# GEOLOGY AND GROUND-WATER RESOURCES OF THE SAN CARLOS INDIAN RESERVATION, GILA, GRAHAM, AND PINAL COUNTIES, ARIZONA

U.S. GEOLOGICAL SURVEY

Water-Resources Investigations Report 89-4152

Prepared in cooperation with the

ARIZONA DEPARTMENT OF WATER RESOURCES

DEPARTMENT OF THE INTERIOR

MANUEL LUJAN, JR., Secretary

U.S. GEOLOGICAL SURVEY

Dallas L. Peck, Director

---

For additional information write to:

District Chief
U.S. Geological Survey
Water Resources Division
Federal Building, FB-44
300 West Congress Street
Tucson, Arizona 85701-1393

Copies of this report can be purchased from:

U.S. Geological Survey
Books and Open-File
Reports Section
Federal Center, Building 810
Box 25425
Denver, Colorado 80225

## CONTENTS



## ILLUSTRATIONS

[Plates are in pocket]

## FIGURES

Page



## TABLES

Page

## CONVERSION FACTORS

For readers who prefer to use International System (SI) units, rather than the inch-pound terms used in this report, the following conversion factors may be used:

| *Multiply inch-pound unit* | *By* | *To obtain SI unit* |
|---|---|---|
| inch (in.) | 25.40 | millimeter (mm) |
| foot (ft) | 0.3048 | meter (m) |
| mile (mi) | 1.609 | kilometer (km) |
| square mile ($mi^2$) | 2.590 | square kilometer ($km^2$) |
| acre-foot (acre-ft) | 0.001233 | cubic hectometer ($hm^3$) |
| cubic foot per second ($ft^3/s$) | 0.02832 | cubic meter per second ($m^3/s$) |
| gallon per minute (gal/min) | 0.06309 | liter per second (L/s) |
| foot squared per day ($ft^2/d$) | 0.0929 | meter squared per day ($m^2/d$) |
| degree Fahrenheit (°F) | (temp°F-32)/1.8) | degree Celsius (°C) |

*Sea level*: In this report "sea level" refers to the National Geodetic Vertical Datum of 1929 (NGVD of 1929)—A geodetic datum derived from a general adjustment of the first-order level nets of both the United States and Canada, formerly called "*Sea Level Datum of 1929*".

# GEOLOGY AND GROUND-WATER RESOURCES OF THE SAN CARLOS INDIAN RESERVATION, GILA, GRAHAM, AND PINAL COUNTIES, ARIZONA

By

James G. Brown

---

## ABSTRACT

The San Carlos Indian Reservation includes about 2,900 square miles in east-central Arizona. Relatively impermeable pre-Tertiary rocks are exposed in about 23 percent of the reservation and underlie water-bearing Tertiary and Quaternary basin fill and Quaternary stream alluvium in much of the southern part of the reservation. About 9,000 members of the San Carlos Apache Tribe live in the reservation and rely on ground water to meet public-supply, irrigation, and other needs.

Basin fill is widespread in the valleys of the San Carlos and Gila Rivers and consists of fine sand, silt, limestone, clay, and pyroclastic volcanic rocks that may attain a total maximum thickness of more than 3,200 feet in the reservation. Quaternary stream alluvium overlies the basin fill along many streams and washes. Stream alluvium consists of poorly sorted and unconsolidated sandy gravel and gravelly, muddy sand that reaches a maximum thickness of 100 feet along the San Carlos and Gila Rivers. The volume of recoverable water stored in the basin fill to a depth of 1,200 feet is estimated to be about 20 million acre-feet. The volume of recoverable water stored in the stream alluvium on the reservation is estimated to be more than 100,000 acre-feet. The stream alluvium along the San Carlos River supplies most of the water used for drinking. Water in much of the reservation is suitable for most uses except for that in the alluvium along the Gila River, which contains large concentrations of dissolved solids.

## INTRODUCTION

A general adjudication of water rights on the Gila River system is being conducted in the Superior Court of Arizona under authorization of Arizona Revised Statutes Title 45, Chapter 1, Article 6. The San Carlos Indian Reservation lies entirely within and is a hydrologically significant part of the system. Fair and responsible adjudication requires adequate knowledge of the surface-water and ground-water resources of the entire drainage basin. This study, done in cooperation with the Arizona Department of Water Resources, was undertaken to provide information needed to adjudicate water rights on the Gila River system.

### *Purpose and Scope*

This report describes the spatial distribution, volume, and quality of available ground water in the San Carlos Indian Reservation in

Arizona. The report focuses on three principal water-bearing units: (1) volcanic rocks of Tertiary and Quaternary age on the Natanes Plateau, (2) basin fill of Tertiary and Quaternary age, and (3) stream alluvium of Quaternary age.

The scope of work included a review and compilation of existing data and literature to provide background for the present study, water-level measurements to define the water table and volume of saturated aquifer material, well discharge measurements, and an aquifer test to determine aquifer properties. Ground-water samples were taken to determine the chemical characteristics of the ground water.

### *Location and Geographic Setting*

The San Carlos Indian Reservation includes about 2,900 $mi^2$ in parts of Gila, Graham, and Pinal Counties in east-central Arizona (fig. 1). About 9,000 people live on the reservation (Valley National Bank, 1987, p. 44) and rely on the ground-water and surface-water resources of the reservation for domestic, agricultural, and industrial uses. The reservation is bounded on the north by the Black and Salt Rivers, on the east by the Graham-Greenlee County line, and in the southeast extends to the crest of the Gila Mountains. The reservation extends from 10 to 15 mi south of the Gila River in the southwest; the western boundary is a few miles east of Globe, Arizona.

The San Carlos Reservoir is on the Gila River in the southwestern part of the study area. The reservoir has a maximum usable capacity of more than 900,000 acre-ft of water, which is used to irrigate crops in downstream areas.

The San Carlos Indian Reservation lies almost entirely within the Basin and Range physiographic province of the western United States (Fenneman, 1931) and ranges in altitude from about 2,200 ft above sea level along the Gila River downstream from the San Carlos Reservoir to more than 8,000 ft at Mount Turnbull. The valley floors of the San Carlos and Gila Rivers are less than 3,000 ft above sea level. The northern part of the reservation, which includes the Natanes Plateau, is generally greater than 5,000 ft above sea level. Although included in the Basin and Range province, the rocks that compose the Natanes Plateau and the area eastward to the boundary of the reservation are relatively flat-lying and more closely resemble landforms characteristic of the Colorado Plateau province.

The climate on the reservation is semiarid with hot summers and cool winters. Climatic variations in the study area are a function largely of land surface altitude. Average annual rainfall ranges from less than 15 in. in the relatively low-lying area southwest of San Carlos Reservoir to more than 20 in. in the mountains southwest of the confluence of the White and Black Rivers and at Mount Turnbull (Sellers and Hill, 1974, p. 7). Rainfall occurs mainly in the winter and summer. During the winter, frontal storms that move in from the Pacific Ocean cause widespread, light to moderate rainfall (and snowfall at higher altitudes). During the summer, convective storms cause localized but sometimes intense rainfall. In the town of San Carlos, at an altitude of 2,643 ft, the average daily maximum and minimum temperatures in July are 101 °F and

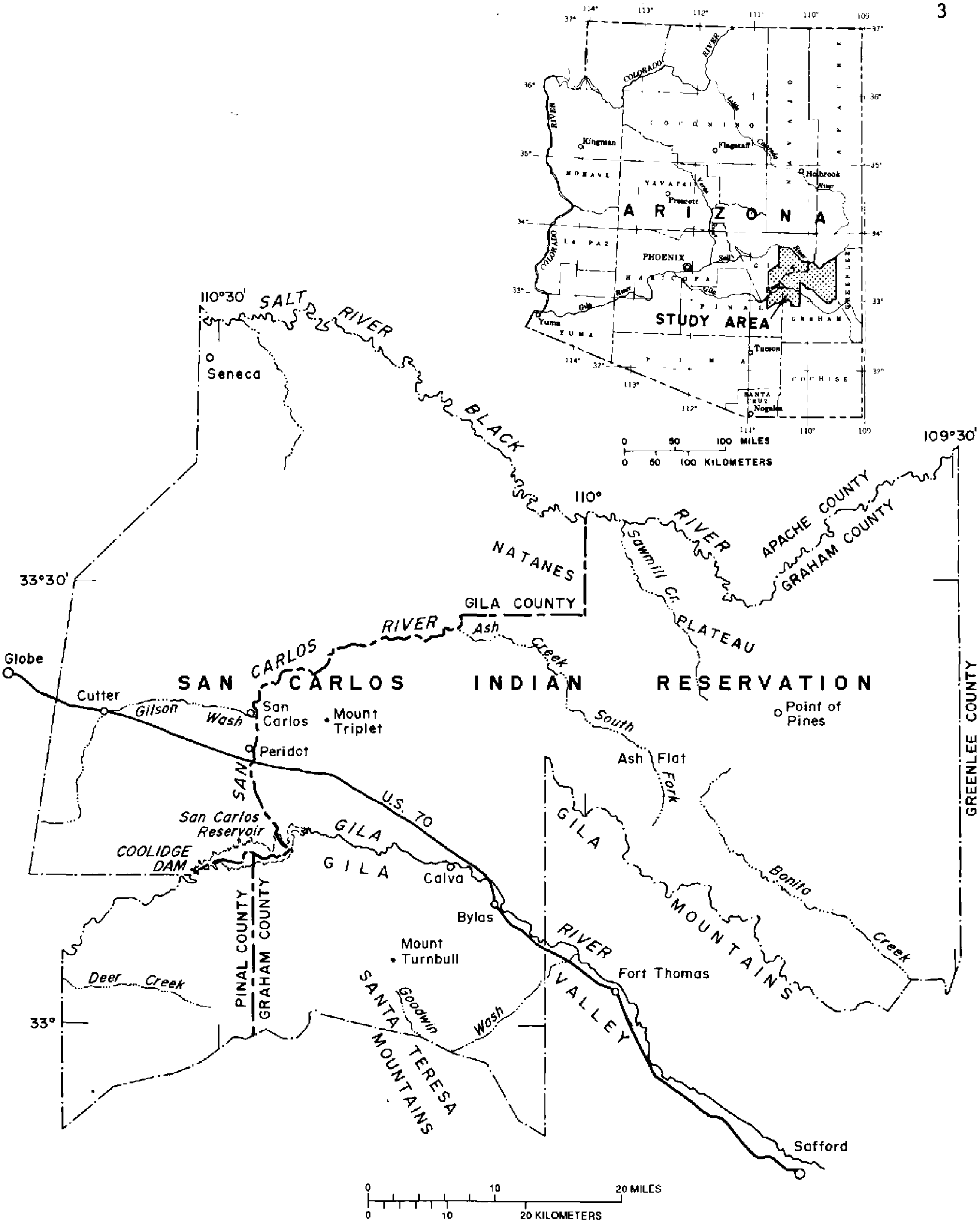



Figure 1.--Location of San Carlos Indian Reservation.

68 °F, respectively. In January the average maximum and minimum daily temperatures are 61 °F and 27 °F respectively (Sellers and others, 1985). Average temperatures in areas of higher altitudes are slightly cooler.

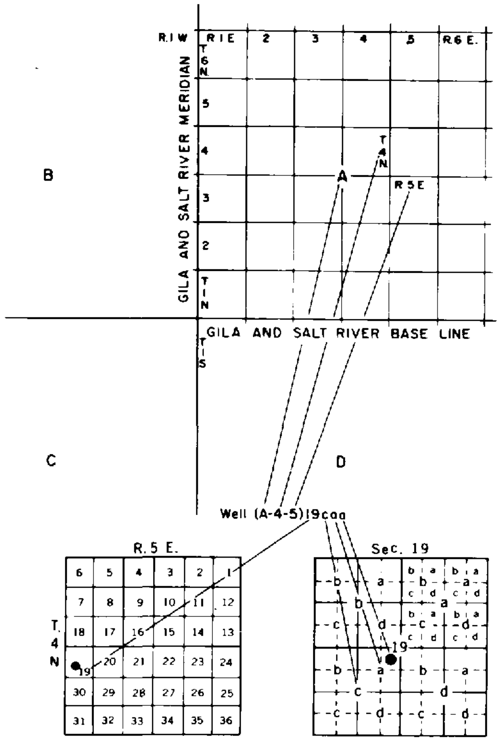
In the northern part of the reservation, surface-water drainage is northward into either the westward-flowing Black or Salt Rivers. In the southern part, streams drain to either the Gila River or the San Carlos River, which is the largest tributary to the Gila River on the reservation. The Black and Salt Rivers are perennial. The Gila River on the reservation is perennial during most years. The San Carlos River is dry at times in most years (Wilson and Garrett, 1989). Tributary streams to the Gila River between the head of San Carlos Reservoir and Bylas are dry most of the year (Burkham, 1975, p. 9) and flow only in response to large amounts of rainfall. The quantity and duration of flow in tributary streams in other areas of the reservation are unknown.

## *Previous Investigations*

The hydrology and geology of the San Carlos Indian Reservation have been described by several investigators beginning in the latter half of the nineteenth century. One of the earliest studies of the area was done by Gilbert (1875), who applied the name Gila Conglomerate to sediments of late Cenozoic age now included in the basin fill. Schwennesen (1921) studied the geology and water resources along the Gila and San Carlos Rivers on the reservation in order to determine the feasibility of using ground water for irrigation. Bromfield and Shride (1956) appraised the mineral resources of the reservation. The basin fill of Tertiary and Quaternary age was studied by Marlowe (1961) as a part of a study of late Cenozoic geology along the Gila River. Culler and others (1970) described the methods and objectives of an investigation of water use by phreatophytes in the Gila Valley on the reservation. Weist (1971) studied the geology and ground-water system of the Gila Valley as part of the phreatophyte study. Berry (1976) studied the mid-Tertiary volcanic rocks of the White Mountain volcanic province, which includes the Natanes Plateau.

## *Methods of Investigation*

Water levels, well-construction information, and drillers' logs were obtained from files of the U.S. Bureau of Indian Affairs. The San Carlos Apache Tribe Utility Authority provided well-construction information, drillers' logs, and water-quality analyses for tribal wells. The Indian Health Service provided water-chemistry analyses for public-supply wells. Well-construction information, drillers' logs, lithologic logs, and water-chemistry analyses were obtained from files of the U.S. Geological Survey and Arizona Department of Water Resources. Information was also collected from published and unpublished reports, and several well drillers provided well logs and other information. Field data were collected during the spring and summer of 1988. Most of the wells in the reservation were inventoried; water levels and discharges were measured at many of these wells. Wells are numbered in accordance with the Bureau of Land Management's system of land subdivision (fig. 2). Water samples were




The well numbers used by the Geological Survey in Arizona are in accordance with the Bureau of Land Management's system of land subdivision. The land survey in Arizona is based on the Gila and Salt River meridian and base line, which divide the State into four quadrants. These quadrants are designated counterclockwise by the capital letters A, B, C, and D. All land north and east of the point of origin is in A quadrant, that north and west in B quadrant, that south and west in C quadrant, and that south and east in D quadrant. The first digit of a well number indicates the township, the second the range, and the third the section in which the well is situated. The lowercase letters a, b, c, and d after the section number indicate the well location within the section. The first letter denotes a particular 160-acre tract, the second the 40-acre tract, and the third the 10-acre tract. These letters also are assigned in a counterclockwise direction, beginning in the northeast quarter. If the location is known within the 10-acre tract, three lowercase letters are shown in the well number. In the example shown, well number (A-4-5)19caa designates the well as being in the NE¼NE¼SW¼ sec. 19, T. 4 N., R. 5 E. Where more than one well is within a 10-acre tract, consecutive numbers beginning with 1 are added as suffixes.

Figure 2.--Well-numbering system in Arizona.

collected at 20 wells drilled into the basin fill and stream alluvium throughout the study area and were analyzed for major ion and selected trace-element concentrations. At these wells, specific conductance, pH, alkalinity, and temperature were measured in the field. Chemical analyses from four wells sampled by the U.S. Geological Survey and the Arizona Department of Water Resources between 1985 and 1988 were also used in this study. An aquifer test was conducted along the San Carlos River to estimate the transmissivity and specific capacity in the stream alluvium along the river. Drill cuttings were collected from a well to obtain lithologic and particle-size data for the stream alluvium and the uppermost part of the basin fill.

