70	66		1.4	421	706	7.7	
(C-6-1) 31dab	Cooperative Security Corp.	W	111 ALVM	16.0	190 - 223	6 M	7-01-65	TP-16	46		82	116	179		324	0	291	355	2.2	.7	1,230	2,060	7.8	
(C-6-2) 14dba	Cooperative Security Corp.	W	111 ALVM	18.0	810	130 M	6-09-65	TP-16	46		29	13	36		198	0	22	14		.0	.253	393	8.1	Perf. 0-556 Feet
(C-6-2) 13caa	Cooperative Security Corp.	W	111 ALVM	16.0	525	400 M	7-01-65	TP-16	55		35	18	37		208	0	38	21		.4	300	461	8.0	Perf. 0-339 Feet
(C-7-2) 35bcc	R. J. McKinney	W	111 ALVM	15.5	225	10 R	3-29-66	TP-16	23		42	114	383		487	0	842	94		.4	1,740	2,430	7.8	

Table 31. Northern Juab Valley. Records of a Spring with Temperature of 20° C and a Well with Water Temperature of 15.5° C, and Chemical Analyses of Water from Both.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER															
(C-12-1) 12aacS	Ray Lunt	S	111 ALVM	20.0		1.3M	7-15-65	TP-17	38		69	27	232		222	0	81	368		2.8	962	1,690	7.2	
(D-13-1) 23cdc	J. H. Greenhalgh	W	111 ALVM	15.5	120		8-15-51	TP-17	36		58	36	66		210	0	65	136	.2	6.5	504	869		B.07
							6-11-64	TP-17			59	38	59	3.1	173	14	61	149			560	880	8.7	

Table 32. Park Valley. Records of Springs with Water Temperatures of 16° to 26.5° C and Chemical Analyses of Water from Those Springs

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(B-10-15) 6cdbS	Warm Spring No.2	S	400 ABRG	20.0		386M	11-07-68	TP-30	19		63	21	77		184	0	29	162		1.1	501	860	7.6	
(B-12-15) 19aabS	Warm Spring No.1	S	400 ABRG	26.5		340E	8-12-66	TP-30	14		36	8	27	1.7	108	2	15	57	.2	.1	223	406	8.5	B.02
(B-13-12) 30caaS	L. G. Carter	S	111 ALVM	25.0		5E	6-17-66	TP-30	10		39	11	44	.6	156	0	19	65	.2	1.4	274	482	8.0	B.07 Listed in Curlew Valley
(B-13-13) 27dddS	C. D. Larson	S	111 ALVM	21.0			6-17-66	TP-30	15		44	10	250	3.2	588	0	39	125	1.0	3.0	795	1,290	8.0	B.51 Sampled at Pond
(B-13-13) 34cbbS	W. R. Carter	S	111 ALVM	21.0			6-17-66	TP-30	12		24	21	52	1.5	208	0	20	49	.5	1.1	292	491	8.1	B.15 Sampled at Pond
(B-13-13) 35bbbS	E. M. Richardson	S	111 ALVM	23.0			6-17-66	TP-30	.8		28	17	290	3.2	578	47	31	148	1.1	1.0	918	1,490	8.9	B.56 Sampled at Pond
(B-13-14) 24ddcS	R. R. Pugsley	S	111 ALVM	23.0			6-17-66	TP-30	11		45	12	43	2.9	150	0	20	76	.5	1.2	314	500	7.2	B.09 Sampled at Pond
(B-13-16) 23ccdS	Head Spring	S	400 ABRG	21.0		20E	8-12-66	TP-30	10		54	8.3	20	1.0	187	0	8.8	36	.1	.1	240	421	8.0	B.02
(B-10-15) 6accS	Watercress Sprs.	S	300 PLZC	16.0		29M	11-07-68	TP-30													530	1,000		
(B-11-11) 6dbbS	Black Butte Sprs.	S		19.0		18R	9-23-60	TP-30	14		520	124	6,670	276	206	0	224	11,600		15	20,300	30,400		Belongs in Curlew Valley
(B-13-14) 21dddS	R. E. Palmer	S	111 ALVM	19.5		2E	8-12-66	TP-30	11		25	5.4	31		114	0	12	32		.1	162	304	8.1	
(B-13-14) 24cacS	M. W. Kunzler	S	111 ALVM	17.0		2E	6-17-66	TP-30	11		26	8.3	49	.4	117	0	19	61	.2	.3	233	414	7.5	B.07
(B-13-14) 26ddaS	J. H. Kunzler	S	111 ALVM	17.0			8-12-66	TP-30	13		35	11	24	2.8	189	0	6.2	20	.3	1.1	204	362	8.0	B.04 Sampled at Pond
(B-13-14) 28abcS	E. R. Morris	S	111 ALVM	16.0		20E	8-12-66	TP-30	11		14	3.4	23		82	0	6.6	.8		.1	111	199	7.3	Sampled at Pond

