UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION
GROUND WATER BRANCH

PRELIMINARY REPORT ON GROUND WATER IN THE BONANZA LAKE AREA, POWER AND BLAINE COUNTIES, IDAHO

By Harold Meisler

Open-file report. Subject to revision.

Prepared for the U. S. Bureau of Reclamation

Boise, Idaho
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CONTENTS

ILLUSTRATIONS

TABLES

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ABSTRACT

The investigation in the Bonanza Lake area of northwestern Power and southeastern Blaine Counties was made to determine the direction of ground-water movement and to ascertain the relation of the regional ground-water body to the Snake River.

The surface of the area is nearly flat to gently rolling, and slopes to the west. Lake Channel, an abandoned channel of the Snake River, and a few volcanic cones modify the gentle relief. The climate is semiarid, the annual precipitation ranging from 10 to 15 inches. Most of the area is uncultivated and covered with sagebrush, the predominate vegetation. A significant amount of the area is dry farmed; about 500 to 650 acres is irrigated with ground water pumped from wells or from ponds in Lake Channel.

The Bonanza Lake area and vicinity are underlain by windblown deposits of Recent age (not shown on the geologic map); alluvium with admixed windblown material and black basalt, both also of Recent age; undifferentiated Snake River basalt, of Pliocene to Recent age; the American Falls lake beds and Cedar Butte basalt, of Pleistocene age; and the Raft Lake beds and Massacre volcanics and associated rocks, of Pliocene(?) age.

The alluvium contains ground water at shallow depth, but because of its limited areal extent it is not an important aquifer. The Snake River basalt is the most important aquifer in the area and yields water to irrigation, domestic, and stock wells. Several springs discharge from the basalt into Lake Walcott. The Cedar Butte basalt is a major aquifer supplying water to a number of stock and domestic wells and to Bonanza Lake.

Ground water moves southward and southwestward through the area from the Aberdeen-Springfield tract on the northeast and possibly from the downstream end of American Falls Reservoir. Part of the ground water is discharged to the Snake River and Lake Walcott and part moves westward out of the area to the main ground-water body. The amount of ground water can not be determined from the data now available. Data from dam-site borings and wells suggest the possibility that a part of the ground water in the area may be perched above the regional water table.

INTRODUCTION

Purpose and Scope of Report

Investigations of the ground-water resources are being made at a number of places in the Snake River Plain by the Geological Survey in cooperation with and at the request of the Bureau of Reclamation. The studies are an integral part of the Bureau of Reclamation's comprehensive investigation and evaluation of undeveloped land and water resources of the upper and middle Snake River basin. The study of the

Bonanza Lake area is one phase of the broader investigation of the Snake River Plain and was made to determine the direction of ground-water movement in this area and to ascertain the relation of the regional ground-water body to the adjacent reach of the Snake River. The information in this open-file report ultimately will be incorporated in a report for publication.

Location and Extent of Area

The Bonanza Lake area is in the Snake River Plain immediately north of the Snake River between American Falls and Lake Walcott, in northwestern Power and southern Blaine Counties, Idaho (fig. 1). It is within Tps. 8 and 9 S., Rs. 27 to 30 E., Boise baseline and meridian.

The area on the southeast side of the Snake River in T. 7 S., R. 31 E., and T. 8 S., Rs. 30 and 31 E., also was studied in order to determine the relationship between the Snake River and the regional water table in the reach between American Falls reservoir and Lake Walcott.

Methods of Investigation

An inventory of wells in the area was made in the summer and fall of 1956, and depth-to-water measurements in wells were made wherever possible. Third-order spirit leveling to most of the wells was done by the Bureau of Reclamation. Drillers' logs were obtained wherever possible.

