Ground Water in the Upper Part of the Teton Valley Teton Counties, Idaho and Wyoming

By CHABOT KILBURN

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By Chabot Kilburn

ABSTRACT

The Teton Valley in eastern Idaho and western Wyoming is bordered by mountains on the east, south, and west. The climate is characterized by cool summers and cold winters. Precipitation on the valley floor averages about 16 inches and on the adjacent mountain ranges to as much as 70 inches. At the higher elevations the precipitation occurs mostly as snow.

Rocks consisting principally of limestone, sandstone, quartzite, and shale of Paleozoic and Mesozoic ages crop out in the mountains and presumedly underlie the valley at depth. Silicic volcanic rocks of Miocene and Pliocene age are exposed across the northern end of the valley and also crop out discontinuously along the lower slopes of the mountain fronts. Basalt of Tertiary and probable Quaternary age overlies the silicic volcanic rocks at places in the northern part of the valley. Remnants of glacial drift of Pleistocene age occur at the mouths of canyons entering the valley from the east. Coalescing alluvial fans, of late Tertiary to Recent age, extend from the mountain fronts almost to the flood plain of the Teton River, which flows along the axis of the valley. Alluvium of Recent age underlies the channel and flood plain of the river. Loess of Pleistocene age blankets much of the basalt, silicic volcanic rock, glacial drift, and alluvial-fan deposits.

Many small springs issue from the older rocks along the valley margin and many small to large springs rising in alluvium and along the toes of the alluvial fans feed the Teton River. The alluvial-fan deposits and alluvium are the principal water-bearing formations. Adequate yields for irrigation can be obtained from wells tapping these deposits in the eastern part of the valley.

An aquifer test in well 4N–45E–13ad1 indicated that the alluvial-fan deposits in that area have a coefficient of transmissibility of about 550,000 gallons per day per foot and a coefficient of storage of 0.03. Wells pumped at 1,500 gallons per minute for 60 days and spaced a quarter of a mile apart would not seriously interfere with one another. Sparse data indicate that irrigation wells generally would be unsuccessful on the west side of the valley.

The average annual precipitation on the basin is estimated to be about 725,000 acre-feet. Of this amount, about 285,000 acre-feet flows out of the valley in the Teton River, 25,000 to 50,000 acre-feet leaves the valley by underflow, and about 400,000 acre-feet is evapotranspired.

Chemical analyses of water from 26 sources indicate that the water is moderately hard to hard but otherwise is of excellent quality for irrigation, domestic, and stock uses.

The U.S. Bureau of Reclamation has considered a plan of development that would provide both a water supply for about 15,200 acres of land now dry-farmed

on the west side of the valley and a supplemental water supply for the presently irrigated land on the east side. Water for the west side of the valley would be obtained from a reservoir that would be created by construction of a dam on the Teton River, and that for the east side would be obtained from wells. Part of the water used for irrigation but not needed by the crops would flow overland to the river and part would recharge the ground-water reservoir. As a result of the development, consumptive use of water would be increased about 1 acre-foot per acre of newly irrigated land and 0.4 acre-foot per acre in the area already under irrigation. Thus, the annual amount of water now flowing from the basin, either as surface water or as underflow, would be decreased about 25,000 acre-feet.

INTRODUCTION

The Teton Valley is almost entirely in Teton County, eastern Idaho, in Tps. 3–7 N., Rs. 44–46 E., Boise base line and meridian, but it includes about 5,000 acres in Tps. 44 and 45 N., R. 118 W., sixth principal meridian and base line, in Teton County, Wyo. (fig. 1). The valley, which has an area of nearly 250 square miles, lies between

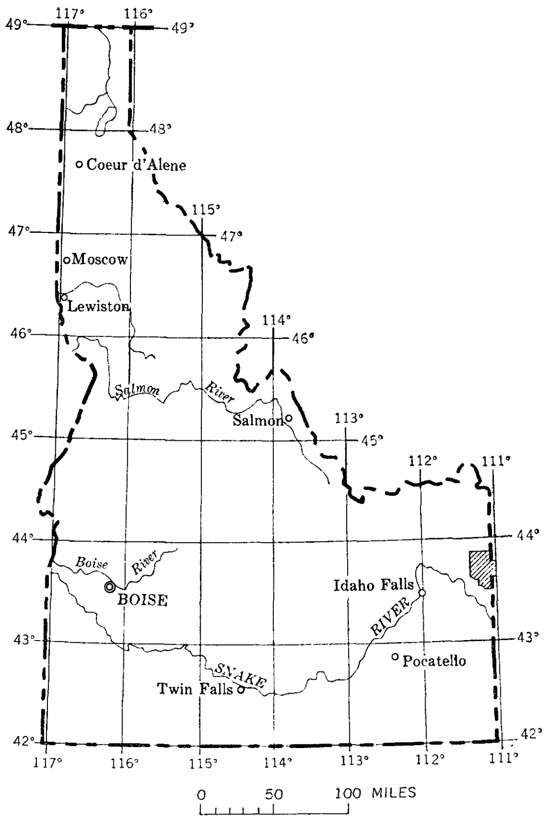

FIGURE 1.—Index map of Idaho showing area described in this report.

the Teton Range on the east and the Big Hole Mountains on the west and is bordered on the south by the Snake River Range. The Idaho-Wyoming State line passes through the eastern part of the valley.

The Teton Valley is approximately 5 miles wide at its southern end near Victor and widens toward the northwest to a maximum width of about 12 miles near Felt. The north end of the valley is formed by the North Fork of the Teton River and the Teton River. This investigation extended northward only to Badger Creek.

The valley forms part of the upper Teton River drainage basin and is locally referred to as the Teton Basin.

The investigation of the ground-water resources of the Teton Valley is part of a cooperative program between the U.S. Geological Survey and the U.S. Bureau of Reclamation to delineate areas of potential ground-water development in the upper Snake River basin and to estimate the effects of development on streamflow. This report evaluates the ground-water resources and the effects of ground-water development in the Teton Valley.

The fieldwork was done during the spring, summer, and fall of 1958 and intermittently during 1959 and 1960. Wells were drilled at three sites to help define the water table in critical areas and to aid in evaluating aquifer characteristics. The geology of the valley was mapped and most of the wells south of Felt were inventoried.

Well owners supplied well data, and Mr. Loy M. Jensen of the Soil Conservation Service, the Hopkins Brothers Water Well Drilling Contractors, and the A. C. Morris & Sons Well Drilling Co. furnished drillers' logs of wells and other data.

The first geologic and topographic mapping in the Teton Basin region was done by members of the Hayden Survey in 1872–77 (Bradley, 1873; St. John, 1879). Phosphate deposits along the west side of the Teton Mountains have been described by Blackwelder (1911) and Gardner (1944) and in the Big Hole Mountains and Snake River Range by Schultz (1918). The coal deposits of the Horseshoe Basin district of the Teton Valley coal field have been studied by Woodruff (1914), Schultz (1918), Mansfield (1920), Evans (1919, 1924), and Kiilsgaard (1951). Oil possibilities in parts of the area have been investigated by Kirkham (1922) and Heikkila (1953).

Blackwelder (1915) interpreted the post-Cretaceous history of the Teton Range and the region to the south and southeast, and Fryxell (1930), Horberg (1938), Horberg, Edmund, and Fryxell (1955), Baker (1942), Wanless, Belknap, and Foster (1955), and Edmund (1951) have described the glacial and structural geology and stratigraphy. A summary of the stratigraphy, structure, and physiography of the Teton Mountains can be found in the 11th annual field conference guidebook of the Wyoming Geological Association (1956).

Detailed geologic mapping of parts of the Big Hole Mountains and Snake River Range was done by Kiilsgaard (1951), R. H. Espach, Jr.,[1] Frank Royse Jr.,[2] and W. Andrau.[3]

The U.S. Bureau of Agricultural Economics (1940, 1942) made studies of the availability and use of water in the Teton Basin.

The U.S. Bureau of Reclamation has investigated several damsites within the basin, and has test-drilled some sites.

The well-numbering system used in Idaho by the Geological Survey indicates the location of wells within the official rectangular subdivisions of the public lands, in reference to the base line and meridian. The first two segments of the number designate the township and range. The third segment gives the section number 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 (fig. 2). Within the quarter sections, 40-acre tracts are lettered in the same manner. Thus well 5N–45E–25bd1 is in the SE¼NW¼ sec. 25, T. 5 N., R. 45 E., and is the first well visited in that tract. Springs are numbered in the same manner except that S is inserted between the two letters and the serial number. Only springs which were sampled for quality of water analyses are numbered in this report.

PHYSICAL SETTING

TOPOGRAPHY AND DRAINAGE

The Teton Valley occupies the central part of a mountainous drainage basin that is characterized by high relief. The Teton Range, on the east side of the valley, rises from an altitude of about 6,000 feet in the valley, on long dip slopes, and culminates in alpine summits, the highest of which is the Grand Teton at an altitude of 13,766 feet. The Snake River Range on the south side and the Big Hole Mountains on the west side are somewhat less rugged and not so high; their highest points range in altitude from 8,500 to about 9,000 feet.

Tributaries of the Teton River, which is the main stream, have eroded steep-sided valleys into the surrounding mountains. In the Teton Range the tributary valleys are somewhat U-shaped because of alpine glaciation; elsewhere the tributary valleys are V-shaped.

The Big Hole Mountains and Snake River Range consist largely of resistant rocks which have been steeply tilted by faulting. The

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[1] Espach, R. H., Jr., 1957, Geology of the Mahogany Ridge area, Big Hole Mountains, Teton County, Idaho: Wyoming Univ. Master of Arts thesis.

[2] Royse, Frank, Jr., 1958, Geology of the Pine Creek Pass area, Big Hole Mountains, Teton and Bonneville Counties, Idaho: Wyoming Univ. Master of Arts thesis.

[3] Andrau, W., 1958, Geology of the West Pine Creek area, Bonneville County, Idaho: Wyoming Univ. Master of Arts thesis.

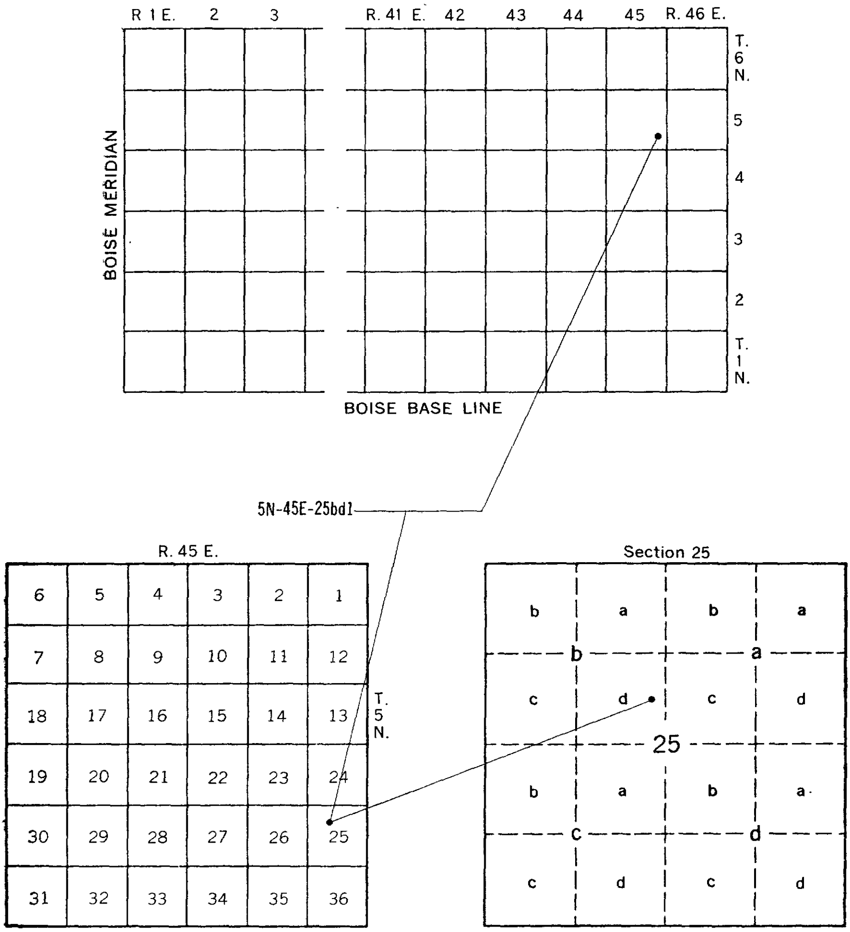

FIGURE 2.—Sketch of well-numbering system.

mountainous terrain adjacent to the southwestern part of the valley is characterized by southeast-trending strike ridges. A large topographic basin has formed at the headwaters of Horseshoe Creek in the northwestern part of the Big Hole Mountains. This basin is bounded on its west side by a high northwest-trending escarpment which rises abruptly to an altitude of 8,879 feet at its highest point. The escarpment forms part of the western edge of the upper Teton drainage basin.

Teton Valley is floored largely by alluvial fans that radiate from the mouths of the canyons of tributary streams. The gradient of the land surface east of the Teton River increases from about 30 feet per mile near the river to an average of slightly more than 100 feet per mile near the base of the Teton Range. The surface west of the river rises at an average slope of about 75 feet per mile to the base of the Big Hole Mountains. Along its axis the valley descends at a gradient of about 6 feet per mile, from about 6,025 feet, west of Victor, to about 5,900 feet in The Narrows northwest of Tetonia.

The Teton River, which has been forced westward by the faster growing fans from the Teton Range, has removed the lower part of the alluvial fans extending from the Big Hole Mountains. The scarp thus formed has a maximum height of about 30 feet and extends along the river from sec. 5, T. 3 N., R. 45 E., to the Narrows.

The valley floor west of the Narrows and north of Packsaddle Creek terminates abruptly against a north-trending steep scarp. The land surface west of the scarp is a dip slope on volcanic rocks which slope up toward the Big Hole Mountains. The ramplike surface is dissected by nearly straight gullies that radiate outward from the northern end of the mountains.

A range of low hills extends northward from Tetonia for about 5 miles in T. 6 N., R. 45 E. These hills, here called the Tetonia Hills, have a local relief of several hundred feet and are about 2½ miles wide. Badger Creek has cut through the hills and divided them into two nearly equal parts.

The flat alluvial floor at the north end of the valley, between the Tetonia Hills and the Teton River, terminates at Badger Creek. The area north of Badger Creek and east of the Teton River is a low, rolling upland dissected by the deep gorges of Badger Creek and the Teton River.

The Teton River rises in the southern part of the Teton Range near the Snake River Range and flows northwestward into the valley. Northwest of Victor it is joined by Little Pine Creek which drains the northern end of the Snake River Range. Northward, the river collects drainage from tributaries which head in the Teton and Big Hole Mountains. The major tributaries from the Teton Range are, from south to north, Fox, Darby, Teton, and Bear Creeks, the South and North Forks of Leigh Creek, and Badger Creek. The major tributaries from the Big Hole Mountains are Mahogany, Twin, Horseshoe, and Packsaddle Creeks, and in the Snake River Range, Little Pine and Pole Creeks.

The elevation of the river at the junction of Little Pine Creek and Teton River is slightly above 6,000 feet. The river flows northward down the valley for approximately 19 miles and then leaves the valley about 3 miles west of Tetonia, at an elevation of 5,915 feet in a steep-sided, narrow canyon that it has cut into the rolling upland at the northern end of the valley. The entrance to the canyon, locally called the Narrows, is in the SE¼ sec. 15, T. 6 N., R. 44 E. After entering the Narrows the river flows northwestward about 8 miles to its confluence with the North Fork of the Teton where it turns westward to the Henrys Fork of the Snake River 30 miles to the west. The river drops approximately 630 feet between the Narrows and its junction with the North Fork of the Teton River.

The U.S. Bureau of Agricultural Economics (1942) describes the natural vegetation of the valley as follows: "The upland portions of the Basin are heavily forested. Spruce predominates but pine, fir, quaking aspen, birch, and other varieties are abundant. The non-arable footslopes are largely covered by sagebrush. Willows flourish along the streams in the bottomlands of the valleys. Bunchgrass and buffalo grass are found throughout the area, except in the low lands along the river where swamp grass, tules, and other semi-aquatic growths predominate."

CLIMATE

Climatological data collected by the U.S. Weather Bureau indicate an average annual temperature of 39.6 °F at Driggs. January, with a mean temperature of 16.9 °F, usually is the coldest month, and July, with a mean temperature of 63.4 °F, usually is the warmest month. The maximum temperature recorded at Driggs was 97 °F in July 1926 and June 1931, and the minimum was −50 °F in February 1933. The average maximum, mean, and average minimum monthly temperatures recorded at Driggs are shown in figure 3. The average

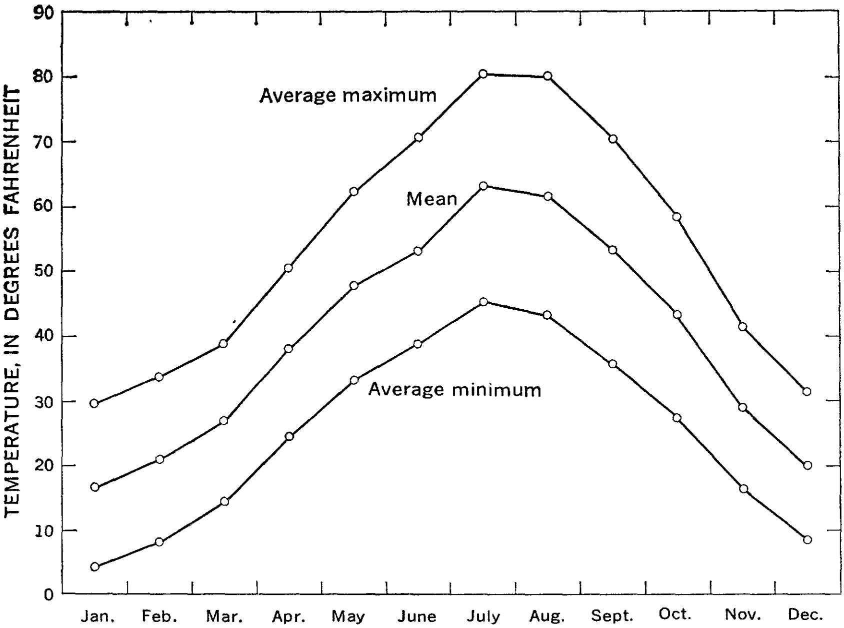

FIGURE 3.—Average maximum, mean, and average minimum monthly temperatures at Driggs, Idaho, for 42 years of record, 1907–58.

frost-free season is 71 days, extending from June 19 to August 29; it has ranged from 18 days in 1939 to 135 days in 1911.

During the period 1907–58, the annual precipitation at Driggs ranged from 8.58 inches in 1958 to 28.85 inches in 1925 and averaged 16.39 inches. The average annual precipitation at Tetonia is 13.9 inches and at the Tetonia Experiment Station at Tetonia is 12.6 inches. The average monthly precipitation and the average annual departure from the normal precipitation recorded at Driggs are shown in figure 4.