County geologic maps (Wilson and Moore, 1958; Wilson and others, 1959) were used in compiling much of the generalized geology map (pl. 1). Orthophotoquads at a scale of 1:24,000 were used to determine the contact between the stream alluvium and the basin fill along the San Carlos River and in part of the Gila Valley. A depth to bedrock map was used to define the subsurface configuration of the basin fill in the southern part of the reservation.

### *Acknowledgments*

During the course of this study many individuals and agencies gave freely of their time and information. The Tribal Council of the San Carlos Apache Tribe allowed personnel from the U.S. Geological Survey to do field work on the reservation and provided a field guide. Edward Collette, Water and Waste Water Department of the San Carlos Apache Tribe, provided well records, water-quality information, and access to department wells. Dale Mossefin, Indian Health Service, provided water-quality information. William Noline and other personnel of the U.S. Bureau of Indian Affairs in San Carlos provided well information and helped collect data at Bureau wells. Private well drillers also contributed to the study. William F. Stephens of Duncan provided well logs and information about conditions found during the drilling of several wells on the reservation. Norman Grim of Globe provided well logs and drill cuttings. Russell Shorten, San Carlos Game and Fish Department, was field guide. His knowledge of the reservation and assistance in many of the data-collection activities contributed to the successful completion of this study.

## GEOLOGY

Rocks in the reservation range in age from Precambrian to Quaternary (Wilson and Moore, 1958; Wilson and others, 1959). The northern part of the reservation, which is in the Colorado Plateau structural province as defined by Bromfield and Shride (1956, p. 615), is characterized by relatively flat-lying basaltic and basaltic andesitic volcanic rocks of Tertiary and Quaternary age. The southern part is in the Basin and Range structural province of Bromfield and Shride (1956, p. 615) and is characterized by northwestward-trending mountains composed of pre-Tertiary igneous, metamorphic and sedimentary rocks. These mountains are separated by alluvium-filled structural basins. Pre-Tertiary rocks are exposed in about 23 percent of the reservation. Sedimentary rocks, volcanic rocks, basin fill, and alluvium of Tertiary and Quaternary age cover the remaining area.

### *Pre-Tertiary Rocks*

Rocks of Precambrian to Cretaceous age are widespread in the western and southern parts of the reservation (pl. 1). Southwest of the Natanes Plateau, these rocks are exposed mainly in the mountains and are covered by alluvial material of Tertiary and Quaternary age in low-lying areas. They also crop out along the escarpment of the Natanes Plateau west of 110° 15' longitude, and on the Natanes Plateau along the west edge of the reservation. Rocks of Precambrian age include granite, basalt, quartzite, conglomerate, shale, and limestone. Younger rocks include Cambrian quartzite, pre-Devonian diabase, Devonian and Carboniferous limestone, and Cretaceous granite and volcanic rocks (Wilson and Moore, 1958; Wilson and others, 1959). None are known to yield water to wells in the study area.

Interbedded volcanic and sedimentary rocks of Cretaceous age are widespread in the southwestern part of the reservation (pl. 1). These deposits include more than 2,700 ft of agglomerate, mudflows, flow breccias, and tuff; and about 300 ft of conglomerate, sandstone, mudstone, and water-worked tuff. Conglomerate, sandstone, water-worked tuff, and agglomerate may have favorable water-bearing characteristics, depending on the degree of cementation and fracturing at depth (Davis and DeWiest, 1966, p. 338). Owing to the lack of data, little is known about the storage and movement of ground water in these rocks.

### *Cretaceous and Tertiary Granitic Rocks*

Cretaceous and Tertiary granitic rocks are exposed mainly on the flanks of Mount Turnbull and at Granite Basin about 10 mi southwest of Coolidge Dam. This unit yields small amounts of water to springs, mainly through fractures.

### *Tertiary and Quaternary Volcanic Rocks*

Volcanic rocks of Tertiary and Quarternary age consist mainly of basalt, basaltic andesite, and rhyolite and are widespread in the northern and eastern parts of the reservation. They dip gently to the north, and are generally lithologically uniform throughout the reservation and adjacent areas.

At Point of Pines, the total exposed thickness of volcanic material is between 2,500 and 3,600 ft (Heindl, 1958, p. 10). The base of the volcanics is not exposed, nor do any wells drilled into volcanics on the reservation penetrate underlying units. As a result, the maximum thickness of volcanics in this area is unknown.

The volcanic sequence at Point of Pines has been informally subdivided into three units (Berry, 1976, p. 289). The oldest of the three volcanic units consists mainly of basalt and basaltic andesite and is typically weathered. Individual flow breccias between 5 and 10 ft thick are common. The maximum exposed thickness of this unit is about 2,460 ft. The middle volcanic unit described by Berry (1976) is about 800 ft thick and consists mainly of rhyolitic ash flows and air-fall tuffs with individual flows generally between 10 and 20 ft thick. The middle volcanic unit also includes welded tuffaceous agglomerate (Heindl, 1958, p. 10). The upper volcanic unit is composed mainly of basaltic andesite, is about 300 ft thick, and contains individual flow breccias that are between 2 and 5 ft thick.

Heindl and McCullough (1961, p. 18) also used a three-fold subdivision to describe deposits in the lower Bonita Creek area located just south of the reservation boundary. Tertiary volcanic rocks in this area may be as much as 3,450 ft thick.

Tertiary volcanics along the east border of the reservation in T. 1 S., R. 28 E., have been down-faulted, and drillers' logs indicate that they are overlain by stream alluvium and basin fill that is from 315 to more than 670 ft thick. Five wells drilled in the basin encountered between 200 and 900 ft of predominantly volcanic flow and pyroclastic materials. Drillers' logs from two of these wells indicate that the volcanics are interbedded with fine-grained sedimentary deposits that range in thickness from 20 to 50 ft.

### *Tertiary and Quaternary Basin Fill*

Basin fill of Tertiary and Quaternary age is widespread in the Gila Valley and from San Carlos to the west boundary of the reservation. Basin fill overlies consolidated rocks ranging in age from Precambrian to Tertiary. Basin-fill deposits also underlie Ash Flat, the Point of Pines vicinity, and several smaller areas in the northern part of the reservation. Owing to a lack of data, the following discussion applies only to basin fill in the Gila Valley and from San Carlos to the west boundary of the reservation.

The basin fill consists mainly of fine sand, silt, limestone, and clay that occur in well-bedded but laterally discontinuous units (Marlowe, 1961). Thick beds may be traced laterally for more than a mile (Weist, 1971, p. 4). Particle size and sorting varies little along the axis of the Gila River Valley, but an increase in the percent by weight of soluble carbonate material in the basin fill from east to west was observed north of the Gila River. Volcanic tuff deposits are interbedded with these sediments and may be recognizable over a distance of about 10 mi (Marlowe, 1961).

Marlowe (1961) divided the basin fill into red and white facies on the basis of carbonate percentages and placed all sediments containing more than 15 percent carbonate material into the white facies. Weist (1971) divided basin fill in the Gila Valley into a sand and silt facies and a limestone facies that generally are equivalent to the red and white facies recognized by Marlowe (1961).

The red facies of Marlowe (1961) consists primarily of calcareously cemented light-tan to red-brown silt, sand, and clay that contains lenses of limestone and pyroclastic material. The white facies, which is finer grained and in places contains less clastic material than the red facies, is a light-tan to white silt, clay, and limestone that is commonly interbedded with volcanic rocks. The white facies is bounded on the west and south by the San Carlos and Gila Rivers, respectively, and extends eastward along the flanks of Mount Triplets and the Gila Mountains through R. 20 E. (pl. 1). In some places, limestone of the white facies lies in depositional contact with Tertiary volcanics of the Gila Mountains (Marlowe, 1961, p. 14).

Many studies of basin-fill aquifers in the southwest have shown that the lithologic characteristics of basin-fill deposits may vary greatly laterally and with depth. The studies by Marlowe (1961) and Weist (1971) describe only the upper few hundred feet of the basin fill and may not reflect the nature of these deposits at depth. Basin fill may be more than 3,200 ft thick in the study area (Oppenheimer and Sumner, 1980). Basin fill may be more than 6,400 ft thick in the Gila Valley east of the reservation boundary (Oppenheimer and Sumner, 1980), and in some areas may include more than 2,400 ft of lacustrine deposits (Marlowe, 1961, p. 119). Well (D-1-16)4cdc (fig. 2, pl. 2), located just west of the reservation boundary, penetrated about 1,850 ft of basin-fill material. A lithologic log of the well indicates that the basin fill consists of varying percentages of mud, and sand and gravel derived from quartzitic, granitic, and metamorphic rocks. The basin fill contains an average of 85 percent sand and gravel from 50 to 400 ft below the land surface and contains an average of 95 percent sand and gravel between depths of 400 and 1,600 ft. Between a depth of 1,600 ft and the contact with underlying volcanic and sedimentary rocks at a depth of 1,850 ft, the basin fill contains about 80 percent sand and gravel. The hydraulic properties of the underlying materials are unknown.

### *Quaternary Basalt*

Basalt flows of Quaternary age overlie basin fill east and southwest of San Carlos. The basalt flows lie above the regional water table and are not known to contain usable amounts of ground water.

### *Quaternary Stream Alluvium*

Stream alluvium of Quaternary age overlies the basin fill along the Gila and San Carlos Rivers. Weist (1971, p. 7) described the areal and vertical extent of the stream alluvium in the Gila Valley:

> "Along the Gila River, the channel is 4,000-8,000 ft wide, and drilling indicates that it is filled with alluvial deposits to a maximum depth of about 85 ft. Along the tributaries, a few alluvial channels range from 1,000 to 3,000 ft wide, but most of the channels are only a few hundred feet wide. The alluvium in the tributary channels probably is less than 40 ft thick."

Along the San Carlos River, seven drillers' logs and one lithologic log indicate that the alluvial deposits generally are between 60 and 80 ft thick. Between the San Carlos area and the San Carlos Reservoir, the deposits range from 1,200 to 4,900 ft wide.

The stream alluvium is unconsolidated and consists of poorly sorted sandy gravel and gravelly, muddy sand. Along the Gila River, the alluvium contains particles ranging in mean grain size from silt to pebbles, and contains an average of about 35 percent gravel (Weist, 1971, p. 9). In general, the percentage of gravel-sized material below the water table is greatest along the central part of the trough (Weist, 1971, p. 9). Drill cuttings of stream alluvium from a well about 2 mi north of San Carlos consist of poorly sorted, gravelly, muddy sand that contain an average of 22 percent gravel below the water table. The contact between the alluvium and the underlying basin fill at this location was placed at the first appearance of hard siltstone fragments that did not break down in the wet-sieving process.

Weist subdivided the stream alluvium of the Gila Valley into terrace alluvium and flood-plain alluvium. The flood-plain alluvium is less well compacted, generally coarser grained, and may be better sorted than the terrace alluvium. The two units are otherwise similar lithologically and form a single aquifer (Weist, 1971, p. 16). Data were not available to determine if the alluvium along the San Carlos River could be similarly subdivided.

## GROUND WATER RESOURCES

### *Ground-Water Development*

The San Carlos Apache Tribe uses ground water to meet all drinking-water needs and to supply a significant part of its irrigation water. Ground-water resources are developed most intensely along the San Carlos and Gila Rivers, where more than 900 gal/min may be pumped from individual wells completed in the stream alluvium and in the uppermost part of the basin fill. Along the Gila River, ground water is used mainly for irrigation or livestock because it contains large concentrations of dissolved solids and is unsuitable for human consumption.

In areas underlain by volcanic deposits, ground-water development has been limited to a few stock wells that probably yield less than 50 gal/min. As a result, ground water in volcanic rocks on the Natanes Plateau may be at or near steady-state conditions. Under such conditions, the rate of flow into and out of the aquifer is equal, and long-term water levels in the aquifer are steady. The effects of ground-water withdrawals adjacent to the reservation in T. 1 S., R. 28 E., on water levels in the reservation are unknown.

In areas underlain by basin fill, ground water is used mostly to water stock. Ground water is withdrawn from small-capacity wells equipped with pumps connected either to windmills, small (1 to 5 horsepower) gasoline engines, or electric motors. The city of Globe operates several public-supply wells less than 1 mi from the west boundary of the reservation in T. 1 S., R. 16 E. In well (D-1-16)9bdc, static water levels have declined about 170 ft between 1974 and 1987. The effect that pumping in this area has had on the water table in adjacent areas of the reservation is unknown. East of San Carlos Reservoir, about 25 widely scattered stock wells obtain water from basin fill. Water levels measured in the Gila Valley during the 1960's and also during the present study do not indicate a definite trend of either rising or falling water levels.

Several wells in the area have been measured annually as part of a regional monitoring network. Water levels in the stream alluvium apparently have not been affected by development along either the San Carlos or Gila Rivers. Water levels in well (D-1-18)13bba rose about 10 ft between 1970 and 1988, probably in response to increased recharge from the San Carlos River and tributaries during years of greater than normal flow (fig. 3). At well (D-4-22)13acd, about 5 mi southeast of Bylas, long-term water levels have changed little between 1960 and 1988, but have risen for short periods in response to large flows in the Gila River (fig. 4). At well (D-4-22)35ada, water levels have risen at a rate of about 1 ft/yr since 1960.

### *Quaternary Stream Alluvium*

Along the Gila and San Carlos Rivers, water levels in wells in the stream alluvium of Quaternary age were between 9 and 31 ft below the land surface in 1988. Ground water in the alluvium along the San Carlos and Gila Rivers flows southward and westward, respectively, toward the San Carlos Reservoir.

In 1988, depth to ground water along Goodwin Wash was between 14 and 50 ft below the land surface (pl. 2). In the alluvium east of Point of Pines, the depth to water in a dug well was 3 ft below the land surface. Measured depths to water in two public-supply wells near Point of Pines were 36 and 50 ft. Although no well data are available, it is likely that these wells are also perforated in alluvial deposits because observed water levels in nearby wells drilled in the volcanic rocks on the Natanes Plateau are greater than 300 ft below the land surface.

Dense growths of phreatophytes (plants that use ground water) consisting mainly of saltcedar and mesquite occur along the Gila River above the San Carlos Reservoir and use significant amounts of ground water. Flow in the alluvium past a cross section between Calva and Bylas was estimated to be about 610 acre-ft/yr, and flow past a cross section near the upstream edge of San Carlos Reservoir was only about 200 acre-ft/yr (Weist, 1971, p. 13). Much of this loss was attributed to water use by phreatophytes.