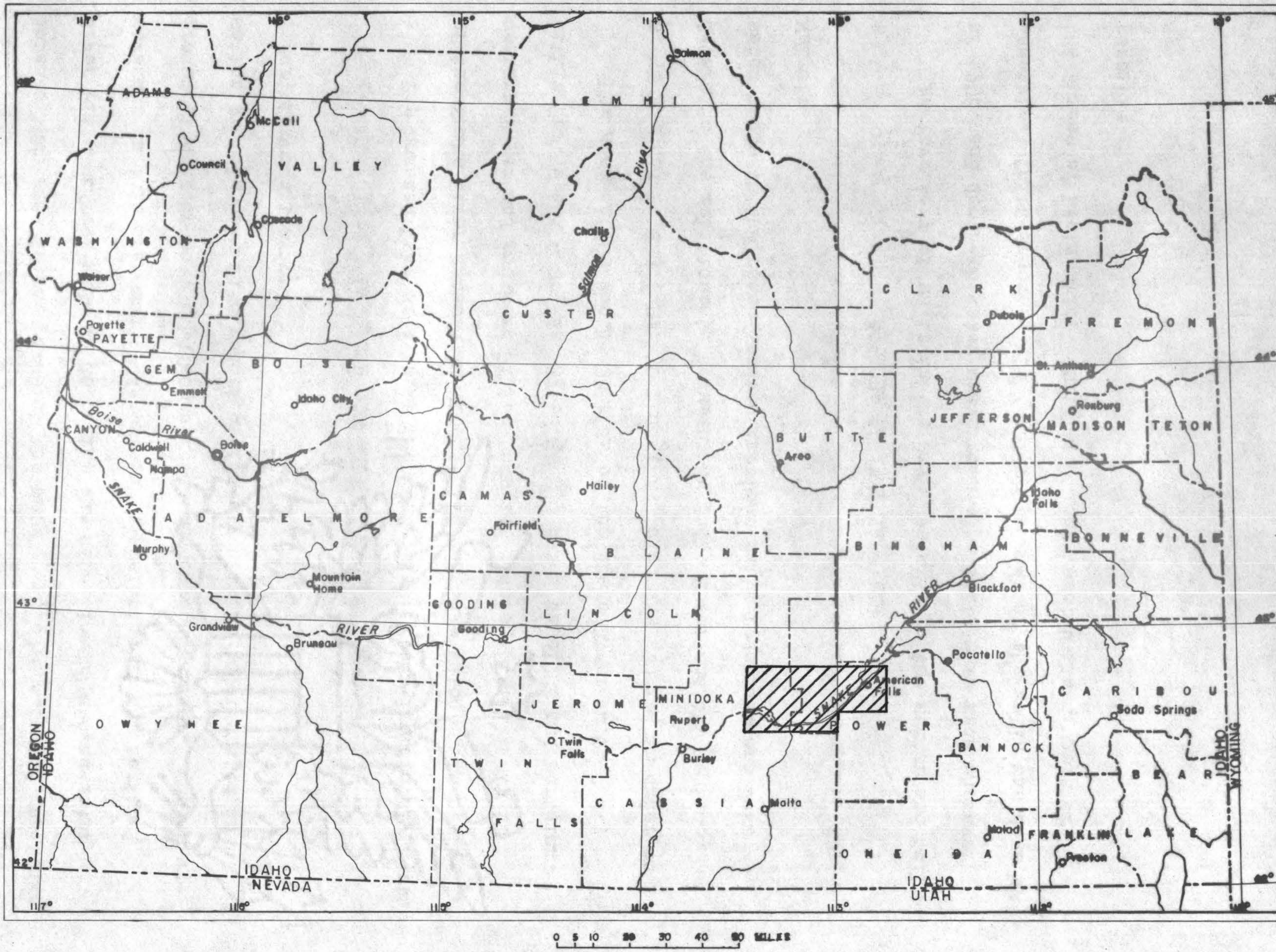

Figure 1. Index map of southern Idaho showing area covered by this report

Springs discharging into Lake Walcott were examined and their elevations determined by altimeter. Elevations of two ponds, Bonanza Lake and one of the "Potholes," whose surfaces represent the water table, also were determined with an altimeter.

Because ground water moves downgradient approximately perpendicular to the water-table contours, the general direction of ground-water movement can be determined from a water-table contour map. The water-table map (pl. 1) of the Bonanza Lake area was constructed from elevations of water levels of wells, springs, and ponds (tables 1 and 2). The water-table map of Crosthwaite and Scott (1956) was used for control along the western boundary of the area and the map of Stewart, Nace, and Deutsch (1951) was used for control along the southeast side of the area.

Well-Numbering System

The well-numbering system used in Idaho by the Geological Survey indicates the locations of wells within the official rectangular subdivisions of the public lands, with reference to the Boise baseline and meridian (fig. 2). The first two segments of a number designate the township and range. The third segment gives the section number and is followed by two letters and a numeral, which indicate the quarter section, the 40-acre tract, and the serial number of the well within the tract. Quarter sections are lettered a, b, c and d in counterclockwise order, from the northeast quarter of each section. Within the quarter sections 40-acre tracts are lettered in the same manner. Well 8S-30E-12ca1 is in the SE$\frac{1}{4}$SW$\frac{1}{4}$ sec. 12, T. 8 S., R. 30 E., and is the well first visited in that tract. An L after the third segment indicates a lake or pond, and S indicates a spring.

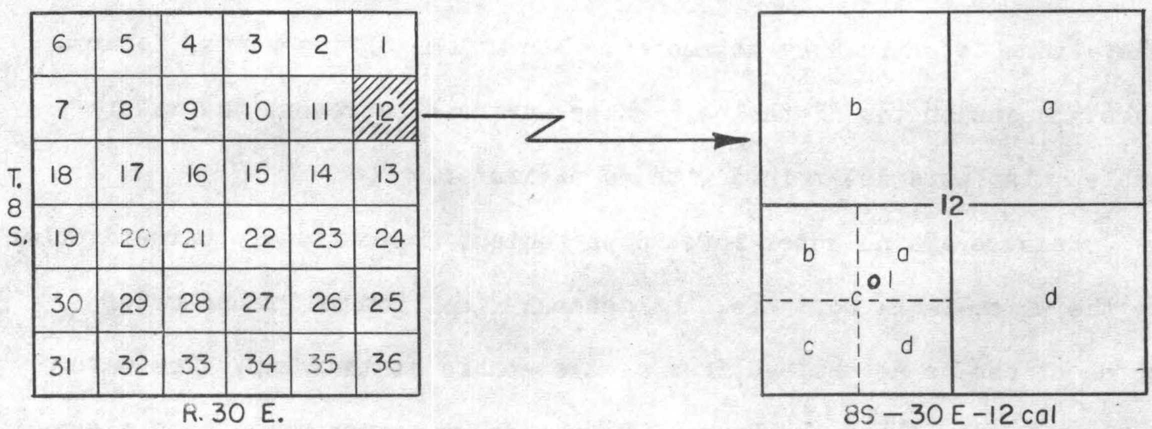

Figure 2.—Sketch showing well-numbering system

GEOGRAPHIC SETTING

The surface of the Snake River Plain in this area is nearly flat to gently rolling and slopes to the west. The altitude of the plain ranges generally from 4,200 to 4,500 feet above mean sea level. Basalt is at or near the surface throughout the area, but is overlain at many places by surficial deposits of windblown sand and silt. A few volcanic cones, one of which has been named Cedar Butte, rise a few tens to about a hundred feet above the level of the plain in the northern and northeastern parts of the area.

The surface of the Bonanza Lake area is cut by Lake Channel, a steep-walled canyon believed to be an abandoned channel of the Snake River (Stearns, 1938). (See fig. 3.) The lake is in the southwestern part of T. 8 S., R. 29 E., the northwestern part of T. 9 S., R. 29 E., and the east-central part of T. 9 S., R. 28 E. The channel trends southwest and is approximately 9 miles long, extending $5\frac{1}{2}$ miles southwestward to the Snake River and $3\frac{1}{2}$ miles westward, parallel to the river. The width of the channel ranges from approximately a third of a mile in the north to 3 miles in the south where it fronts along the Snake River. Four coves, ranging in width from less than a tenth to more than a third of a mile, have been cut into the basalt in the northeast portion of the channel and widen it to about 2½ miles. Lake Channel is floored by alluvium; in the southern part of the channel, along the Snake River, an alluvial deposit called the Bonanza Bar has been built up. Bonanza Lake and several other spring-fed ponds, including the "Potholes," are located in Lake Channel.

The Snake River, which forms the south and southeast boundary of the Bonanza Lake area, has cut a steep-walled canyon as much as 160 feet below the general land surface in the eastern part of the area. The river has been dammed by Minidoka dam and backed up to Massacre Rocks, thus forming Lake Walcott. The level of Lake Walcott from Lake Channel to Minidoka Dam is 20 to 40 feet below the general land surface immediately adjacent to the lake.