The average annual precipitation within the Teton Basin is indicated on the isohyetal map shown on plate 1, which was adapted from one

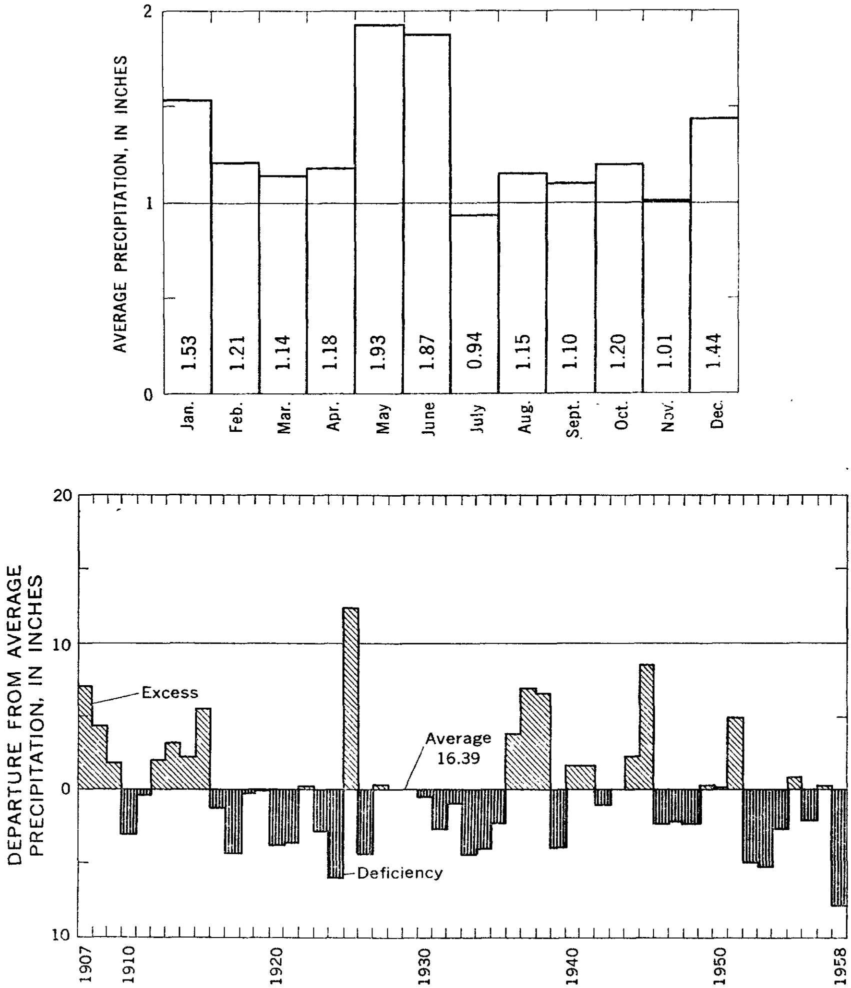

FIGURE 4.—Average monthly precipitation and annual departure from average precipitation at Driggs for the period 1907–58.

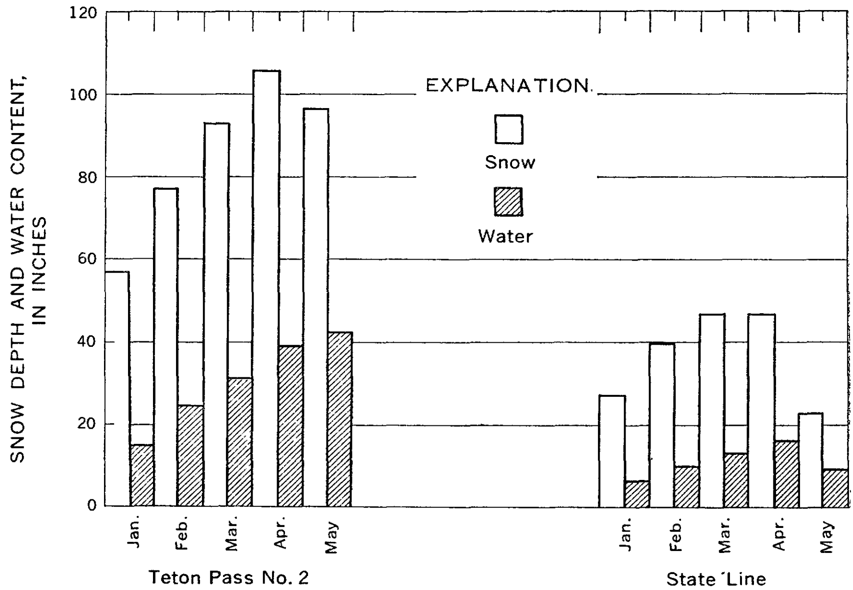

FIGURE 5.—Graphs of average depth and water content of snow at Teton Pass No. 2 (1945–58) and State Line (1936–58) snow courses, Teton Basin area, Idaho and Wyoming.

prepared by Thomas, Broom, and Cummans (1963). Precipitation during the winter months is largely in the form of snow, but during the summer months occurs mainly as thunder storms and showers which often are intense but of short duration.

The depth to which snow accumulates in the mountains is measured by the U.S. Soil Conservation Service at two stations at the southern end of the Teton Mountains. The greatest accumulations measured at the State Line and Teton Pass No. 2 snow courses were 74 inches (April 1936) and 130 inches (April 1950) respectively. The average snow depth and water content measured at these stations for the periods of record are shown in figure 5. The State Line snow course is in the Teton River Canyon in sec. 32, T. 3 N., R. 46 E., at an elevation of about 6,600 feet, and the Teton Pass No. 2 snow course is on Teton Pass in sec. 24, T. 41 N., R. 118 W., in Wyoming, at an elevation of about 8,500 feet.

DEVELOPMENT

According to the 1950 U.S. Census the population of Teton County, Idaho, was 3,204, or 397 less than in 1940. In 1950 the village of Driggs, the county seat and main commercial center, had a population of 941 and Victor and Tetonia had populations of 431 and 232. The population of that part of Teton County, Wyo., in the Teton Basin is estimated to be less than 100.

The valley is primarily an agricultural region, dairying and the raising of livestock being the most important economic enterprises. The greater part of the valley is used for the production of livestock feed. The major farm crops of the valley are small grains, hay, seed peas, and seed potatoes; some vegetables and fruits are grown for local consumption. Some lumbering is carried on in the surrounding mountains, and a quarry in Darby Canyon produces crushed limestone which is used in refining sugar.

WATER UTILIZATION

Most of the wells in the Teton Valley are used for domestic and stock supplies. No more than about 20 are used for irrigation and public supply.

Nearly all the wells are drilled, are 6 to 8 inches in diameter, and range in depth from about 50 feet to 300 feet. Where the depth to water is shallow, some driven wells equipped with sand points are used. A few dug wells are sources of supply, but most dug wells have been abandoned or are unused. Nearly all the wells are equipped with jet pumps and with electric motors of ½ to 1 horsepower.

Water supplies for many farms and dwellings near the Teton Mountains are furnished by small water companies. In the most part, such supplies are obtained from springs at the foot of the mountains and are distributed through small-diameter pipelines. Most domestic and stock supplies for farmsteads near the foot of the mountains to the south and west are from springs. Water supplies for homesteads away from the mountains are obtained from wells or, as at a few places at the southern end of the valley, from ditches.

Victor, Driggs, and Tetonia have public water-supply systems. Victor uses springs several miles up Game Creek. Driggs uses surface water diverted from Teton Creek in Wyoming. Well 5N–45E–26dal is used during periods of high water demand. The well water is pumped to an elevated steel storage tank from which it is distributed to the mains. Tetonia derives its main supply from well 6N–45E–28cal and a supplemental supply, during periods of higher than normal demand, from well 6N–45E–29ddl.

Ground water is not used extensively in the Teton Valley for irrigation purposes. In 1958, 11 irrigation wells—nearly all in Tps. 5 and 6 N., R. 45 E.,—were used to supply irrigation water to approximately 800 acres. Most of these wells are used only in the latter part of the summer to supply supplemental water when surface-water supplies are usually inadequate.

Seven of the irrigation wells are dug and are less than 50 feet deep. They are from 4 to 7 feet in diameter and are curbed with boards. All but one are equipped with turbine pumps powered by tractor engines. Of the four drilled wells, two are used for the irrigation of small cemeteries; the other two are 16 and 20 inches in diameter and are reported to be 190 and 238 feet deep, respectively. They are equipped with turbine pumps; the pump in the 16-inch well has an electric motor and the other is powered by a butane gas engine.

Descriptive information on wells in the Teton Valley is summarized in table 7 on page 25.

All surface-water sources within the basin are utilized for irrigation but not all the water is used. The U.S. Bureau of Reclamation (1960) estimated that 17,670 acres of land was irrigated in 1958, approximately 800 acres of which was irrigated with ground water when the surface-water supply was inadequate. Of this acreage, 15,450 acres was east of the river and 2,220 acres was west of the river. Water is diverted from the streams entering the valley and is distributed through unlined canals. In low areas adjacent to the Teton River the land is subirrigated when the water table rises near the land surface.

During the spring runoff much of the streamflow is diverted and spread over as much land as possible. This diversion helps subirrigate the lower part of the valley and, because it reduces the demand for water by the downstream users, allows upstream users on the higher parts of the fans to divert larger supplies of water for a longer period. Because the water supply diminishes rapidly after the snowmelt season, this method allows the available supply to be used over a larger area. It is reported, however, that the water supply never is adequate for full production on all the developed land. There are no reservoirs for storage of surface water.

GEOLOGIC SETTING

The geology of the Teton Mountains and parts of the Big Hole Mountains has been described in several reports (see "References," p. 45). The areal geology and stratigraphy of the rock units in the mountains bordering the valley, described in reports by Gardner (1944), Kiilsgaard (1951), Heikkila (1953), Espach (footnote 1, p. 4), and Royse (footnote 2, p. 4), have been used freely in the compilation of the geologic map (pl. 2). Alluvial deposits and volcanic rocks in the valley were mapped by the writer in the field by photogeologic methods. The stratigraphic units cropping out in the Teton Basin are summarized in table 1.

The Teton Valley is a southward-trending reentrant of the northeastern part of Snake River Plain. The Teton Mountains, which border the valley on the east, consist of a westward-tilted fault block that exposes Precambrian basement rocks on its east side. The Big Hole Mountains and Snake River Range, which form the western and southern margins of the valley, compose the northernmost extent of the Utah-Idaho thrust-fault belt. Most of the rocks are of Paleozoic and Mesozoic age.

The following brief summary of the Tertiary and Quaternary geologic history of the Teton Basin is based on a much more detailed summary by Love (1956, p. 140–150) of the Late Cretaceous, Tertiary, and Quaternary geologic history of Teton County, Wyo.:

Although volcanic activity began in the region during early Eocene time and has continued into the Recent, the volcanic rocks in the Teton Basin are chiefly silicic rocks of Miocene, Pliocene, and Pleistocene(?) age and basaltic rocks of Pleistocene age.

The present Teton Basin began to take shape as a result of large-scale normal faulting which began at the close of middle Pliocene time. The Teton Mountains were displaced upward more than 20,000 feet and the Big Hole Mountains and Snake River Range were formed. Faulting has continued from Pliocene time to the present.

As the mountains were uplifted, alluvial-fan deposits began to accumulate rapidly on their flanks. From time to time ash, flows of rhyolite(?), and welded tuff covered parts of the basin. The latest period of volcanism, possibly early Pleistocene in age, was marked by the encroachment of basaltic lava flows on the lower end of the valley. Lake beds may have been deposited in still water behind lava dams, but the evidence of the occurrence of lake beds is not conclusive.

The Teton Mountains, and possibly the Big Hole Mountains, were glaciated during Pleistocene time. Three glacial stages, separated by warmer periods in which the glaciers were extensively melted, have been recognized.

GEOLOGIC UNITS AND THEIR WATER-BEARING PROPERTIES

CONSOLIDATED SEDIMENTARY ROCKS OF PALEOZOIC AGE

Rocks of Paleozoic age compose most of the western half of the Teton Mountains and crop out in extensive northwest-trending belts in the Big Hole Mountains and the Snake River Range (pl. 2). They consist mainly of limestone and dolomite but contain some thick units of shale and sandstone in the upper and lower parts of the section.

These rocks dip westward from the Teton Range and pass beneath the alluvium of the Teton Valley, west of which they are uplifted and brought to the surface again by extensive faulting in the Big Hole Mountains and Snake River Range.

The extensive faulting and brecciation of these rocks are important factors in the occurrence and movement of ground water. Numerous springs rise in and along the edges of the Big Hole Mountains and Snake River Range. Some of the wells in the southwestern part of

TABLE 1.—*Character and water-bearing properties of geologic units in the Teton Basin*

System	Series	Stratigraphic unit	Thickness (feet)	Character and distribution	Water supply
Quaternary	Recent	Alluvium	(?)	Unconsolidated stream and flood-plain deposits of clay, silt, sand, and gravel along streams; interfingered with alluvial fan deposits.	Yields water to wells adjacent to the Teton River. Springs and seeps discharge into Teton River.
		Landsline and mudflow deposits	0–40±	Unconsolidated, poorly sorted deposits of clay, silt, sand, and gravel of local extent found along edges of valley.	Unimportant because of limited area and position above water table.
	Pleistocene	Loess	0–100	Wind deposits of clayey and sandy silt containing some fine gravel deposited by streams. Forms the surficial deposits throughout most of the northern part of the valley, and mantles parts of the alluvial fans along the west side of the valley north of Mohogany Creek and the glacial deposits and silicic volcanic rocks along the northeast side.	May yield small supplies locally from perched zones of saturation. Above the main water table in all areas.
		Alluvial-fan deposits	0–325+	Unconsolidated, well to poorly sorted deposits of clay, silt, sand, and gravel underlying most of the valley floor.	Yield abundant water. Major aquifer in the Teton Valley.
		Glacial drift	(?)	Unconsolidated, poorly sorted deposits of clay, silt, sand, and gravel at mouths of Teton and Fox Creeks.	Above the water table in Teton Valley but may yield supplies adequate for domestic and stock use in tributary valleys.
Quaternary (?) and Tertiary	Pleistocene(?), Pliocene, and Miocene	Basalt	0–200±	Black to dark-gray basalt and olivine basalt in 1 to 3 flows. Crops out in many places in the northern part of the valley.	Generally above the water table but where below the water table locally may yield abundant supplies. Also may yield water locally from perched zones of saturation.
		Silicic volcanic rocks	100–400+	Varicolored volcanic rocks consisting of flow rocks(?), welded tuff, tuff, volcanic breccia, pumice, and basalt. Composition probably ranges from latite to rhyolite. Rocks underlie the northern half of the basin and are exposed in many places. Remnants crop out along the mountain fronts in the southern half of the valley.	Water-bearing properties not well known, but rocks locally contain perched water. Possibly form an important potential aquifer in northern part of basin. Generally yield sufficient water for domestic and stock supplies and, at some places, possibly would yield sufficient water for irrigation.

TABLE 1.—*Character and water-bearing properties of geologic units in the Teton Basin*—Continued

System	Series	Stratigraphic unit	Thickness (feet)	Character and distribution	Water supply
Cretaceous to Triassic		Sedimentary rocks, undifferentiated	6,000–11,000±	Varicolored shale, siltstone, sandstone, conglomerate, limestone, and coal. Crop out over much of the Snake River Range and Big Hole Mountains and in the northern and southern parts of the Teton Range. Probably underlie most of the valley at depth.	An important source of spring water. Probably would yield water sufficient for domestic and stock purposes.
Permian to Cambrian		Sedimentary rocks, undifferentiated	2,600–5,300±	Mainly limestone and dolomite but contain some thick units of shale and sandstone in upper and lower parts of the section. Crop out in extensive northwest-trending belts in the Snake River Range and Big Hole Mountains and form nearly all the western dip slope of the Teton Mountains. The exposed rocks are Mississippian to Permian in age. Probably underlie all the valley at depth.	Do.

the valley between Mahogany Creek and Drake Canyon may have been drilled through the alluvial sediments and into the underlying consolidated rocks. The yield of most of these wells is sufficient for stock and domestic use, but the yield of some is inadequate.

CONSOLIDATED SEDIMENTARY ROCKS OF MESOZOIC AGE

Rocks of Mesozoic age crop out in extensive areas in the Big Hole Mountains and Snake River Range and probably are present at depth beneath much of the valley. They are exposed largely at the southern end of the Teton Range along the north side of Teton River and also in the northern half of the range outside of the area shown on plate 2. Their surface distribution in the basin is shown on the geologic map (pl. 2). The rocks consist of beds of varicolored shale, siltstone, sandstone, limestone, and conglomerate. In the Horseshoe Creek area they contain numerous beds of coal.

The rocks have been extensively faulted and folded. The faulting and resulting brecciation of the rocks have produced channels for movement of ground water, and several springs arise along the fault traces.

Wells drilled through the alluvium south and west of Victor and south of Grove Creek may tap rocks of Mesozoic age. Yields derived from these rocks may be sufficient for domestic and stock use. However, the yields of some wells are insufficient for these purposes.

SILICIC VOLCANIC ROCKS OF TERTIARY AND QUATERNARY(?) AGE

Volcanic rocks of silicic composition, probably closely allied with those in the Yellowstone Park area, are present within much of the Teton Valley. These rocks are Tertiary and possibly early Quaternary in age, and probably extended throughout most of the basin at one time. The distribution of the remnants now exposed along the flanks of mountains and in the lower parts of the basin is shown on plate 2.

The silicic volcanic rock sequence consists of rhyolite(?) flows, welded tuff, volcanic breccia, basalt(?), and, locally, pumice. Deposits of alluvial sand and gravel intercalated in the volcanics were noted by Kiilsgaard (1951, p. 18) in the north canyon wall of Packsaddle Creek in the Big Hole Mountains. Sediments, possibly including lacustrine clay, are reported by the Bureau of Reclamation to have been found intercalated in the volcanic rocks during test drilling of a reservoir site in sec. 15, T. 6 N., R. 44 E. Well 6N–44E–22ddl penetrated 93 feet of silt, sand, and gravel after passing through 45 feet of silicic volcanic rock (table 6).

At the southern end of the valley the silicic volcanic sequence is less than 100 feet thick. The deposits thicken northward, about 400 feet of volcanic material being exposed in the canyon walls of the Teton River near its junction with the North Fork of the Teton River. The maximum thickness of the volcanics in the basin is not known.

The base of the sequence, where examined, lies unconformably upon rocks of Paleozoic and Mesozoic age. The silicic volcanics in the northern part of the valley are overlain at most places by basalt, deposits of windblown silt, and glacial drift. Where exposed, as in the canyon walls of the Teton River and Badger Creek, basalt or loess rests directly upon the silicic volcanics.