The saturated thickness of stream alluvium along the Gila River generally is between 30 and 40 ft and averages about 35 ft. The saturated thickness of the alluvium along the San Carlos River generally is between about 40 and 65 ft. The average transmissivity of stream alluvium along the Gila River was estimated by Hanson (1971, p. 24) to be about 9,800 $ft^2$/day from flood-wave propagation analysis. Hanson also estimated that the transmissivity was about 28,000 $ft^2$/day in T. 3 S., R. 13 E. from a drawdown aquifer test. The transmissivity of the alluvium along the San

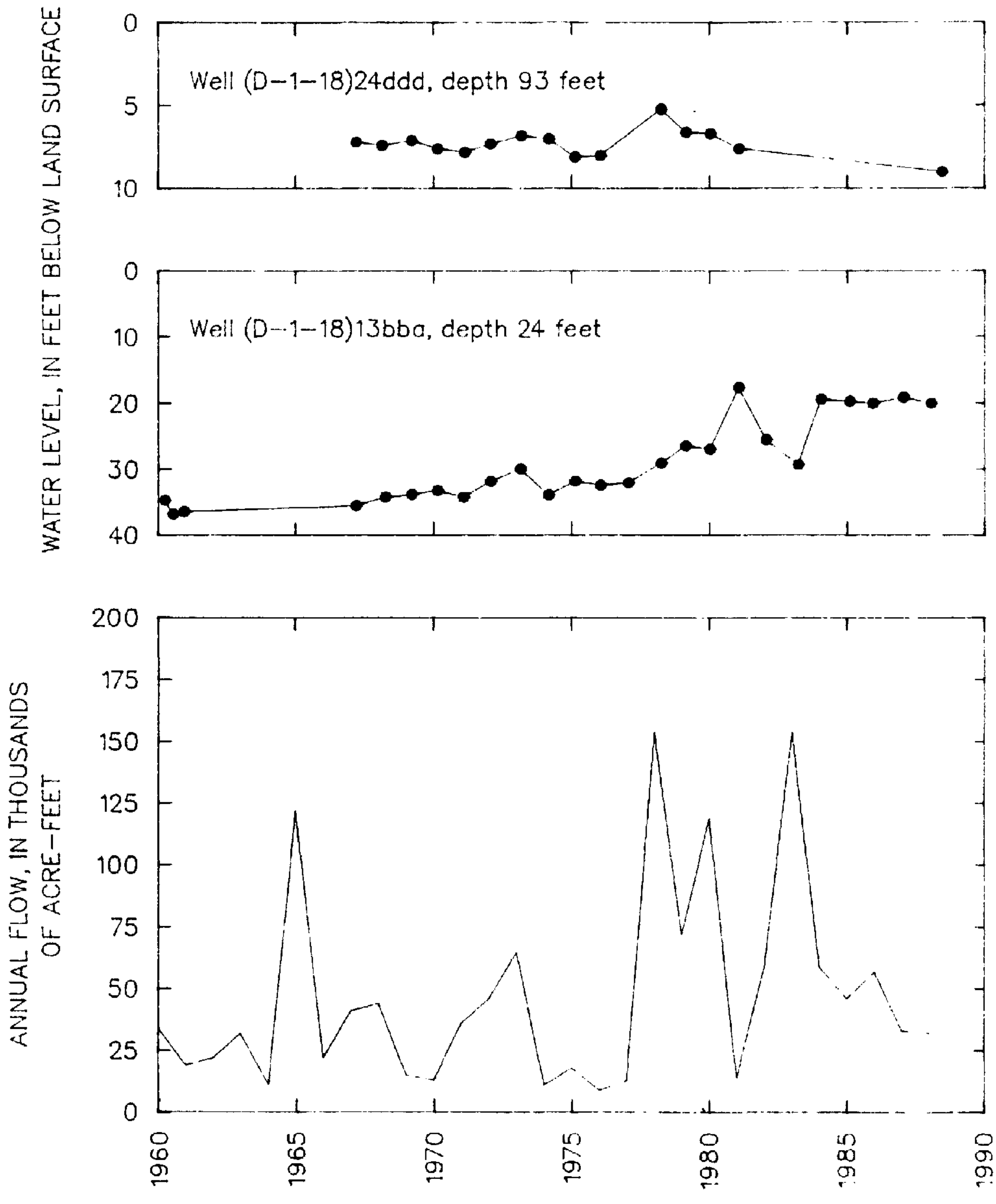



Figure 3.--Annual flow in the San Carlos River near Peridot and measured water levels in wells, 1960-88.

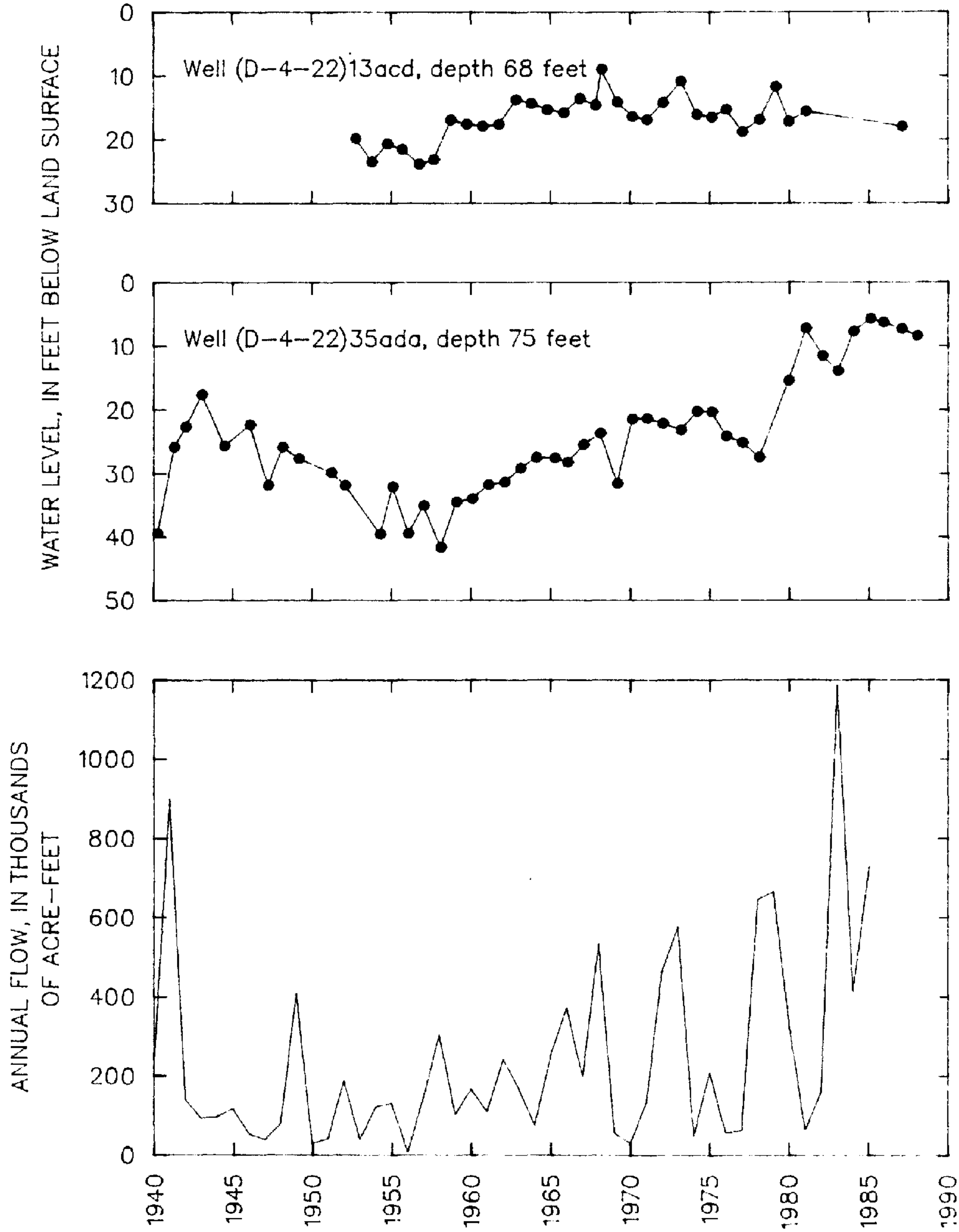



Figure 4.--Annual flow in the Gila River at Calva and measured water levels in wells, 1940-88.

Carlos River near Peridot is estimated to be about 19,000 $ft^2$/day from an 8-hour recovery test done as a part of this study. The specific yield of the alluvium was estimated to be about 0.15 from an aquifer test (Hanson, 1971, p. 6).

The volume of recoverable ground water in a given area is a function of the areal extent and saturated thickness of the aquifer and the specific yield of saturated material. The specific yield is the ratio of the volume of water that a saturated rock or soil will yield by gravity to the total volume of that rock or soil (Lohman and others, 1972, p. 12). Because most natural water-bearing materials will retain some water against the force of gravity, the volume of recoverable ground water is less than the total volume of water in storage.

The volume of recoverable ground water in the stream alluvium of the major drainages was estimated using all available drillers' and lithologic logs, water levels, orthophotoquads, and the estimated specific-yield value. In addition to the logs and water levels shown in table 3, more than 50 lithologic logs and 45 water levels from observation and test wells drilled along the Gila River during the 1960's were used to determine the areal and vertical extent of saturated stream alluvium. Using these data, the volume of recoverable ground water in stream alluvium along the San Carlos and Gila Rivers is estimated to be more than 100,000 acre-ft (table 1). About 55 percent of this ground water is in the Gila Valley; however, the water is of poor quality and is unsuitable for many uses.

Table 1.--*Areal distribution of volume of recoverable ground water in stream alluvium*

[Values, in acre-feet, are not intended to imply accuracy to the precision shown]

| Subarea | Volume of recoverable ground water |
|---|---|
| Gila Valley | 63,000 |
| Goodwin and Telegraph washes | 7,000 |
| San Carlos | 44,000 |
| Total | 114,000 |

*Tertiary and Quaternary Basin Fill*

Ground water in the basin fill of Tertiary and Quaternary age occurs under both unconfined and confined conditions. Basin fill is recharged by rainfall, snowmelt, and streamflow infiltration on the slopes of the Gila and Santa Teresa Mountains (Weist, 1971, p. 12). Some of this water percolates to the water table and then flows toward the Gila River.

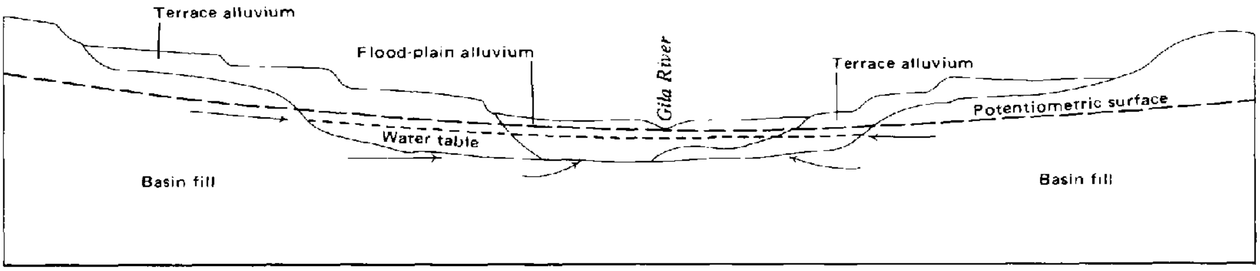
Before reaching the river, the ground water becomes confined, probably by fine-grained materials that may occur at depth near the axis of the valley. Observed depths to water in the basin fill in the Gila Valley were between 24 and 491 ft in 1988 and were shallowest near the Gila River. The water level in wells perforated in basin fill adjacent to the Gila River generally is higher than the water level in nearby wells perforated in stream alluvium, indicating that ground water may flow from the basin fill into the stream alluvium (fig. 5). A well drilled into basin fill a few miles east of the head of San Carlos Reservoir flowed at a rate of about 0.5 gal/min, and the water level in a nearby observation well perforated in stream alluvium was about 12 ft below the land surface (Weist, 1971, p. 12). Weist estimated that in an area of about 9 $mi^2$ between the head of the San Carlos Reservoir and Bylas about 5,400 acre-ft/yr of water from the basin fill recharges the stream alluvium.

Basin fill west of the San Carlos River is recharged mostly by rainfall and streamflow infiltration. Measured water levels in this area in 1988 were between 40 and 459 ft below the land surface. In 1987, static water levels were more than 550 ft below the land surface just west of the reservation (pl. 2).

Aquifer tests of the basin fill aquifer about 4 mi west of Cutter in the 1970's yielded transmissivity values ranging from 1,200 to 2,500 $ft^2$/day (Water Resource Associates, 1975). These tests used wells that were perforated in as much as 500 ft of saturated basin fill, and yielded values that may be indicators of the transmissivity of the upper part of the basin fill.

Water levels measured in more than 30 wells scattered throughout the area were used to define the water-table configuration in the basin fill. Because water levels in the basin fill in the Gila Valley do not appear to have changed significantly since the 1960's, water-level data collected from 12 wells during that time were included in the analysis. The bottom of the basin fill was estimated using a depth-to-bedrock map (Oppenheimer and Sumner, 1980). Basin fill is overlain by volcanic rocks of Quaternary age east of San Carlos (pl. 1). The areal extent, thickness, saturated thickness, and lithologic character of basin fill in this area is unknown. The volume of water stored in basin fill that is overlain by these volcanic rocks was not estimated.

The specific yield of basin fill in nearby basins has been estimated to be from 0.03 to 0.25 and is dependent mainly on lithology. In basins that have extensive areas that contain more than 50 percent silt and clay, transient flow models matched observed conditions best using specific-yield values between 0.03 and 0.15 (Freethey and Anderson, 1986). Data on basin-fill lithology at depth in the study area, including the thickness and extent of fine-grained deposits, are lacking. For that reason, an average specific-yield value of 0.10 is used in this estimate. The volume of recoverable ground water in the basin fill to a maximum depth of 1,200 ft below the land surface in the southwestern part of the reservation (excluding the area east of San Carlos in which basin fill is overlain by volcanic rocks of Quaternary age) is estimated to be about 20 million acre-ft (table 2). Owing to a lack of data, the volume of recoverable ground water in the basin fill at Ash Flat and Point of Pines was not estimated.




EXPLANATION

→ DIRECTION OF GROUND-WATER FLOW

Figure 5.--Generalized geology in the Gila River Valley and ground-water movement at right angle to the Gila River (Laney, 1971).

Table 2.--*Areal distribution of volume of recoverable ground water in basin fill*

[Values, in millions of acre-feet, are not intended to imply accuracy to the precision shown]

| Subarea[1] | Volume of recoverable ground water |
|---|---|
| Cutter | 2.1 |
| Gila Valley | 15.2 |
| San Carlos | 2.2 |
| Total | 19.5 |

[1]Subareas are shown on plate 1.

### *Tertiary and Quaternary Volcanic Rocks*

As stated earlier, volcanic rocks of Tertiary and Quaternary age on the reservation consist mainly of many individual deposits of flow breccia, air fall tuffs, basalt flows, basaltic andesite flows, ash flows, and welded tuffaceous andesite. Permeability of fractured or brecciated flow rocks in southern Arizona ranges from low to high and may vary greatly over short distances. The availability of water in flow rocks is also controlled by the degree of interconnection of fractures and other openings (Heindl, 1965, p. 9). The permeability and porosity of volcanic tuff is a function of grain size and sorting. Welded tuffs have low permeabilities (Davis and DeWiest, 1966, p. 337). Data are insufficient to estimate the storage and transmissive properties of the volcanic rocks.

Observed water levels in the volcanic rocks ranged between 345 and 745 ft below the land surface. Because available water-level measurements are widely scattered in both space and time, ground-water flow directions in the volcanic rocks could not be reliably determined. The upper volcanic unit, which is about 300 ft thick, is probably unsaturated, and the middle unit is partially saturated. Only the lower volcanic unit lies completely below the water table. Similarly, only the lower unit is saturated in the Bonita Creek area just south of the reservation boundary. The lower unit in this area ranges in thickness from 500 to 1,250 ft and yields limited quantities of water to small ephemeral streams (Heindl and McCullough, 1961, p. 15). No water-level rises were observed during the drilling of several wells in volcanic rocks on the Natanes Plateau (W.F. Stephens, well driller, oral commun., 1988), indicating that ground water in the volcanic rocks probably is unconfined.

In contrast, ground water in volcanic rocks adjacent to the reservation in T. 1 S., R. 28 E., is confined. Basin fill that overlies the volcanic rocks and faults that bound the basin at least partially impede ground-water flow out of the area. Water-level rises of more than 500 ft were observed in two wells drilled into volcanic rocks. In one well, ground water encountered at a depth of 585 ft in volcanic rocks reportedly rose to the surface and flowed at an unknown rate. The degree of hydraulic connection between ground water in this area and that on the reservation is unknown.

### *Pre-Tertiary Rocks*

Where fractures and (or) faults are present, granitic, metamorphic, and sedimentary rocks of pre-Tertiary age on the reservation may yield small amounts of water to springs. Wells in the reservation, however, are not known to obtain water from these rocks.

In the Globe area (fig. 1), nine wells are perforated in and obtain significant amounts of water from Paleozoic limestone units (Mineral Extraction Task Force, 1983, p. A29-A31) that are also present in the southwestern part of the reservation. Analysis from one of these wells indicates that the water was a calcium bicarbonate type and contained 532 mg/L dissolved solids (Mineral Extraction Task Force, 1981, p. 63). In the study area, one of these limestone units commonly contains fractures and solution channels (Willdon, 1964, p. 23). However, no wells on the reservation are known to obtain water from this unit.