The large quantity of windblown sand in the Bonanza Lake area has formed dunes of small to moderate size. In the northern part a very marked easterly alinement of the sand dunes may be noted on aerial photographs.

The climate of the area, like that of most of the Snake River Plain, is semiarid, the annual precipitation ranging from 10 to 15 inches. The average annual precipitation at Rupert 20 miles west of the area is 9.95 inches and at American Falls, 12.96 inches. The mean annual temperature at Rupert is 47.6°F and at American Falls is 46.2°F (data from U. S. Weather Bureau).

Most of the area is uncultivated and is used for grazing. Sagebrush is the predominant form of vegetation on the uncultivated land, but grasses, rabbit brush, and other shrubs associated with a semiarid climate are present. Some dry farming, especially of wheat, is carried on, and approximately 500 to 650 acres is irrigated at the present time. The cultivated area merges with the Aberdeen-Springfield area to the northeast, where a large tract is irrigated with both surface and ground water.

GEOLOGIC FORMATIONS AND THEIR WATER-BEARING CHARACTERISTICS

The Bonanza Lake area and vicinity are underlain by windblown deposits of Recent age (not shown on the geologic map); alluvium with admixed windblown material and black basalt, both also of Recent age; undifferentiated Snake River basalt, of Pliocene to Recent age; the American Falls lake beds and Cedar Butte basalt, of Pleistocene age; and the Raft Lake beds and Massacre volcanics and associated rocks, of Pliocene(?) age. The geology of the area, shown in figure 3, was described by Stearns (1938) and is shown on plate 6 of his report.

Much of the Bonanza Lake area is mantled by thin surficial deposits of windblown sand, silt, and clay of Recent age. At some places sand dunes rise as much as 30 feet above the general land surface. The windblown material is above the water table and therefore not water bearing.

Overlying the Snake River basalt in the northwestern part of the area are fresh flows of black basalt of Recent age. These flows are part of the Wapi lava field, which forms the northwest boundary of the Bonanza Lake area.

Alluvium of Quaternary age, consisting of fluviatile deposits of clay, silt, sand, and gravel and admixed windblown clay, silt, and sand, extends from Bonanza Lake along Lake Channel to the Snake River. The channel northeast of Bonanza Lake has been largely filled with windblown material. Bonanza Bar, a large alluvial deposit, occupies the southern part of the channel. The alluvium in Lake Channel and Bonanza Bar were deposited by the Snake River when it occupied Lake Channel. According to Stearns (1938, p. 149) the channel was an outlet for ancient American Falls Lake when that lake was formed as the result of damming of the Snake River by the Cedar Butte basalt. The alluvium in Lake Channel contains ground water at shallow depth, discharged from the surrounding basalt, and contains many ponds where the water table is at the surface. However, because of its limited areal extent, the alluvium is of only local importance as an aquifer in the Bonanza Lake area.

The Snake River basalt, of Pliocene to Recent age, underlies the area west and north of Lake Channel (fig. 3). The Snake River basalt underlies most of the Snake River Plain and consists of many individual flow sheets 10 to 75 feet thick. The basalt originated from the many volcanic vents throughout the plain. It is gray to black in color, fine grained, and dense to vesicular. The individual basalt flows are generally more vesicular toward the top than they are at the bottom. In many places small feldspar and olivine phenocrysts are visible to the unaided eye. Most of the flows of the undifferentiated Snake River basalt have smoothly rolling surfaces. Locally the surfaces are corded and "ropy." The thickness of basalt in the Bonanza Lake area is not known.

The Snake River basalt is the most important water-bearing formation in the Bonanza Lake area, as well as in the Snake River Plain as a whole. It is highly permeable and capable of transmitting large quantities of water. Openings in basalt important to the occurrence and movement of ground water include irregular contacts between flows or between flows and interbedded sediments, including open spaces and brecciated zones caused by rapid cooling and solidification; open horizontal and vertical joints, including columnar joints, caused by shrinkage during cooling; vesicles formed by escaping gases; and tubes in ropy basalt.

Several springs discharge into Lake Walcott and a number of stock and domestic wells withdraw water from the basalt.

In the Eagle Rock area and to the north and east, the American Falls lake beds overlie the Cedar Butte basalt. The lake beds consist principally of clay, silt, sand, pebbly sand, and at least one bed of tuff and one layer of intercalated basalt. They yield small to moderate amounts of water to domestic, stock, and irrigation wells. A more complete discussion of their water-bearing characteristics is contained in a report by Stewart, Nace, and Deutsch (1951).

The Cedar Butte basalt, of Pleistocene age, lies to the east and northeast of Lake Channel and forms cliffs along the east side of Lake Channel and the north side of the Snake River. The Cedar Butte basalt is a flow of aphanitic blue pahoehoe basalt containing phenocrysts of fresh olivine. The source of this basalt was a dome which has been largely eroded away (fig. 3). Cedar Butte cone and a companion cone to the north are remnants of this original dome. Cinder deposits occur