Within most of the valley the lower part of the sequence is a more or less massive rhyolite(?). The rhyolite(?) forms the canyon walls of the Teton River and Badger Creek in T. 7 N., R. 44 E. Overlying the rhyolite(?) is a sequence of tuffs and volcanic breccia that ranges from less than 1 foot to possibly several hundred feet in thickness. The volcanic breccia appears to be restricted mainly to the western slopes of the Teton Range. Locally, as in the Tetonia Hills, there are thin deposits of pumice. Similar material, forming a bed a few feet in thickness, occurs at the base of the section in Horseshoe Canyon in the Big Hole Mountains. A single flow of basalt about 18 feet thick was penetrated in the drilling of well 6N–44E–21ddl.

This flow is near the top of the unit and is overlain by about 9 feet of tuff(?).

In many places the rhyolite(?) and welded tuff are broken by vertical and horizontal cracks, or joints. Most of the openings are very narrow, but locally may be wide. Some of the joints do not extend far, but others may extend for long distances and to great depths. Commonly several sets extend in different directions and hence intersect. Joints are produced by several forces—chiefly by shrinkage during cooling of the rock or by pressure. Where there has been extensive deformation, as in the Teton Valley area, the rocks have been displaced along the fractures, and faults that may extend to considerable depths have been produced. Open joints and faults may be of special significance as reservoirs and conductors of water, and sheer or breccia zones are likely to yield large amounts of water.

Unconsolidated deposits of ash contain interstices between the grains of the material. If the ash particles are fairly coarse, the interstitial spaces may be large enough to allow movement of ground water through them. If, however, the particles are of fine size or the ash has been altered to clay, movement of water through it will be restricted because of reduced permeability and adhesion of the water to the ash particles. In consolidated ash, or tuff, ground water may occur in joints or other fractures.

The yields of wells drilled into tbe silicic volcanic rocks should, in most places, be sufficient for domestic and stock uses. In general, the deeper a well penetrates below the water table, the more openings are intersected and the larger will be the yield.

BASALT OF TERTIARY AND QUATERNARY(?) AGE

Basalt of Tertiary and probable Quaternary age underlies much of the northern part of the Teton Valley (pl. 2). The basalt generally consists of one to three flows, 25 to 150 feet in thickness, that may be equivalent in part to the extensive basalt flows of the Snake River Group to the west in the Snake River Plain. Throughout much of the area the basalt is mantled by eolian silt or stream-deposited sand and gravel. Where the lower contact is exposed, it rests directly upon the silicic volcanic rocks.

From the Narrows, in sec. 15, downstream to sec. 3, T. 6 N., R. 44 E., one to three basalt flows are exposed in the canyon walls of the Teton River. The flows accumulated in a depression accentuated by faulting. The lower two flows terminate abruptly against the south side of a fault along the north side of sec. 3. The area east of the Teton River and north along both sides of the river downstream from sec. 3, is underlain by a single(?) flow of basalt 25 to 100 feet thick.

Basalt can be traced in the subsurface as far south as sec. 21, T.

6 N., R. 44 E. Approximately 20 feet of basalt was penetrated in test well 6N–44E–21ddl between the depths of 95 and 115 feet, and an additional 13 feet was penetrated between the depths of 144 and 157 feet. The latter, however, is overlain by 17 feet of silicic volcanic rock and thus is considereably older. Basalt, possibly equivalent to the lower unit and reportedly overlying rhyolite flows east of Mount Manning in the Big Hole Mountains, has been observed by Kiilsgaard (1951, p. 18).

Throughout the northern part of the valley the basalt is believed to be above the main water table, although locally, as in the area adjacent to the Teton River between the Narrows and sec. 3, T. 6 N., R. 44 E., the lower part of the basalt may be below the water table. There may be some perched water bodies at the base of the basalt where it lies on much less permeable tuff.

Ground water occurs in basalt chiefly in openings formed during the cooling of the lava and in zones of vesicular and fragmental material between successive lava sheets, or in vesicular zones at the bottom and top parts of the flows. Vesicular zones and joints are generally interconnected over large areas, though not uniformly in all directions. These openings act as conduits through which water can flow easily into wells that pass into or through them. Jointed and vesicular basalt commonly yields large quantities of ground water to wells where the saturated thickness is more than about 50 feet.

ALLUVIAL-FAN DEPOSITS AND ALLUVIUM OF QUATERNARY AGE

A large part of the floor of the Teton Valley is underlain by alluvium of late Tertiary to Recent age. The alluvium is composed of alluvial-fan deposits and stream-channel and flood-plain deposits. The two types of deposits are shown separately on the geologic map (pl. 2). However, because the course of the Teton River has not always been the same as it is at present, the deposits probably interfinger at depth.

Most of the streams flowing out of the mountains bordering the valley have formed alluvial fans which extend outward into the valley from the mouths of the canyons. Tongues of stream-channel and flood-plain alluvium extend up the canyons of these streams for short distances from the head of each fan, and a narrow band of flood-plain deposits borders the Teton River. The surface features of the alluvial-fan deposits and stream-channel and flood-plain deposits can be distinguished easily during mapping, but in some areas the contact of the flood-plain deposits cannot be located precisely. Inasmuch as all these alluvial deposits are quite similar in their water-bearing characteristics they are described as though they constituted a single unit and are referred to collectively as alluvium.

The alluvium ranges in thickness from a few feet along the borders of the valley to several hundred feet near the center of the valley. The maximum thickness is unknown. Test well 4N–45E–13aa1, drilled into the Darby Creek fan about 3.5 miles southeast of Driggs, had not reached bedrock when drilling was stopped at 325 feet. Several wells at the north end of the valley, in the vicinity of Tetonia, reportedly have been drilled through the alluvium. Well 6N–44E–26ba1 was reported to have struck rock at 43 feet, well 6N–45E–29dd1, at Tetonia, reportedly struck rock at 230 feet, and well 6N–45E–3dd1, along Badger Creek, reportedly struck lava at 45 feet and bottomed in 2 feet of gravel at 101 feet. (See table 6.)

The alluvium is composed of rock waste brought into the valley from the adjacent mountains by streams. It consists of pebbles and boulders in a mixture of sand and finer debris. In the alluvial fans the coarsest debris is nearest the mouths of the tributary canyons. The size then decreases toward the base of the fans where the debris consists largely of clay, silt, sand, and small gravel. The fans probably include numerous beds of clean gravel, but the bulk of the material is not well sorted. Such deposits are the result of erratic conditions of streamflow where the fan may at one time have received coarse material carried by a flood and soon after received only the finer sediments carried by the stream. The better sorted gravels probably were deposited in definite stream channels leading from the canyons, and the poorly sorted deposits probably formed between the principal channels when the streams overflowed their banks.

The stream-channel and flood-plain deposits are better stratified and sorted than the alluvial-fan deposits. Logs of test pits dug by the U.S. Bureau of Reclamation, in secs. 18 and 19, T. 5N., R. 45 E., indicate that the alluvium along the Teton River consists of interbedded lenses and stringers of clay, silt, sand, and gravel that interfinger with alluvial-fan deposits.

HYDROLOGIC PROPERTIES OF THE ALLUVIAL AQUIFER

Water in alluvial deposits occupies the pore spaces between the rock particles. Where the sand and gravel are clean and well sorted, water can be transmitted through them quite readily. Poorly sorted material transmits less water.

The alluvial deposits beneath the valley floor compose the best aquifer in the Teton Valley. A single aquifer test was made, on well 4N–45E–13ad1, to determine the coefficients of transmissibility and storage, which indicate respectively the ability of the aquifer to transmit water and to release water from storage. The coefficient of transmissibility (*T*) may be expressed as the number of gallons of water a day that will flow through a strip of the aquifer 1 foot wide under a hydraulic gradient of 1 foot per foot, or (an equivalent expression) through a strip of the aquifer 1 mile wide under a hydraulic gradient of 1 foot per mile. The volume of water that will flow each day through each mile-wide section of the aquifer, therefore, is the product of the hydraulic gradient, in feet per mile, and the coefficient of transmissibility. The coefficient of storage (*S*) is defined as the volume of water the aquifer releases from, or takes into, storage per unit surface area of the aquifer per unit change in the component of head normal to that surface. The coefficient may be thought of as the fraction of a cubic foot of water that is discharged from each vertical column of the aquifer having a base 1 foot square as the water level is lowered 1 foot. Under water-table conditions, the coefficient of storage is approximately equal to the specific yield, which is the ratio of the volume of water a saturated material will yield by gravity to its own volume.

Test well 4N–45E–13ad1 was drilled into the Darby Creek fan approximately 1¼ miles from the base of the Teton Mountains and 4 miles from the Teton River. The well site was about 100 yards north of the dry channel of Darby Creek. An observation well was drilled 300 feet north of the test well.

A cable-tool (percussion) rig was used to drill the test and observation wells. Samples of cuttings obtained at 5-foot intervals from both holes showed a heterogeneous mixture of gravel and silty sand to the bottom of each hole. The driller's log, however, reported many zones that contained clay admixed with the gravel. The gravel was nearly always broken when it was bailed from the holes, but gravel on the surface contained material of cobble and small boulder size.

The test well was drilled to a depth of 304 feet and was cased to a depth of 299 feet with 16-inch casing. The casing was perforated with slots approximately ⅜ by 2½ inches. There were 120 perforations between 230 and 240 feet, 196 perforations between 255 and 275 feet, and 28 perforations between 275 and 295 feet. The bottom of the casing was left open. The total open area in the perforated zones was equal to about 2¼ square feet.

The test well was developed by surging and bailing over a period of 28 hours. Approximately 50 cubic feet of sand and fine gravel was bailed from the hole during this period.

The observation well, 4N–45E–13aa1, 8 to 6 inches in diameter, was drilled to 321 feet and was cased to 229 feet with 8-inch casing and with 6-inch casing from 228 feet to 313.5 feet. A total of 73 perforations, approximately ¼ by 2½ inches, were cut into the 6-inch casing.

Mundroff (1960, p. 11–12, 76–89) describes the aquifer tests and analyzes results in considerable detail; they are not repeated here.

He concludes that the coefficient of transmissibility is about 500,000 gallons per day per foot and that the coefficient of storage is about 0.03.

The drawdown in a well has two components, the drawdown or head loss due to the laminar flow of water in the aquifer toward the well and the drawdown or head loss (well loss) resulting from the turbulent flow of water in the aquifer in the immediate vicinity of the well, through the well screen, and in the well casing. Well loss, in feet, may be represented approximately by the following relationship (Jacob, 1947):

$$\text{Well loss} = CQ^2,$$

where C is the well-loss constant, and Q is the rate of pumping, in gallons per minute. Mundorff (1960, p. 80) found that the well-loss constant, for rates of as much as 910 gpm, is 3.3×10^{-6} in well 4N–45E–13adl.

GLACIAL DEPOSITS OF QUATERNARY AGE

Glacial drift of Pleistocene age, consisting of poorly sorted sand, gravel, and boulders, was deposited in nearly all the tributary canyons in the Teton Range. Remnants of these deposits were seen at the mouths of Fox and Darby Creek Canyons. The largest area of glacial material within the valley is at the mouth of Teton Canyon near Alta, Wyo. The glacial debris may interfinger at depth with the alluvial-fan deposits of Teton Creek. The deposits are overlain by loess.

Ground water in the glacial drift occurs in the spaces between rock grains. Till, or rock material deposited directly by the ice, is a heterogeneous unsorted mixture that commonly has a low porosity and will not yield water readily to wells. However, interbedded with the till are lenses and beds of well-sorted, clean sand and gravel. These beds are much more permeable than the till, and yield water freely.

Properly constructed and developed wells dug or drilled into the glacial deposits may yield sufficient water for domestic and stock use and at a few places perhaps sufficient supplies for irrigation. Depths to water are shallowest within Teton Canyon and increase rapidly away from the mouth of the canyon.

LOESS OF QUATERNARY AGE

Deposits of windblown silt cover much of the valley floor west of the Teton River and the northern and northeastern parts of the valley. Remnants of the loess remain on the alluvial fans of Twin, Horseshoe, and Packsaddle Creeks. Where the underlying bedrock could be reasonably determined in the northeastern part of the valley the overlying loess was not mapped. For example, the area underlain by silicic volcanic rocks in the Tetonia Hills is about 95 percent covered by loess ranging in thickness from zero to several feet. Because no other rock was observed below the loess and it is unlikely that any occurs, the loess was not mapped. Areas shown as glacial deposits also are mantled with loess. The distribution of the loess in the northwestern part of the valley is shown on plate 2.

The thickness of the loess ranges from zero to as much as 100 feet. Some sand and fine gravel, probably deposited by small streams from the adjacent mountains, is in the loess. Test well 6N–44E–21ddl penetrated 95 feet of silt that contained some admixed sand and gravel.

On the basis of one *Equus* sp. tooth, the loess is tentatively dated as post-Kansan in age (post-middle Pleistocene) by Edward Lewis (written communication, 1960).

Loess is a porous material whose intergranular voids are of such a size that it has a high water-retaining capacity but permits only slow percolation. In the Teton Valley it is everywhere above the main water table. Locally it may contain a small amount of perched water. Loess yields water very slowly but may supply enough for domestic or farm use.

WATER RESOURCES

SURFACE WATER

The surface-water supply of the Teton Valley is derived from tributary streams entering the valley from the adjacent mountains and from springs which discharge in and along the mountain fronts and in the bottom lands adjacent to the Teton River. The largest contributions are made by streams which head in the Teton Range. Streams draining the Big Hole Mountains and the Snake River Range are quite small and relatively unimportant because of their small catchment area and because these mountains do not receive as much precipitation as the Teton Mountains (pl. 1 and table 5, p. 37). The supply derived from springs along the edges of the valley is also quite small. Numerous large and small springs in and adjacent to the bottom lands bordering the Teton River give rise to many short streams which discharge into the river. Discharge from most of these springs is intermittent and begins in the late spring, when the rising water table intersects the land surface in the lower parts of the valley, and continues into the late fall and winter. This supply is of little value to water users in the valley because the water is at a low elevation, but it is of major importance to downstream users for it sustains the base flow of the river.

The period of maximum runoff occurs in the spring when high daytime temperatures cause rapid melting of the snow at the higher elevations within the basin. Runoff usually reaches a maximum in the latter part of May or early June and then decreases rapidly (fig. 6).

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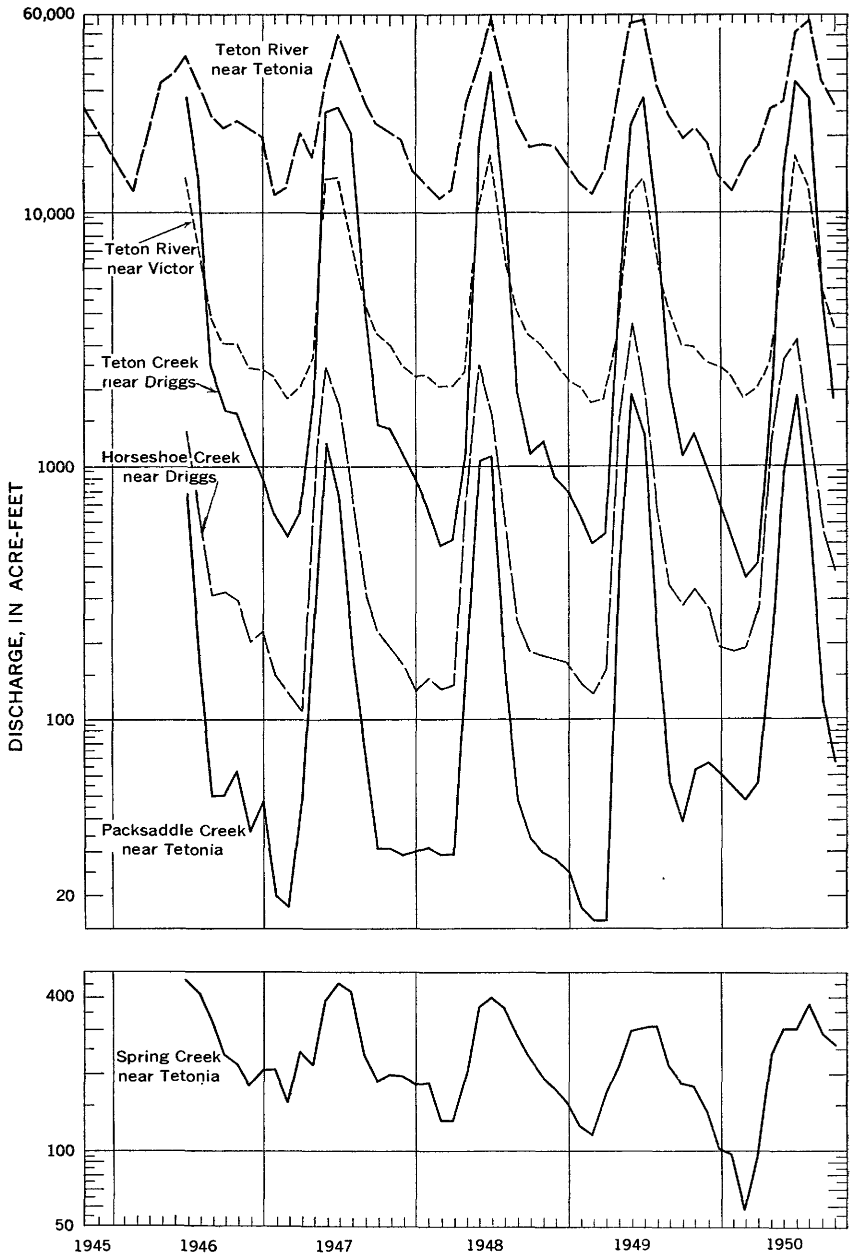

Figure 6.—Monthly discharge of streams, in acre-feet, in the Teton Basin, Idaho, October 1945 to September 1950.

During the remainder of the year, most of the tributary streams flow only intermittently in some reaches.

Seepage losses from the channels and diversions for irrigation from these streams prevent any water from reaching the Teton River, except during periods of maximum runoff. For example, the U.S. Bureau of Agricultural Economics states (1942, p. 28) that Darby Creek loses at least 40 cfs (cubic feet per second) between the State line and the Teton River, a distance of about 4½ miles. Large seepage losses from the channels have also been measured on other streams in the valley.