### *Accuracy of Storage Estimates*

The uncertainty associated with the estimates of the volume of recoverable ground water in storage in the basin fill and stream alluvium are a function of the uncertainty of individual storage components, the extent of data interpolation and (or) extrapolation, and intrinsic measurement errors. The mean error of the depth-to-bedrock map used to define the bottom of the basin fill is 23 percent for depths less than 2,000 ft, but probably varies greatly over the mapped area (Oppenheimer and Sumner, 1981, p. 114). The error may be greater in areas where well and gravity data are scarce.

No wells penetrate the base of the basin fill in the Gila Valley on the reservation, and the accuracy of the depth-to-bedrock map in this area is unknown. However, the depth to bedrock in much of the area is greater than 23 percent deeper than 1,200 ft. Because this analysis considers only ground water stored within 1,200 ft of the land surface, the uncertainties in the depth-to-bedrock estimate in this area may not be critical to the accuracy of the storage estimate.

The minimum contour interval on the depth-to-bedrock map is 400 ft. According to the map, about 60 percent of the area underlain by basin fill is estimated to be less than 400 ft deep. This area contains about 25 percent of the total volume of saturated basin fill. In addition, water-level measurements in this area are widely scattered. As a result, the estimate of the saturated thickness in much of this region has a great degree of uncertainty. An average saturated thickness of 200 ft was used to estimate the volume of recoverable ground water in storage in this area. However, a change of 100 ft in this estimate would change the estimate of recoverable ground water in storage by about 3 million acre-ft.

Uncertainties in the true value of specific yield may also affect the accuracy of the storage estimate. For example, if a specific-yield value of 0.08 were used instead of 0.10, the estimate of recoverable ground water in storage would change by almost 5 million acre-ft. In addition, the different sources of error may combine to cause even larger errors. The computed volume of recoverable ground water in the basin fill is estimated to be within 50 percent of the actual value.

The areal and vertical extent of stream alluvium of the San Carlos and Gila Rivers were mapped on the basis of more than 50 lithologic logs and 45 water levels and is fairly well defined. The greatest uncertainty in the estimate is the thickness of stream alluvium in Gilson, Seven-Mile, and Goodwin Washes. On the basis of the present estimate, storage in these areas accounts for about 38 percent of the good-quality water in the stream alluvium. The computed volume of available ground water stored in the stream alluvium is estimated to be within 25 percent of the actual value.

### *Water Quality*

Ground water in basin fill and stream alluvium throughout much of the reservation is of good quality and is suitable for most uses. Water in the stream alluvium along the Gila River contains large concentrations of dissolved solids and is unsuitable for either drinking or irrigation (pl. 2). Water quality on the reservation is controlled by natural geochemical processes that have locally been affected by man's activities.

Ground water throughout much of the reservation contains less than 500 mg/L dissolved solids, except for that from basin fill and stream alluvium along the Gila River. Water from wells (D-3-22)18ccb and (D-3-22)30ddd contains more than 4,000 mg/L dissolved solids (pl. 2). Both of these wells are adjacent to the Gila River and are thought to be perforated mainly in stream alluvium. Observed large concentrations are caused by (1) inflow of highly mineralized water under artesian pressure from the underlying basin fill into the alluvium, (2) percolation of irrigation water with large dissolved-solid concentrations, and (3) evaporative concentration of salts caused by use of ground water by phreatophytes (Gatewood and others, 1950, p. 76-79).

Observed dissolved-solids concentrations in the basin fill in the Gila Valley in 1988 were between 242 and 384 mg/L (pl. 2), and were either sodium bicarbonate, calcium bicarbonate, or mixed-bicarbonate type water. All samples were obtained from the sand and silt facies and none were closer than about 2 mi from the Gila River. Ground-water quality in basin fill in other areas in the reservation may be variable, and is probably controlled largely by lithology. Laney (1977, p. 8-9) found that ground water in basin fill near the limestone facies contained more than 3,000 mg/L dissolved solids, and water from a well that penetrated deposits containing large percentages of silt and clay contained more than 2,570 mg/L dissolved solids. In addition, water in basin fill adjacent to the Gila River contained between 670 and 2,570 mg/L dissolved solids.

Ground water in stream alluvium and the uppermost part of basin fill beneath the San Carlos River and Seven-Mile Wash is suitable for most uses. Ground water beneath Seven-Mile Wash contains between 254 and 367 mg/L dissolved solids and is a mixed-bicarbonate or sodium bicarbonate type. Below the confluence of the San Carlos River and Seven-Mile Wash, dissolved-solids concentrations are less than 500 mg/L and the ground water is a mixed-bicarbonate type.

Water samples from two wells contained concentrations of dissolved arsenic that exceeded the maximum contaminant level of 50 μg/L for arsenic in drinking-water supplies (U.S. Environmental Protection Agency, 1986). One of the wells is drilled into basin fill south of the San Carlos Reservoir and contained 230 μg/L of dissolved arsenic. The other well, in San Carlos, contained 76 μg/L of dissolved arsenic and is thought to obtain water mainly from the stream alluvium, although wells commonly are drilled into the uppermost part of the basin fill and may obtain water from both units.

## CONSIDERATIONS FOR FURTHER STUDY

In order to improve storage estimates for the basin fill and the stream alluvium, additional data of various types would be useful. The estimate of storage in the basin fill would be improved by additional information from wells that penetrate underlying unit(s), especially in areas of shallow bedrock. Such wells would provide information on the thickness of the basin fill as well as the vertical and areal distribution of fine-grained deposits. Geophysical methods may be the most cost-effective way to obtain the needed information. Seismic data may help define the water-table and bedrock configuration. Resistivity data may help locate fine-grained deposits and shallow bedrock. Borehole-gravity data and gamma-gamma logs may help to determine vertical variations in density and, indirectly, the specific yield. Other borehole-geophysical methods, including neutron and electric logs, may provide useful information (Tucci and Pool, 1986, p. 52-54).

## SUMMARY

The San Carlos Indian Reservation includes about 2,900 $mi^2$ in east-central Arizona. Ground water is the principal source of water for the reservation's approximately 9,000 residents. Residents use ground water to meet domestic, public-supply, and agricultural needs.

Relatively impermeable rocks of pre-Tertiary age are exposed in about 23 percent of the reservation and underlie younger sediments throughout the rest of the reservation. Basin fill of Tertiary and Quaternary age and stream alluvium of Quaternary age are the main water-bearing units in the southern part of the reservation. On the Natanes Plateau, volcanic rocks are a potentially important source of water. Currently, most stock wells in this area obtain water from shallow stream alluvium that overlies the volcanics in tributary streambeds.

Tertiary and Quaternary volcanic rocks are widespread in the northern part of the reservation. The thickness of these deposits exceeds

3,500 ft. Data were not available with which to estimate the volume of ground water stored in volcanic rocks.

Basin-fill sediments are widespread in the valleys of the San Carlos and Gila Rivers and consist of fine sand, silt, limestone, clay, and pyroclastic volcanic rocks that may attain a maximum thickness of more than 3,200 ft in the reservation. The observed transmissivity of the upper part of the basin fill ranges from 1,200 to 2,500 $ft^2$/day. The specific yield of nearby basins has been estimated to be between 0.03 and 0.25. An average specific yield of 0.10 was used in this analysis to estimate the volume of recoverable ground water in basin fill. The volume of recoverable ground water in the basin fill to a depth of 1,200 ft is estimated to be about 20 million acre-ft.

Stream alluvium of Quaternary age overlies basin fill along the San Carlos and Gila Rivers and is also present in many of the tributary streams in the reservation. Stream alluvium consists of poorly sorted and unconsolidated sandy gravel and gravelly, muddy sand that may be as thick as 100 ft. The average transmissivity of the alluvium in the Gila Valley is about 9,800 $ft^2$/day but locally may be as high as 28,000 $ft^2$/day. The transmissivity in stream alluvium along the San Carlos River is estimated to be about 19,000 $ft^2$/day. An average specific yield of 0.15 was used to estimate the volume of recoverable ground water in stream alluvium. The volume of recoverable ground water in the stream alluvium of the San Carlos and Gila Rivers and major tributaries in the reservation is estimated to be more than 100,000 acre-ft.

The alluvium underlying the San Carlos River supplies most of the water used for drinking. Ground water in much of the reservation is suitable for most uses except for that in the stream alluvium along the Gila River, which contains large concentrations of dissolved solids and is unsuitable for drinking and possibly harmful to crops. Locally, water in the stream alluvium and basin fill may contain concentrations of dissolved arsenic that exceed Federal drinking water standards.

## SELECTED REFERENCES

Berry, R.C. 1976, Mid-Tertiary volcanic history and petrology of the White Mountains volcanic province, southeast Arizona: Princeton, New Jersey, Princeton University unpublished doctoral thesis, 317 p.

Bromfield, C.S., and Shride, A.F., 1956, Mineral resources of the San Carlos Indian Reservation: U.S. Geological Survey Bulletin 1027-N, 79 p.

Burkham, D.E., 1975, Flow from small watersheds adjacent to the study reach of the Gila River Phreatophyte Project, Arizona: U.S. Geological Survey Professional Paper 655-I, 19 p.

Culler, R.C., Burkham, D.E., Collings, M.R., Davidson, E.S., and Laney, R.L., 1970, Objectives, methods, and environment—Gila River Phreatophyte Project, Graham County, Arizona: U.S. Geological Survey Professional Paper 655-A, 25 p.

Davis, S.N., and DeWiest, R.J.M., 1966, Hydrogeology: New York, John Wiley, 463 p.

Fenneman, N.M., 1931, Physiography of the western United States: New York and London, McGraw-Hill, 534 p.

Freethey, G.W., and Anderson, T.W., 1986, Predevelopment hydrologic conditions in the alluvial basins of Arizona and adjacent parts of California and New Mexico: U.S. Geological Survey Hydrologic Investigations Atlas 664, 3 sheets.

Gatewood, J.S., Robinson, T.W., Colby, B.R., Hem, J.D., and Halpenny, L.C., 1950, Use of water by bottom-land vegetation in lower Safford Valley, Arizona: U.S. Geological Survey Water-Supply Paper 1103, 210 p.

Gilbert, G.K., 1875, Report on the geology of portions of New Mexico and Arizona: U.S. Geographical and Geological Surveys West 100th Meridian Report, v. 3, p. 525-544.

Hanson, R.L., 1971, Subsurface hydraulics in the area of the Gila River Phreatophyte Project, Graham County, Arizona, *with a section on* Aquifer tests by S.G. Brown: U.S. Geological Survey Professional Paper 655-F, 27 p.

Heindl, L.A., 1958, Geology of the Point of Pines area, San Carlos Indian Reservation, Graham County, Arizona: Arizona Geological Society Digest, v. 1, p. 10-11.

____________1967, Groundwater in fractured rock in Southern Arizona, *in* Hydrology of fractured rock—Dubrovnik Symposium, 1965 proceedings: International Association of Scientific Hydrology, Publication 74, v. 12, p. 503-513.

Heindl, L.A., and McCullough, R.A., 1961, Geology and availability of water, lower Bonita Creek area, Graham County, Arizona: U.S. Geological Survey Water-Supply Paper 1589, 56 p.

Laney, R.L., 1977, Effects of phreatophyte removal on water quality in the Gila River Project area, Graham County, Arizona, *with a section on* Statistical analysis by H.J. Hjalmarson: U.S. Geological Survey Professional Paper 655-M, 23 p.

Lohman, S.W., and others, 1972, Definitions of selected ground-water terms Revisions and conceptual refinements: U.S. Geological Survey Water-Supply Paper 1988, 21 p.

Marlowe, J.I., 1961, Late Cenozoic geology of the lower Safford Basin on the San Carlos Indian Reservation, Arizona: University of Arizona unpublished doctoral thesis, 184 p.

Mineral Extraction Task Force, 1981, Geohydrology of the Globe-Miami area: Central Arizona Association of Governments, METF-5, 103 p.

____________1983, Water quality report for the Globe-Miami area: Central Arizona Association of Governments, METF-6, vol. 1, 189 p.

Oppenheimer, J.M., and Sumner, J.S., 1980, Depth-to-bedrock map, Basin and Range province, Arizona: Laboratory of Geophysics, University of Arizona.

____________1981, Gravity modeling of the basins in the Basin and Range province, Arizona: Arizona Geological Society Digest, v. 13, p. 111-115.

Schwennesen, A.T., 1921, Geology and water resources of the Gila and San Carlos valleys in the San Carlos Indian Reservation: U.S. Geological Survey Water-Supply Paper 450-A, 86 p.

Sellers, W.D., and Hill, R.H., eds., 1974, Arizona climate, 1931-1972: Tucson, University of Arizona Press, 616 p.

Sellers, W.D., Hill, R.H., and Sanderson-Rea, M., eds., 1985, Arizona climate—The first hundred years: Tucson, University of Arizona Press, 143 p.

Tucci, Patrick, and Pool, D.R., 1986, Use of Geophysics studies in the alluvial basins of Arizona, *in* Anderson, T.W., and Johnson, A.I., eds., Regional Aquifer Systems of the United States, Southwest Alluvial Basins of Arizona: American Water Resources Association Monograph Series No. 7, p. 37-56.

U.S. Environmental Protection Agency, 1986, Quality criteria for water: EPA-440/5-86-001, 501 p.

Valley National Bank, 1987, Arizona statistical review, 73rd annual edition: Phoenix, Arizona, Valley National Bank report, 85 p.

Water Resource Associates, 1975, Geohydrology of the Globe-Cutter groundwater basin: Report prepared for the City of Globe, Arizona, 20 p.

Weist, W.G., Jr., 1971, Geology and ground-water system in the Gila River phreatophyte project area, Graham County, Arizona: U.S. Geological Survey Professional Paper 655-D, 22 p.

Willden, Ronald, 1964, Geology of the Christmas quadrangle, Gila and Pinal Counties, Arizona: U.S. Geological Survey Bulletin 1161-E, 64 p.

Wilson, E.D., Moore, R.T., and Pierce, H.W., 1959, Geologic map of Gila County, Arizona: University of Arizona, Arizona Bureau of Mines, 1 sheet.

Wilson, E.D., and Moore, R.T., 1958, Geologic map of Graham and Greenlee Counties, Arizona: University of Arizona, Arizona Bureau of Mines, 1 sheet.

Wilson, R.P., and Garrett, W.B., 1989, Water resources data for Arizona, water year 1987: U.S. Geological Survey Water-Data Report AZ-87-1, 385 p.