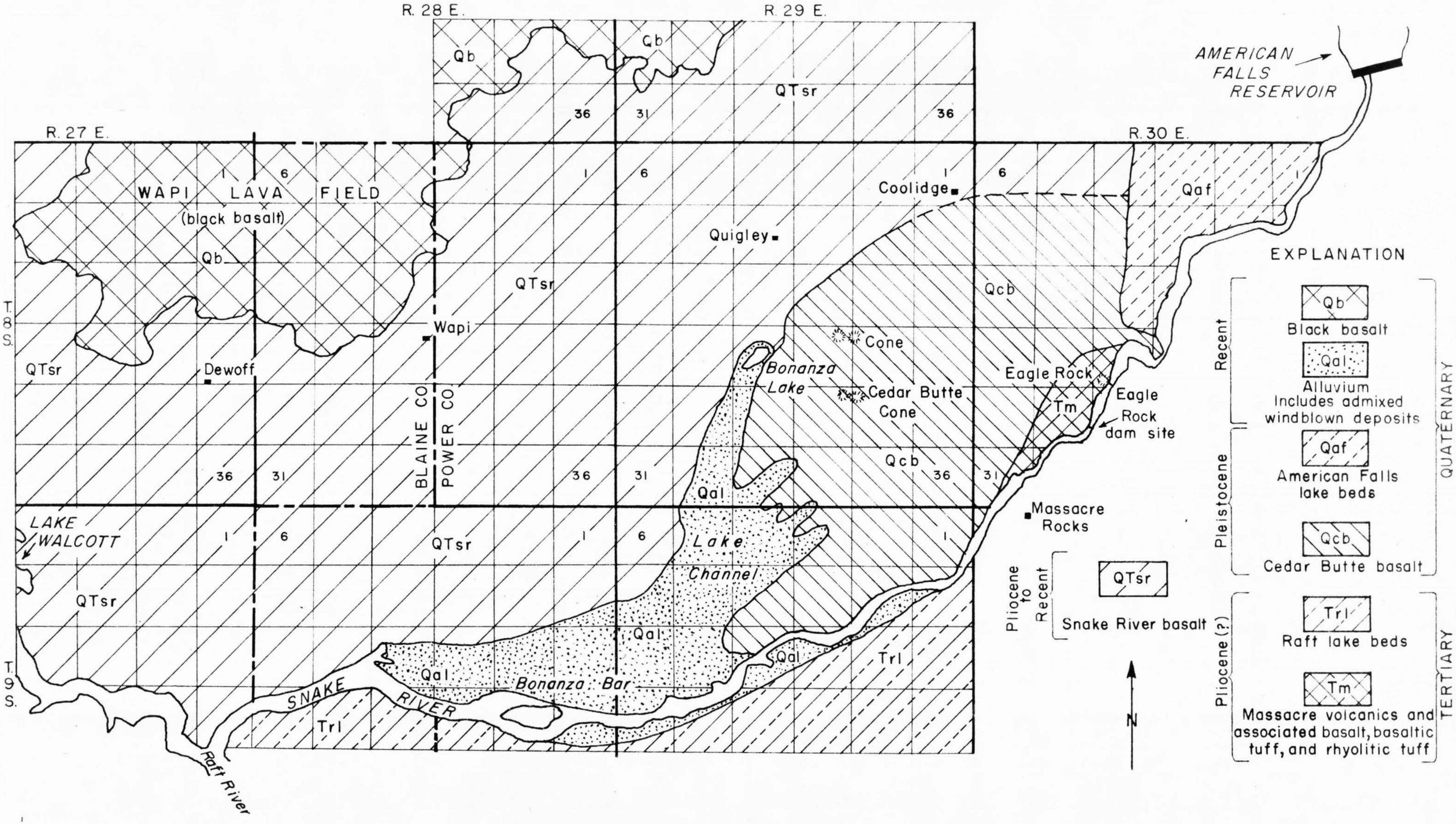

Figure 3.--Generalized geologic map of the Bonanza Lake area, Idaho

Adapted from Stearns, 1938, plates 4 a 6

1 0 1 2 3 4 MILES

Scale

north of these cones and are probably associated with them. The Cedar Butte basalt dammed and displaced the Snake River, thus forming ancient American Falls Lake. According to Stearns the basalt is about 200 feet thick. The Cedar Butte basalt is a major water-bearing formation in the Bonanza Lake area, supplying water to a number of stock and domestic wells. Seepage from this aquifer supplies the water to Bonanza Lake.

In the Eagle Rock area, which lies to the east of the Bonanza Lake area, sandy, silty and clayey lake beds, cinders, and basaltic and rhyolitic tuffs crop out. According to Stearns and Isotoff (1956), whose work is based on field mapping and examination of drill cores at the Eagle Rock dam site, the Raft lake beds, of Pliocene(?) age, underlie the Cedar Butte basalt. The Raft lake beds consist of buff to pale-yellow partly consolidated sandy, silty, and clayey sediments containing lenses of coarse gravel, calcareous concretions, and thin layers of hardpan.

On the south side of the Snake River, directly south of the Bonanza Lake area, the Raft lake beds extend from the vicinity of Massacre Rocks to the Raft River. The Raft lake beds probably extend under the Snake River basalt and the Cedar Butte basalt in the Bonanza Lake area. The Raft lake beds are generally poor aquifers.

Beneath the Raft lake beds, in the Eagle Rock area, is a series of cinder beds, tuffs, tuff breccias, and tuffaceous sandstones. These include the Massacre volcanics, the Walcott welded tuff (formerly the Eagle Rock tuff), and Neely lake beds (Stearns and Isotoff, 1956). The rocks are probably porous and somewhat jointed, as indicated by the difficulty experienced in obtaining the return of drilling fluid in 21 test holes drilled at the Eagle Rock dam site. However, no other information is available about their water-bearing characteristics. It is not known whether these beds underlie the Bonanza Lake area.

Well logs from the Bonanza Lake and the Eagle Rock areas are included at the end of this report.

GROUND WATER

Occurrence and Sources

Ground water in the Bonanza Lake area occurs under water-table conditions in the Snake River basalt, Cedar Butte basalt, and alluvium. The depth to water ranges from zero, where ground water emerges at the surface in the several ponds in Lake Channel, to more than 250 feet in the northern part of the area at well 7S-20E-25ccl. In a part of the area the ground water may be perched.

The average annual precipitation in the area is approximately 14 inches (U. S. Dept. of the Army, 1952). Much of this precipitation is retained as soil moisture and is returned to the atmosphere by evaporation and transpiration. Probably only a small portion of the precipitation becomes ground-water recharge.

It is believed that most of the ground water is derived from underflow into the area. Ground water moves into the Bonanza Lake area from the northeast, east, and southeast. Probable sources of ground water include the main mass of ground water moving in a southwesterly direction through the Snake River Plain, infiltration of irrigation water applied to the Aberdeen-Springfield tract, leakage out of American Falls Reservoir, and underflow from areas to the southeast. According to Stearns (1938, p. 153), numerous sloughs appeared in Lake Channel and the level of Bonanza Lake rose as a result, at least in part, of the ground-water rise caused by irrigation of the Aberdeen-Springfield tract. He stated further that since the filling of American Falls Reservoir in 1926 the rise in the surface of Bonanza Lake is indicative of leakage from the Reservoir. Probably all three sources contribute ground water to the area. However, the data at present are insufficient to show the exact sources or quantities of ground water in the Bonanza Lake area.