Table 33. Promontory Mountains. Records of Wells and Springs with Water Temperatures of 15.5° to 25° C and Chemical Analyses of Water from those Wells and Springs.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(B-6-5) 21aacS	Compton Spring	S		21.0		42M	3-16-67	TP-38	13		81	36	440	9.8	242	0	76	750	.4	3.0	1,520	2,660	7.7	B.12
				21.5			11-27-70		16		72	38	420	14	249		78	680	.1			2,800	7.5	
(B-7-5) 15cbaS		S		25.0		310E	10-16-63	TP-38										13,100			24,900	34,400		
(B-8-5) 5caaS	V. S. Poulsen	S	300 PLZC	20.0		300E	11-28-70	TP-38														6,560		
(B-8-5) 5cdcS	V. S. Poulsen	S	300 PLZC	22.0		220E	3-23-66	TP-38	15		92	54	1,180	43	246	0	176	1,950	1.0	5.0	3,750	6,390	7.7	B.62
(B-10-6) $9bbb_2$	National Park Service	W	121 SLLK	22.5	423	24M	5-31-67	TP-38							177	0		260			837	1,190	7.4	
				21.5			6-02-67	TP-38	66	.04	82	33	96	23	176	0	38	260	.8	3.8	852	1,190	7.5	B.06
B-7-5) 9bbbS	Shaw Spring	S		17.0		10E	11-28-70	TP-38														1,250		
(B-7-5) 15bcdS	H. S. Arthur	S		16.5		10E	10-16-63	TP-38													2,110	3,700		
(B-7-5) 15cdbS		S		19.5		3E	11-28-70	TP-38														10,500		
(B-7-5) 16aaaS		S		15.5		5E	10-16-63	TP-38													1,230	2,140		
(B-7-5) 16aadS		S		15.5		5E	10-16-63	TP-38										610			1,320	2,350		
(B-7-5) 22bacS	H. S. Arthur	S		18.5		3E	10-16-63	TP-38										3,000			5,050	8,600		
(B-7-5) $22bdbS_1$		S		16.0		3E	11-28-70	TP-38														2,940		
(B-7-5) $22bdbS_2$		S		18.0		2E	11-70	TP-38																
				17.5			10-16-63	TP-38													3,900	6,650		
(B-7-5) 22cacS		S		16.5		40E	10-16-63	TP-38													2,390	4,170		
(B-7-5) 22cdcS		S		19.5			10-16-63	TP-38										10,300			19,000	21,500		
(B-7-6) 14bccS		S		16.0		5E	12-02-70	TP-38														10,600		
(B-7-6) 23accS	Squaw Spring 1	S		16.5		5E	12-02-70	TP-38		.00	32	20	290	14	184	0	67	420	.1	1.4	933	1,680	7.6	B.17
(B-10-5) 11accS	Fish Spring	S	300 PLZC	17.0		373M	12-02-70	TP-38														11,300		
(B-10-5) 11daaS	Thiokol Chemical	S	300 PLZC	16.5		10M	12-02-70	TP-38														8,230		
(B-10-8) 13cbd	Swan Land & Livestock Co.	W	121 SLLK	18.0	286	20R	11-28-69	TP-38	56		184	265	1,850		187	9	620	3,300		76	7,060	10,500	8.0	

[illegible] Rush Valley. Records of One Well and Three Springs with Water Temperatures of 16° to 26.5° C and Chemical Analyses of Water from the Well and Springs

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(C-8-5) 6ddb	McFarland & Hullinger	W	111 ALVM	16.0	534	4100M	12-22-64	TP-23	13	.33	40	27	36	2.8	192	0	28	70	.6	.0	344	558	7.6	Mn .01 B .09
(C-7-5) 32abaS	Roy Davis	S	111 ALVM	20.0		600	12-22-64	TP-23	14	.12	46	38	47	2.8	237	0	35	106	.3	1.4	412	725	7.8	Mn .07 B .06
(C-5-5) 9cbaS	Warm Spring	S	111 ALVM	24.0		1000	9-22-64	TP-23	20	.88	58	24	110	11	174	0	90	179	1.0	.4	594	981	8.0	Mn .02 B .17 WRB13 shows 583 dis solids this analyses
	Morgans W.S.			26.5			7-18-67	WRB-13	19		48	28	112	11	162		98	188	1.4	.0	586	1,000	7.8	B .18, Li .03, Br .3, I .01 Possibly WRB13 in error on dissolved solids
(C-5-5) 17aaaS	Russells Warm Spring	S	111 ALVM	21.5		450	4-29-66	WRB-13	17		51	21	73	11	170		55	124	1.6	.2	438	779	7.4	B .14, Li .03, Br .3, I .01 Possibly WRB13 in error on dissolved solids
							7-18-67	WRB-13	19		55	17	71	10	170		65	122	1.5	.0	445	744	7.5	B .14, Li .02, Br .2, I .02
				14.0			9-22-64	TP-23	18	.53	52	20	74	14	176	0	59	135	1.3	.4	463	789	7.8	B .14, Mn .01 Pond Temp?

Table 35-A. Skull Valley. Records of Wells and Springs with Water Temperatures of 20° to 26.5° C and Chemical Analyses of Water from Some of Those Wells and Springs