# HYDROLOGIC DATA

Table 3.--Records of selected wells

County: 007, Gila County; 009, Graham County; 021, Pinal County.
Primary use of water: S, Stock; U, Unused; I, Irrigation; P, Public supply; H, Domestic; C, Commercial.
Method of construction: D, Dug; P, Air percussion; C, cable tool.
Type of finish: P, perforated or slotted; F, gravel with perforations.
Miscellaneous: Dashes indicate no data.

| Local well number | Site identifier | County | Primary use of water | Date well con-structed | Method of con-struction | Diameter of interval, in inches | Type of finish | Depth of well, in feet | Depth to top of open interval, in feet below the land surface | Altitude of land surface, in feet above sea level |
|---|---|---|---|---|---|---|---|---|---|---|
| (A-01-16)15aba | 332610110393001 | 007 | S | -------- | D | --- | - | 19 | ----- | 3,840 |
| (A-01-16)27dbc | 332349110393201 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,360 |
| (A-01-17)01aca | 332741110311401 | 007 | U | -------- | - | --- | - | ------- | ----- | 3,180 |
| (A-01-17)03dcd | 332705110331701 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,140 |
| (A-01-17)05bad | 332745110353801 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,407 |
| (A-01-17)05bba1 | 332752110355101 | 007 | U | -------- | - | --- | - | ------- | ----- | 3,440 |
| (A-01-17)05bba2 | 332752110355102 | 007 | U | -------- | - | --- | - | ------- | ----- | 3,440 |
| (A-01-17)15cdd | 332525110332801 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,154 |
| (A-01-18)01aac | 332233110270601 | 007 | P | -------- | - | --- | - | ------- | ----- | 2,687 |
| (A-01-18)03bcc | 332736110273701 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,160 |
| (A-01-18)17acb | 332554110291301 | 007 | S | -------- | - | --- | - | ------- | ----- | 2,901 |
| (A-01-18)17ddd | 332525110285001 | 007 | S | -------- | - | --- | - | ------- | ----- | 2,868 |
| (A-01-18)28cad | 332355110281501 | 007 | S | -------- | - | --- | - | ------- | ----- | 2,840 |
| (A-01-18)28dad | 332349110275001 | 007 | I | -------- | - | --- | - | ------- | ----- | 2,760 |
| (A-01-18)29cdc | 332338110292601 | 007 | S | -------- | - | --- | - | ------- | ----- | 2,840 |
| (A-01-18)34cca | 332255110273001 | 007 | U | -------- | - | --- | - | ------- | ----- | 2,715 |
| (A-01-21)11dda | 332624110065901 | 009 | S | -------- | - | --- | - | ------- | ----- | 4,361 |
| (A-01-22)21acc | 332459110031601 | 009 | S | -------- | - | --- | P | 272 | 212 | 4,560 |
| (A-01-24)08abc | 332651109515001 | 009 | U | -------- | - | --- | P | 814 | 714 | 6,040 |
| (A-01-24)08acb | 332651109514901 | 009 | S | -------- | D | --- | - | ------- | ----- | 6,040 |
| (A-01-25)01bdc | 332733109414401 | 009 | S | -------- | - | --- | - | ------- | ----- | 6,180 |
| (A-01-25)29acc | 332402109454001 | 009 | S | -------- | - | --- | - | ------- | ----- | 5,920 |
| (A-01-25)36cad | 332302109413701 | 009 | S | -------- | - | --- | - | ------- | ----- | 5,849 |
| (A-02-17)01bac | 333257110313201 | 007 | S | -------- | - | --- | - | ------- | ----- | 4,052 |
| (A-02-17)06bad | 333257110363801 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,760 |
| (A-02-17)14dda | 333040110315401 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,661 |
| (A-02-17)20abd1 | 333019110352401 | 007 | U | -------- | - | --- | - | ------- | ----- | 3,460 |
| (A-02-17)20abd2 | 333019110352402 | 007 | U | -------- | - | --- | - | ------- | ----- | 3,460 |
| (A-02-17)20abd3 | 333023110352101 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,480 |
| (A-02-17)31bbc | 332840110370201 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,589 |
| (A-02-17)31ddd | 332759110361001 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,460 |
| (A-02-17)34bba | 332842110334801 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,266 |
| (A-02-18)27ccd | 332853110273001 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,337 |
| (A-02-18)32dcd | 332801110290401 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,020 |
| (A-02-21)08cda | 333136110104301 | 007 | S | -------- | - | --- | - | ------- | ----- | 4,880 |
| (A-02-23)01aad | 333301109532901 | 009 | U | -------- | - | --- | - | ------- | ----- | 5,720 |
| (A-02-25)26acb | 332924109423501 | 009 | S | -------- | - | --- | - | ------- | ----- | 5,960 |
| (A-02-26)17abc | 333111109392201 | 009 | U | -------- | - | --- | - | ------- | ----- | 6,240 |
| (A-02-26)31daa | 332817109400201 | 009 | S | -------- | - | --- | - | ------- | ----- | 6,440 |
| (A-02-27)03cdd | 333222109311301 | 009 | S | -------- | - | --- | P | 565 | 525 | 6,090 |
| (A-02-27)06dbb | 333240109341201 | 009 | S | -------- | P | --- | - | 773 | ----- | 6,320 |
| (A-03-17)24dba | 333516110310701 | 007 | S | -------- | - | --- | - | ------- | ----- | 4,093 |
| (A-03-19)07dda | 332847110235501 | 007 | U | -------- | - | --- | - | ------- | ----- | 5,650 |
| (A-03-21)17dbc | 333559110103001 | 007 | S | -------- | - | --- | - | ------- | ----- | 5,480 |
| (A-03-21)28dbc | 333424110094501 | 007 | S | -------- | - | --- | - | ------- | ----- | 5,260 |

Method water level measured: S, Steel tape; V, Calibrated electric tape; R, Reported.
Method discharge measured: M, totaling meter; C, current meter; O, orifice; E, estimated; V, volumetric measurement; W, Weir; P, Pitot-tube meter.
Type of lift: P, piston; T, turbine; S, submersible.
Type of power: G, gasoline; W, windmill; E, Electric.
Type of log available: D, drillers'; P, photovideo.

| Local well number | Water level, in feet | Method water level meas-ured | Date water level meas-ured | Dis-charge, in gallons per minute | Method dis-charge meas-ured | Date dis-charge meas-ured | Type of lift | Type of power | Date of lift | Type of log avail-able |
|---|---|---|---|---|---|---|---|---|---|---|
| (A-01-16)15aba | 0.23 | S | 07-05-88 | -------- | - | -------- | P | G | -------- | - |
| (A-01-16)27dbc | ------ | - | -------- | -------- | - | -------- | P | W | -------- | - |
| (A-01-17)01aca | 39.5 | V | 07-06-88 | -------- | - | -------- | P | - | 07-06-88 | - |
| (A-01-17)03dcd | ------ | - | -------- | -------- | - | -------- | P | G | -------- | - |
| (A-01-17)05bad | ------ | - | -------- | -------- | - | -------- | P | G | 07-05-88 | - |
| (A-01-17)05bba1 | ------ | - | -------- | -------- | - | -------- | - | - | -------- | - |
| (A-01-17)05bba2 | ------ | - | -------- | -------- | - | -------- | - | - | -------- | - |
| (A-01-17)15cdd | 459 | V | 07-05-88 | -------- | - | -------- | P | G | 07-05-88 | - |
| (A-01-18)01aac | ------ | - | -------- | -------- | - | -------- | T | E | 06-24-88 | - |
| (A-01-18)03bcc | ------ | - | -------- | -------- | - | -------- | P | G | 07-06-88 | - |
| (A-01-18)17acb | 68.4 | S | 06-24-88 | -------- | - | -------- | P | G | 06-24-88 | - |
| (A-01-18)17ddd | ------ | - | -------- | -------- | - | -------- | P | W | 06-24-88 | - |
| (A-01-18)28cad | ------ | - | -------- | -------- | - | -------- | S | E | 08-18-88 | - |
| (A-01-18)28dad | 26.4 | S | 06-24-88 | -------- | - | -------- | S | E | -------- | - |
| (A-01-18)29cdc | ------ | - | -------- | -------- | - | -------- | P | W | 07-05-88 | - |
| (A-01-18)34cca | ------ | - | -------- | -------- | - | -------- | - | - | -------- | - |
| (A-01-21)11dda | 98.7 | V | 06-22-88 | -------- | - | -------- | P | W | 06-22-88 | - |
| (A-01-22)21acc | 200 | - | - -71 | -------- | - | -------- | P | G | 10-25-88 | - |
| (A-01-24)08abc | 760 | - | 01- -72 | -------- | - | -------- | S | - | 08-25-88 | D |
| (A-01-24)08acb | 8.85 | S | 07-06-88 | -------- | - | -------- | P | G | 07-06-88 | - |
| (A-01-25)01bdc | ------ | - | -------- | -------- | - | -------- | S | E | 06-23-88 | - |
| (A-01-25)29acc | ------ | - | -------- | -------- | - | -------- | P | G | 10-25-88 | - |
| (A-01-25)36cad | ------ | - | -------- | -------- | - | -------- | P | W | 06-23-88 | - |
| (A-02-17)01bac | ------ | - | -------- | -------- | - | -------- | P | W | -------- | - |
| (A-02-17)06bad | 18.7 | S | 07-05-88 | -------- | - | -------- | P | W | 08-09-88 | - |
| (A-02-17)14dda | ------ | - | -------- | -------- | - | -------- | - | - | -------- | - |
| (A-02-17)20abd1 | ------ | - | -------- | -------- | - | -------- | - | - | -------- | - |
| (A-02-17)20abd2 | ------ | - | -------- | -------- | - | -------- | - | - | -------- | - |
| (A-02-17)20abd3 | ------ | - | -------- | -------- | - | -------- | P | G | 07-05-88 | - |
| (A-02-17)31bbc | ------ | - | -------- | -------- | - | -------- | P | W | 07-05-88 | - |
| (A-02-17)31ddd | 79.2 | V | 07-05-88 | -------- | - | -------- | P | G | -------- | - |
| (A-02-17)34bba | ------ | - | -------- | -------- | - | -------- | P | G | 07-05-88 | - |
| (A-02-18)27ccd | 205 | V | 07-06-88 | -------- | - | -------- | P | G | 07-06-88 | - |
| (A-02-18)32dcd | ------ | - | -------- | -------- | - | -------- | P | W | 07-06-88 | - |
| (A-02-21)08cda | ------ | - | -------- | -------- | - | -------- | P | G | 07-06-88 | - |
| (A-02-23)01aad | 346 | V | 07-06-88 | -------- | - | -------- | - | - | -------- | - |
| (A-02-25)26acb | ------ | - | -------- | -------- | - | -------- | S | E | 06-23-88 | - |
| (A-02-26)17abc | ------ | - | -------- | -------- | - | -------- | P | W | 06-23-88 | - |
| (A-02-26)31daa | ------ | - | -------- | -------- | - | -------- | S | E | 06-23-88 | - |
| (A-02-27)03cdd | 525 | R | - -71 | -------- | - | -------- | P | G | 08-07-88 | D |
| (A-02-27)06dbb | 745 | - | 12- -70 | -------- | - | -------- | P | G | 07-01-88 | - |
| (A-03-17)24dba | ------ | - | -------- | -------- | - | -------- | P | W | -------- | - |
| (A-03-19)07dda | ------ | - | -------- | -------- | - | -------- | P | - | 09-15-88 | - |
| (A-03-21)17dbc | ------ | - | -------- | -------- | - | -------- | P | - | 07-06-88 | - |
| (A-03-21)28dbc | ------ | - | -------- | -------- | - | -------- | P | - | 07-06-88 | - |

Table 3.--Records of selected wells--Continued

| Local well number | Site identifier | County | Primary use of water | Date well con-structed | Method of con-struction | Diameter of interval, in inches | Type of finish | Depth of well, in feet | Depth to top of open interval, in feet below the land surface | Altitude of land surface, in feet above sea level |
|---|---|---|---|---|---|---|---|---|---|---|
| (A-03-26)26dca | 333412109361201 | 009 | S | -------- | - | --- | - | ------- | ----- | 6,746 |
| (A-04-18)06cdc | 334251110303301 | 007 | S | -------- | - | --- | - | ------- | ----- | 5,500 |
| (A-04H-17)24ddd | 334523110304801 | 007 | P | -------- | - | --- | - | ------- | ----- | 4,780 |
| (D-01-16)02bbd | 332231110411101 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,300 |
| (D-01-16)05aad | 332233110411601 | 007 | I | - -74 | - | --- | - | 1,210 | ----- | 3,320 |
| (D-01-16)12dbc1 | 332119110395001 | 007 | H | -------- | - | --- | - | ------- | ----- | 3,200 |
| (D-01-16)12dbc2 | 332130110395001 | 007 | U | -------- | - | --- | - | ------- | ----- | 3,200 |
| (D-01-16)12dcc | 332114110394301 | 007 | C | -------- | - | --- | - | ------- | ----- | 3,200 |
| (D-01-16)13dab | 332040110393201 | 007 | H | -------- | - | --- | - | ------- | ----- | 3,190 |
| (D-01-16)22bcc | 331958110422001 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,496 |
| (D-01-16)25bcc | 331907110401901 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,292 |
| (D-01-17)08cab | 332136110375501 | 007 | H | -------- | - | --- | - | ------- | ----- | 3,110 |
| (D-01-17)08cbc | 332129110381701 | 007 | H | -------- | - | --- | - | ------- | ----- | 3,160 |
| (D-01-17)09bcb | 332149110370901 | 007 | U | -------- | - | --- | - | ------- | ----- | 3,060 |
| (D-01-17)09daa | 332136110361501 | 007 | U | 01-01-51 | - | --- | - | 125 | ----- | 2,995 |
| (D-01-17)10aba | 332200110353301 | 007 | U | -------- | - | --- | - | ------- | ----- | 3,000 |
| (D-01-17)10abb | 332159110353901 | 007 | P | -------- | - | --- | - | ------- | ----- | 2,997 |
| (D-01-17)17bbc | 332101110381201 | 007 | I | -------- | - | --- | P | 266 | 145 | 3,130 |
| (D-01-17)18aad | 332103110381901 | 007 | H | -------- | - | --- | - | ------- | ----- | 3,120 |
| (D-01-17)18bcd | 332031110391801 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,190 |
| (D-01-17)21ddd | 331932110361902 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,633 |
| (D-01-18)01daa | 332227110265801 | 007 | P | -------- | - | --- | - | ------- | 47 | 2,680 |
| (D-01-18)08bcc | 332140110320401 | 007 | S | -------- | - | --- | - | ------- | ----- | 2,850 |
| (D-01-18)08dbb | 332135110312801 | 007 | I | -------- | - | --- | - | ------- | ----- | 2,820 |
| (D-01-18)11ddd | 332114110275901 | 007 | U | -------- | - | --- | - | ------- | ----- | 2,680 |
| (D-01-18)12dca | 332119110271401 | 007 | P | -------- | - | --- | - | ------- | ----- | 2,660 |
| (D-01-18)12dcd1 | 332118110271601 | 007 | U | -------- | - | --- | - | ------- | ----- | 2,660 |
| (D-01-18)12dcd2 | 332117110271501 | 007 | P | -------- | - | --- | - | ------- | ----- | 2,660 |
| (D-01-18)12dda | 332126110265901 | 007 | U | -------- | - | --- | - | ------- | ----- | 2,645 |
| (D-01-18)13aaa | 332112110265601 | 007 | U | -------- | - | --- | - | ------- | ----- | 2,640 |
| (D-01-18)13adb | 332054110271101 | 007 | P | -------- | - | --- | | 77 | 33 | 2,640 |
| (D-01-18)13adc1 | 332048110271001 | 007 | U | -------- | - | --- | - | ------- | ----- | 2,640 |
| (D-01-18)13adc2 | 332048110271002 | 007 | P | -------- | - | --- | - | ------- | ----- | 2,640 |
| (D-01-18)13bba | 332108110274501 | 007 | U | -------- | - | --- | - | ------- | ----- | 2,665 |
| (D-01-18)13bca | 332058110274301 | 007 | U | -------- | - | --- | - | ------- | ----- | 2,670 |
| (D-01-18)13dba1 | 332045110271501 | 007 | U | -------- | - | --- | - | ------- | ----- | 2,640 |
| (D-01-18)13dba2 | 332045110271401 | 007 | U | -------- | - | --- | - | ------- | ----- | 2,640 |
| (D-01-18)14aad | 332102110280201 | 007 | I | -------- | - | --- | - | ------- | ----- | 2,660 |
| (D-01-18)14bab | 332109110284301 | 007 | U | -------- | - | --- | - | ------- | ----- | 2,740 |
| (D-01-18)15bdc | 332049110294101 | 007 | S | -------- | - | --- | - | ------- | ----- | 2,788 |
| (D-01-18)24aaa1 | 332016110270001 | 007 | I | -------- | - | --- | - | ------- | ----- | 2,620 |
| (D-01-18)24aaa2 | 332018110270101 | 007 | U | -------- | - | --- | - | ------- | ----- | 2,620 |
| (D-01-18)24aab | 332024110264801 | 007 | I | - -34 | - | --- | - | 110 | ----- | 2,620 |
| (D-01-18)24dbd | 331946110271301 | 007 | U | -------- | - | --- | - | ------- | ----- | 2,620 |
| (D-01-18)24ddd | 331934110265801 | 007 | U | -------- | - | --- | - | ------- | ----- | 2,600 |
| (D-01-18)25dab1 | 331857110270901 | 007 | U | -------- | - | --- | - | 109 | 57 | 2,600 |
| (D-01-18)25dab2 | 331857110270501 | 007 | I | - -34 | - | --- | - | 200 | ----- | 2,590 |
| (D-01-18)25dbd1 | 331852110271401 | 007 | H | -------- | - | --- | - | ------- | ----- | 2,600 |
| (D-01-18)25dbd2 | 331852110271402 | 007 | H | -------- | - | --- | - | ------- | ----- | 2,600 |
| (D-01-18)30cbc | 331850110330201 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,470 |