Direction of Ground-Water Movement

Ground water flows downgradient approximately perpendicular to the water-table contour lines shown on the water-table map (pl. 1). It is possible that the water table shown is in part perched. In general the contours show that the water table is in the form of a broad ridge, the crest of which slopes to the southwest. Ground water moves chiefly to the west and south; it is believed that little of the total water supply is discharged to the southeast. The ground water is tributary to the Snake River within the area, except in the northwestern part where it moves westward toward Minidoka County.

Ground-Water Discharge

Several springs issue from the Snake River basalt into Lake Walcott in the area west of Lake Channel (pl. 1). They were described by Stearns (1938, p. 151-153). These springs have been largely flooded by Lake Walcott, but many of them may be seen in the fall when the level of Lake Walcott is lowered. Gifford Springs, which include Big Gifford Spring and Little Gifford Spring, are a series of springs and seeps in sections 16 and 17, T. 9 S., R. 28 E. Before flooding of Lake Walcott, Big Gifford Spring reportedly discharged about 24 cubic feet per second (cfs). Another spring in sec. 19, T. 9 S., R. 28 E., reportedly discharged about 12 cfs. Hunt Spring (location not determined) yielded about 1 cfs. Smith Spring in sec. 9, T. 9 S., R. 27 E., discharged about 2 cfs. Stearns estimates the total flow of the springs to have been probably about 25 to 35 cfs before flooding by Lake Walcott.

Several springs discharge into the Snake River on the north side in the stretch from American Falls west to Lake Channel. Rueger Spring, in sec. 31, T. 7 S., R. 31 E., is about 30 feet above the river and issues from the American Falls lake beds. The average measured flow of this spring from 1925 to 1928 was 15.8 cfs. Davis Springs in sec. 36, T. 7 S., R. 30 E., issue from basalt in the Massacre volcanics. The average measured flow from Davis Springs in the period 1925 to 1928 was 3.5 cfs. Mary Franklin Mine Springs in sec. 11, T. 8 S., R. 30 E., also issue from permeable basalt of the Massacre volcanics and discharged approximately 9.9 cfs in the period 1925 to 1928. Mower Springs, opposite Rock Creek in sec. 12, T. 9 S., R. 29 E., is a line of seeps discharging not more than 1.5 cfs.

A small quantity of ground water is withdrawn by pumping. Approximately 21 stock and domestic wells are in use in the area, and about 500 to 650 acres is irrigated with ground water in the northeastern and eastern parts of the area for a period of approximately 60 to 100 days annually.

The springs listed above probably discharge a total of about 65 cfs, but the total ground-water discharge from the Bonanza Lake area by springs to the river, by underflow to the west, and by pumpage is not known.

Relation between the Regional Water Table and the Snake River

In order to understand more clearly the relation of the ground water in the Bonanza Lake area to the Snake River, a brief study was made of ground-water conditions on the south and southeast sides of the Snake River. Areas were studied where existing data might aid interpretation of ground-water conditions in the Bonanza Lake area. A preliminary report by J. W. Stewart, R. L. Nace, and Morris Deutsch (1951) covers the Michaud Flats Project, which is east of the Bonanza Lake area on the southeast side of the Snake River and American Falls Reservoir. Data from that report and unpublished data were used to construct a water-table profile (pl. 1) along the Snake River from American Falls Reservoir to Lake Walcott. The profile shows the relation between the Snake River and the water table on both the north and south sides of the river.

The relation between the water table on the north side and American Falls reservoir is not clear, but it appears that the southern part of the reservoir near American Falls Dam is perched above and influent to the ground-water reservoir. Farther north the water table may be contiguous with the reservoir surface. Because of insufficient data, a full understanding of the hydrologic conditions along the west side of American Falls Reservoir is not possible at the present time. It is clear, however, that from American Falls dam to the western part of

R. 27 E. the water table on the north side is above, and the ground water is tributary to, the Snake River. From the western part of R. 27 E. westward, the water table on the north side is below the Snake River and the river loses water.

On the south side of the Snake River the elevation of the water table along the river is not accurately known. However, estimates based on available data indicate that ground water is tributary to American Falls Reservoir except near American Falls Dam, where the water table slopes under the reservoir. From American Falls Dam west to the middle of R. 28 E. the water table on the south side slopes to the north and appears to be below the river level. From the middle of R. 28 E. to the western part of R. 27 E. the water table is probably contiguous with the surface of the Snake River and is in the form of a ground-water ridge probably caused by underflow from the Raft River valley. West of R. 27 E. the water table is below Lake Walcott and is probably contiguous with the water table on the north side.

From American Falls Dam to about the middle of R. 28 E. the water table on the north side is above the Snake River, whereas on the south side the water table is below the river and appears to slope northwestward toward it. Moreover, the water table on either side of the river slopes toward the river (pl. 1). A possible explanation of the complex hydrologic relations is shown in figure 4. It is possible that the water table mapped on the north side is perched and is not the regional water table. If the Raft lake beds extend into the Bonanza Lake area they may constitute the perching bed. The water table on the south side of the river, therefore, may be contiguous with a water table beneath the one mapped on the north side. Then the principal water table on the north and south sides may form a broad trough which is approximately parallel to the Snake River, the ground water moving down the trough in a westerly direction and turning to the northwest in R. 25 or 26 E., where it may flow beneath the Minidoka Project. If such a trough exists, it can be explained only on the basis of a higher transmissibility which results in a lower gradient even though the quantity of water transmitted per unit cross-sectional area is greater. The postulated trough would serve as a drain for aquifers of lower transmissibility to the north and south.

CONCLUSIONS

Ground water in the Bonanza Lake area occurs in basalt of Pliocene to Recent age and alluvium of Quaternary age. The ground water is derived from underflow from the northeast, east, and southeast and probably originates from the large ground-water body to the northeast, the Aberdeen-Springfield tract, the American Falls Reservoir, and the area to the southeast of the Snake River. The water-table contour map indicates that the direction of ground-water movement in the Bonanza Lake area is generally southwestward and that the ground water is tributary to the Snake River and to the main ground-water body to the west. The quantities of ground-water recharge and discharge in the Bonanza Lake area are not known.

The Snake River and Cedar Butte basalts probably yield moderate to large quantities of water to wells. The alluvium probably will yield small to moderate quantities of water to properly constructed wells.