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(B-1-9) 24cdd	Bertagnole	W	111 ALVM	24.0	215	40R	12-29-65	TP-18	24	.93	78	102	849	39	158	0	146	1,540	.8	11	3,070	5,190	7.3	Mn .02, B .46
(C-1-7) 9caaS	Utah Fish & Game Dept.	S	Fault	22.0		30E	8-27-65	TP-18																
(C-1-7) 9cadS	Utah Fish & Game Dept.	S	Fault	22.0		30E	8-27-65	TP-18																
(C-1-7) 15bdbS		S	Fault	23.5			9-05-41	TP-18										6,720						
(C-1-7) 25accS		S	Fault	20.0			9-05-41	TP-18										9,600						
(C-1-8) 6abc	C. Hammond	W	300 PLZC	26.5	64	10R	11-49	TP-18																Water reported saline
(C-2-8) $24ccS_2$		S	Fault	22.0		25E	7-18-63	TP-18	18	.53	101	46	1,060	25	183	0	133	1,890	.1	2.8	3,490	5,810	7.3	B .3, Mn. 0
(C-2-8) 26dabS	No. Horseshoe Spring	S	111 ALVM	23.0			7-18-63	TP-18	47	.50	126	47	1,500	47	244	0	190	2,420	.2	8.7	4,720	7,720	7.8	B .39, Mn. 0 } Estimated total flow 30 cfs. 26dba in chem. analysis table
(C-2-8) 26dbcS	So. Horseshoe Spring	S	111 ALVM	23.0			7-18-63	TP-18	29	.11	123	49	1,720	59	246	0	227	2,700	.7	6.0	5,120	8,570	7.3	B .40, Mn. 0 }
(C-2-9) 7cbS	Radium Spring	S	Fault	21.0		2E		TP-18																
							7-19-63	TP-18	15	.01	180	96	314	8.2	232	0	163	840	.2	3.3	1,930	3,090	7.7	B .15 Another temp of 15° 10-27-63
(C-3-8) 10cccS	Deseret Livestock South Spring	S	Fault	23.0		1800E	7-30-63	TP-18	17	.09	152	61	1,970	66	241	0	280	3,150	.4	6.9	5,980	9,820	7.3	Mn .01, B .47 Discharge is from 5 springs at north end of spring area.
(C-3-8) 15cbaS	Deseret Livestock South Spring	S	Fault	21.5		230E	7-30-63	TP-18	16	.15	138	55	1,960	66	223	0	260	3,090	.3	4.3	5,770	9,590	7.2	Mn .04, B .44 One spring in large spring area
(C-3-8) 21ddbS	Deseret Livestock	S	Fault	24.0		10E	7-23-63	TP-18	11	1.2	23	5.4	14	.9	90	0	10	26	.2	.1	137	238	7.1	Mn .10, B .02

Table 35-B. Skull Valley. Records of Wells and Springs with Water Temperatures of 15.5° to 19.5° C and Chemical Analyses of Water from Some of the Wells and Springs

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(C-1-7) 9cccS	Utah Fish & Game	S	Fault	18.5		2390 M	7-18-63	TP-18	14	1.1	134	79	2,630	93	212	0	310	4,260	.1	4.1	7,850	12,900	7.7	Mn .04, B .79
(C-1-7) 25dabS	Utah Lime Co.	S	Fault	19.0			8-05-41	TP-18										6,850						
(C-1-7) 31aad	L. C. Hales	W	111 ALVM	15.5	100	100 M	8-30-55	TP-18																
(C-1-7) 31dcd	A. B. Callister & L. C. Hale	W	111 ALVM	16.5	130	10 R	7-18-63	TP-18	29	.38	62	37	859	34	212	0	118	1,380	.2	2.1	2,680	4,690	7.3	Mn. 00, B .23
(C-1-7) 32bd	A. B. Callister & L. C. Hale	W	111 ALVM	19.0	130	1800 R	7-18-63	TP-18	31	.41	107	71	1,220	45	234	0	231	1,980	.2	3.8	4,010	6,540	7.2	Mn. 00, B .57
				19.0			9-05-63	TP-18	31	.39	106	69	1,180	46	233	0	248	1,950	.2	8.1	3,910	6,320	7.3	Mn .02, B .38
(C-2-7) $6caa_1$	J. Q. Griffiths	W	111 ALVM	16.5	255	450 R	7-31-53	TP-18																
(C-2-7) $6caa_2$	J. Q. Griffiths	W	111 ALVM	15.5	130	50 E	4-29-55	TP-18	32		70	41	793	30	206	0	107	1,270	.2	6.0	2,480	4,370	7.7	
(C-2-7) 6cdaS	Burnt Spring	S	Fault	19.5		Seep	7-18-63	TP-18	26	.18	84	45	824	31	207	0	114	1,360	.2	7.4	2,680	4,610	7.3	Mn. 00, B .23
(C-2-8) 13dcbS	Muskrat Spring	S	Fault	19.0		50 E	7-18-63	TP-18	22	.17	85	36	639	25	218	0	87	1,050	.1	5.1	2,060	3,670	7.4	Mn. 00, B .19
(C-2-8) 24bcd	E. R. Flinders	W	111 ALVM	16.0	132	540 M	7-01-54	TP-18	22		70	31	485	16	199		76	825	.1	3.7	1,610	2,910		
(C-2-8) 24ccS		S	Fault	18.0		25 E	7-18-63	TP-18	22	.78	103	44	1,020	32	190	0	126	1,720	.1	3.4	3,430	5,650	7.1	Mn. 00, B .26
(C-2-8) 25bbd	M. D. Arbon	W	111 ALVM	18.0		355 M	7-01-54	TP-18	22		95	46	993	34	188		128	1,630	.1	4.4	3,090	5,350		
(C-3-8) 12abS		S	Fault	19.0		4.6M	7-30-63	TP-18	21	.03	63	11	60	.8	203	0	20	102	.2	1.2	395	678	7.5	Mn. 00, B .04
(C-5-7) 35bcbS	Sand Spring	S	Fault	17.0		5 E	8-14-63	TP-18	7.3	.30	51	2.4	13	.7	270	0	11	17	.1	.2	241	453	7.7	Mn. 00, B .03
(C-6-8) 15cacS	Orr's Ranch	S	Fault	15.5		150 E	8-15-63	TP-18	19	.70	59	32	142	7.7	238	0	49	245	.4	1.5	706	1,220	7.4	Mn. 00, B .12
(C-2-7) 7ccc	D. Lawrence	W	111 ALVM	17.0	175	600 R	3-16-54	TP-18	21		78	42	820	30	190	0	95	1,350	.1	4.5	2,530	4,590	7.8	B .28
(C-3-7) 30ddbS		S	Fault	16.0		50 E	7-31-63	TP-18	10	.03	38	9	24	1.1	158	0	10	31	.1	.3	199	343	7.6	B .02, Mn. 00
(C-3-9) 8ccS	Eight Mile Spring	S	Fault	18.0		3.6M	7-23-63	TP-18	13	.72	180	111	268	8.5	196	0	129	855	.1	3.7	1,940	3,050	7.9	Mn .08, B .17 100 gpm E from whole spring area
				18.0			9-05-63	TP-18	13	.48	174	114	262	7.9	196	0	129	840	.3	2.6	2,070	3,000	7.3	Mn .01, B .18
(C-4-8) 33aba	Hatch Bros. Co.	W	111 ALVM	15.5	500	350 M	8-01-63	TP-18	25	.09	28	23	153	12	190	0	40	222	.1	12	616	1,090	7.3	Mn. 00, B .08