| Local well number | Water level, in feet | Method water level meas-ured | Date water level meas-ured | Dis-charge, in gallons per minute | Method dis-charge meas-ured | Date dis-charge meas-ured | Type of lift | Type of power | Date of lift | Type of log avail-able |
|---|---|---|---|---|---|---|---|---|---|---|
| (A-03-26)26dca | ------ | - | -------- | -------- | - | -------- | P | - | 07-01-88 | - |
| (A-04-18)06cdc | ------ | - | -------- | -------- | - | -------- | P | W | 09-15-88 | - |
| (A-04H-17)24ddd | ------ | - | -------- | -------- | - | -------- | S | E | 09-15-88 | - |
| (D-01-16)02bbd | ------ | - | -------- | -------- | - | -------- | P | W | 07-05-88 | - |
| (D-01-16)05aad | ------ | - | -------- | -------- | - | -------- | - | - | -------- | D |
| (D-01-16)12dbc1 | ------ | - | -------- | -------- | - | -------- | S | E | 07-07-88 | - |
| (D-01-16)12dbc2 | 209 | V | 06-15-88 | -------- | - | -------- | S | - | 06-15-88 | - |
| (D-01-16)12dcc | ------ | - | -------- | -------- | - | -------- | S | E | 06-15-88 | - |
| (D-01-16)13dab | ------ | - | -------- | -------- | - | -------- | S | E | 06-24-88 | - |
| (D-01-16)22bcc | ------ | - | -------- | -------- | - | -------- | P | G | 06-16-88 | - |
| (D-01-16)25bcc | ------ | - | -------- | -------- | - | -------- | P | W | 06-24-88 | - |
| (D-01-17)08cab | ------ | - | -------- | -------- | - | -------- | S | E | 06-15-88 | - |
| (D-01-17)08cbc | ------ | - | -------- | -------- | - | -------- | S | E | 06-16-88 | - |
| (D-01-17)09bcb | ------ | - | -------- | -------- | - | -------- | S | - | 06-16-88 | - |
| (D-01-17)09daa | 19.0 | - | 11-01-51 | -------- | - | -------- | - | - | -- | - |
| (D-01-17)10aba | ------ | - | -------- | -------- | - | -------- | S | E | 06-16-88 | - |
| (D-01-17)10abb | 67.2 | S | 06-16-88 | -------- | - | -------- | S | E | 06-16-88 | - |
| (D-01-17)17bbc | 109 | S | 06-15-88 | -------- | - | -------- | T | G | 06-15-88 | D |
| (D-01-17)18aad | ------ | - | -------- | -------- | - | -------- | S | E | 06-15-88 | - |
| (D-01-17)18bcd | 177 | S | 06-24-88 | -------- | - | -------- | P | G | 06-24-88 | - |
| (D-01-17)21ddd | ------ | - | -------- | -------- | - | -------- | P | W | 06-15-88 | - |
| (D-01-18)01daa | ------ | - | -------- | 200 | M | 09-13-88 | S | E | 06-15-88 | P |
| (D-01-18)08bcc | ------ | - | -------- | -------- | - | -------- | S | E | 06-16-88 | - |
| (D-01-18)08dbb | ------ | - | -------- | -------- | - | -------- | S | E | 06-16-88 | - |
| (D-01-18)11ddd | 14.7 | V | 06-16-88 | -------- | - | -------- | - | - | -------- | - |
| (D-01-18)12dca | ------ | - | -------- | -------- | - | -------- | T | E | 06-14-88 | - |
| (D-01-18)12dcd1 | 31.5 | S | 06-14-88 | -------- | - | -------- | - | - | -------- | - |
| (D-01-18)12dcd2 | 30.6 | S | 06-14-88 | -------- | - | -------- | T | E | 06-14-88 | - |
| (D-01-18)12dda | 4.00 | S | 03-01-67 | -------- | - | -------- | - | - | -------- | - |
| (D-01-18)13aaa | ------ | - | -------- | -------- | - | -------- | T | - | 06-14-88 | - |
| (D-01-18)13adb | ------ | - | -------- | 448 | M | 09-21-88 | S | E | 08-16-88 | - |
| (D-01-18)13adc1 | 18.1 | S | 08-16-88 | -------- | - | -------- | - | - | -------- | - |
| (D-01-18)13adc2 | 18.7 | S | 08-16-88 | -------- | - | -------- | S | E | 08-16-88 | - |
| (D-01-18)13bba | 36.0 | S | 09-01-59 | -------- | - | -------- | J | E | -------- | - |
| (D-01-18)13bca | 19 | S | 09-22-88 | -------- | - | -------- | T | - | 09-22-88 | - |
| (D-01-18)13dba1 | ------ | - | -------- | -------- | - | -------- | - | - | -------- | - |
| (D-01-18)13dba2 | 22.0 | S | 09-01-59 | -------- | - | -------- | - | - | -------- | - |
| (D-01-18)14aad | 41.0 | S | 09-01-59 | -------- | - | -------- | T | E | -------- | - |
| (D-01-18)14bab | 72.6 | S | 09-14-88 | -------- | - | -------- | - | - | -------- | - |
| (D-01-18)15bdc | ------- | - | -------- | -------- | - | -------- | P | W | 06-14-88 | - |
| (D-01-18)24aaa1 | 14.6 | S | 06-14-88 | -------- | - | -------- | T | E | 06-14-88 | - |
| (D-01-18)24aaa2 | ------- | - | -------- | -------- | - | -------- | T | - | 06-14-88 | - |
| (D-01-18)24aab | 10.0 | S | 03-01-67 | -------- | - | -------- | T | N | -------- | D |
| (D-01-18)24dbd | ------- | - | -------- | -------- | - | -------- | - | - | -------- | - |
| (D-01-18)24ddd | 7.00 | S | 03-01-67 | -------- | - | -------- | T | - | -------- | D |
| (D-01-18)25dab1 | 25.4 | S | 06-14-88 | -------- | - | -------- | - | - | -------- | - |
| (D-01-18)25dab2 | ------- | - | -------- | 627 | C | 09-20-88 | T | E | 06-14-88 | D |
| (D-01-18)25dbd1 | ------- | - | -------- | -------- | - | -------- | S | E | 09-22-88 | - |
| (D-01-18)25dbd2 | ------- | - | -------- | -------- | - | -------- | C | E | 09-22-88 | - |
| (D-01-18)30cbc | ------- | - | -------- | -------- | - | -------- | P | G | 06-15-88 | - |

Table 3.--Records of selected wells--Continued

| Local well number | Site identifier | County | Primary use of water | Date well constructed | Method of construction | Diameter of interval, in inches | Type of finish | Depth of well, in feet | Depth to top of open interval, in feet below the land surface | Altitude of land surface, in feet above sea level |
|---|---|---|---|---|---|---|---|---|---|---|
| (D-01-18)35dab | 331806110281201 | 007 | H | -------- | - | --- | P | 225 | 115 | 2,740 |
| (D-01-18)35dac | 331801110281001 | 007 | P | -------- | - | --- | - | ------- | ----- | 2,735 |
| (D-01-18)36aac | 331828110270701 | 007 | P | -------- | - | --- | - | ------- | ----- | 2,590 |
| (D-01-18)36adb | 331818110271001 | 007 | I | -------- | - | --- | - | ------- | ----- | 2,575 |
| (D-01-18)36ddd | 331744110265801 | 009 | P | -------- | - | --- | - | 50 | ----- | 2,560 |
| (D-01-19)06ccb | 332216110264801 | 007 | U | -------- | - | --- | - | ------- | ----- | 2,680 |
| (D-01-19)06ccc | 332210110265401 | 007 | U | -------- | - | --- | - | 105 | 89 | 2,680 |
| (D-01-19)06ccd | 332210110264001 | 007 | U | 10- -88 | C | --- | - | 125 | ----- | 2,670 |
| (D-01-19)22cba | 331947110233301 | 009 | S | -------- | - | --- | - | ------- | ----- | 3,132 |
| (D-01-19)30bac | 331920110263901 | 009 | P | -------- | - | --- | - | ------- | ----- | 2,600 |
| (D-01-19)30cdb | 331844110263801 | 009 | P | -------- | - | --- | - | ------- | ----- | 2,600 |
| (D-01-20)12bbc | 332154110152601 | 009 | S | -------- | - | --- | - | ------- | ----- | 4,037 |
| (D-01-22)27bbc | 331919110050701 | 009 | S | -------- | - | --- | - | ------- | ----- | 5,140 |
| (D-01-23)07abc | 332153110013101 | 009 | S | -------- | - | --- | - | ------- | ----- | 4,770 |
| (D-01-23)07abd | 332151110012301 | 009 | S | -------- | - | --- | - | ------- | ----- | 4,767 |
| (D-01-23)10bdc | 332142109583801 | 009 | S | -------- | - | --- | - | ------- | ----- | 4,950 |
| (D-01-23)31cdb | 331750110014501 | 009 | U | -------- | - | --- | - | ------- | ----- | 5,050 |
| (D-01-24)27acc | 331903109521501 | 009 | S | -------- | - | --- | - | ------- | ----- | 5,228 |
| (D-01-25)11abb | 332202109450301 | 009 | P | -------- | - | --- | - | ------- | ----- | 5,920 |
| (D-01-25)11bad | 332153109450801 | 009 | P | -------- | - | --- | - | ------- | ----- | 5,920 |
| (D-01-25)13bbb1 | 332110109443301 | 009 | P | -------- | - | --- | - | ------- | ----- | 5,920 |
| (D-01-25)13bbb2 | 332110109443401 | 009 | H | -------- | - | --- | - | ------- | ----- | 5,920 |
| (D-01-26)06cdb | 332213109431501 | 009 | S | -------- | - | 42 | - | 13 | ----- | 5,872 |
| (D-02-16)02baa | 331737110405701 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,409 |
| (D-02-16)23bba | 331500110410901 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,680 |
| (D-02-16)26abc | 331407110405001 | 007 | U | -------- | - | --- | - | 13.5 | ----- | 3,760 |
| (D-02-16)26bdb | 331358110410001 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,780 |
| (D-02-16)28ddb | 331328110423701 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,940 |
| (D-02-16)35dda | 331238110402401 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,960 |
| (D-02-17)01dca | 331703110332401 | 009 | S | -------- | - | --- | - | ------- | ----- | 3,820 |
| (D-02-17)20ada | 331451110371801 | 007 | - | 09-16-75 | - | --- | P | 680 | 580 | 4,740 |
| (D-02-17)31caa | 331250110385501 | 007 | U | -------- | - | --- | - | ------- | ----- | 3,980 |
| (D-02-17)32acc | 331259110374401 | 007 | S | -------- | - | --- | - | ------- | ----- | 4,360 |
| (D-02-18)09cad | 331613110303501 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,033 |
| (D-02-18)12dab | 331619110270901 | 007 | I | -------- | C | 149 | P | 149 | ----- | 2,520 |
| (D-02-18)12dac | 331618110270501 | 007 | I | -------- | C | --- | P | 149 | ----- | 2,520 |
| (D-02-18)12dad | 331617110265801 | 007 | I | -------- | - | --- | - | ------- | ----- | 2,522 |
| (D-02-18)12dba | 331619110271201 | 007 | U | -------- | C | --- | P | 151 | ----- | 2,540 |
| (D-02-18)17abd | 331546110312701 | 007 | U | -------- | - | --- | - | ------- | ----- | 3,260 |
| (D-02-18)18bcb | 331545110330001 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,780 |
| (D-02-18)21cbc | 331433110305801 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,173 |
| (D-02-19)06bac | 331734110263401 | 009 | U | -------- | - | --- | - | ------- | ----- | 2,620 |
| (D-02-19)07cbc1 | 331616110265401 | 007 | U | -------- | - | --- | - | ------- | ----- | 2,520 |
| (D-02-19)07cbc2 | 331616110265601 | 007 | U | -------- | - | --- | - | ------- | ----- | 2,520 |
| (D-02-20)11abb | 331646110155201 | 009 | S | -------- | - | --- | - | ------- | ----- | 3,100 |
| (D-02-21)08abd | 331642110124601 | 009 | S | -------- | - | --- | - | ------- | ----- | 3,447 |
| (D-02-21)22cac | 331426110105901 | 009 | S | -------- | - | --- | - | ------- | ----- | 3,040 |
| (D-02-21)25dac | 331338110082901 | 009 | S | -------- | - | --- | - | ------- | ----- | 3,240 |
| (D-02-21)26caa | 331347110095101 | 009 | S | -------- | - | --- | - | ------- | ----- | 3,120 |
| (D-02-21)32acb | 331305110124701 | 009 | U | -------- | - | --- | - | ------- | ----- | 2,820 |

| Local well number | Water level, in feet | Method water level meas-ured | Date water level meas-ured | Dis-charge, in gallons per minute | Method dis-charge meas-ured | Date dis-charge meas-ured | Type of lift | Type of power | Date of lift | Type of log avail-able |
|---|---|---|---|---|---|---|---|---|---|---|
| (D-01-18)35dab | 148 | V | 10-26-88 | -------- | - | -------- | S | E | 10-26-88 | D |
| (D-01-18)35dac | 151 | V | 06-15-88 | -------- | - | -------- | S | E | 06-15-88 | - |
| (D-01-18)36aac | ------ | - | -------- | 160 | M | 09-21-88 | T | E | 06-15-88 | - |
| (D-01-18)36adb | 17.7 | S | 06-14-88 | 879 | P | 09-20-88 | T | E | 06-14-88 | - |
| (D-01-18)36ddd | ------ | - | -------- | 231 | M | 09-21-88 | S | E | 06-16-88 | - |
| (D-01-19)06ccb | ------ | - | -------- | -------- | - | -------- | T | - | 06-15-88 | - |
| (D-01-19)06ccc | 11.2 | V | 06-15-88 | -------- | - | -------- | S | - | 06-15-88 | - |
| (D-01-19)06ccd | ------ | - | -------- | -------- | - | -------- | - | - | -------- | G |
| (D-01-19)22cba | ------ | - | -------- | -------- | - | -------- | P | W | 06-14-88 | - |
| (D-01-19)30bac | ------ | - | -------- | -------- | - | -------- | S | E | 06-15-88 | - |
| (D-01-19)30cdb | ------ | - | -------- | 335 | C | 06-15-88 | S | E | 06-15-88 | - |
| (D-01-20)12bbc | 406 | V | 06-22-88 | -------- | - | -------- | P | G | 06-22-88 | - |
| (D-01-22)27bbc | 23.1 | S | 06-22-88 | -------- | - | -------- | P | W | 06-22-88 | - |
| (D-01-23)07abc | ------ | - | -------- | -------- | - | -------- | S | E | 06-22-88 | - |
| (D-01-23)07abd | 13.8 | S | 06-22-88 | -------- | - | -------- | P | W | 06-22-88 | - |
| (D-01-23)10bdc | ------ | - | -------- | -------- | - | -------- | P | W | 06-22-88 | - |
| (D-01-23)31cdb | ------ | - | -------- | -------- | - | -------- | P | - | 06-22-88 | - |
| (D-01-24)27acc | 441 | V | 06-22-88 | -------- | - | -------- | P | W | 06-22-88 | - |
| (D-01-25)11abb | 50.0 | S | 06-23-88 | -------- | - | -------- | S | E | 06-23-88 | - |
| (D-01-25)11bad | ------ | - | -------- | -------- | - | -------- | S | E | 06-23-88 | - |
| (D-01-25)13bbb1 | 35.6 | S | 06-23-88 | -------- | - | -------- | S | E | 06-23-88 | - |
| (D-01-25)13bbb2 | ------ | - | -------- | -------- | - | -------- | S | E | 06-23-88 | - |
| (D-01-26)06cdb | 3.0 | S | 06-23-88 | -------- | - | -------- | P | W | 06-23-88 | - |
| (D-02-16)02baa | ------ | - | -------- | -------- | - | -------- | P | W | 06-24-88 | - |
| (D-02-16)23bba | 10.4 | S | 06-24-88 | -------- | - | -------- | P | G | 06-24-88 | - |
| (D-02-16)26abc | 7.3 | S | 06-24-88 | -------- | - | -------- | P | - | 06-24-88 | - |
| (D-02-16)26bdb | 10.2 | S | 06-24-88 | -------- | - | -------- | P | W | 06-24-88 | - |
| (D-02-16)28ddb | ------ | - | -------- | -------- | - | -------- | P | W | 06-24-88 | - |
| (D-02-16)35dda | ------ | - | -------- | -------- | - | -------- | P | G | 06-24-88 | - |
| (D-02-17)01dca | ------ | - | -------- | -------- | - | -------- | P | G | 10-26-88 | - |
| (D-02-17)20ada | ------ | - | -------- | -------- | - | -------- | - | - | -------- | D |
| (D-02-17)31caa | ------ | - | -------- | -------- | - | -------- | S | - | 06-24-88 | - |
| (D-02-17)32acc | ------ | - | -------- | -------- | - | -------- | P | G | 06-24-88 | - |
| (D-02-18)09cad | ------ | - | -------- | -------- | - | -------- | P | W | 06-24-88 | - |
| (D-02-18)12dab | 19.8 | S | 09-14-88 | 906 | M | 09-14-88 | T | E | 09-14-88 | D |
| (D-02-18)12dac | 18.3 | S | 09-14-88 | 940 | M | 09-14-88 | T | E | 09-14-88 | D |
| (D-02-18)12dad | 16.5 | S | 09-14-88 | -------- | - | -------- | T | E | 09-14-88 | - |
| (D-02-18)12dba | 25.0 | S | 09-14-88 | -------- | - | -------- | - | - | -------- | D |
| (D-02-18)17abd | ------ | - | -------- | -------- | - | -------- | - | - | -------- | - |
| (D-02-18)18bcb | ------ | - | -------- | -------- | - | -------- | P | W | 10-26-88 | - |
| (D-02-18)21cbc | ------ | - | -------- | -------- | - | -------- | P | W | 06-24-88 | - |
| (D-02-19)06bac | ------ | - | -------- | -------- | - | -------- | - | - | -------- | - |
| (D-02-19)07cbc1 | 16.9 | S | 09-14-88 | -------- | - | -------- | - | - | -------- | - |
| (D-02-19)07cbc2 | 17.3 | S | 09-14-88 | -------- | - | -------- | T | - | 09-14-88 | - |
| (D-02-20)11abb | ------ | - | -------- | -------- | - | -------- | P | W | 06-21-88 | - |
| (D-02-21)08abd | 11.2 | S | 06-21-88 | -------- | - | -------- | P | W | 06-21-88 | - |
| (D-02-21)22cac | ------ | - | -------- | -------- | - | -------- | P | G | 06-21-88 | - |
| (D-02-21)25dac | ------ | - | -------- | -------- | - | -------- | P | W | 06-21-88 | - |
| (D-02-21)26caa | ------ | - | -------- | -------- | - | -------- | P | W | 06-21-88 | - |
| (D-02-21)32acb | 106 | V | 06-21-88 | -------- | - | -------- | P | - | 06-21-88 | D |