It is possible that the water table mapped north of the Snake River in the Bonanza Lake area is perched above relatively impervious rocks, perhaps the Raft lake beds, and is not the regional water table. However insufficiency of data prevents a full understanding of the hydrologic conditions in the area.

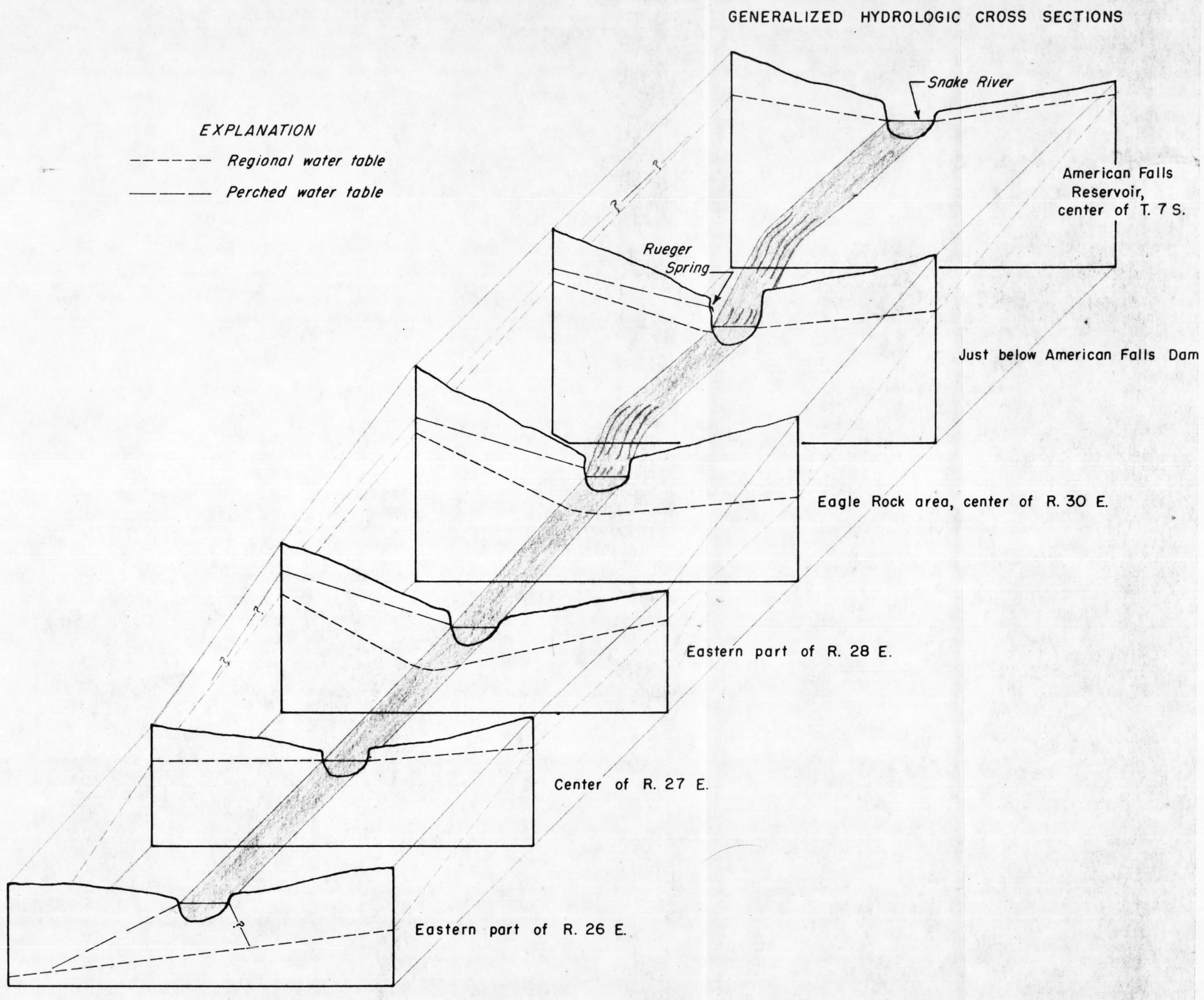

Figure 4.--Schematic diagram showing possible relation of ground water to Snake River in area from American Falls Reservoir to Lake Walcott.

LOGS OF WELLS AND CORE HOLES

The following drillers' logs were obtained from well owners. The terminology has been slightly modified to achieve a degree of uniformity.

7S-30E-26ab1. Paul McMillan irrigation well.

Log obtained from George Vollmer, driller.

Material	Thickness (feet)	Depth (feet)
Sand	7	7
Basalt. First water at 63 feet	56	63
Sand and reddish clay	47	110
Clay, blue	15	125
Sand, dark gray	35	160
Clay, gray	60	220
Basalt	15	235
Cinders. Main flow of water	6	241

8S-27E-19dd1. U. S. Bureau of Land Management stock well.

Log obtained from the U. S. B. L. M., Shoshone, Idaho on Aug. 24, 1956.

Basalt	50	50
Sand and fine gravel	75	125
Sandstone	10	135

8S-27E-7dal. Charles Irwin irrigation well.

Log obtained from R. R. Common, driller, on October 29, 1953.

Material	Thickness (feet)	Depth (feet)
Well deepened from 200 to 390 feet. Log from 0 to 200 feet missing.		
Basalt, light gray, coarse grained	16	216
Cinders, red	14	230
Clay, red and sand	1	231
Sand, red	18	249
Gravel	5	254
Clay, light gray	6	260
Clay, blue	7	267
Basalt, black, coarse grained	13	280
Basalt, gray, coarse grained	30	310
Basalt, gray, hard	25	335
Clay, red and sand	6	341
Clay, brown, "burnt"	38	379
Basalt, black	11	390

8S-27E-23ddl. U. S. Bureau of Land Management stock well.

Log obtained from the U. S. B. L. M., Shoshone, Idaho on Aug. 24, 1956.

Basalt	70	70
Sand, fine. Water	15	85
Basalt	8	93

8S-27E-31dd1. U. S. Bureau of Reclamation observation well.

Drillers' log obtained from the Bureau of Reclamation June 6, 1951.