Streamflow data consist of continuous records of flow at gaging stations formerly maintained on the Teton River and smaller tributaries and of periodic and occasional measurements of flow at other sites. Seven stations have at various times been maintained by the U.S. Geological Survey or U.S. Bureau of Reclamation in the valley. Average discharge at these stations and their periods of record are given in table 2. On many small streams where no continuous records of flow are available, miscellaneous measurements of streamflow have been made to assist in water distribution between May and September. Records of daily flow and results of miscellaneous measurements have been published in annual water-supply papers of the U.S. Geological Survey and in the annual report of the watermaster of Water District 36. During 1958 and 1959 no gaging stations were operated in the valley. The locations of the stations listed in table 2 are shown on

TABLE 2.—*Summary of records of streamflow past gaging stations in the Teton Basin, Idaho*

Station	Drainage area (sq mi)	Years of complete record	Discharge, in cfs (date)			Records available
			Maximum	Minimum	Average	
Teton River near Victor, secs. 19 and 30, T. 3 N., R. 46 E.	47.6	6	445 (6-7-52)	22 (2-20-47)	81.9	May 1946 through October 1952.
Teton Creek near Driggs, sec. 23, T. 46 N., R. 118 W.	33.8	6	1,030 (6-6-52)	6.0 (4-7-48, 3-30-48)	110	June 1946 through October 1952.
Teton River near Driggs, SE¼ sec. 13, T. 5 N., R. 44 E.	303	5	1,480 (6-2-36)	132 (11-19, 24-35)	310	May 1935 through September 1940.
Packsaddle Creek near Tetonia, sec. 18, T. 5 N., R. 44 E.	5.7	4	58 (5-19-49)	.1 (1-22-47)	4.74	June 1946 through October 1950.
Spring Creek near Tetonia, sec. 14, T. 6 N., R. 45 E.	----------	4	16 (4-13-50)	.9 (3-16, 17-50)	3.78	June 1946 through October 1950.
Horseshoe Creek near Driggs, sec. 27, T. 5 N., R. 44 E.	11.7	6	81 (5-3-52)	.7 (11-12-46)	12.0	May 1946 through October 1952.
Teton River near Tetonia, sec. 15, T. 6 N., R. 44 E.	471	19	1,900 (6-28-45)	62 (1-16, 17-43)	393	October 1929 to December 1932; May to September 1934; July to September 1935-37; May to September 1940; June 1941 to October 8, 1957.

plate 3. Hydrographs for six of these stations for the period between 1946 and 1950 are shown in figure 6.

The flow of the Teton River was gaged at a station in the Narrows at the north end of the valley in sec. 15, T. 6 N., R. 44 E., between 1929 and 1957 (Teton River near Tetonia); continuous records of flow are available, however, only for the periods 1930–32 and 1942–57. The flow past this point represented the total surface outflow of that part of the basin south of Badger Creek. The area is outlined on plate 1. The discharge ranged from a minimum of 62 cfs observed on January 16 and 17, 1943, to a maximum of 1,900 cfs observed on June 28, 1945. The average discharge for the 19-year period of record (1930–32, 1942–57) was 393 cfs, or 284,500 acre-feet per year. The total yearly and average monthly discharges of the Teton River are shown in figure 7.

The discharge of the Teton River is at its lowest during January and February, when it averages slightly more than 200 cfs. Because runoff increases during the spring, the discharge increases to its maximum during June when the average is about 865 cfs. After June, the discharge rapidly diminishes through August and then declines less rapidly through autumn and winter.

GROUND WATER

In several places in the Teton Valley, water is reported to have risen in wells to various heights above the level at which it was struck; confinement beneath layers of silt and clay or hardpan of small areal extent is thus indicated. However, the ground water in the alluvial aquifer is considered to occur under water-table conditions.

Artesian conditions exist when a water-bearing horizon, overlain by an impermeable or relatively impermeable bed, is completely saturated and the water is under sufficient pressure that it will rise above the top of the aquifer. If the pressure is great enough to lift water in the well above the land surface, the well will flow. No flowing wells occur in the Teton Valley, although water is reported to have flowed from a seismic shothole drilled in the SW¼SW¼ sec. 30, T. 6 N., R. 46 E. Water in several wells in the lower parts of the valley adjacent to the subirrigated area rises during the summer to heights slightly above the land surface.

THE WATER TABLE

The principal factors that control the shape and slope of the water table are the topography of the land surface, the configuration of the underlying bedrock, the permeability of the materials through which the ground water moves, the relative location of areas of recharge to and discharge from the ground-water reservoir, and the relative rates of recharge and discharge.

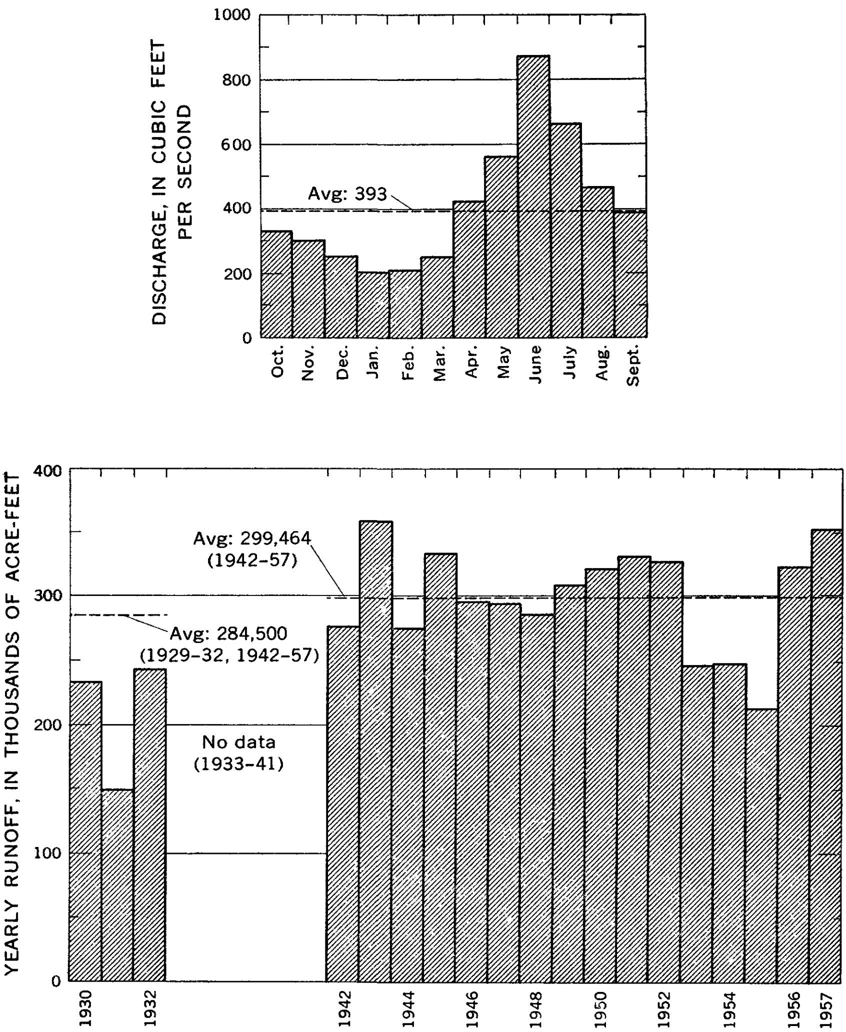

FIGURE 7.—Average monthly discharge, water years 1942–57 (above), and total annual discharge, water years 1930–32 and 1942–57 (below), of the Teton River near Tetonia.

The water table is generally a sloping surface of the same general shape as the land surface, except that the water table is more subdued. Ground water moves in response to gravity and the water table slopes in the direction of ground-water movement. Normally the water table is continually fluctuating, rising when recharge to the ground-water body exceeds discharge and declining when discharge exceeds recharge. Maintainance of a nearly constant elevation of the water table indicates that water is being recharged about as fast as it is being discharged.

The approximate configuration of the water table in the alluvial aquifer in April 1959 is shown on plate 4. Ground water moves from the valley margins toward the center of the valley but turns northward more or less parallel with the course of the river. The gradient of the water table is nearly 100 feet per mile in the upper parts of the fans adjacent to the mountains but decreases to about 25 feet per mile in the lower half of the alluvial fans. Because of local artesian conditions in the silicic rocks, the contour lines may in part reflect artesian rather than water-table conditions. Locally, for example south of Idaho 33 and west of the Teton River, the water table in the alluvium is perched above the water table in the silicic volcanic aquifer. Plate 4 does not attempt to show the relation of the perched water to the water table in the silicic volcanic rocks.

Water levels in wells rise and fall with fluctuations of the water table. In general, the major factors which control the changes in the altitude of the water table in the Teton Valley are (1) mass underflow from the surrounding mountains, (2) percolation from streams, irrigation canals, and irrigated fields, and (3) ground-water discharge into the Teton River. Small changes, generally of short duration, may be caused by infiltration of rainfall, transpiration by vegetation, variations of barometric pressure, and earthquakes. In general, however, changes of water levels in wells reflect changes in the amount of ground water stored in the aquifer.

Observations and measurements of water levels in wells in the valley were made during 1939 and 1940 by Beckstrom and Klein (in U.S. Bureau of Agricultural Economics, 1942) by the U.S. Bureau of Reclamation during 1947, and by the U.S. Geological Survey during 1947, 1950, and 1958–60.

The maximum and minimum measured depths to water in several wells are listed in table 3 and indicate the approximate range in water-level fluctuations in wells in the Teton Valley. Water-level fluctuations at some places are greater or less than those indicated in the table.

The character and approximate magnitude of water-level fluctuations in the Teton Vall ;y are shown in figures 8 and 9. Figure 8 shows the fluctuations of the water table in several wells measured in 1939 and 1940 by Beckstrom and Klein (in U.S. Bur. Agr. Economics, 1942, table 8, p. 139). Figure 9 shows the fluctuations in well 4N–45E–13ad1 during 1959 and 1960.

The hydrograph of well 4N–45E–13ad1 clearly shows the effect of recharge from snowmelt and surface runoff from the surrounding mountains in the spring. When runoff starts, large amounts of water are diverted to irrigate parts of the alluvial fans and lands lying at the base of the fans. The water infiltrates the highly porous sand and

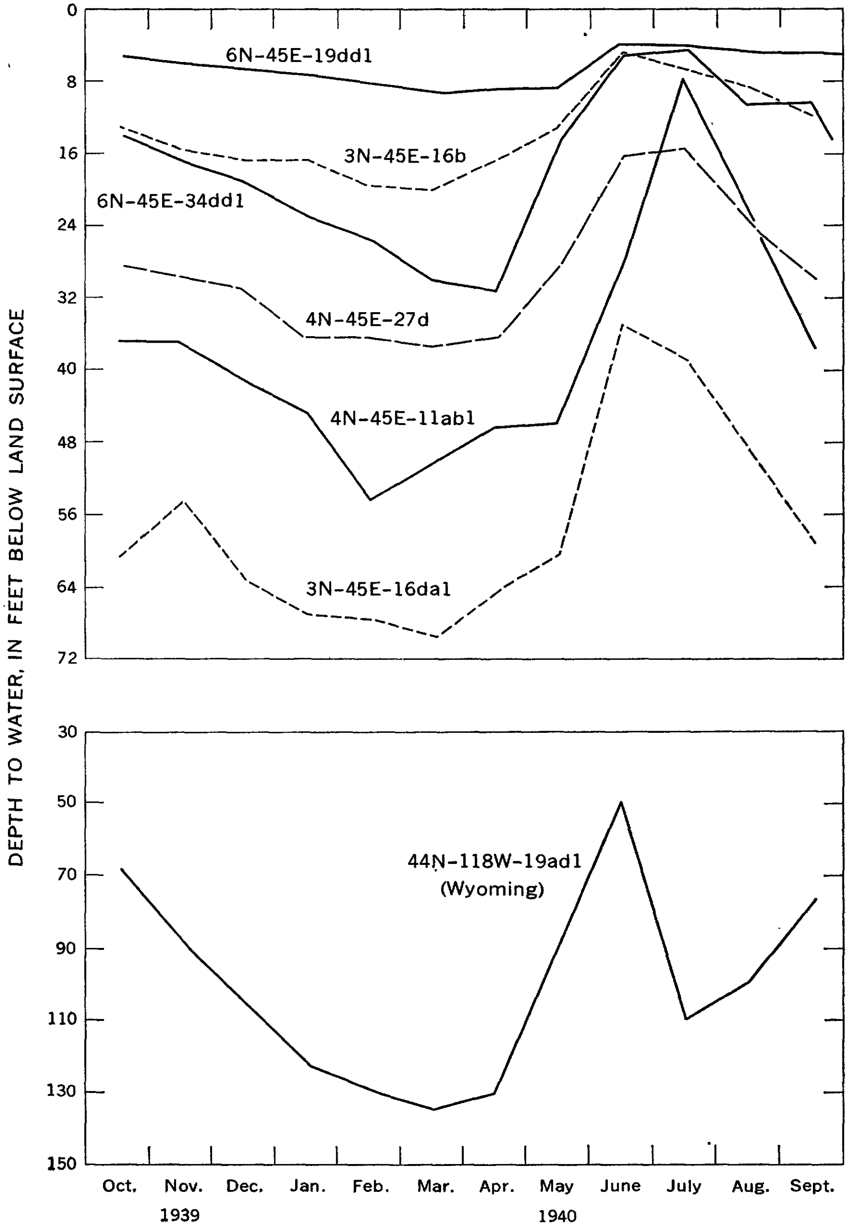

FIGURE 8.—Hydrographs of selected wells in the Teton Valley.

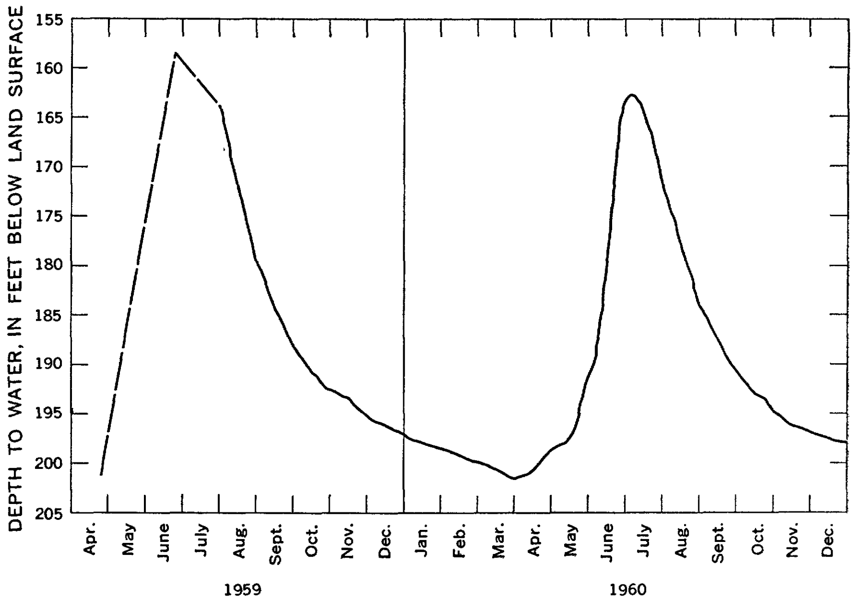

FIGURE 9.—Hydrograph of well 4N-45E-13adl.

gravel and causes the water table to rise rapidly. The water table reaches its maximum elevation during the latter part of June or early part of July just after the peak runoff of the streams. As streamflow diminishes, the water table declines. The decline is rapid during the latter part of July, August, and September but continues at a decreased rate through autumn and winter. Generally the water table reaches its lowest elevation in March.

Water levels in wells penetrating artesian aquifers fluctuate in response to changes in atmospheric pressure. When the barometric

TABLE 3.—*Maximum and minimum measured depths to water in some wells in the Teton Valley*

Well	Depth of water below land surface				Fluctuation (feet)
	Minimum		Maximum		
	Feet	Date	Feet	Date	
3N-45E-16da1	35.2	6-15-40	69.8	3-15-40	34.6
4N-45E-11ab1	7.5	7-15-40	54.2	2-15-40	46.7
13ad1	159.6	6-24-59	201.0	4-24-59	41.4
27ad1	7.5	6-25-47	48.1	3-15-40	40.6
5N-45E-2ca1	9.9	6-25-58	Well dry at 50 ft	5-10-58 4-21-59	39+
5N-45E-8ba1	4.5	7-18-47	25.5	5-15-40	21.0
18aa1	10.5	10- 5-50	14.0	5-15-40	3.5
6N-45E-19dd1	3.6	6-11-47	10.8	4-21-59	7.2
34dd1	2.9	7-23-47	31.5	4-15-40	28.6
44N-118W-19ad1	32.2	7-24-47	138.2	4-21-59	106.0

pressure declines the water level in the wells rises, and when the pressure rises the water level declines. In artesian aquifers the fluctuations of the water table closely approximate the actual change in barometric pressure.

Water-level fluctuations of very short duration are caused by earthquake shocks. The Hebgen Lake earthquakes in Montana, August 17 and 18, 1959, were recorded on many water-level recorders in Montana, Idaho, and adjoining States. The water level in well 4N–45E–13ad1, about 80 miles from the epicenter, showed a foreshock, the main earthquake, and several aftershocks (fig. 10). This well recorded the largest fluctuation of any recorder-equipped observation well in Idaho. The total amplitude of the fluctuation in this well was more than 10 feet—more than 5 feet above and more than 5 feet below the initial water level.

The approximate depth to water in the alluvial aquifer during April 1959 is shown on plate 3. The depth to water in the aquifer at that time ranged from less than 1 foot in some areas adjacent to the

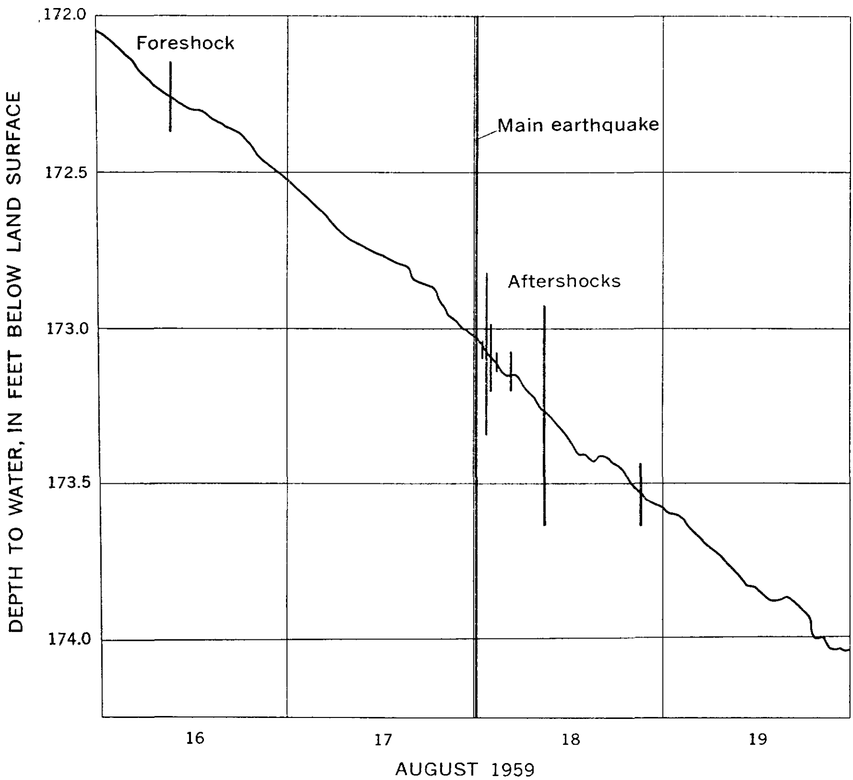

FIGURE 10.—Hydrograph showing effect of the Montana earthquake on water levels in well 4N–45E–13ad1, Teton Valley

Teton River to more than 240 feet in well 4N–46E–6dd1 at Darby. Seasonal water-level fluctuations are only a few feet in wells in and adjacent to the marshlands in the lower part of the valley but they increase progressively away from that area to as much as 85 feet in the upper parts of the alluvial fans.