Table 36. Snake Valley. Records of Springs and Wells with Water Temperatures of 15.5° to 27° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(C-15-19) 31bcS	Gandy Warm Sprs	S	370 CMBR	27.0		4500	3-03-66	WRB-13	20		50	21	28	2.7	278	0	21	20	.7	3.6	294	498	7.6	
				26.5		9000	7-12-67	WRB-13	21		50	18	29	3.6	250	0	29	26	.7	1.9	288	485	7.6	
(C-16-18) 9S	2 miles south of Foote's Ranch	S		20.0		1000	1908?	WSP-277 PR-492																
(C-16-18) 22cabS	Twin Springs	S		20.0		1800 E	10-15-64	TP-14																
(C-18-18) 16abbS	Knoll Springs	S		19.5		3 E	10-15-64	TP-14																
10dS				21.0			1908?	WSP-277																
(C-18-19) 20ddd2	J. D. Hill	W		22.0	560	75 E	10-24-57	TP-14																
(C-18-19) 28bbb	J. D. Hill	W		22.0	640		1957	TP-14																
(C-14-18) 33S	Miller's Ranch 8 Miles south Trout Creek	S		18.0		500	1908?	WSP-277 PR-492																
(C-20-19) 7aab	G. S. Quate	W		15.5	569	?	11-17-36	TP-14																
(C-20-19) 1bcc	BLM	W		16.5		1 E	5-26-51	TP-14																

Table [illegible]A. Tooele Valley. Wells and One Spring with Water Temperatures of 20° to 30° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(C-2-4) 9cda	Kennecott Copper	W	111 ALVM	30.0	687		2-28-63	BD-7	30		112	44	894		231	0	66	1,520		1.2	2,780	5,200	7.5	Perf. 536-562, 592-666
(C-2-5) 13bca	Ed Cassity	W		23.0	3540		5-05-61	BD-7							124	0		510				1,910	7.8	Oil Test
(C-2-5) $34bca_3$	Neldo Lemmon	W	111 ALVM	23.0	320	200 E	9-26-61	BD-7							208	0		1,700				5,600	7.6	
(C-2-5) 34cbc	M. Mortenson	W	111 ALVM	21.0	380		8-18-58	BD-7	28		74	34	204		252	0	91	332		2.1	889	1,580	7.7	
(C-2-6) 16aadS	Grantsville Warm Springs	S	111 ALVM	24.5		400 E	3-15-66	WRB-13	27		584	188	8,910	237	233		662	15,000	1.7	1.3	25,800	40,400	7.5	B 1.5 Others also from WRB-13
(C-2-6) 23cbb	J. R. Worthington	W	111 ALVM	20.0	210	300 E	5-31-61	BD-7	62	0	46	16	231		206	0	35	337		1.9	822	1,470	7.7	
				20.0			8-22-62	BD-7	52	.03	40	16	200	19	206	0	31	295	0.6	.8	774	1,360	7.5	B .10
(C-3-4) 32bcc	Tooele City	W	111 ALVM	21.5	710	325 M	12-09-54	BD-7	44	.79	62	6	87		219	0	30	93	1.3	32	397		7.0	
							8-24-55	BD-7	34	.0	75	12	52		270	0	24	66	.2	12	418		7.6	