Material	Thickness (feet)	Depth (feet)
Soil	2	2
Clay and basalt boulders	2	4
Basalt, gray, broken. Water at 10 feet	12	16
Clay and cinders	9	25
Clay. Some rock and sand	50	75
Clay, hard, gravel, and broken basalt	10	85
Basalt, gray	10	95
Basalt, black	12	107
Basalt, broken and yellow "soapstone"	2	109
Basalt, black	24	133
Sand, hard	7	140

8S-28E-16da1. Union Pacific railroad well.

Log furnished to U. S. Bureau of Reclamation Jan. 14, 1947 by W. B. Groome, Division Superintendent, Union Pacific Railroad Company.

Material	Thickness (feet)	Depth (feet)
Soil (loess)	10	10
Basalt, hard	25	35
Basalt	15	50
Basalt, red hard	30	80
Basalt, red broken	62	142
Sand	40	182
Basalt, hard	8	190
Basalt, porous	6	196
Basalt, hard. Some water at 200 feet	4	200
Basalt, porous	2	202
Basalt, dark hard. More water at 215 feet	13	215
Basalt, brown, porous	5	220
Basalt, dark	20	240
Basalt, light porous	10	250
Basalt, dark hard	8	258
Basalt, porous. Water 258'-260'; rose to 170 feet	2	260
Basalt, hard dark	15	275
Clay, yellow, very soft	45	320
Clay, blue. Water stands at 170 feet	35	355
Bottom, March 24, 1913		355

The following 2 core hole logs are from the Idaho Power Company's Eable Rock damsite. The cores were examined by Mr. Harold T. Stearns Nov. 16, 1952, and the logs received from Mr. R. E. Gale, Vice President, Idaho Power Company on Feb. 25, 1957. These two logs are representative of several from the right abutment.

Core Hole 5 (8S-30E-21bb1). Right (north) bank, Eagle Rock dam site, Idaho Power Company

Material	Thickness (feet)	Depth (feet)
Cinders, dark brown and dust	13	13
Basalt, pebbles, water worn	2	15
Sand, brown, coarse to fine, cindery	5	20
Basalt, coarse grained fragments, may not be in place	7	27
Tuff, brown, poorly consolidated	5	32
Sand, brown, cindery, few lava fragments	23	55
Tuff-breccia, gray, cemented with calcite	14	69
Tuff-breccia, light brown, hard	6	75
Cinders, brown, friable	10	85
Lava, gray, clinkery, with tiny vesicles	2	87
Lava, black, very hard, dense	14	101
Lava, gray, vesicular	1	102
Tuff-breccia, light brown, hard	25	127
Tuff-breccia, brown and gray, ½" piece of dense glassy rock	5	132
Tuff-breccia, dark gray	10	142
Tuff-breccia, dark gray, almost black, with quartzite pellets and fragments of brown lava	8	150

Core Hole 4 (8S-30E-21bcl). Right (north) bank, Eagle Rock dam site,

Idaho Power Company.

Material	Thickness (feet)	Depth (feet)
Basalt, lava boulders	5	5
Cindery tuff, friable with hard nodules	10	15
Cinders, brown friable	19	34
Tuff breccia, gray	1	35
Tuff, dark brown, lapilli	9	44
Similar to above but changed to rusty color by infiltration of lime and iron	2	46
Tuff, brown, lapilli, poorly consolidated	4	50
Tuff, rusty colored, hard breccia	6	56
Tuff, gray, hard breccia	26	82
Tuff, friable, sandy and cindery	20	102
Tuff, gray and brown, lapilli	5	107
Tuff, gray, hard, breccia	10	117
Tuff, rusty, containing fragments of lava and clay	5	122
Tuff, brown, hard and tuff breccia with a few large fragments of vesicular lava	45	167

8S-30E-21dc1. U. S. Bureau of Reclamation test hole at Eagle Rock dam site.

Log by L. D. Jarrard, U. S. B. R.

Material	Thickness (feet)	Depth (feet)
Soil	2	2
Basalt, gray, coarsely vesicular with calcite encrustations along most of the joint planes	11	13
Basalt, gray to almost black, dense to finely vesicular	13	26
Basalt, grades from fragmental ejectamenta to dense basalt	2	28
Tuff and breccia, mostly dark purplish tuff with small fragments of basalt	54	82
Basalt, gray to blue-black, dense	6	88
Tuff, gray	1	89
Volcanic sand, dark purplish-red to black with some breccia	37	126

8S-30E-21dc2. U. S. Bureau of Reclamation test hole at Eagle Rock dam site.

Log by W. E. Mead, U. S. B. R.

Soil and overburden	3	3
Alluvium (unconsolidated sand and gravel)	22	25
Tuff, black, earthy, with angular fragments of basalt	55	80

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Table 1.--Records of wells in and adjacent to the Bonanza Lake area, Power and Blaine Counties, Idaho

Alt. of land surface: E, estimated.

Depth of well: M, measured. Other depths are as reported and not confirmed by measurements.

Type of pump: C, centrifugal; N, none; P, piston; T, shaft turbine.

Use of well: A, abandoned or destroyed; D, domestic; I, irrigation; O, observation; RR, railroad; S, stock; U, unused.

Depth to water: Measured depths to water are given to the nearest tenth of a foot. Reported depths to water are given to the nearest whole foot.

Well number	Owner	Alt. of land surface	Year drilled	Depth of well	Casing Dia. (in)	Casing Depth (ft)	Character of aquifer	Water level Depth to water	Water level Date	Water level Alt. of water surface	Type of pump	Use of water	Remarks
Blaine County													
8S-27E-													
7da1	Charles Irwin	-	1952	390	18-14-12	70	Basalt and cinders	165.0	10-27-52	-	T	I	Partial log.
7db1	do	4,260 E.	1912	168M	6	20	Basalt	142.7	9-13-51	4,117±	P	S	
16cd1	Schodde Bros.	-	1936	162	6	-		142	6- 3-36	-	P	D,S	
19dd1	U.S.Bureau Land Management	4,240.2	1955	146M	6	125	Sand and gravel	112.6	10-18-56	4,127.6	P	S	Log.
23dd1	do	4,296.3	1955	92M	6	85	Basalt	70.7	do	4,225.6	None	S	do
31dd1	U.S.Bureau of Reclamation	4,202.5	1951	140	8	86	do	21.1	10- 2-56	4,181.4	do	O	do
8S-28E-													
16da1	Union Pacific Railroad	4,399 E.	1912	355	12-10	196	Basalt	158.0	10-18-56	4,241	T	RR	Log.
32cd1	-	-	-	-	8	-	-	156.0	do	-	P	S	