RECHARGE

Ground-water recharge in the Teton Basin is directly or indirectly from precipitation on the basin. Ground water in the alluvium is recharged by (1) seepage losses from streams and canals, (2) infiltration of precipitation and of irrigation water from fields, and (3) inflow from bedrock and alluvium underlying tributary streams in the mountains.

The alluvium is recharged principally during the runoff season from the middle of March through the latter part of June and early July. The amount of recharge from rainfall is controlled in part by topography, permeability of the surficial deposits, and the amount, distribution, and intensity of rainfall. In the surrounding mountains, surface runoff is fairly large and rapid because of the steep slopes. Precipitation in the valley areas is almost entirely absorbed by the sandy soil or surficial deposits except during periods of very intense rainfall.

Precipitation on the valley floor averages 14 to 19 inches (pl. 1), of which about 36 percent falls in the growing season between April and September. Approximately two-thirds of the growing-season precipitation falls during May and June. The amount of recharge from precipitation on the valley floor during the summer months probably is very small, because nearly all the moisture evaporates, is transpired by plants, or replenishes soil moisture. During the winter months, precipitation accumulates as snow which melts in the spring and early summer. In areas of the valley floor where the soil cover is thin or consists of highly permeable sand and gravel, a large amount of the water from melting snow percolates downward to the water table. Elsewhere, as in areas of thick loessial soils, the low permeability and high porosity tend to restrict infiltration, and much of the water is held as soil moisture or runs off on the surface.

An undetermined amount of recharge to the alluvium is derived from many small springs and seeps which issue from Paleozoic and Mesozoic rocks along the southern and southwestern edge of the valley floor and from the silicic volcanic rocks in the northern part of the valley east of Tetonia. Some springs issue from silicic volcanic rocks southeast of Victor, but most of the flow is supplied by rocks of Paleozoic and Mesozoic age. Warm Creek and Spring Creek east of Tetonia derive a large part of their flows from springs and lose large amounts of water by seepage through their beds.

DISCHARGE

Natural ground-water discharge occurs by seepage into streams, by evaporation and transpiration by plants directly from ground water, and by underflow out of the valley. Artificial discharge results from the pumping of water from wells. In the Teton Valley a great deal more ground water is discharged through natural processes than is discharged from wells. The largest quantities are discharged from springs and seeps which arise where the water table intersects the surface in the lower parts of the valley floor. Lesser quantities are discharged from springs and seeps along the edges of the valley floor.

A large percentage of the streamflow in the valley is base flow, that is, ground water which is contributed to the streams through springs and seeps. Streamflow during the latter part of summer and the autumn and winter months is mostly base flow. The base flow of the Teton River, between 1953 and 1957, was estimated from streamflow graphs to reach a maximum of nearly 600 cfs during the middle of July and to decline to approximately 200 cfs during the middle of February, when base flow is at a minimum.

A large but undetermined amount of ground water is evaporated and transpired in areas where the water table and capillary fringe are near the surface. The U.S. Bureau of Reclamation in 1960 estimated that slightly more than 11,000 acres, nearly all of which is in the lowest parts of the valley adjacent to the river, was subirrigated. In the late spring and early summer, large amounts of water stand on the surface, and much of the ground water discharged in this area is consumed through evaporation and transpiration. The watermaster of the basin reported that the flow of the Teton River increases 50 cfs or more on a cloudy day because of reduced transpiration and evaporation losses. (U.S. Bureau of Agricultural Economics, 1942, p. 31).

An undetermined amount of ground water leaves the valley at its northern end west of Tetonia. Test holes in the vicinity of the Narrows penetrated beds of permeable sand and gravel intercalated with fractured and jointed silicic volcanic rocks. Ground water leaves the valley by underflow through sand and gravel and jointed silicic volcanic rocks. Some of the water is discharged to the river from springs below the Narrows.

The few data at hand are not sufficient to calculate the volume of underflow from the valley. The hydrologic characteristics of the volcanic rocks, which make up the bulk of the material through which ground water flows, suggest that the underflow may be 25,000 to 50,000 acre-feet per year.

CHEMICAL QUALITY OF GROUND AND SURFACE WATERS

Because water moving through rock or soil dissolves minerals, the chemical character of the water is closely related to the composition of the soils and rock materials through which the water passes. The concentration of the dissolved mineral matter in ground water is controlled partly by the solubility of the rock materials and partly by the length of time the water is in contact with the rock. Chemical analyses of water from 26 sources, including 14 wells, 5 springs, and 7 streams and a canal, collected in 1947, 1950, 1957, and 1958, are shown in table 4. Ten of the analyses show the concentrations of the constituents and characteristics commonly determined in water analyses. The remaining 16 show only some of the more important constituents and characteristics. The analyses were made by the U.S. Geological Survey, the U.S. Bureau of Reclamation, and the Idaho Department of Public Health.

A long period of record is usually required to define accurately the continually changing quality of surface water. The analyses of single samples from some of these sources listed in table 4 are therefore of limited value, but they probably indicate the chemical quality of the base flows of the streams.

WATER QUALITY IN RELATION TO SOURCE

The chemical quality of the water that was analyzed is shown by bar graphs on plate 2.

Ground and surface waters containing significant amounts of sulfate occur in the southwestern part of the valley. Analyses of water from springs 4N–45E–30baS1, 3N–45E–7abS2, and 3N–45E–21adS1 and from Mahogany Creek show sulfate concentrations of 159, 37, 45, and 67, respectively. These waters have moved over and through rocks of Paleozoic and Mesozoic age which have been extensively faulted, and the sulfate may have been derived from rocks that contain fossiliferous material or gypsum.

The temperature of water issuing from springs 3N–45E–7abS2 and 4N–45E–30baS1 was 68° and 55°F, respectively; these temperatures are warmer than the ground water in the surrounding area and indicate that some of the water has come from deep sources. The temperature of much of the ground water ranges from 42° to 48°F.

Most bodies of surface and ground water in the basin generally can be classified as calcium bicarbonate water and are quite similar in chemical composition (table 4). The general similarity in chemical composition between surface water entering the valley and the ground water is apparent both from comparison of analyses in the table and from examination of the bar diagrams on plate 2. Because the alluvium is composed of the same types of rock materials as occur in the nearby mountains, significant changes in chemical composition of the water do not occur. The amount of dissolved solids and the hardness increase, however, as the ground water moves through the alluvium to areas of discharge. The proportion of dissolved solids in the ground water in the alluvium may vary considerably because of the varying rates of movement through the alluvium. The resulting approximate composition of the water as it leaves the valley via the Teton River is indicated by the analysis of Teton River water collected at the highway bridge crossing the river west of Tetonia.

WATER QUALITY IN RELATION TO USE

Domestic and stock use.—Total dissolved solids in ground-water samples analyzed ranged from 165 to 352 ppm (parts per million) and averaged 212 ppm. The hardness ranged from 43 to 323 ppm and averaged 169 ppm. Most of the water samples were classified as hard (121 to 180 ppm) or very hard (more than 180 ppm) water. Except for the hardness and for a high iron content of a few ground-water supplies, the water in the Teton Valley is considered excellent for domestic and stock use.

Irrigation use.—The suitability of water for irrigation is contingent upon the effects of mineral constituents on both the plant and the soil. Excessive salts affect plant growth by limiting the intake of water by the plant or by altering its metabolic reactions. Changes in soil structure, permeability, and aeration also are caused by high concentration of salt. The soil drainage controls to a large extent the deleterious effect of waters containing various concentrations of salts. Well-drained, open soils allow crops to be grown even though irrigated by waters containing fairly large concentrations of salts. On the other hand, poor drainage permits salt concentrations to build up to toxic proportions in the root zone. Specific limits of permissible salt concentrations for irrigation water cannot be set because of wide variations in the salinity tolerance of different plants and in the permeability of the soils and other factors affecting drainage.

Wilcox (1948) has classified the suitability of various types of water for irrigation use. Under his classification the suitability is judged on measurements of electrical conductivity and sodium content reported as percent sodium. The sodium concentration is important in classifying an irrigation water because sodium reacts with soil to reduce its permeability.

Sodium content may be expressed in terms of percent sodium and is defined by

$$\text{Percent Na} = \frac{Na^{+}(100)}{Ca^{+2}Mg^{+2}+Na^{+}}$$

where all ionic concentrations are expressed in milliequivalents per liter. The results are plotted against specific conductance on a diagram to define the suitability class of water.

TABLE 4.—*Chemical analyses of water in the Teton Valley*

[Results in parts per million except as indicated. Analyses by the U.S. Bureau of Reclamation unless otherwise indicated]

Well or spring number, or surface-water location	Date of collection	Temperature (°F)	Silica (SiO_2)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Bicarbonate (HCO_3)	Sulfate (SO_4)	Chloride (Cl)	Fluoride (F)	Nitrate (NO_3)	Boron (B)	Total dissolved solids	Hardness as $CaCO_3$: Calcium, magnesium	Hardness as $CaCO_3$: Noncarbonate	Percent sodium	Sodium-adsorption-ratio (SAR)	Specific conductance (micromhos at 25°C)	pH
Well																					
4N-45E-11ab1[1]	10- 9-50	46	12	------	54	21	3.2		250	5.1	2.0	0.2	18	------	239	221	16	3	0.09	409	------
13ad1	11-18-58	42	------	------	38	12	0.0	0.0	179	1.4	1.4	------	.0	0.04	------	144	------	0	.00	277	7.94
27da1[1]	10- 9-50	47	9.6	------	------	------	2.4		237	4.1	.0	.2	7.7	------	------	200	6	3	------	373	------
5N-44E-36aa1[1]	10- 9-50	47	18	------	85	27	9.0		385	17	6.0	.2	.6	------	352	323	8	6	.22	601	------
5N-45E-23ab1[1]	10- 9-50	47	11	------	44	9.8	4.5		183	3.3	1.0	.2	5.6	------	170	150	0	6	.16	290	------
26da1[1]	7-24-57	45	8.6	0.03	44	12	.8	.4	188	4.6	.5	.1	1.6	------	165	159	5	1	.03	296	7.9
6N-44E- 9cc1	11- 4-58	47	------	------	28	9.5	6.9	.0	134	5.3	11	------	.0	.00	------	109	------	12	.29	245	7.42
26ba1	10- 9-50	53	12	------	52	16	8.3		243	6.8	3.0	.2	3.1	------	221	196	0	8	.26	384	------
28bc1	11- 4-58	48	------	------	12	3.2	4.1	.0	66	1.4	3.2	------	.0	.04	------	43	------	17	.27	111	7.14
6N-45E- 6dd1	11- 4-58	47	------	------	35	8.8	4.1	.0	149	7.2	3.9	------	9.3	.06	------	124	------	7	.16	261	7.38
28ca1[2]	*1947*	50	------	.1	41	9.5	5		146	3	3.0	.1	------	------	172	142	------	7	.18	------	7.4
31dc1[1]	10- 9-50	48	16	2.7	58	11	.3		225	2.9	1.0	.2	1.7	------	202	190	6	0	.01	351	------
34bd1[1]	10- 9-50	48	14	------	58	13	4.3		241	3.1	2.0	.2	4.2	------	218	198	1	5	.13	372	------
44N-118W-19ad1[1]	10-11-50	47	10	.33	46	11	1.2		188	3.7	1.0	.6	2.2	------	168	160	6	2	.04	297	------
Average	----------	47	12.4	------	46	13	3.9		201	4.9	2.8	.2	4.2	------	212	169	------	------	------	328	------
Spring																					
3N-45E- 7abS2	11- 5-58	68	------	------	48	19	1.4	.0	198	37	1.1	------	.0	.0	------	198	------	1	.04	368	7.72
21adS1	11- 5-58	45	------	------	55	20	2.8	.0	226	45	.7	------	.0	.0	------	120	------	3	.08	399	7.62
23daS1	11- 5-58	43	------	------	53	17	1.8	.0	246	6.7	.4	------	.0	.0	------	202	------	2	.06	382	7.66
4N-45E-30baS1	11- 5-58	55	------	------	82	28	2.3	.0	208	159	2.1	------	.0	.10	------	320	------	2	.06	604	7.40
6N-45E-34bbS1	11- 5-58	46	------	------	44	9.7	2.3	.0	188	3.8	2.5	------	5.0	.04	------	150	------	3	.08	292	7.36

Surface water																					
Teton River, Idaho, SE¼ NW¼ sec. 13, T. 3 N., R. 45 E	11- 5-58	37	------	------	41	14	.0	.0	192	6.2	1.8	------	.0	.10	------	160	------	0	.0	298	8.00
Mahogany Creek, Idaho, NE¼ NE¼ sec. 14, T. 4N., R. 44 E	11- 5-58	38	------	------	64	21	1.4	.0	230	67	1.4	------	.0	.00	------	246	------	1	.04	449	8.16
Packsaddle Creek, Idaho SE¼ SE¼ sec. 7, T. 5 N., R. 44 E	11- 5-58	38	------	------	45	6.4	4.1	.0	184	1.0	1.8	------	.0	.16	------	139	------	6	.15	284	8.14
Canal off Darby Creek, Wyo., SE¼NE¼ sec. 19, T. 43 N., R. 118 W	11- 5-58	37	------	------	37	13	.0	.0	176	4.3	.7	------	.0	.04	------	146	------	0	.0	268	7.98
Teton Creek, Wyo., SW¼ sec. 23, T. 44 N., R. 118 W	11- 5-58	37	------	------	32	10	.0	.0	151	1.9	1.4	------	.0	.06	------	121	------	0	.0	231	8.12
North Fork of Leigh Creek, Wyo., NW¼ sec. 32, T. 45 N., R. 118 W	11- 5-58	34	------	------	38	9.2	.9	.0	167	1.0	1.4	------	.0	.06	------	133	------	1	.03	254	8.14
Teton River, Idaho [1], NW¼ sec. 26, T. 6 N., R. 44 E	8-27-57	60	9.0	0.08	52	17	3.1	.8	230	8.0	1.2	0.2	1.5	------	209	200	6	3	.96	367	8.3

[1] Analysis by U.S. Geol. Survey.
[2] Analysis by Idaho Dept. Pub. Health.

Use of a classification based on the sodium-adsorption-ratio (SAR), because the sodium-adsorption-ratio is related to the extent the soil will adsorb sodium, is suggested by the U.S. Salinity Laboratory Staff (1954). It is defined by the equation

$$SAR=\frac{Na^{+}}{\sqrt{\frac{Ca^{+2}+Mg^{+2}}{2}}}$$

where the concentrations of the constituents are expressed in milliequivalents per liter. The SAR values are plotted against specific conductance on a standard diagram that defines the sodium (alkali) hazard and the salinity hazard. All water sampled in the valley had a low-sodium hazard and a low-to-medium salinity hazard.

Although boron is necessary in very small quantities for normal growth of all plants, it is toxic in larger concentrations. None of the water in which boron was determined contained excessive amounts.

Table 4 lists percent sodium, sodium-adsorption-ratio, specific conductance, and boron content of the water samples analyzed.

POTENTIAL WATER SUPPLY

Data on the amount of precipitation and the flow of the Teton River and its tributaries within the Teton Valley that can be used to make estimates of the available water supply are limited. The available records of precipitation and streamflow through 1958 have been summarized on pages 7–9 and 21–24.

The volume of average annual precipitation within the valley was calculated by use of the isohyetal map (pl. 1) and is listed in table 5. The estimates are for that area outlined on plate 1 that is tributary to the Teton River above the gage site in the Narrows. The estimated average annual precipitation is 567,000 acre-feet on the mountains bordering the valley and 158,000 acre-feet on the valley floor, a total of 725,000 acre-feet within the drainage basin above the gage. Inasmuch as the average discharge of the Teton River at the Narrows for the periods 1929–32 and 1941–57 was 284,500 acre-feet, the average difference between the volume of annual precipitation and the volume of annual outflow is 440,500 acre-feet. This amount is the sum of evapotranspiration within the basin and underflow northward out of the basin. The underflow may be 25,000 to 50,000 acre-feet per year. Therefore, the remaining 400,000 acre-feet (approximately) is evaporated from open water surfaces and transpired by plants. This amount of evapotranspiration is equivalent to about 16 inches of precipitation on the drainage basin.

TABLE 5.—*Estimated average annual precipitation on the Teton Basin*

Basin subarea	Drainage area		Estimated precipitation	
	Square miles	Acres	Inches	Acre-feet
Teton Range	196	125,000	41.8	436,000
Big Hole Mtns	65	42,000	23.1	80,000
Snake River Range	30	19,000	31.9	51,000
Subtotal	291	186,000		567,000
Teton Valley floor west of Teton River and Little Pine Creek	41	26,000	16.5	36,000
Teton Valley floor east of Teton River and Little Pine Creek	140	90,000	16.3	122,000
Subtotal	181	116,000		158,000
Basin total	472	302,000		725,000
Average			28.8	

WATER-DEVELOPMENT POSSIBILITIES

The U.S. Bureau of Reclamation and the U.S. Corps of Engineers (1960, table 21) have investigated possible damsites at several locations on the tributary streams and at the Narrows and west of Driggs on the Teton River. Reportedly, the Narrows damsite is not feasible because the rocks would leak excessively. Because the Driggs damsite appeared more suitable (U.S. Bureau of Reclamation and the U.S. Corps of Engineers, 1960, p. 7–37), construction has been proposed of a dam 43 feet high and 6,500 feet long to store 50,000 acre-feet of water, of which 35,000 acre-feet could be used for irrigation. Water would be pumped from the reservoir to 15,200 acres of land lying on the west side of the valley.

The Bureau of Reclamation estimates that about 27,800 acres of land on the east side of the valley would require about 25,000 acre-feet of water in addition to that already available, to provide a full supply for irrigation. This amount would be supplied by groundwater pumping.