Table 37-B. Tooele Valley. Wells and One Spring with Water Temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(C-1-4) 26ddd	Leslie Salt	W	111 ALVM	16.0	227	120 R	11-24-61	BD-7	14	.01	72	57	533	24	230	0	48	960	.2	2.3	1,820	3,550	8.1	B=.22
(C-1-6) 22ddd	Solar Salt	W	111 ALVM	16.0	630	40 R	1959	BD-7																
(C-2-4) 10bcd	KCC	W	111 ALVM	16.5	133	6 M	9-06-62	BD-7										638				2,590		
15 cac	KCC	S	111 ALVM	18.0		2600 R	8-22-58	BD-7	25		76	41	288		242	0	144	450		4.6	1,150	1,990	7.6	
(C-2-4) 15cdc	S. W. Clark	W	111 ALVM	16.0	305	1200 R	6-27-61	BD-7	19		122	43	321		292	0	277	460		2.7	1,390	2,330	7.5	
(C-2-4) 17dad	E. J. Jeremy	W	111 ALVM	16.5		6 M	11-29-61	BD-7										262				1,300		
(C-2-4) $31acc_9$	R. Castagno	W	111 ALVM	17.0	180		8-18-58	BD-7	17		56	20	135		273	0	28	182		5.8	578	1,070	8.0	
(C-2-4) 31ada	E. Walters	W	111 ALVM	15.5	200	15 M	10-04-60	BD-7	14	.00	48	18	106	1.8	258	0	26	122	.2	12	475	836	7.9	B=.08
(C-2-4) $31add_2$	E. Walters	W	111 ALVM	15.5	202		8-18-58	BD-7	17		52	19	96		272	0	28	112		9.7	468	846	7.9	
(C-2-4) $31add_6$	E. Walters	W	111 ALVM	16.0	271	660 M	6-05-62	BD-7																
(C-2-4) 31bcb	F. Hickman	W	111 ALVM	17.0	343	80 E	12-28-60	BD-7	17	.01	66	25	119	3.2	262	0	27	198	.1	5.9	605	1,080	7.9	
(C-2-4) $31bdc_2$	R. Castagno	W	111 ALVM	17.0	260		8-18-58	BD-7	15		52	19	136		244	0	35	180		6.0	569	1,030	8.3	
(C-2-4) $31bdc_3$	R. Castagno	W	111 ALVM	18.5	352	1200 M	6-05-62	BD-7																
(C-2-4) $31caa_5$	E. Walters	W	111 ALVM	16.5	172		8-18-58	BD-7	16		43	17	168		270	0	33	200		4.8	615	1,110	8.1	
(C-2-4) $31cda_2$	E. Walters	W	111 ALVM	16.0	500	1080 M	9-07-62	BD-7																
(C-2-4) $31dac_3$	H. C. Dillard	W	111 ALVM	16.0	174		8-20-58	BD-7	15		54	19	98		280	0	28	112		11	475	863	7.8	
(C-2-4) 31dad	H. C. Dillard	W	111 ALVM	16.5	727	300 M	8-20-58	BD-7	14		55	18	107		285	0	30	120		13	497	880	8.0	
(C-2-4) 32cac	R. Boyce	W	111 ALVM	16.0	500		9-11-62	BD-7																
(C-2-4) 32cad	R. Boyce	W	111 ALVM	16.0	400	50 M	9-07-61	BD-7																
(C-2-4) 33aab	J. E. England	W	111 ALVM	16.0	403	1760 M	7-28-62	BD-7																
(C-2-5) $5ccc_2$		W	111 ALVM	16.5			4-19-63	BD-7										3,620				10,400		
(C-2-5) $5dcd_4$	G. S. Higley	W	111 ALVM	15.5	417		10-11-61	BD-7										232				1,030		
(C-2-5) $6ddd_7$	L. Pessnal	W	111 ALVM	16.5	360	L.9M	10-10-62	BD-7										1,640				5,150		
(C-2-5) 18dcc	E. M. Clark	W	111 ALVM	15.5	300		3-08-62	BD-7																
(C-2-5) 27add	E. Cassity	W	111 ALVM	18.0	355	150 E	6-20-62	BD-7																
(C-2-4) 28bca	C. Higley	W	111 ALVM	15.5	335	900 E	10-16-62	BD-7	24		132	47	152		220	0	86	412		5.1	966	1,800	7.4	
(C-2-5) 32daa	J.M. Fraser	W	111 ALVM	15.5	410	200 E	6-19-62	BD-7																
(C-2-5) $33dad_3$	J. C. Palmer	W	111 ALVM	19.5	400	200 E	4-11-61	BD-7	28	.12	91	37	255	6.0	247	0	86	454	.3	3.5	1,080	1,940	8.1	B=.17
(C-2-5) 33dba	L. A. Bollnder	W	111 ALVM	17.0	525	200 E	6-19-62	BD-7																
(C-2-5) 33dbb	R. Fawson	W	111 ALVM	18.5	265		3-07-62	BD-7																
(C-2-5) 33dcd	T. McMichall	W	111 ALVM	19.0	285	535 M	8-22-58	BD-7	31		88	34	190		264	0	93	323	4.8		894	1,530	7.6	
(C-2-5) 34ddd	N. Pantos	W	111 ALVM	18.0	440		7-01-59	BD-7	21		51	26	202		217	0	48	315		.4	770	1,390	7.8	
(C-2-5) $35add_1$	H. G. Langford	W	111 ALVM	18.5	513		6-28-61	BD-7														1,460		
(C-2-5) $35add_2$	S. A. Langford	W	111 ALVM	17.0	145	30 R	8-18-58	BD-7	17		93	36	298		253	0	39	550		5.7	1,160	2,180	7.7	

Table [illegible] Tooele Valley. Wells and One Spring with Water Temperatures of 15.5° to 19.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER															
(C-2-5) 35cbd	Grantsville SCD	W	111 ALVM	19.0	400		3-06-62	BD-7																
(C-2-5) 36adc	J. H. Palmer	W	111 ALVM	18.5	442	950 M	3-07-59	BD-7	17		61	23	124		264	0	25	192		3.8	576	1,070	7.6	
(C-2-5) 36add	J. H. Palmer	W	111 ALVM	16.5	310		8-18-58	BD-7	16		58	21	131		262	tr	29	192		2.5	578	1,070	8.2	
(C-2-5) 36bdd	T. Castagno	W	111 ALVM	18.0	445	500 E	8-18-58	BD-7	16		47	21	176		244	0	31	250		2.8	664	1,240	7.7	
(C-2-5) 36dad	R. J. Nelson	W	111 ALVM	15.5	259		8-22-58	BD-7	21		69	22	161		274	0	33	249		5.8	696	1,220	7.8	
(C-2-5) 36dcd	J. A. Smith	W	111 ALVM	19.0	325	1250 E	8-20-58	BD-7	22		88	34	431		214	0	45	760		5.2	1,490	2,710	7.4	
(C-2-6) 14ddd	C. H. Worthington	W	111 ALVM	18.5	434	100 E	10-03-62	BD-7										80				604		
(C-2-6) 22dbd	Utah Lime & Stone	W	111 ALVM	19.0	147	100 R	9-06-62	BD-7										119				715		
(C-2-6) $23cbb_2$	J. R. Worthington	W	111 ALVM	16.5	95		2-20-60	BD-7	36		26	11	124		198	0	20	139		.5	454	783	7.6	
(C-2-6) $23cdc_2$	B. Castagno	W	111 ALVM	16.0	400	1460 M	9-11-62	BD-7	33		39	14	63		170	0	20	93		.7	344	604	7.7	
(C-3-5) $4bbb_2$	V. P. Fawson	W	111 ALVM	15.5	407	1300 M	8-22-62	BD-7	21	.00	118	43	194		220	0	50	468		1.6	1,000	1,910	7.5	