Table 1.--Records of wells in and adjacent to the Bonanza Lake area, Power and Blaine Counties, Idaho--Continued

Well number	Owner	Alt. of land surface	Year drilled	Depth of well	Casing		Character of aquifer	Water level			Type of pump	Use of water	Remarks
					Dia. (in)	Depth (ft)		Depth to water	Date	Alt. of water surface			
Power County													
7S-28E-													
25cc1	Armin Schroeder	4,516.9	1910	300	6	-	-	254.1	10-19-56	4,262.8	P	S	
7S-29E-													
32cb1	Edward Walter	4,468.2	-	-	6	-	-	175.6	10-18-56	4,292.6	P	S	
33ac1	William Liese	4,491.8	1953	298	20	8	Basalt	191.4	10-16-56	4,300.4	T	I	Irrigates 160 ac.
7S-30E-													
21dc1	John Rast	4,535.6	1952	255	21	18	do	197.8	8- 7-53	4,337.8	T	I	Irrigates 240 ac.
24dd1	C. H. Vollmer	4,394.3	1953	215	16	185	Cinders	56.7	8-10-53	4,337.6	T	I	
25da1	Mack Bowler	-	1949	230	16	200	Basalt	70	-49	-	T	I	Irrigates 200 ac.
26ab1	Paul McMillan	4,413.4	1949	242	12	241	Cinders	58.9	10- 1-53	4,354.5	None	I	Log.
30da1	Fred Tiede	4,561.0	1952	295	18	30	do	239.3	8- 6-53	4,321.7	T	I	Irrigates 160 ac.
8S-28E-													
1aa1	Armin Schroeder	4,494.9	1910	225	6	-	-	226	-28	4,269±	P	S	
2aa1	do	4,578.6	1910	360	6	-	-	320	-50	4,259±	P	S	
8S-29E-													
1c	William Nachtigal	-	1916	190	4	10	-	170	-51	-	P	S	
6cc1	Armin Schroeder	4,473.1	1910	220	6	-		210	-56	4,263±	P	S	
9ca1	William Nachtigal	4,454.1	1916	209	6	10		198.5	10- 5-56	4,255.6	P	S	
9db1	do	-	-	199M	6	-		Dry	8-22-56	-	-	A	
15ab1	Mack Bowler	4,407.4	1953	154	6	10		138.1	10-18-56	4,269.3	P	S	
15dd1	do	-	-	119M	6	12		Dry	8-15-56	-	None	A	
21ca1	Ella Wetzel	-	1956	63	6	52		5	5- -56	-	C	D	
21da1	Mack Bowler	-	1920	200	6	10		190	-	-	P	S	

Table 1.--Records of wells in and adjacent to the Bonanza Lake area, Power and Blaine Counties, Idaho--Continued

Well number	Owner	Alt. of land surface	Year drilled	Depth of well	Casing Dia. (in)	Casing Depth (ft)	Character of aquifer	Water level Depth to water	Water level Date	Water level Alt. of water surface	Type of pump	Use of water	Remarks
8S-29E--(Continued)													
23ba1	Mack Bowler	-	1910	210	6	10		195	-52	-	P	S	
24cb1	do	-	1915	240	6	10		230	-46	-	P	S	
24dd1	do	-	1934	230	6	10		215	-34	-	P	D,S	
26aa1	do	4,501.8	1910	230	6	-		-	-	-	P	S	
8S-30E-													
18cc1	Mack Bowler	4,397.5	1953	350	16	310		132.6	10-16-56	4,264.9	None	A	
19bb1	do	4,429.8	-	254M	5	-		187.1	8- 5-56	4,242.7	do	A	
21bb1	Idaho Power Co.	4,210.4	1952	150	None	-		-	-	-	None	-	Test hole, log.
21bc1	do	4,257.3	1952	167	do	-		-	-	-	do	-	do
21cd1	U.S.Bureau of Reclamation	4,239.4	1951	126M	-	-		43.3	10-12-51	4,196.1	do	-	do
21dc2	do	4,237.0	do	80M	-	-		47.5	1-23-52	4,189.5	do	-	do
9S-29E-													
4bc1	Mrs. Lula Hunt	-	1930	20	12	20	-	6	-30	-	P	D,S	
4bc2	do	-	1956	50	5	50	-	3.7	10-18-56	-	None	U	
4bc3	do	4,226.3	do	50	8-5	50	-	2.5	10-18-56	4,223.8	C	I	
5cb1	Forrest Hunt	-	-	-	-	-	-	-	-	-	P	D	
5da1	Mrs. Lula Hunt	4,230.8	1954	50	6	50	-	7.5	8-22-56	4,223.3	C	D,S	

Note: Records of wells southeast of the Snake River and American Falls Reservoir are contained in the report "Preliminary report on ground water in the Michaud Flats Project, Power County, Idaho" by Stewart, J. W., Nace, R. L. and Deutsch, Morris.

Table 2.--Records of springs and lakes in the Bonanza Lake area, Power and Blaine Counties, Idaho

Spring or lake number	Name	Approx. alt. of water surface or vent	Character of aquifer	Estimated discharge (cfs)	Remarks
Blaine County					
9S-27E- 9bd1S	Smith(?) Spring	4,202	Basalt	1-2	
16cb1S	Unnamed Spring	4,198	do	-	
23a 1S	do	4,198	do	-	
Power County					
7S-30E-36dc1S	Davis Spring	4,330±	Basalt and tuff	3.5	
7S-31E-31cb1S	Rueger Spring	4,290±	Lake beds	16	Fish hatchery
8S-29E-21ca1L	Bonanza Lake	4,251	-	-	
8S-30E-11ac1S	Mary Franklin Mine Springs		Basalt	10	
9S-28E-16-17S	Gifford Springs		do	24	
18ca1L	"Potholes" (ponds)	4,203	do	-	
19ba1S	Unnamed Spring	4,198	do	-	
9S-29E-12 1S	Mower Springs	-	-	1.5	