EFFECTS OF PUMPING

If the coefficients of transmissibility and storage indicated by the pumping test on well 4N–45E–13ad1, 500,000 gpm (gallons per minute) per foot and 0.03, respectively, are approximately correct, then the possible drawdown occurring at any distance to as much as several miles from a pumped well in an infinite aquifer can be determined from figures 11 and 12. The distance-drawdown graph (fig. 11) is for wells having pumping rates of 500, 1,000, and 1,500 gpm at the end of a pumping period of 60 days, or slightly less than the growing season of 71 days. The theoretical drawdown produced by a well pumping at a rage of 1,500 gpm for as much as 200 days may be determined from figure 12. If such a well were pumped continuously

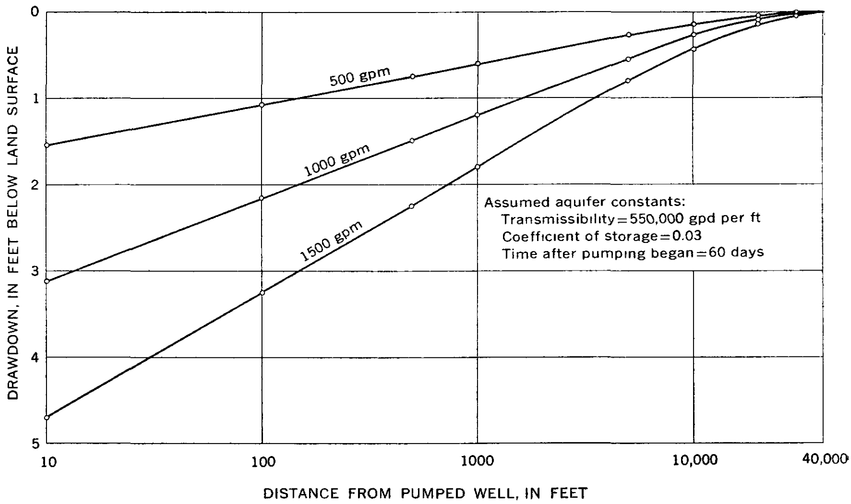

FIGURE 11.—Theoretical distance-drawdown curves for wells pumping 500, 1,000, and 1,500 gpm at the end of 60 days continuous pumping.

during the growing season and none of the pumped water returned to the aquifer, the drawdown 100 feet from the well at the end of this time would be about 3.3 feet, and at a distance of 1 mile, about 0.8 foot. Through use of these graphs, then, it is possible to estimate the approximate drawdown during the irrigation season of wells pumping between 500 and 1,500 gpm, for the drawdown is directly proportional to the pumping rate.

According to the above graphs, the drawdown produced by a well

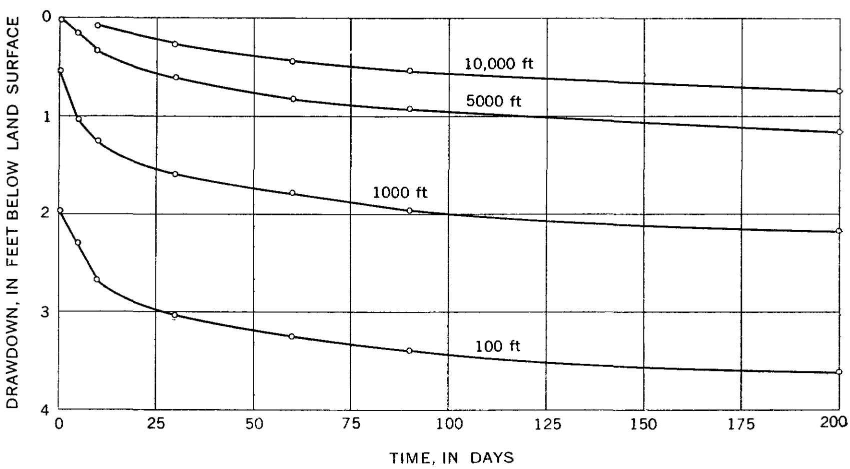

FIGURE 12.—Theoretical time-drawdown curves for a well pumping 1,500 gpm at distances of 100, 1,000 5,000, and 10,000 feet from the pumped well in an infinite aquifer.

pumping 1,500 gpm is less than 2 feet a quarter of a mile or more from the pumped well. Therefore, if wells are spaced fairly uniformly along one or two lines throughout the area where supplemental water for irrigation is desired, the needed quantity of water could be withdrawn without serious interference between wells, even though they were pumped simultaneously and each yielded 1,500 gpm.

The permeability of the alluvial deposits probably is less in the lower parts of the alluvial fans and close to the Teton River because in those places the alluvial fans contain a higher proportion of fine-grained deposits. Because the coefficient of transmissibility is less, the drawdowns in these areas will be somewhat greater than that postulated above. It should be noted that the graphs apply only to the alluvial aquifer, that the values for T and S may differ locally within much of the valley, and that aquifer tests should be made in other locations to determine whether the graphs are applicable to those areas. Furthermore, boundary effects in these hypothetical examples have been disregarded.

The alluvial aquifer is bounded on the south, east, and west by relatively impermeable bedrock, and on the north by much less permeable silicic volcanic rocks that constitute a partial barrier boundary. If a well near a barrier boundary is pumped, the expansion of the cone of depression is blocked by the boundary and the drawdown within the cone is increased. The resulting greater lift should be considered when locating a well near a barrier boundary. However, the river acts as a recharge boundary, and the effect of a recharge boundary is to reduce the drawdown from what it would be in an infinite aquifer. The net effect of the four boundaries would differ according to the location of the pumped well. Because the north and south barrier boundaries would generally be at a considerably greater distance from the pumped wells than the east and west boundaries, their effects would be comparatively small. Thus the effects of the eastern barrier boundary and western recharge boundary would be predominant, and the actual drawdown would be greater or less than the theoretical drawdown according to whether the pumped well is nearer the barrier boundary or the recharge boundary.

All ground and surface water in the Teton Basin is tributary to the Teton River. Much of the underflow from the alluvium discharges from springs in the lower parts of the valley floor adjacent to the Teton River, and ground-water development in the area will cause a decrease in the discharge of these springs. If wells were constructed and pumped in the lower parts of the valley, water levels might drop sufficiently to alleviate somewhat the drainage problem and thereby to decrease the use of water by waste vegetation in these areas.

Simons (1953, p. 62) estimates that net consumptive use of applied irrigation water in the Henrys Fork basin ranges from 1 to 1.4 acre-feet per acre. The smaller figure is for the upper part of the basin. Jensen and Criddle (1952, p. 12) estimate that consumptive use by crops in the upper Teton Valley ranges from 9.7 inches for peas to 12.4 inches for alfalfa, and averages about 11.3 inches (0.94 acre-foot per acre). Inasmuch as precipitation supplies about 3.5 inches of the consumptive-use requirements (Jensen and Criddle, p. 12), about 7.8 inches of the crop requirement must be obtained from irrigation water. On the basis of the above data, it seems reasonable to assume that 1 acre-foot per acre of irrigated land is an adequate figure for consumptive use of applied irrigation water in the Teton Valley. Thus, development of new land with ground water would deplete the total outflow by 1 acre-foot for each acre put into production. This depletion would affect both streamflow and ground-water outflow. Water pumped in excess of 1 acre-foot per acre would return to the ground as recharge or discharge directly into streams.

Ground water pumped for supplemental use on presently developed land would deplete the water supply somewhat less than 1 acre-foot per acre. The Bureau of Reclamation has suggested pumping 25,000 acre-feet of ground water annually to supplement the present surface-water supply for 27,800 acres (p. 37). If the present supply, including precipitation, is adequate to allow crops to reach 60 percent of maturity, then depletion of ground water would be about 11,000 acre-feet (40 percent ×27,800), or about 3.3 percent of the total amount of water that leaves the basin. Water pumped from the proposed reservoir west of Driggs (p. 37) for 15,200 acres of new land would deplete the supply about 15,000 acre-feet. Thus total depletion due to the proposed development would be about 25,000 acre-feet.

Most of the unused water, both surface and ground, would move toward the Teton River for reuse in the valley or farther downstream. The alluvial aquifer east of the river responds rapidly to recharge, and most of the unconsumed water would return promptly to the aquifer. The aquifer west of the river is much less permeable than that east of the river, and unconsumed water would move slowly into and through it. Surface waste would return rapidly to the river.

WELL HYDRAULICS

When a well is pumped, water is removed from storage in the aquifer and the water level is lowered from its static level. The zone of water-level lowering around a pumped well takes the form of an inverted cone. The depression of the water table, or the piezometric surface in artesian aquifers, is greatest at the well and becomes progressively less with increasing distance from the well. The size and shape of the cone are functions of the coefficient of permeability and storage of the aquifer and the rate of withdrawal of water. The quantitative relation of the yield to drawdown (the specific capacity) of the well may be expressed as gallons per minute per foot of drawdown. It is partly dependent upon the permeability of the aquifer, the hydrologic boundaries, the effective diameter of the well, and the length of time the well has been pumped. Because the drawdown consists of two components the drawdown in the aquifer and well loss, as explained on page 20, the specific capacity also is related to the rate of pumping.

The effective diameter of a well that taps unconsolidated materials—such as, the sand and gravel forming the alluvial fill of the Teton Valley—can be increased by adequate well development. Surging and bailing, for example, removes much of the clay, silt, and fine sand clogging the interstices of the aquifer adjacent to the well and increases the permeability of the materials.

The larger the effective diameter of a well the larger the specific capacity of the well. The effective diameter of a well tapping a sand and gravel aquifer should be large enough to keep the entrance velocity of water flowing into the well at a minimum. Water which enters a well at a high velocity is capable of carrying larger quantities of fine sediment into the well than water entering at a lower velocity.

CONSTRUCTION AND DEVELOPMENT OF WELLS

In consolidated formations, where the material surrounding the well is stable, ground water enters directly into an uncased well from joints and fractures. In unconsolidated sand and gravel, however, a casing is necessary to support the wall of the well. To admit water freely to the well, the casing must be perforated or equipped with a well screen. The perforations should be large enough to allow 50 to 80 percent of the surrounding grains to enter the well. Water should be allowed to enter all parts of a well tapping permeable water-bearing zones. The casing should be unperforated adjacent to zones composed of clay, silt, or very fine sand.

The most efficient method of constructing a well in sandy aquifers is to use a well screen, for the screen openings can be selected to filter a specific fraction of the sand. A slot size which passes 50 to 80 percent of the aquifer material should be selected, because the coarse remaining fraction forms a highly permeable zone around the well. Screen manufacturers will recommend the most satisfactory slot size on the basis of a grain-size analysis of the unconsolidated material bailed from the well by the driller.

Another common method of well construction involves use of an artificial screen or envelope of gravel around the perforated parts of the casing. The gravel increases the effective well diameter, acts as a strainer to keep fine material out of the well, and protects the casing from caving of the surrounding rock material. A gravel-packed well properly constructed in a sand and gravel aquifer generally has a higher yield per foot of drawdown than one of the same diameter not surrounded by gravel. An envelope of 3 to 6 inches of gravel is usually required to be effective. The size of the gravel used in packing a well should be about 4 times the average size of the coarsest 25 percent of the material in the aquifer. In perforated casing the slot openings should be three-fourths the size of the gravel. The proper grain-size distribution for a gravel pack, therefore, should be related to (1) the grain size of the materials making up the aquifer and (2) the perforation or screen slot size.

Upon completion of drilling, the well should be developed to increase its specific capacity (yield per foot of drawdown), prevent sanding, and obtain maximum economic well life. This development is accomplished by removing the fine sediments from the materials surrounding the perforated sections of the casing or the well screen. Development methods commonly employed by local drillers are pumping and surging.

Development by pumping is the more common method. The well is first pumped at a low discharge rate until the water becomes clear. Then the well is pumped at successively higher rates, and each pumping rate is maintained until the water clears again. When the well has been pumped at a maximum rate and the water has cleared, the pump should be shut down and the water level in the well allowed to recover. Then the entire process should be repeated.

A more effective method of development is by surging. A plunger or surge block is attached to the drill stem and is operated in a rapid up-and-down motion in the casing. The surge block fits tight against the casing and acts as a piston. The block is operated above the perforations or well screen; as it rises it pulls the water into the well, and when lowered it forces the water out into the aquifer. The resulting surging action, especially if rapid, creates a large and vigorous movement of water in and out of the well. The result is to bring the fine sediment from the aquifer into the well so that it may be removed by the bailer. Surging and bailing should be carried on until no more sand or mud enters the well.

Upon completion of development, the well should be test pumped to determine its maximum yield and the amount of drawdown at that yield. This testing is accomplished by measuring the static water level, after which the well is pumped at a maximum rate until the resulting pumping level stabilizes. The depth to water again is measured, and the difference in the two measurements, that is, the drawdown, is computed. The test data provide a basis for determining the water supply available from the well, for selecting the type of pump, and for estimating the probable cost of pumping.

SUMMARY

The main ground-water aquifers in the Teton Valley are silicic volcanic rock and the alluvial fill underlying the valley floor. The former underlies the alluvium beneath much of the valley and crops out at the north end and along the edges of the valley. Small supplies of water are obtained from springs which issue from consolidated limestone and sandstone rocks along the valley margins.

All water in the valley is derived directly or indirectly from precipitation that falls within the drainage basin. During April, May, and June, when runoff from melting snow on the higher elevations of the basin reaches its maximum, water is diverted from the streams and is spread over as much land as possible. There the surficial materials are highly permeable, as the alluvial fans generally are, and the infiltrating water causes a rapid rise of the water table. Recharge to the ground-water reservoir is greatest at this time. Lesser amounts of recharge throughout the remaining part of the year are derived from (1) seepage losses from streams and canals, (2) infiltration of precipitation and irrigation water from fields, and (3) inflow from underlying or adjacent "bedrock" aquifers and alluvium underlying tributary streams in the mountains.

Ground water moves from the valley margins toward the center of the valley but turns northward as it nears the Teton River and moves northward more or less parallel with the course of the river.

Seasonal fluctuations of the water table due to recharge and discharge of water from the alluvium are only a few feet in the area adjacent to the Teton River and increase progressively to more than 85 feet in the upper parts of the alluvial fans.

Large amounts of ground water are discharged from springs that arise at the base of the alluvial fans when the water table has risen sufficiently to intersect the land surface in the lower parts of the valley. Much smaller amounts are discharged from springs at the base of the mountains. Discharge by pumping in 1960 probably amounted to only a few thousand acre-feet.

Streamflow within the valley varies considerably throughout the year. Maximum streamflow occurs during May and June when runoff is greatest, and the minimum during January and February. The highest precipitation and runoff occur in the Teton Mountains, which constitute 196 square miles of the drainage basin, and the least occur in the Big Hole Mountains which make up 65 square miles of the drainage basin.

The surface outflow or discharge from that part of the basin south of Badger Creek has been recorded at a gaging station in the Narrows in sec. 15, T. 6 N., R. 44 E., through which the Teton River leaves the main part of the valley. Streamflow has ranged from a maximum of 1,900 cfs on June 28, 1945, to a minimum of 62 cfs on January 16 and 17, 1943. The average flow for the period October 1929 to September 1957 was 393 cfs. Base flow between 1953 and 1957 was estimated to average nearly 600 cfs during the middle of July and approximately 200 cfs during the middle of February.

The average yearly amount of precipitation on the basin above the gage site in the Narrows is estimated to be approximately 725,000 acre-feet. Of this amount about 430,000 acre-feet falls upon the Teton Range, about 130,000 acre-feet falls upon the Big Hole Mountains and Snake River Range, and about 160,000 acre-feet falls upon the valley floor. The average outflow past the gage during the period of record was about 285,000 acre-feet, a difference, therefore, of about 440,000 acre-feet. Of this amount approximately 25,000 to 50,000 acre-feet leaves the valley as underflow, the remainder being dissipated by evapotranspiration, which would be equivalent to about 16 inches over the basin.

The chemical quality of both surface and ground waters within the valley is very similar, and can generally be classified as calcium bicarbonate water. Ground and surface waters in the southwestern part of the valley contain significant amounts of sulfate. Several springs having waters slightly warmer than the ground water occur in the surrounding area.

Hardness of the water analyzed ranges from 43 to 323 ppm. All waters sampled are rated as excellent to good for irrigation use.

The hydraulic properties of the alluvial aquifer at well 4N–45E–13ad1 were determined to be 550,000 gpm per foot for the coefficient of transmissibility and 0.03 for the coefficient of storage. If it is assumed that these values characterize the alluvial aquifer as a whole, it can be computed that wells pumped at 1,500 gpm, for a growing season of about 71 days, would not seriously interfere with each other if they were in one or two lines and spaced a quarter of a mile apart.

A large but undetermined amount of water is stored in the alluvium. The amount probably is large enough to supply most foreseeable irrigation needs. Any pumping, however, will reduce ground-water discharge to the river. It is estimated that ground-water development proposed by the Bureau of Reclamation would deplete the annual water supply by about 25,000 acre-feet.