TABLE 38. Tule Valley. Wells and Springs with Water Temperatures of 16° to 31° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER: SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(C-16-15) 13babS	Coyote Spring	S	Fault	28.0 28.0		10 E 100 E	9-19-74 1-15-76	TP-56 TP-56	23	.03	71	38	350	37	266		330	450	1.1	.12	1,430	2,400 2,000		B .61
(C-16-15) 26cabS		S	Fault	24.5			9-19-74	TP-56														1,700		
(C-17-15) 10aabS		S	Fault	27.5 27.5			9-19-74 1-15-76	TP-56 TP-56														1,600 1,500		
(C-17-15) 10abaS	No. Tule Spring	S	Fault	28.0			9-19-74	TP-56																
(C-17-15) 10acaS		S	Fault	27.0			9-19-74 9-12-62	TP-56 TP-56			72	41	201	20	248	0	262	230			992	1,575 1,590		B .24
(C-17-15) 15abcS	So. Tule Spring	S	Fault	25.0			9-19-74	TP-56														1,750		
(C-17-15) 25bcbS		S	Fault	27.0			9-19-74	TP-56														2,300		
(C-17-15) 25cbb		W	Fault	31.0	42	200	11-20-53	TP-56																Water only 4 feet below land surface
(C-16-15) 34dacS	Willow Spring	S	Fault	19.5			9-19-74	TP-56														1,900		
(C-17-16) 28dbdS	Skunk Spring	S	Fault	16.0		3 M	6-20-73	TP-56	16	.05	240	110	170	2.8	264	0	270	640	.7	.43	1,580	2,700		Mn .02, B .44, P .01
(C-22-14) 1cba	IBEX Well #108	W		16.5	493	 13.9	1-14-76 9-24-48	TP-56 TP-56	22		47	33	180	19	297		200	170	1.1	.53	821	1,320		B .34, P .01

Table 39. Wah Wah Valley. Wells and Springs with Water Temperatures of 15.5° to 24.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER: SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(C-24-13) 34ccb	BLM Wah Wah Well	W	*	15.5	294	30	12-17-62 9-25-63	TP-47 TP-47	33 30	.12 .21	77 64	29 45	366 436	15 18	160 186	0 0	179 205	585 670	.5 .4	5.3 4.9	1,380 1,600	2,380 2,730	7.1 7.2	* Older Alluvium
(C-28-14) 11abb	Earth Sciences Inc.	W	*	24.5	1,472		9-27-73	TP-47	58		21	6.4	86	11	169	0	82	32	1.0	.85	586	985	7.5	P.18, B.12 * Older Alluvium
(C-27-15) 11aadS$_1$	Wah Wah Ranch No. 2	S	*	19.0		10 E	10-12-72	TP-47																* Discharge from tufa deposits
(C-27-15) 11aadS$_2$	Wah Wah Ranch No. 3	S	*	19.0		5 E	10-12-72	TP-47																* Discharge from tufa deposits
(C-27-15) 11abaS$_1$	Wah Wah Ranch No. 1	S	300 PLZC	19.5		450 E	9-14-62 5-27-68	TP-47 TP-47	13 13		67 63	29 32	22 20	1.5 1.2	316 310	0 0	14 14	37 42	.1 .2	5.7 6.9	340 338	624 600	7.9 7.8	B.02 B.02
(C-27-15) 12bbaS$_1$	Wah Wah Ranch No. 6	S	*	18.0			10-12-72	TP-47																* Discharge from tufa deposits
(C-27-15) 12bbcS$_1$	Wah Wah Ranch No. 5	S	*	18.0		10 E	10-12-72	TP-47																* Discharge from tufa deposits
(C-27-15) 12bcdS$_1$	Wah Wah Ranch No. 4	S	*	16.5		20 E	10-12-72	TP-47																*Discharge from tufa deposits
(C-27-15) 11aadS$_1$ 11aadS$_2$ 12bba 12bbc	Wah Wah Ranch 2, 3, 5 & 6	S		19.0			9-14-62	TP-47	13		60	30	20	1.2	298	0	14	36	.1	4.9	324	592	7.9	B.02 Total Flow Wah Wah Springs 500gpm E