Table 3.--Records of selected wells--Continued

| Local well number | Site identifier | County | Primary use of water | Date well con- structed | Method of con- struction | Diameter of interval, in inches | Type of finish | Depth of well, in feet | Depth to top of open interval, in feet below the land surface | Altitude of land surface, in feet above sea level |
|---|---|---|---|---|---|---|---|---|---|---|
| (D-02-23)16cbb | 331531109595701 | 009 | U | -------- | - | --- | - | ------- | ----- | 5,215 |
| (D-02-24)12cdc | 331601109502901 | 009 | U | -------- | - | --- | - | ------- | ----- | 5,060 |
| (D-02-24)19cdc | 331417109553401 | 009 | U | -------- | - | --- | - | ------- | ----- | 5,163 |
| (D-02-25)15aaa | 331551109453901 | 009 | S | -------- | - | --- | - | ------- | ----- | 5,487 |
| (D-02-25)25cca | 331331109442301 | 009 | S | -------- | D | --- | - | 17.5 | ----- | 5,283 |
| (D-03-16)02bcb | 331214110411401 | 007 | S | -------- | - | --- | - | ------- | ----- | 4,100 |
| (D-03-17)02bdd | 331204110344501 | 007 | S | -------- | - | --- | - | ------- | ----- | 3,600 |
| (D-03-18)05cad | 331155110313701 | 007 | U | -------- | - | --- | P | 272 | 54.0 | 2,600 |
| (D-03-18)05cdc | 331140110314601 | 007 | P | -------- | - | --- | - | ------- | ----- | 2,662 |
| (D-03-18)05dda | 331147110310701 | 007 | P | -------- | - | --- | - | ------- | ----- | 2,600 |
| (D-03-19)11cac | 331103110222601 | 009 | S | -------- | - | --- | - | ------- | ----- | 2,680 |
| (D-03-19)19cac | 330918110263801 | 009 | S | -------- | - | --- | - | ------- | ----- | 2,660 |
| (D-03-19)24dda | 330912110204701 | 009 | S | -------- | - | --- | - | ------- | ----- | 3,120 |
| (D-03-19)26bbc | 330854110224101 | 009 | S | -------- | - | --- | - | ------- | ----- | 3,100 |
| (D-03-19)29dad | 330827110245301 | 009 | S | -------- | - | --- | - | ------- | ----- | 2,930 |
| (D-03-19)36bda | 330753110211901 | 009 | S | -------- | - | --- | - | ------- | ----- | 3,458 |
| (D-03-20)01ccd | 331144110151201 | 009 | S | -------- | - | --- | - | ------- | ----- | 2,530 |
| (D-03-20)05dba | 331158110185701 | 009 | U | -------- | - | --- | - | ------- | ----- | 2,500 |
| (D-03-20)10cda | 331055110170401 | 009 | S | -------- | - | --- | - | ------- | ----- | 2,628 |
| (D-03-20)29aac | 330851110184801 | 009 | S | -------- | - | --- | - | ------- | ----- | 4,000 |
| (D-03-21)09ddc | 331048110113101 | 009 | U | -------- | - | --- | - | ------- | ----- | 2,560 |
| (D-03-21)13acb | 331026110084101 | 009 | U | -------- | C | --- | F | 52 | 10 | 2,560 |
| (D-03-21)13dab | 331015110082801 | 009 | I | -------- | - | --- | - | ------- | ----- | 2,560 |
| (D-03-21)13dad | 331007110081901 | 009 | - | -------- | - | --- | - | 161 | ----- | 2,580 |
| (D-03-21)14bbb | 331042110101701 | 009 | U | -------- | - | --- | - | ------- | ----- | 2,580 |
| (D-03-21)15aac | 331037110102701 | 009 | H | -------- | - | --- | - | ------- | ----- | 2,580 |
| (D-03-21)15abb | 331044110104301 | 009 | H | -------- | - | --- | - | ------- | ----- | 2,580 |
| (D-03-21)16aac | 331038110113101 | 009 | U | -------- | - | --- | - | ------- | ----- | 2,600 |
| (D-03-21)28abc | 330850110114801 | 009 | S | -------- | - | --- | - | ------- | ----- | 3,080 |
| (D-03-21)30bcd1 | 330838110141501 | 009 | U | -------- | - | --- | - | ------- | ----- | 3,360 |
| (D-03-21)30bcd2 | 330838110141502 | 009 | S | -------- | - | --- | - | ------- | ----- | 3,360 |
| (D-03-22)18cbc | 331004110081001 | 009 | I | -------- | - | --- | - | ------- | ----- | 2,560 |
| (D-03-22)18ccb | 331004110080701 | 009 | U | -------- | - | --- | - | ------- | ----- | 2,560 |
| (D-03-22)30add | 330836110071801 | 009 | U | -------- | - | --- | - | ------- | ----- | 2,600 |
| (D-03-22)30bdd | 330838110074301 | 009 | U | -------- | - | --- | - | ------- | ----- | 2,665 |
| (D-03-22)30dad | 330826110071401 | 009 | I | -------- | - | --- | - | ------- | ----- | 2,600 |
| (D-03-22)30dda | 330819110071901 | 009 | I | -------- | - | --- | - | ------- | ----- | 2,600 |
| (D-03-22)30ddd | 330809110071301 | 009 | I | -------- | - | --- | - | 125 | ----- | 2,600 |
| (D-03-22)31aca | 330751110073101 | 009 | U | -------- | - | --- | - | ------- | ----- | 2,720 |
| (D-03-22)31adb | 330754110072101 | 009 | U | -------- | - | --- | - | ------- | ----- | 2,680 |
| (D-03-22)32ccd | 330720110070401 | 009 | U | -------- | - | --- | - | ------- | ----- | 2,700 |
| (D-03-25)20dad | 330913109474301 | 009 | S | -------- | - | --- | - | ------- | ----- | 5,080 |
| (D-03-25)21cbb | 330919109473701 | 009 | S | -------- | D | --- | - | 11 | ----- | 5,060 |
| (D-03-25)21dad | 330913109464201 | 009 | S | -------- | D | --- | - | 9.5 | ----- | 5,046 |
| (D-03-25)29abd | 330852109475701 | 009 | U | -------- | D | --- | - | 8 | ----- | 5,139 |
| (D-03-26)06acd | 331204109424501 | 009 | S | -------- | - | --- | - | 271 | 221 | 5,180 |
| (D-03-26)08dba | 331107109414501 | 009 | S | -------- | - | --- | - | ------- | ----- | 5,169 |
| (D-03-26)20cac | 330912109421101 | 009 | S | -------- | - | --- | - | ------- | ----- | 4,841 |
| (D-03-26)34ada | 330747109392301 | 009 | S | -------- | - | --- | - | ------- | ----- | 4,420 |
| (D-03-26)36ada | 330752109372601 | 009 | S | -------- | - | --- | - | ------- | ----- | 4,997 |

| Local well number | Water level, in feet | Method water level meas-ured | Date water level meas-ured | Dis-charge, in gallons per minute | Method dis-charge meas-ured | Date dis-charge meas-ured | Type of lift | Type of power | Date of lift | Type of log avail-able |
|---|---|---|---|---|---|---|---|---|---|---|
| (D-02-23)16cbb | ------ | - | -------- | -------- | - | -------- | P | W | 06-22-88 | - |
| (D-02-24)12cdc | ------ | - | -------- | -------- | - | -------- | - | - | -------- | - |
| (D-02-24)19cdc | ------ | - | -------- | -------- | - | -------- | P | W | 06-22-88 | - |
| (D-02-25)15aaa | ------ | - | -------- | -------- | - | -------- | P | W | 07-08-88 | - |
| (D-02-25)25cca | 3.3 | S | 07-08-88 | -------- | - | -------- | P | W | 07-08-88 | - |
| (D-03-16)02bcb | ------ | - | -------- | -------- | - | -------- | P | W | 06-24-88 | - |
| (D-03-17)02bdd | ------ | - | -------- | -------- | - | -------- | - | - | -------- | - |
| (D-03-18)05cad | 45.6 | S | 10-26-88 | -------- | - | -------- | - | - | -------- | D |
| (D-03-18)05cdc | 13.2 | S | 06-24-88 | -------- | - | -------- | T | E | 06-24-88 | - |
| (D-03-18)05dda | 116 | V | 10-26-88 | -------- | - | -------- | S | E | 10-26-88 | - |
| (D-03-19)11cac | ------ | - | -------- | -------- | - | -------- | P | W | 07-07-88 | - |
| (D-03-19)19cac | ------ | - | -------- | -------- | - | -------- | P | G | 07-07-88 | - |
| (D-03-19)24dda | ------ | - | -------- | -------- | - | -------- | P | W | 07-07-88 | D |
| (D-03-19)26bbc | 259 | V | 07-07-88 | -------- | - | -------- | P | G | 07-07-88 | - |
| (D-03-19)29dad | ------ | - | -------- | -------- | - | -------- | P | W | 07-07-88 | - |
| (D-03-19)36bda | 179 | V | 07-07-88 | -------- | - | -------- | P | W | 07-07-88 | - |
| (D-03-20)01ccd | ------ | - | -------- | -------- | - | -------- | P | W | 06-16-88 | - |
| (D-03-20)05dba | 13.4 | S | 07-07-88 | -------- | - | -------- | - | - | -------- | - |
| (D-03-20)10cda | ------ | - | -------- | -------- | - | -------- | P | G | 06-16-88 | - |
| (D-03-20)29aac | ------ | - | -------- | -------- | - | -------- | P | G | 07-07-88 | - |
| (D-03-21)09ddc | 26.6 | S | 06-16-88 | -------- | - | -------- | - | - | -------- | - |
| (D-03-21)13acb | 8.9 | S | 09-22-88 | -------- | - | -------- | T | - | 09-22-88 | - |
| (D-03-21)13dab | 17.1 | V | 06-16-88 | -------- | - | -------- | T | E | 06-16-88 | - |
| (D-03-21)13dad | ------ | - | -------- | -------- | - | -------- | - | - | -------- | - |
| (D-03-21)14bbb | ------ | - | -------- | -------- | - | -------- | T | G | 06-16-88 | - |
| (D-03-21)15aac | ------ | - | -------- | -------- | - | -------- | S | E | 06-16-88 | - |
| (D-03-21)15abb | ------ | - | -------- | -------- | - | -------- | S | E | 06-16-88 | - |
| (D-03-21)16aac | 24.5 | V | 06-16-88 | -------- | - | -------- | S | - | 06-16-88 | - |
| (D-03-21)28abc | ------ | - | -------- | -------- | - | -------- | P | W | 06-21-88 | - |
| (D-03-21)30bcd1 | ------ | - | -------- | -------- | - | -------- | - | - | -------- | - |
| (D-03-21)30bcd2 | ------ | - | -------- | -------- | - | -------- | P | G | 07-07-88 | - |
| (D-03-22)18cbc | ------ | - | -------- | 370 | W | 09-22-88 | T | E | 06-16-88 | D |
| (D-03-22)18ccb | 10.7 | S | 06-16-88 | -------- | - | -------- | - | - | -------- | - |
| (D-03-22)30add | 13.6 | V | 06-17-88 | -------- | - | -------- | T | - | 06-17-88 | - |
| (D-03-22)30bdd | ------ | - | -------- | -------- | - | -------- | S | - | 06-17-88 | - |
| (D-03-22)30dad | ------ | - | -------- | -------- | - | -------- | T | E | 06-17-88 | - |
| (D-03-22)30dda | 18.8 | S | 06-17-88 | -------- | - | -------- | T | E | 06-17-88 | - |
| (D-03-22)30ddd | 22.4 | S | 06-17-88 | 655 | C | 09-22-88 | T | E | 06-17-88 | - |
| (D-03-22)31aca | ------ | - | -------- | -------- | - | -------- | - | - | -------- | - |
| (D-03-22)31adb | ------ | - | -------- | -------- | - | -------- | - | - | -------- | - |
| (D-03-22)32ccd | 71.4 | S | 06-17-88 | -------- | - | -------- | P | - | 06-17-88 | - |
| (D-03-25)20dad | ------ | - | -------- | -------- | - | -------- | P | G | 07-08-88 | - |
| (D-03-25)21cbb | 5.4 | S | 07-08-88 | -------- | - | -------- | P | W | 07-08-88 | - |
| (D-03-25)21dad | 4.0 | S | 07-08-88 | -------- | - | -------- | P | G | 07-08-88 | - |
| (D-03-25)29abd | 5 | S | 07-08-88 | -------- | - | -------- | - | - | -------- | - |
| (D-03-26)06acd | 157 | S | 07-08-88 | -------- | - | -------- | P | W | 07-08-88 | D |
| (D-03-26)08dba | ------ | - | -------- | -------- | - | -------- | P | W | 07-08-88 | - |
| (D-03-26)20cac | ------ | - | -------- | -------- | - | -------- | P | W | -------- | - |
| (D-03-26)34ada | ------ | - | -------- | -------- | - | -------- | P | W | 07-08-88 | - |
| (D-03-26)36ada | ------ | - | -------- | -------- | - | -------- | P | W | 07-08-88 | - |