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BASIC DATA

TABLE 6.—*Logs of wells*

Material	Thickness (feet)	Depth (feet)	Material	Thickness (feet)	Depth (feet)
4N-45E-13aa1					
[U.S. Bur. Reclamation. Casing: 8 in.; 0-229 ft 6-in. casing perforated entire length]					
Boulders	15	15	Sand and gravel	35	215
Clay and boulders	15	30	Sand and pea gravel	80	295
Cement gravel	140	170	Boulders and gravel	10	305
Gravel, coarse; struck water at 170 ft, raised to 155 ft	10	180	Sand and gravel	20	325
4N-45E-13ad1					
[U.S. Bur. Reclamation. Casing: 16 in., 0-301 ft; perforated 230-295 ft]					
Boulders	15	15	Clay, sand, and gravel	5	245
Boulders, clay, and gravel	5	20	Clay, red, and gravel	10	255
Boulders and clay	5	25	Gravel, clay, and sand	5	260
Cement gravel	25	50	Sand and gravel	5	265
Gravel	7½	57½	Sand, gravel, and clay	5	270
Gravel and clay	67½	125	Cement gravel	5	275
Clay and gravel	30	155	Gravel, sand, and clay	5	280
Gravel and clay; struck water at 205 ft	50	205	Gravel and clay	5	285
Gravel	10	215	Clay and gravel	5	290
Gravel and clay	15	230	Clay, gravel, and sand	5	295
Sand and gravel; water stands at 190 ft	10	240	Sand, gravel, and clay	5	300
4N-45E-27da1					
[D. Lloyd Brown. Casing: 5½ in., 0-60 ft]					
Soil	1½	1½	Gravel, sand, and cobbles	58½	60
5N-44E-11aa1					
[Claude Fullmer]					
Topsoil and clay	10	10	Clay	3	23
Sand and gravel	10	20	Sand	3	26
5N-44E-35dd1					
[Raymond Ripplinger. Casing: 6 in., 0-110 ft]					
Dug well, no record	------------	40	Sand, brown	8	88
Clay; contains sand and gravel	40	80	Clay, sandy, sand, and gravel	22	110
5N-45E-2ca2					
[Verl Jardine. Casing: 6 in., 0-100 ft]					
Soil and gravel	15	15	Clay and sand	30	95
Clay	45	60	Gravel, fine, water-bearing	5	100
Clay and fine gravel, water-bearing	5	65			
5N-45E-25bd1					
[Claude Dalley and Melton Butler. Casing: 16 in., 0-190 ft; perforated 25-190 ft]					
Sand and gravel	58	58	Clay and boulders	19	168
Clay and boulders	71	129	Clay, sandy, and boulders	5	173
Clay and gravel, water	4	133	Clay and boulders	6	179
Clay and boulders	8	141	Cement gravel	9	188
Clay and gravel	5	146	No record	2	190
Sand and gravel, water	3	149			

TABLE 6.—*Logs of wells*—Continued

Material	Thickness (feet)	Depth (feet)	Material	Thickness (feet)	Depth (feet)
5N-46E-7bd1					
[George Peacock. Casing: 6 in., 0-130 ft]					
Soil	6	6	Clay	50	130
Gravel and boulders; some clay	74	80	Sand, black; water rose to 28 feet		130
6N-44E-15dd2					
[U.S. Bur. Reclamation. Diamond-drill hole 6 near Narrows damsite]					
Topsoil and windblown silty soil	5	5	Rhyolite, soft, decomposed, or white quartz sand	29	91
Gravel and clay mixed	6	11	Rhyolite, soft	1	92
Basalt, soft	1	12	Rhyolite, medium hard	38	130
Basalt, broken	28	40	Rhyolite, broken	15	145
Clay	5	45	Rhyolite, hard, broken	15	160
Sand and silt	5	50	Rhyolite, alternately soft and hard	5.2	165.2
Sand, fine	8.5	58.5			
Rhyolite, hard	3.5	62			
6N-44E-21dd1 (OW-6)					
[U.S. Bur. Reclamation. Casing: 8 in., 0-110 ft; 6 in., 0-146½ ft. Log from examination of drill cuttings]					
Silt and sand; some gravel	95	95	Vitric tuff, sandy and silty	8	165
Basalt	20	115	Silicic volcanic rock	62	227
Silt and sand; some gravel	12	127	Crystal tuff, or ash, or coarse quartzitic sand	23	250
Silicic volcanic rock	17	144	Silicic volcanic rock	50	300
Basalt	13	157			
6N-44E-22dd1 (OW-5)					
[U.S. Bur. Reclamation. Casing: 8 in., 0-242½ ft. Log from examination of drill cuttings]					
Silt and sand; some gravel	33	33	Silicic volcanic rock; may contain intercalated beds of silt, sand, and gravel	45	165
Sand and silt; some gravel	22	55	Silt, sand, and gravel; may contain beds of clay below 200 feet	92½	257½
Silicic volcanic rock	43	98			
No sample	2	100			
Silicic volcanic rock	13	113			
Silt, sand, and gravel	7	120			
6N-45E-3dd1					
[John Reiley. Casing: 6 in., 0-45 ft]					
Gravel	45	45	Gravel	2	101
Lava	54	99			
6N-45E-8dd1					
[John D. Phillips]					
Soil	5	5	Rock	35	120
Gravel	80	85			
6N-45E-22cd1					
[H. J. Phillips. Casing: 6 in., 0-32 ft]					
Gravel	10	10	Rock	23	33

TABLE 6.—*Logs of wells*—Continued

6N-45E-28dd1

[Cache-Clawson Cemetery. Casing: 6 in., 0–110 ft]

Material	Thickness (feet)	Depth (feet)	Material	Thickness (feet)	Depth (feet)
Soil	2	2	Clay, brown, sticky	65	115
Shale, loose, caving	8	10	Pumice, light-gray	13	128
Boulders and lava	14	24	Sandstone, brown	32	160
Boulders, loose, and loose dirt	10	34	Clay, brown	8	168
Rock, brown, solid	4	38	Rock, brown, porous	7	175
Rock, brown, porous	12	50			

6N-45E-29dd1

[Union Pacific Railroad. Casing: 12 in., 0–231 ft]

Material	Thickness (feet)	Depth (feet)	Material	Thickness (feet)	Depth (feet)
Gravel and boulders	10	10	Gravel, fine, water-bearing	35	230
Gravel	30	40	Lava	50	280
Gravel, coarse, water-bearing	35	75	Lava, soft, honeycombed, water-bearing	30	310
Gravel and dry sand	20	95	Lava	7	317
Gravel, muddy	40	135	Gravel	5	322
Gravel and sand	35	170			
Gravel	25	195			

TABLE 7.—*Records of wells in the Teton Valley, Idaho and Wyoming*

Well: See p. 4 for description of well-numbering system.
Type of well: A, augered; Dn, driven; Dr, drilled; Du, dug.
Depth of well: M, measured; all others reported.
Casing depth: Reported depth below land surface.
Character of aquifer: G, gravel; R, undifferentiated rock; S, sand; Ss, sandstone; V, volcanic rock.
Altitude of land surface: Altitudes to the nearest foot were determined from topographic map or by altimeter; altitudes in feet and tenths were determined by spirit leveling.
Depth to water: Reported depths are given in feet below land surface; measured depths are given in feet and tenths below land surface.
Type of pump: C, centrifugal; J, jet; N, none; P, piston; S, submersible; T, turbine.
Use of water: A, abandoned; C, commercial; D, domestic; I, irrigation; O, observation; PS, public supply; S, stock; T, test; U, unused.
Remarks: Ca, chemical analysis included in report; L, log of well included in report.

Well	Owner	Type of well	Depth (feet below land surface)	Casing		Character of aquifer	Altitude of land surface (feet above mean sea level)	Water level			Pump		Reported yield of well (gpm)	Use of water	Remarks
				Diameter (inches)	Depth (feet)			Depth to water (feet)	Date	Altitude of water surface (feet above mean sea level)	Type	Horsepower			
3N-45E-3cd1	E. A. Johnson	Dr	98	6		S, G	6,128	75.6	5- 9-58	6,052	J	¾		D, S	
4cd1	Claiborne	Du	15M	24×30				6.0	10- 5-50		N			D	Ca.
4cd2	Art Kearsley	Dn	27	1½	27	S, G					C	½		D	
6ab1	Elles Kunz	Dr	62M	6	72		6,057	13.8	4-22-59	6,043	C			D, S	
6ba1	Monroe Duskin, Jr.	Dr	44	6	44	S					C	½		D, S	Water runs over top of casing in spring.
6ca1	do	Du	5M	48×48			6,060.0	.3	10- 6-50	6,059.7	N			A	
8aa1	J. W. Bagley	Dn	19	2	19	S					C	⅛		D	
9cc1	Carroll Hamble	Du	14M	24×36	14		6,075	Dry	4-20-59		N			A	
9cd1	Carl Hemling	Du	14M	36x36		G		8.1	10- 5-50		N			A	
10ca1	Frank McBride	Dr	160	6,4	160	G	6,195	106.8	6- 9-58	6,088	P	1		D, S	
12bb1	Mrs. Edith F. Humble.	Dr	160	8,4		G					P	1		D	
13cd1	P. S. Rammell & Sons.	Du, Dr	170	144x66,		S, G	6,250.0	66.4	5-15-47	6,183.6	N			A	Dug to 95 ft, drilled to 170 ft.
15aa1	James Campbell	Dr	160	6			6,204	111.4	6- 9-58	6,093	J	1		D, S	
15ac1	Paul Miller	Dr	137M	6			6,170	105.6	4-22-59	6,064	J			D	
16ba1	Fred Dirksen	Du	80			G	6,079.8	8.0	5-26-47	6,071.8	J	¾		D, S	
16da1	J. R. Blanchard	Dr	87	6				59	9-15-40		J	½		D	
17ba1	I. H. Kersley	Du, Dr	89	6	89	S	6,100.9	18.5	5-26-47	6,082.4	J	1		D, S	Dug to 35 ft, drilled to 89 ft.
18ab1	Francis Weeks	Du	36	36x36		G	6,195.0	13.8	5-26-47	6,181.2	N			A	
21aa1	George Murdock	Du		60x60			6,134.6	59.3	5-15-47	6,075.3				A	

TABLE 7.—*Records of wells in the Teton Valley, Idaho and Wyoming*—Continued

Well	Owner	Type of well	Depth (feet below land surface)	Casing: Diameter (inches)	Casing: Depth (feet)	Character of aquifer	Altitude of land surface (feet above mean sea level)	Water level: Depth to water (feet)	Water level: Date	Water level: Altitude of water surface (feet above mean sea level)	Pump: Type	Pump: Horsepower	Reported yield of well (gpm)	Use of water	Remarks
4N-44E- 1aa1	Max Bowen	Du	14M	48x48	14		6,039.0	12.2	4-20-59	6,026.8	J			U	
1ba1	Joseph E. Furniss	Du	9M	42x42	9	G	6,041	6.2	4-20-59	6,035	C	¼		D, S	
								3.7	6-4-58	6,037					
2aa1		Du		36x36				13.2	10-2-50		N			A	
12bb1	N. E. Dustin	Dr	175	6	150	V		10			S			D, S	
12bd1	Golden R. Wood	Dr	151M	6	60	V	6,156	6.0	5-15-58	6,150	S	½		D, S	
12ca1	Monte Piquet	Du	20	48x48	20	S,G,V	6,186	1.6	5-15-58	6,184	T	4		I	Yield inadequate.
12dc1	L. E. Wood	Dr	115	6		V?					J	1		D, S	
13dc1	George H. Foster	Dr	89M	6	94		6,194	19.3	5-15-58	6,175	J	¾		D, S	Log reported as all clay.
4N-45E- 1ad1	David Johnson	Dr	175	6	175	S, G	6,216	107	10- -50		P	1½		D	
1ad2	do	Dr	125M	6	140	G	6,216	115.0	6-17-58	6,101	N			A	Well reported to go dry in February.
2bd2	Van Kampens Bros.	Dr	71M	6			6,076	7.2	4-21-59	6,069	C	⅓		S	
4aa1	Ralph H. Martin	Du	9M	5½	12	G	6,027	5.5	6-23-58	6,022	J	½		D, S	
6ab1		Du	4M	24x24	4			1.4	5-14-58		N			A	
6cc1	Morris A. Josephson.	Dr	90	5	84	S, G	6,097	62.8	4-22-59	6,034	J	1		D, S	
6dd1		Du	20M	24x30	20		6,038.3	13.8	4-20-59	6,024.5	N			A	
7bb1	Norma Dustin	Dr	100	5⅜	100	V					N			A	Yield inadequate.
7bb2	do	Dr	168	6		G					S			D, S	
7cc1	Henry T. Bates	Dr	173 M	6	160	Ss?	6,161	118.3	4-22-59	6,043	S	½		D, S	
8bd1	George Spencer	Dn	13M	1½	13		6,021	6.3	4-20-59	6,015	S			U	
11ab1	Lester Denton	Du, Dr	69M	6		G	6,117	47.4	4-21-59	6,070	J	½		D, S	Ca.
13aa1	U.S. Bureau of Reclamation.	Dr	321M	8, 6	313	S, G	6,271.7	194.0	12-10-58	6,077.7	N			U	L.
13ad1	do	Dr	304M	16	301	S, G	6,275.4	201.2	4-21-59	6,074.2	N			O	L, Ca.
14ba1		Du	55M	36x36			6,122	53.8	4-21-59	6,068	P			U	
14cd1	Darrell Kunz	Dr	107	6			6,133.8	63.8	4-21-59	6,070.0	P	1		D, S	
15da1	Jackson	Du	22M	48x60	22	G		17.8	10-9-50		N			U	
15db1	do	Du	13M	16	13	G		10.0	10-9-50		P	¼		D	

17db1	Alma A. Kunz	Dr	50M	6	52	S	6,004	11.4	4-20-59	5,993	J	¾		D, PS	
18bb1	Dale Josephson	Dr	145	6		S, G					J	1		D	
18bc1	Monroe Dustin	Dr	120	5¾	120	S, G	6,154	110.8	5-15-58	6,043	J	1½		U	
19cd1	John Miller	Du	8M	12x24		S		3.8	10-9-50		P				
22aa1	Charles Allen	Du	26M	36x48	26			12.9	10-9-50		T	½		D, S	
22ab1	Mrs. Laura Byrne	Du	10M	12x12		G	6,062	8.5	4-21-59	6,054	S			D	
23dd1	Levar Burnside	Dr	117	6	105	G	6,166	101.8	4-21-59	6,064	J	1		D, S	
27ad1	J. Dewey and Christianson Bros.	Du, Dr	115M	15	125	G	6,096.3	16.5	8-11-58	6,079.8	N			A	Unsuccessful irrigation well. L.
27bd1	Boyd Moulton	Dr	37M	6	38	S			6-21-58		J	¼		D	Water flowing over top of casing, which is 4.9 ft below land surface.
27bd2	do	Du	13M		13		6,054	7.5	4-21-59	6,046	P			U	
27da1	D. Lloyd Brown	Dr	60	5½	60	S, G		21.0	10-9-50		J	½		D, S	Ca, L.
27dd1	Mrs. Dan Gordon	Dr	56M	5¼			6,093	31.8	5-12-58	6,061	J	⅓		D, S	
28dd1	Boyd Moulton	Du	15	48x48		G		4.6	10-6-50		P			S	
30ab1	Bert Kunz	Dr	44M	6	44	G	6,016		4-22-59		C	½		D	Water flowing over top of casing, which is 2.3 ft below land surface.
30ca1	D. H. Kunz	Dr	110	6	110		6,088	43.8	5-9-58	6,044	J	¾		D, S	Reported to have struck rock at about 60 ft.
30cd1	M. G. Kunz	Dr	156M	6		S	6,060	50.7	5-13-58	6,009	J	1½		D	Log reported as nearly all red clay.
30dd1	Marvin Williams	Dr	50	6			6,012		5-13-58		C	½		D, S	Water flowing from pipe joint to pump, which is 3.5 ft below land surface.
31ab1	Mrs. Monroe Duskin, Sr.	Dr	83M	6		S, G	6,058	13.1	4-22-59	6,045	C	½		D	
31cd1	Alma Kunz	Dr	101	6			6,079	33.4	8-7-58	6,046	J	½		D	
33cc1	Ralph Jones	Du	14	36x36			6,054.6	4.0	10-6-50	6,050.6	T			D	
34ad1	Ellen Nelson	Du	16M	48x48			6,087.0	20.1	10-6-50	6,066.9	N			A	
34ca1	Lloyd Woolscenhulme.	Dr	40	6	40	S					J	½		D, S	
34cc1	Howard Tonks	Dr	40+	6	50	S			(?)		J	¾		D, S	
34dd1	Vernal Parson	Dr						42.6	10-6-50		T	1		D, S	
35dd1	James O. Kay	Dr	102	5	102	G		70			J			D, S	
36dc1	Wayne Boam	Dr	132	6			6,155	37.3	4-21-59	6,118	P	½		D, S	
4N-46E-6cb1	Robert D. Mackley.	Dr	174	6	174	G					S	1		D, S	

TABLE 7.—*Records of wells in the Teton Valley, Idaho and Wyoming*—Continued

Well	Owner	Type of well	Depth (feet below land surface)	Casing: Diameter (inches)	Casing: Depth (feet)	Character of aquifer	Altitude of land surface (feet above mean sea level)	Water level: Depth to water (feet)	Water level: Date	Water level: Altitude of water surface (feet above mean sea level)	Pump: Type	Pump: Horsepower	Reported yield of well (gpm)	Use of water	Remarks
6dd1	G. J. Gasser	Dr	257	8	255		6,324	242.0	4-21-59	6,082	P	1½		D, S	
18cc1	Thomas G. Foster	Dr	219	6	219			182			P	2		D	
31bb1	E. H. Rasmussen	Dr	200	6	200	Ss		67.0	10-9-50		P	1		D, S	
5N-44E-1aa1	Breckenridge Bros.	Dr	18M	5	18			6.4	10-5-50		C	½		D, S	
1da1	Ray J. Sorensen	Dr	45M	6		S	5,968.9	12.1	4-20-59	5,956.8	J	½		D, S	
2cc1	Dick Eggbert	Du	45M	18	45	S, G	6,001.9	38.1	4-20-59	5,963.8	P			U	
9ad1	Donald W. Jardine.	Dr	111	6	111	R		77	1941		P	1	3	D, S	
9bb1	Harold J. Lerwill	Dr	328M	6	80	V	6,167.5	242.0	4-20-59	5,925.5	N			U	
9bb2	do	Dr	36M	5		G	6,167.5	5.1	4-20-59	6,162.4	J	½		D	
11aa1	Claude Fullmer	A, Dn	26	6, 1½	26	S, G	5,968.8	17.2	5-8-47	5,951.6	C	½		D, S	L.
11cc1		Du	63M	28x39			6,014.4	60.2	4-20-59	5,954.2	N			U	
12cd1		Du	11M	30x33	11		5,972.8	9.2	6-5-58	5,963.6	N			A	Goes dry in spring.
16ca1	Earl E. Bainbridge.	Dr	403M	8	100	V		245	6- -58		N			U	
24ab1		Du	21M	36x36			5,992.0	19.1	10-9-50	5,972.9	N			A	
26dd1		Du	53M	90x90		S, G	6,044	32.7	5-10-58	6,011	N			A	Unsuccessful irrigation well.
35dd1	Raymond Ripplinger.	Dr	110	6	110	S, G					J	½		D	L.
36aa1	A. F. Murdock	Du					6,005.8	3.8	5-29-47	6,002.0				D	Ca.
5N-45E-2ba1	Vernal Lofthouse	Du	48M	60x60	48	S, G	6,182.5	Dry	5-10-58		T		540 to 630.	I	Irrigates 75 acres.
2ca1	Verle Jardine	Du	50M	66x66	50	S, G	6,169.2	Dry	4-21-59		T			U	Yield reported 1,440 gpm in 1949.
2ca2	do	Dr	100M	6	100	S, G	6,169	57.4	4-21-59	6,112	J			D	L.
3aa1	Arnold Kunz	Du	45M	72x72	46	S, G	6,129.8	34.1	4-21-59	6,095.7	T	45	1,080	I	Irrigates 80 acres.
3aa2	do	Du	40M	66x66	53	S, G	6,136	37.6	4-21-59	6,098	T	41	1,000	I	Irrigates 80 acres.