Table 40. Grand Staircase. Springs with Water Temperatures of 15.5° to 35.5° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS	COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
(C-42-6) 17caa	Big Lake Springs	S	220 NVJO	15.5		100-125 E	8-26-63	WRB-5																
(C-39-7) 36bbb	Stout Canyon Seep	S	210 CRCS	21.5		1 E	7-25-63	WRB-5																Temp. meas. in seepage area
(C-40-7) 11dbb	Hidden Lake Spring	S	210 CRCS	20.5-23.5 11.0		350 E	7-23-63 3-21-65	WRB-5 WRB-8	 6.4	 0.52	 52	 19	 47		 305		 9	 47		 0	 328		 7.9	Lake Temp.
(C-40-7) 34bad	Proposed Town Spring	S	210 CRCS	15.5		Seeps	7-19-63	WRB-5	40	.02	350	231	46		585		1245	28		0	2708			Shallow Aquifer
(C-40-7) 28dba	Calf Pasture Hollow	S	210 CRCS	18.0		4 E	8-12-63	WRB-5																
(C-43-8) 1abc	Yellow Jacket #1	S	220 NVJO	35.5		1/8 M	7-19-64	WRB-8																Temp. Meas. at Pipe. Ground Temp. 131°F.
(C-42-8) 36ddc	Yellow Jacket #2	S	220 NVJO	23.5		.2M	7-19-64	WRB-8	13	0.09	40	11	4.4		145		8.3	6		8.3	191		7.3	Temp. Meas. at discharge pipe
(C-43-8) 9dbb 9dbc	Harris Springs	S	220 NVJO	19.5 23.0		3 E	7-19-64	WRB-8	10	.05	51	13	11		185		9.1	8		0	224		7.6	
(C-42-6) 4cbc	Headwaters Lower Kanab	S	220 NVJO	16.5		25 E	8-01-64	WRB-8																
(C-42-6) 9bbd	Red Canyon	S	220 NVJO	22.0		15 E	8-01-64	WRB-8																
(C-42-5) 35bdb	Alvin Judd House	S	220 NVJO	18.5		.25E	8-29-64	WRB-8																
(C-42-4 1/2)18ccc	East Side Johnson Canyon	S	231 MONV	15.5		3E	8-27-64	WRB-8																
(C-42-4 1/2)32dab 32dba	Johnson Lakes Springs	S	220 NVJO	16.5			8-28-64	WRB-8	6.7	.04	37	20	14		185		9.6	11		0	222		7.8	
(C-39-4 1/2)16cd	Head of Slide Canyon	S	211 KPRS	16.5		1/8 M	7-30-64	WRB-8																Temp. Meas. 100 yds. below source
(C-40-4) 15dd	Findlay Ranch	S	111 ALVM	15.5		.25E	7-31-64	WRB-8																
(C-37-1) 8ddaS	Henrieville Old	S	220 SGCF	15.5		13 M		HG																
(C-40-1) 11 S	Cottonwood #6	S	220 NVJO	16.5		8 M	7-23-64	WRB-8	7.3	.04	37	6.1	6.5		95		21	10		1.0	117		7.3	
(C-40-1) 14cbS	Cottonwood #4	S	111 CLVM	15.5		63 M	7-22-64	WRB-8	9.7	.05	46	7.1	9.5		130		20	10		1.8	194		7.9	
(C-40-1) 14cdS	Cottonwood #5	S	111 ALVM	16.0		5 E	7-23-64	WRB-8																
(C-40-1) 23baS	Cottonwood #3	S	111 ALVM	15.5		58 M	7-22-64	WRB-8	9.7	.05	39	12	14		145		20	11	.3	.0	199		7.6	QAL (Fault in Navajo?)
(C-40-1) 23bcS	Cottonwood #2	S	111 CLVM	18.5		2 E	7-23-64	WRB-8																
(C-41-3) 34cbbS	Kitchen Corral Point Spring	S	231 CHNL	23.5 10.5		.25M	7-26-64 3-22-65	WRB-8 WRB-8	9.4 8.1	.04 .02	15 13	10 10	181 195		270 240		216 211	50 49		.0	680 691		8.7 8.2	(on fault?) Temp meas. at discharge pipe
(C-42-3) 3bcdS	Kitchen Corral Wash	S	111 ALVM	19.5			8-26-64	WRB-8																Water probably rises on bedrock dam
(C-43-7) 21aabS	Water Canyon #1	S	220 NVJO	16.5		10-15 E	8-05-64	WRB-8																

Table 41. Hansel Valley. Spring and Wells with Water Temperatures of 16° to 18° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(B-10-8) 13cbd	Swan Co.	W	121 SLLK	18.0	286	20 R	11-28-69	TP-33	56		184	265	1,850		187	0	620	3,340		76	7,060	10,500	8.0	
(B-11-7) 8bdc	Holmgren Land & Livestock Co.	W	121 SLLK	16.0	235	2	11-28-69	TP-33	52		9.6	53	511		280	0	102	710		18	1,630	2,770	8.2	
(B-11-9) 10aaaS	Monument Pt.	S	300 PLZC	17.5		45 E	8-27-63	TP-33										28,940			52,400	66,200		B 5.7, Br 48,
							10-10-67	TP-33	14		421	796	16,200	564	118	0	1,910	28,200	2.0	27	51,500	61,100	7.4	I.32, Li 4.9.

Table 42. Pilot Valley. Well and Springs with Temperatures of 15.5° to 16° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(B-4-19) 36abdS_1	D. Stephens	S	111 ALVM	15.5		5	9-23-71	TP-41														2,500		
(B-4-19) 36abdS_2	D. Stephens	S	111 ALVM	15.5		5	9-23-71	TP-41														2,500		
(B-4-19) 36acaS_1	D. Stephens Reed Spring	S	111 ALVM	16.0		10	9-23-71	TP-41														2,650		
(B-4-19) 36acc	D. Stephens	W	111 ALVM	16.0	68		9-22-71	TP-41	17	.04	100	24	180	5.4	115	0	13	520	.0	.36	918	1,640	7.5	Mn .03
(B-4-19) 36acdS	D. Stephens Donner Spring	S	111 ALVM	15.5		200	1911	TP-41			50*		85		45	0	<30	105			370			*Ca includes Ca and Mg

Table 43. Pine Valley. Well with a Water Temperature of 16° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(C-25-16) 18bdd	J. Dearden Guyman Well	W	111 ALVM	16.0	340	100 R 30 R	9-13-62 1955	TP-51	31		24	12	27	3.3	124	0	19	30	.7	4.6	204	344	7.6	B .08 Yield 1924

Table 44. Sink Valley. Wells with Water Temperatures of 15° to 18° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(B-1-10) 21ddb	BLM So. Puddle Valley Well	W	111 ALVM	16.0	253		1-13-66	TP-26	40	.35	6.4	.5	653	26	381	0	113	710	1.2	8.5	1,750	3,110	7.7	Mn. 00, B .26, Li .20, Cu. 00 Pb .05, Zn.03, Sr .04, PO_4 .16
(B-3-10) 13dad	Stratton Bros. Construction Co.	W	111 ALVM	16.0	410		8-06-63	TP-26	43	.06	22	17	1280	55	204	0	184	1,880	.8	25	3,610	6,520	7.8	
(B-3-10) 29dcd	BLM Bertagnole Well	W	111 ALVM	16.0	363	20	1-13-66	TP-26	44	1.00	4.4	32	932	34	400	4	347	900	1.8	9.0	2,480	4,410	8.3	Mn .04, B .70, Cu .02, Pb .02, Zn .34, Li .20, Sr .08, PO_4 .86
(B-4-10) 25bac	U.S. Air Force	W	111 ALVM	15.0	225-275		3-23-62	TP-26	39	.12	18	29	1310		578	0	245	1,600	1.6	24	3,550	6,140	8.0	Mn .05
				18.0	399-400		4-04-62	TP-26	28	.02	133	2530	3930		360	0	1260	5,880	1.6	23	14,000	18,100	7.7	Mn .66
				16.0	588-600		4-11-62	TP-26	14	.09	1170	924	8890		216	0	1810	17,000	1.6	21	29,900	42,300	6.9	Mn 2.30
				17.0	225-275	300	7-08-63	TP-26	40	1.90	80	174	2730	86	432	0	772	3,970	1.4	17	8,280	13,400	8.0	B1.70
(B-4-10) 25bcc	U.S. Air Force	W	111 ALVM	17.0	112-162		8-27-63	TP-26	22	.00	27	55	1540	52	348	6	457	2,060	2.3	55	4,500	7,580	8.3	B1.40, Cu .01, Pb .11, Li .80, Br2.0, I .05

Table 45. Yuba Dam to Leamington Canyon. Springs in Mills Valley with Temperatures of 16.5° to 17° C.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(C-16-2) 2aadS	Chase Springs	S	Fault	16.5		1400E	6-13-63	WSP1848	25		130	84	138		268	0	214	370		7.2	1,190	1,910	7.4	
(C-16-2) 27dbdS	Blue Springs	S	Fault	17.0			1-22-63	WSP1848	14		59	34	19		306	0	22	38		1.5	334	607	7.7	
(C-16-2) 34aabS	Molten Springs	S	Fault	16.5			10-23-62	WSP1848	13		63	38	33		310	0	35	68		1.5	410	725	7.8	
				16.5			11-19-63	WSP1848	13		57	38	31		309	0	26	60		2.8	381	674	7.9	

TABLE 46. Records of Castilla, Como, Diamond Fork, and Patio thermal springs and of a well in the Great Salt Lake Desert.

COORDINATES	OWNER OR NAME	SOURCE	GEOLOGIC FORMATION	TEMP. °C	DEPTH (feet)	YIELD (gpm)	DATE OF SAMPLE	REFERENCE	ANALYSIS EXPRESSED AS MILLIGRAMS PER LITER													COND. mmhos	pH	OTHER CONSTITUENTS OR REMARKS
									SiO_2	Fe	Ca	Mg	Na	K	HCO_3	CO_3	SO_4	Cl	F	NO_3	DISSOLVED SOLIDS			
(B-5-13) 31acd	L. W. Keller Corp. Well #2	W	111 ALVM	22	200		3-08-72	TP-42	14	.48	95	75	1300	41	175	0	230	2,200	.6	.94	4,050	7,200	7.7	B.71
(D-9-04) 18baa S	Castilla Hot Springs	S	Fault	40		20	10-20-67	BD-16	30		469	80	1680	10	542	0	1400	2,320	3.6	4.8	6,360	9,480	7.9	B1.4
(A-4-03) 31cab S	Como Warm Springs	S	Fault	26.5			5-21-71	Saxon	1	.05	146	15	15				219	6		0	648		7.9	
				25		9000E	5-18-66	WRB-13	19		109	31	34	8.4	250		231	28	2.0	.1	622	896	7.4	Heavy metals analysis in WRB-13.
(A-7-01) 22caa S	Patio Spring	S	111 ALVM	20		200		PP-492																
						160E	9-16-52	Doynran	11		32	8	7.4		135		9.5	5.5		.6		247	8.1	Collected 1000 Ft below outlet.
(D-8-05) 14d S	Diamond Fork Warm Springs	S	200 MSZC	20		450	10-20-67	WRB-13	17		104	32	117	8.3	264	0	390	36	1.6	.5	837	1,180	7.6	B.2, Li.1, Br.05, I.03