3ad1	Earl Spencer	Du	32M	84x84	32	S, G	6,139.9	4.1	6-11-47	6,135.8	T		1,000	I	Connected by tunnel to a similar well about 10 ft away. Drawdown reported to be 10 ft after many hours pumping 1,000 gpm. Irrigates 55 acres.
3cc1	L. Gilbert	Du	26M	24x24	26		6,088.6	Dry	4-21-59		J	½		S	
3da1	Willhite Estate	Du	45M	72x72		S, G	6,127	8.1	7-31-58	6,119	T			I	
4aa1	Lawrence D. Hall	Du	25M	72x72	30	G	6,095	10.2	7-30-58	6,085	C	19		I	Irrigates 12 acres.
4bd1		Du	16M	48x48	19		6,045	1.0	6-27-58	6,044	P			U	
6ab1	Frank E. Hansen	Du	17M	18	18	G	5,990.7	2.3	7- 8-58	5,988.4	P			U	
6bd1		Du	16M	38x38			5,987.4	15.6	4-20-59	5,971.8	P			U	
6cd1	Dean E. Wade	Dr	30	4	30	S	6,004.3				P	¾		D, S	
6db1	T. M. Bell	Du	32M	60x60	32		6,005.2	17.1	6-20-47	5,988.1				A	
6db2	do	Dr	51	8	51	S, G		28			J	⅓		D, S	
7ba1	John T. Anderson	Dr	36M	6			5,998.8	15.3	6-27-58	5,983.5	J	½		D, S	
7dc1		Dr	54M	6			6,007.8	20.2	4-20-59	5,987.6	P			S	
8ba1	Ralph Moffit	Du	31M	48x48	31		6,023.7	23.6	5- 9-47	6,000.1	P			D, S	
8cc1	Joseph Moffit	Du		48x48			6,007.9	18.5	5-12-47	5,989.4				D	
9ba1	Elmo C. Gee	Du	24M	96x96		G	6,064.3	3.6	6-27-58	6,060.7	T, J	½	1,350	I, D	Can pump dry with turbine in a few minutes.
9cc1	Robert Meikle	Du		60x60			6,044.3	8.0	6- 6-47	6,036.3				D	
9da1	D. M. Baler	Du	29M	12	34	G	6,077.1	18.3	4-21-59	6,058.8	P, C	⅓		D, S	
10cb1		Du	19M	24x24			6,066	2.9	6-26-58	6,063	P			S	
11ab1	Butler	Du	60M	48x48			6,160.1	58.4	4-21-59	6,101.7	P			S	
11ba1	William Knight	Du	63M	6	65	G	6,159.3	7.1	6-25-58	6,152.2	J	1		D, S	Reported to have gone dry several times.
11bd1	Alan E. Egbert	Du	69M	6	65	S, G	6,155.5	5.2	6-24-58	6,150.3	J	1		D, S	
11ca1	William C. Sensenbach.	Dr	88			G					J	¾		D, S	
11db1	L. W. Hastings	Dr	96	6	92	G					J	¾		D, S	
14ad1	L. H. Little	Du	67M	48x48	75	G	6,139.3	43.6	5- 9-47	6,095.7	J	¼		D, S	
14bd1	do	Dr	80	6		G	6,134	5.8	6-24-58	6,128	J	1		D, S	
14cb1	Letman	Du	41M	60x60	41		6,110.9	10.1	6-15-50	6,100.8	P	½		S	
14cc1	John E. Hatch	Dr	42M	6			6,114	37.1	4-21-59	6,077	N			U	
17aa1	Angus Letham	Dr	61M	8	62		6,028	7.0	4-21-59	6,021	J	1		D, S	
18aa1	Orrin Douglas	Dr	44M	6	46	S, G		10.5	10- 5-50		P	¼		D	
19aa1	J. C. Bevin	Du					6,004.2	11.3	5-12-47	5,992.9	P				
19ba1	U.S. Bureau of Reclamation.	Du	11M	48x48	11		5,982.1	.6	6-20-47	5,981.5	N			A	Test pit 1.

TABLE 7.—*Records of wells in the Teton Valley, Idaho and Wyoming*—Continued

Well	Owner	Type of well	Depth (feet below land surface)	Casing: Diameter (inches)	Casing: Depth (feet)	Character of aquifer	Altitude of land surface (feet above mean sea level)	Water level: Depth to water (feet)	Water level: Date	Water level: Altitude of water surface (feet above mean sea level)	Pump: Type	Pump: Horsepower	Reported yield of well (gpm)	Use of water	Remarks
5N-45E-19bb1	do	Du	10M	60x72		G	5,977.0	0.4	6-20-47	5,976.6	N			A	Test pit 2.
20cb1	Alfred Higley	Dn	30	1½	30	S		10	1950		S			D	
23ab1	E. L. Casper	Du, Dr	80	6	80	S, G	6,138.0	55.8	5-12-58	6,082.2	J			D, S	Ca.
23ba1	John E. Hatch	Du	40M	60x60	50	G	6,138	27.3	8-12-58	6,111	N			I	
23dc1		Dr	42M	6	43	S, G		26.1	10- 6-50		N				Well goes dry in winter.
25bd1	Claude Dalley and Melton Butler	Dr	190	16	190	S, G	6,187	100.7	4-21-59	6,086	T	50	675-900	I	L. Irrigates 120 acres.
25dd1	Driggs Cemetery	Dr	85M	6		G		42.5	10- 7-50		T	3	180	I	
26ba1	Byron Curtis	Dr	72	5		S, G		68	1937		P	¾		D, S	
26da1	Village of Driggs	Dr	225	8	225	G	6,151.5	6.1	6-20-47	6,145.4	T	30	500	PS	Ca, L.
30dd1	G. W. Casper	Du	12	72x72				4.4	12-10-50		S			S	Reported to be unfit for drinking because of taste.
31bc1	Fred Murdock	Dn	13M	1½	13	S, G	6,003	3.9	4-20-59	5,999	S			U	
32bb1		Du	6M	36x36				3.5	10- 5-50		N			A	
35dc1	E. G. Taylor	Du	19M	36x48	19			8.7	10- 9-50		P	¼		D	
5N-46E-7ab1	J. M. Peacock	Du	128	6	118	G	6,285.3	81.3	4-21-59	6,204 0	P	¾		D, S	
7bd1	George Peacock	Dr	130	6	130	S		28	Fall 1948		J	1		D, S	L.
8cd1		Dr	300	6			6,384.8	74.2	8-14-58	6,310.6	N			A	
17ac1	Herman Hastings	Dr	190	6	190	S	6,383.0	9.9	6-26-58	6,373.1	P	¾		D, S	
29ac1	Henry A. Garner	Du	64M	36x36	66	G	6,329	63.7	4-21-59	6,265	C	1		U	
29cb1	Quayle Waddell	Du	101M	32x37	112	G	6,272	32.8	4-11-58	6,239	N			U	Dry Apr. 21, 1959.
29dc1	Armene Durtschi	Du	35	36x48				17.0	10- 7-50		P			A	
32ac1	John J. Durtschi	Du	42	6	42	G					J	½		U	
32db1	Albert Hill	Dr	91	6	30	G		5	7- -50		T	¾		U	
6N-44E-9cc1	University of Idaho	Dr	443M	8, 6	460	S, V	6,169.7	374.8	6- 6-58	5,794.9	S		35	D, S	Ca.
11bb1	O. A. Smith	Dr	250+	4				240			P	⅓		D, S	
12ba1	Don McCullit	Dr	71M	6				64.2	10-10-50		P			A	
15dd2	U.S. Bureau of Reclamation	Dr	165				5,981.5	158	9- -32	5,823	N				L. Diamond-drill hole.

20bd1	Earl N. Hoopes	Dr	465	6	45			60.1	6-6-58		S	3		D, S	
21dd1	U.S. Bureau of Reclamation	Dr	300	8, 6	145	V, S	5,987.4	156.3	4-20-59	5,831.1	N			T	L. Observation well 6.
22dd1	do	Dr	257M	8	242	V, S	6,027.7	197.0	7-30-58	5,830.7	N			T	L. Observation well 5.
25ab1	Ralph W. Ure	Dn	32	2	32	G		16			C	½		D, S	
25da1	Preston Fullmer	Dn	20M	1½	20		5,976.3	7.2	8-9-58	5,969.1	N			U	
26ba1	Frank Hanrup	Dr	110M	6	47	V	5,934.0	88.0	4-20-59	5,846.0	T	1		D	Ca. Struck rock at 43 ft.
27bd1	Wayne L. Ord	Dr	121	6		V	5,955.2	68.6	8-8-58	5,886.6	P	1		D	
28bc1	Horace Hoopes	Dr	405	6, 4	380	V	6,079.5	235.	6- -58		S	1		D, S	Ca.
30ca1	Mrs. Shirley Potter	Dr	95	6	25						J	¾		D	Well reported to have gone dry in Sept of 1955 and 1956.
34aa1	Wayne L. Ord	Du	10M	22				6.9	6-6-58		S			U	
35da2	Bill Breckenridge	Dr	27M	6		S		3.7	4-20-59		N			A	Yield inadequate; original depth 250 ft.
36aa1	David Wade	Du		48x48			5,979.4	9.2	5-8-47	5,970.2				D	
36aa2	Fullmer	Dr	80	6			5,990	37.3	4-20-59	5,953	J	¾		D	
6N-45E-3dd1	John R. Reiley	Dr	101	6	45	G		94	8- -58		P	½		D, S	Reported to have struck lava at 54 ft. L.
4ac1	Ruel Eck	Dr	90	6		V		Dry	7- -58		N			A	
4bd1	J. W. Williams	Dr	330	6	20	V		290			P	5	2	D, S	Struck water at 330 ft.
5aa1	Harry Jones	Dr	73M	6		V	6,070.2	22.3	4-20-59	6,047.9	P			S	
6ba1		Dr	62M	6			5,998.8	34.8	4-20-59	5,964.0	P			U	
6da1	Don O. Eck	Dr	96M	6	90		6,030.7	33.6	7-10-58	5,997.1	N			U	
6da3	Owen R. Eck	Dr	130M	6			6,037.7	102.2	4-20-59	5,935.5	P			U	
6dd1	R. O. Eck	Dr	134M	6			6,040.3	78.7	7-10-58	5,961.6	P	1		D, C	Ca.
7aa1	Mrs. Pearl Stewart.	Dr	67M	5½			6,043.5	42.5	7-11-58	6,001.0	N			A	Goes dry.
7bd1	Linderman	Du	46M	37			6,029.7	48.2	4-20-59	5,981.5	N			I	
8ba1	Mrs. Myrtle Williams.	Dr	156M	6			6,061.5	111.0	10-10-50	5,950.5	P			U	
8bb1	do	Dr	157	6	157	G?					P	1		D, S	Original depth 130 ft. Water supply inadequate in February at 130 ft.

TABLE 7.—*Records of wells in the Teton Valley, Idaho and Wyoming*—Continued

Well	Owner	Type of well	Depth (feet below land surface)	Casing: Diameter (inches)	Casing: Depth (feet)	Character of aquifer	Altitude of land surface (feet above mean sea level)	Water level: Depth to water (feet)	Water level: Date	Water level: Altitude of water surface (feet above mean sea level)	Pump: Type	Pump: Horsepower	Reported yield of well (gpm)	Use of water	Remarks
6N-45E-8ca1	E. W. Brower & Sons.	Dr	190	16	179	V		134	7-21-60		T	60		I	Drawdown reported to be 3 ft. after pumping 1 hour at 1,200 gpm during pump test. Plan to irrigate about 260 acres.
8cb1	E. W. Brower	Dr	70	6		G?					J	½		D, S	
8dd1	John D. Phillips	Dr	120								P			D	L.
9ad1		Du	7M	42x42		G	6,158.2	4.7	4-20-59	6,153.5	N			U	
9ad2	Oliver Freeze	Dr	95M	6		V	6,183.0	64.7	4-20-59	6,118.3	J	1½		S	Reported to pump dry.
9bc1		Dr	110M	6			6,119.4	6.2	4-20-59	6,113.2	P			U	
11db1	James A. Shaw	Dr	143M	6			6,301.8	92.8	4-20-59	6,209.0	P			U	
11db1	L. P. Hatch	Dr	138M	6			6,313.1	102.9	7-16-58	6,210.2	P			U	
19cd1		Dn	20M	1½	20		5,990	16.0	8- 9-58	5,974	N			U	
19dd1	Joseph Bahr	Du	15M	48x48			5,992.5	10.8	4-21-59	5,971.7	P	¼		D, S	
20cd1	P. S. Rammel	Du	35M	84x84			6,017.9	34.3	4-20-59	5,983.6	N			U	
20dd1	Darol Mikal	Dr	71M	5¼		G	6,042.1	58.3	4-21-59	5,983.8	J	½		D, S	Log reported as nearly all fine gravel.
22cd1	H. J. Phillips	Dr	33	6	32	R					J	⅓		D	L.
23bd1	Mary Beard	Dr	42M	4		S, G	6,198.2	30.1	4-20-59	6,168.1	J	½		D, S	
23db1	R. S. Beard	Dr	73	6	73	G					J			D, S	
25aa1	G. F. Knight	Dr	145	7	90	G					J	¾		D	
25ab1		Du	32M	24x24				17.9	10- 7-50					D	
25ab2	Merlyn Baler	Dr		6			6,285	15.4	7-25-58	6,270	J	1		U	
25cd1	Easton T. Hansen	Dr	100M	6	96	S, G	6,268.5	12.0	7-24-58	6,256.5	J	1		D, S	
26ac1		Du	26M	60x60				24.7	10- 6-50		N			A	
26bd1	Dave Hansen	Du	42M	60x60				24.6	10- 6-50		N			A	
26db1	Mrs. Adeline Hansen.	Dr	104	6	104	S, G					P	1		D, S	
26dc1	W. A. Hansen	Dr	98	4¼	100	S					P	1(?)		D, S	

27ca1	W. J. O'Brian	Dr	35	6	29		6,153	32.7	7-25-58	6,120	J	½		D	
28ca1	Village of Tetonia	Dr	198	14		V	6,067.9	108.1	6- 7-58	5,959.8	S		100	P, S	Ca.
28cd1	Seth Hansen	Dr	31M	6		G	6,072.7	11.3	10- 7-50	6,061.4	N			U	
28dc1	Ralph Hill	Dr	150M	6		V	6,094.0	108.1	4-20-59	5,985.9	N			U	
28dd1	Cache-Clawson Cemetery.	Dr	175	6	110	V?	6,125.6	28	7- -53		T	3	100	I	L.
29ac1	E. D., G. B., and S. A. Rappleye.	Dr	238	20		S, G, V?					T		1,400	I	Irrigates 197 acres.
29dc1		Du	21M	48×48		S, G	6,038	16.6	8- 6-58	6,021	N			A	Dry Apr. 20, 1959.
29dd1	Union Pacific RR.	Dr	322	12	231	G, V	6,037				T	30		PS	L.
30ab1	J. W. Archibald	Du	9M	48×48				3.2	10- 6-60		S			U	
30ac1	Mure	Dr	49M	6			5,989.6	0.1	7- 8-58	5,989.5	N			U	
30ad1	J. W. Archibald	Du	26M	72×72				10.6	10- 6-50		N			A	
30bb1		Dr	93M	6			5,981	19.6	4-20-59	5,961	N			U	Proposed cemetery irrigation well.
30ca1	Elmer A. Beard	Du	12M					4.0	10- 5-58						
30ca2	do	Dr	42	6	42	G					J	½		D, S	
31aa1	Gardner Hansen	Du	18M					12.8	10- 5-50		N			I	
31ab1	C. M. Allen	Du	18M	36×36		G	5,999.8	12.4	5- 8-47	5,987.4	N			U	Log reported to be all large gravel.
31ba2	Sarah Hansen	Du, Dr						6.6	10- 5-50					D	
31bd1	Haden Community.	Dr	81M	6		G	5,990.3	14.8	4-20-59	5,975.5	P			A	
31dc1	George H. Pearson.	Du, Dr	50	6	50		6,000.4	10.0	7- 8-58	5,990.4	J	½		D, S	Ca.
32ba1	A. H. Cook	Dr	92	6	92	G		20			P	¾		D, S	
33cb1	H. E. Egbert	Dr	62M	5¼	65	G	6,052.6	22.0	4-21-59	6,030.6	J	½		D, S	
33dd1	L. D. Hall	Dr	34	6	34	S, G					C	½		D, S	
34ac1	P. J. Hansen	Dr	47	7			6,129	5	7-28-58	6,124	J	½		D, S	
34bd1	W. H. Hopkins	Dr	28M	6		G	6,115.3	5.4	7-28-58	6,109.9	C	½		D	Ca.
34da1	C. M. Fullmer	Du, Dr	65M					12.3	10- 5-50					I	
34dd1	J. O. White	Du	44M	68×68			6,153.7	7.9	7-30-58	6,145.8	T			I	
35ac1	Bert Shaw	Du, Dr	106	6	106	G	6,190.8	21.5	5- 8-47	6,169.3	J	1		D, S	
35dc1	Kenneth R. Bradley.	Dr	99M	4½	98	G	6,194.0	64.0	4-21-59	6,130.0	J	½		D, S	
6N-46E-19ca1	Vernal Lofthouse	Dr	118M	6		V	6,369.9	73.0	7-24-58	6,296.9	N			A	
19cc1	E. A. Little	Dr	141	6	93	V	6,325.9	30.1	7-24-58	6,295.8	J	1		D, S	
19cc2	do	Dr	260			V		Flowing	7-24-58		N			A	Seismic shothole.
30bc1	David Lofthouse	Dr	103	6							J	1		D	Yield inadequate.
30cb1	Floyd W. Baler	Dr	87M	4½			6,327.7	39.3	4-20-59	6,288.4	J	¾		D, S	Reported to pump dry in spring.
32ba1	J. O. White	Du	59M	72×72			6,439.1	30.2	4-20-59	6,408.9	N			U	
32ca1	Mrs. Leta Fullmer.	Dr	73M	6	72			18.0	7-30-58		J	1		D, S	

TABLE 7.—*Records of wells in the Teton Valley, Idaho and Wyoming*—Continued

Well	Owner	Type of well	Depth (feet below land surface)	Casing: Diameter (inches)	Casing: Depth (feet)	Character of aquifer	Altitude of land surface (feet above mean sea level)	Water level: Depth to water (feet)	Water level: Date	Water level: Altitude of water surface (feet above mean sea level)	Pump: Type	Pump: Horsepower	Reported yield of well (gpm)	Use of water	Remarks
44N-118W-5ac1		Du	16M	39×39				5.9	7-30-58		P			U	
8ad1	Mrs. Irene Kaufman.	Du	14M	36×36	15	G		10.1	7-29-58		N			U	
9cc1	R. P. Rigby	Du	22M	24×24				10.8	7-29-58		J	½		U	
17ad1	Rex J. Rigby	Du	20	36×36				Flowing	7-29-58		N			U	
17ca1	Alfred Kaufman	Du	86	60×60	86	G									Now used for waste disposal.
17dd1	Ralph D. Linsman.	Dr	97	6	97						N			U	Reported to go dry in November and December.
19ad1	Alma J. Duersch	Du	147+	6	147	S	6,395.5	138.2	4-21-59	6,257.3	P			D, S	Ca. Reported to have gone dry in spring of 1958.

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(Continued on next card)

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1. Water-supply—Idaho—Teton Co. 2. Water-supply—Wyoming—Teton Co. 3. Water, Underground—Idaho—Teton Co. 4. Water, Underground—Wyoming—Teton Co. 5. Borings—Idaho—Teton Co. 6. Borings—Wyoming—Teton Co. I. U.S. Bureau of Reclamation. II. Title. (Series)