Table 3.--Records of selected wells--Continued

| Local well number | Site identifier | County | Primary use of water | Date well con-structed | Method of con-struction | Diameter of interval, in inches | Type of finish | Depth of well, in feet | Depth to top of open interval, in feet below the land surface | Altitude of land surface, in feet above sea level |
|---|---|---|---|---|---|---|---|---|---|---|
| (D-03-27)28dcd | 330806109342901 | 009 | S | -------- | - | --- | - | ------- | ----- | 5,011 |
| (D-04-21)24ad UNSURVEYED | 330419110082501 | 009 | - | -------- | - | --- | - | 154 | ----- | 3,440 |
| (D-04-21)32cd 1 | 330210110130201 | 009 | U | 08-01-40 | - | --- | - | 34.0 | ----- | 4,640 |
| (D-04-21)32cd 2 | 330205110130001 | 009 | U | -------- | - | --- | - | 41.0 | ----- | 4,640 |
| (D-04-21)33bac | 330245110120201 | 009 | U | -------- | - | --- | - | ------- | ----- | 4,480 |
| (D-04-21)34bac | 330244110110401 | 009 | U | -------- | - | --- | - | ------- | ----- | 4,240 |
| (D-04-21)35d UNSURVEYED | 330222110093201 | 009 | U | -------- | - | --- | - | 50.0 | ----- | 4,000 |
| (D-04-22)03cbb | 330646110050801 | 009 | U | -------- | - | --- | - | ------- | ----- | 2,620 |
| (D-04-22)03cd UNSURVEYED | 330630110044201 | 009 | U | -------- | - | --- | - | 100 | ----- | 2,680 |
| (D-04-22)04cad | 330639110054801 | 009 | U | -------- | - | --- | - | ------- | ----- | 2,660 |
| (D-04-22)04dab | 330646110052201 | 009 | I | -------- | - | --- | - | ------- | ----- | 2,620 |
| (D-04-22)04dbb | 330645110053701 | 009 | U | -------- | - | --- | - | ------- | ----- | 2,640 |
| (D-04-22)14abd | 330520110032801 | 009 | U | -------- | - | --- | - | ------- | ----- | 2,640 |
| (D-04-22)26aca | 330328110032201 | 009 | U | -------- | - | --- | - | ------- | ----- | 2,840 |
| (D-04-22)26dba | 330315110032201 | 009 | P | -------- | - | --- | - | ------- | ----- | 2,840 |
| (D-04-22)35bdd1 | 330232110034301 | 009 | U | -------- | - | --- | - | ------- | ----- | 2,900 |
| (D-04-22)35bdd2 | 330235110034201 | 009 | U | -------- | - | --- | - | ------- | ----- | 2,880 |
| (D-04-22)35ccb | 330210110040101 | 009 | U | -------- | - | --- | - | ------- | ----- | 2,920 |
| (D-04-22)35ccc | 330207110040501 | 009 | U | -------- | - | --- | - | ------- | ----- | 2,930 |
| (D-04-22)35cdc1 | 330207110034901 | 009 | I | 01-01-52 | - | --- | - | ------- | ----- | 2,920 |
| (D-04-22)35cdc2 | 330206110034501 | 009 | I | 07-03-63 | - | --- | P | 90.0 | 40.0 | 2,920 |
| (D-04-26)01cca | 330634109381301 | 009 | S | -------- | - | --- | - | ------- | ----- | 4,304 |
| (D-04-27)02ddc | 330622109322301 | 009 | S | -------- | - | --- | - | ------- | ----- | 4,800 |
| (D-05-07)14add3 | 325923110360501 | 021 | I | - -51 | - | --- | - | 466 | 110 | 1,382 |
| (D-05-16)25dcd | 325745110393501 | 021 | S | -------- | - | --- | - | ------- | ----- | 3,120 |
| (D-05-16)26a | 325827110410901 | 021 | U | -------- | - | --- | - | 28.0 | ----- | ----- |
| (D-05-16)26cda | 325751110405401 | 021 | U | -------- | D | --- | - | ------- | ----- | 2,760 |
| (D-05-17)30c | 325755110390401 | 021 | S | -------- | - | --- | - | ------- | ----- | 3,260 |
| (D-05-21)23cdd | 325839110095001 | 009 | U | -------- | - | --- | - | ------- | ----- | 3,290 |
| (D-05-21)24aca | 325909110083501 | 009 | U | -------- | - | --- | - | ------- | ----- | 3,234 |
| (D-05-21)27ba | 325832110105701 | 009 | - | -------- | - | --- | - | ------- | ----- | 3,400 |
| (D-05-21)36aab | 325743110052301 | 009 | U | -------- | - | --- | - | ------- | ----- | 3,400 |
| (D-05-22)03bdd | 330145110044001 | 009 | U | -------- | - | --- | - | ------- | ----- | 2,974 |
| (D-05-22)06abb | 330202110070401 | 009 | U | -------- | - | --- | - | ------- | ----- | 3,540 |
| (D-05-22)09bcc | 330046110060401 | 009 | U | -------- | - | --- | - | ------- | ----- | 3,080 |
| (D-05-22)18dab | 325950110072301 | 009 | U | -------- | - | --- | - | ------- | ----- | 3,179 |
| (D-05-22)28dad | 325802110050901 | 009 | U | -------- | - | --- | - | ------- | ----- | 3,198 |
| (D-05-22)29cdd | 325743110064601 | 009 | U | -------- | - | --- | - | ------- | ----- | 3,288 |
| (D-05-22)32bba | 325740110065901 | 009 | U | -------- | - | --- | - | ------- | ----- | 3,298 |
| (D-06-17)07caa | 325527110385201 | 021 | H | -------- | - | --- | - | ------- | ----- | 3,180 |
| (D-06-17)07cdb | 325518110390001 | 021 | S | -------- | - | --- | - | ------- | ----- | 3,000 |
| (D-06-22)16aaa | 325507110053201 | 009 | U | -------- | - | --- | - | ------- | ----- | 3,580 |
| (D-21-27)13cdd1 | 333553109331501 | 003 | - | -------- | - | --- | - | ------- | ----- | ----- |

| Local well number | Water level, in feet | Method water level measured | Date water level measured | Discharge, in gallons per minute | Method discharge measured | Date discharge measured | Type of lift | Type of power | Date of lift | Type of log available |
|---|---|---|---|---|---|---|---|---|---|---|
| (D-03-27)28dcd | ------ | - | -------- | -------- | - | -------- | P | W | 07-08-88 | - |
| (D-04-21)24ad UNSURVEYED | 84.2 | S | 01-17-56 | 7.50 | O | 10- -59 | - | - | -------- | - |
| (D-04-21)32cd 1 | 22.0 | E | 08-01-40 | -------- | - | -------- | P | G | -------- | - |
| (D-04-21)32cd 2 | 10.0 | R | 09-01-40 | -------- | - | -------- | P | G | 09- -40 | - |
| (D-04-21)33bac | 11.8 | S | 01-18-65 | -------- | - | -------- | P | W | 01-18-65 | - |
| (D-04-21)34bac | 55.1 | S | 01-19-65 | -------- | - | -------- | P | - | 01-19-65 | - |
| (D-04-21)35d UNSURVEYED | ------ | - | -------- | -------- | - | -------- | - | - | -------- | D |
| (D-04-22)03cbb | 13.3 | S | 06-17-88 | -------- | - | -------- | - | - | -------- | - |
| (D-04-22)03cd UNSURVEYED | 16.0 | R | 12-01-41 | 1,000 | - | -------- | - | - | -------- | - |
| (D-04-22)04cad | ------ | - | -------- | -------- | - | -------- | - | - | -------- | - |
| (D-04-22)04dab | 17.7 | S | 06-17-88 | -------- | - | -------- | T | E | 06-17-88 | - |
| (D-04-22)04dbb | 18.6 | S | 09-25-59 | -------- | - | -------- | - | - | -------- | - |
| (D-04-22)14abd | ------ | - | -------- | -------- | - | -------- | - | - | -------- | - |
| (D-04-22)26aca | ------ | - | -------- | -------- | - | -------- | S | - | 08-25-88 | - |
| (D-04-22)26dba | 14.2 | S | 08-25-88 | -------- | - | -------- | T | E | 08-25-88 | - |
| (D-04-22)35bdd1 | 42.9 | S | 12-08-64 | -------- | - | -------- | - | - | -------- | - |
| (D-04-22)35bdd2 | ------ | - | -------- | -------- | - | -------- | P | W | 12- -64 | - |
| (D-04-22)35ccb | ------ | - | -------- | -------- | - | -------- | - | - | -------- | - |
| (D-04-22)35ccc | 34.5 | S | 06-20-88 | -------- | - | -------- | P | - | 06-20-88 | - |
| (D-04-22)35cdc1 | ------ | - | -------- | -------- | - | -------- | T | L | 12- -52 | - |
| (D-04-22)35cdc2 | ------ | - | -------- | -------- | - | -------- | - | - | -------- | D |
| (D-04-26)01cca | ------ | - | -------- | -------- | - | -------- | P | W | 07-08-88 | - |
| (D-04-27)02ddc | ------ | - | -------- | -------- | - | -------- | P | E | 07-08-88 | - |
| (D-05-07)14add3 | 88.0 | R | -------- | -------- | - | -------- | T | E | 04-26-84 | D |
| (D-05-16)25dcd | ------ | - | -------- | 2.00 | E | 06- -50 | - | - | -------- | - |
| (D-05-16)26a | 3.10 | - | 03-01-50 | -------- | - | -------- | P | W | -------- | - |
| (D-05-16)26cda | 5.5 | S | 07-07-88 | -------- | - | -------- | P | - | 07-07-88 | - |
| (D-05-17)30c | ------ | - | -------- | -------- | - | -------- | - | - | -------- | - |
| (D-05-21)23cdd | 14.4 | S | 06-20-88 | -------- | - | -------- | - | - | -------- | - |
| (D-05-21)24aca | 33.8 | S | 06-20-88 | -------- | - | -------- | P | - | 06-20-88 | - |
| (D-05-21)27ba | ------ | - | -------- | -------- | - | -------- | - | - | -------- | - |
| (D-05-21)36aab | 13.6 | S | 06-21-88 | -------- | - | -------- | - | - | -------- | - |
| (D-05-22)03bdd | 50.2 | S | 06-20-88 | -------- | - | -------- | P | - | 06-20-88 | - |
| (D-05-22)06abb | 491 | V | 06-20-88 | -------- | - | -------- | P | - | 06-20-88 | - |
| (D-05-22)09bcc | 45.2 | S | 06-20-88 | -------- | - | -------- | P | W | 06-20-88 | - |
| (D-05-22)18dab | ------ | - | -------- | -------- | - | -------- | - | - | -------- | - |
| (D-05-22)28dad | 25.8 | S | 06-21-88 | -------- | - | -------- | P | - | 06-21-88 | - |
| (D-05-22)29cdd | 8.75 | S | 06-21-88 | -------- | - | -------- | P | W | 06-21-88 | - |
| (D-05-22)32bba | ------ | - | -------- | -------- | - | -------- | P | - | 06-21-88 | - |
| (D-06-17)07caa | ------ | - | -------- | .25 | E | 02- -51 | - | - | -------- | - |
| (D-06-17)07cdb | ------ | - | -------- | .25 | - | 02- -51 | - | - | -------- | - |
| (D-06-22)16aaa | 181 | V | 06-21-88 | -------- | - | -------- | P | - | 06-21-88 | - |
| (D-21-27)13cdd1 | ------ | - | -------- | -------- | - | -------- | - | - | -------- | - |

Table 4.--Chemical analyses of water from selected wells

[Abbreviations: Geologic unit: A, alluvium, alluvium and uppermost basin fill; B, basin fill; U, unknown; µS/cm, microsiemens per centimeter; °C, degrees in Celsius; mg/L, milligrams per liter; µg/L, micrograms per liter; <, less than; >, greater than. Dashes indicate no data]

| Local well number | Site identifier | Date | Time | Geologic unit | Specific conductance (µS/cm) | pH (standard units) | Temperature water (°C) | Hardness total (mg/L as $CaCO_3$) | Calcium dissolved (mg/L as Ca) |
|---|---|---|---|---|---|---|---|---|---|
| (A-01-18)17acb | 332554110291301 | 08-18-88 | 1330 | B | 588 | 7.40 | 22.5 | 260 | 63 |
| (A-01-18)28cad | 332355110281501 | 08-18-88 | 0945 | B | 402 | 7.90 | 25.0 | 110 | 23 |
| (A-02-17)34bba | 332842110334801 | 08-16-88 | 1300 | U | 560 | 7.60 | 22.5 | 270 | 62 |
| (D-01-17)10abb | 332159110353901 | 08-15-88 | 1515 | B | 460 | 8.10 | 23.0 | 94 | 16 |
| (D-01-17)21ddd | 331932110361902 | 08-17-88 | 1415 | B | 370 | 7.80 | 26.0 | 160 | 47 |
| (D-01-18)12dcd2 | 332117110271501 | 09-01-88 | 0845 | A | 699 | 7.65 | 22.5 | 130 | 30 |
| (D-01-18)25dab1 | 331857110270901 | 08-25-88 | 1800 | A | 695 | 7.50 | 25.0 | 190 | 48 |
| (D-01-18)36ddd | 331744110265801 | 08-17-88 | 1100 | A | 752 | 7.60 | 21.0 | 230 | 56 |
| (D-01-19)30cdb | 331844110263801 | 08-15-88 | 1100 | A | 750 | 7.70 | 20.0 | 220 | 53 |
| (D-01-23)10bdc | 332142109583801 | 08-24-88 | 1730 | U | 210 | 7.60 | ---- | 90 | 23 |
| (D-01-25)13bbb2 | 332110109443401 | 09-01-88 | 1215 | U | 234 | 7.90 | 17.0 | 110 | 34 |
| (D-02-18)21cbc | 331433110305801 | 08-30-88 | 1045 | B | 419 | 7.70 | 25.5 | 180 | 49 |
| (D-02-20)11abb | 331646110155201 | 08-29-88 | 1045 | B | 450 | 7.60 | 24.5 | 200 | 53 |
| (D-02-21)25dac | 331338110082901 | 08-29-88 | 1400 | B | 599 | 7.50 | 28.0 | 170 | 59 |
| (D-03-18)05cdc | 331140110314601 | 08-19-88 | 1330 | U | 640 | 7.50 | 24.0 | 190 | 51 |
| (D-03-19)11cac | 331103110222601 | 08-30-88 | 1600 | B | 639 | 9.00 | ---- | 10 | 2.5 |
| (D-03-21)28abc | 330850110114801 | 08-29-88 | 1700 | B | 476 | 7.60 | 23.0 | 180 | 47 |
| (D-03-22)18cbc | 331004110081001 | 09-30-86 | 1000 | A | 8,400 | 7.38 | 19.5 | 1,300 | 350 |
| (D-03-22)25ccd | 330813110025701 | 03-17-88 | 1430 | B | 470 | 7.50 | 22.0 | 210 | 43 |
| (D-03-22)30ddd | 330809110071301 | 08-31-88 | 1030 | A | 7,000 | 7.20 | 20.0 | 1,500 | 420 |
| (D-03-26)20cac | 330912109421101 | 08-23-88 | 1345 | U | 348 | 8.10 | 22.0 | 150 | 32 |
| (D-04-22)26dbd | 330311110032201 | 08-25-88 | 1315 | A | 421 | 7.00 | 19.0 | 98 | 31 |
| (D-04-23)19bbc | 330424110020401 | 07-18-85 | 1630 | A | ----- | 7.20 | 19.0 | 130 | 43 |
| (D-05-21)36bcb | 325726110091201 | 07-07-86 | 1445 | U | 450 | 8.70 | 31.0 | 12 | 4.3 |

Table 4.--Chemical analyses of water from selected wells--Continued



| Local well number | Magnesium, dissolved (mg/L as Mg) | Sodium dissolved (mg/L as Na) | Sodium adsorption ratio | Sodium, in percent | Potassium, dissolved (mg/L as K) | Carbonate water field (mg/L as $CO_3$) | Bicarbonate water field (mg/L as $HCO_3$) | Sulfate dissolved (mg/L as $SO_4$) | Chloride, dissolved (mg/L as Cl) |
|---|---|---|---|---|---|---|---|---|---|
| (A-01-18)17acb | 24 | 37 | 1 | 24 | 1.4 | -- | 344 | 30 | 13 |
| (A-01-18)28cad | 13 | 48 | 2 | 48 | 2.9 | -- | 231 | 12 | 12 |
| (A-02-17)34bba | 28 | 24 | 0.7 | 16 | 1.8 | -- | 322 | 33 | 12 |
| (D-01-17)10abb | 13 | 70 | 3 | 61 | 2.7 | -- | 231 | 15 | 29 |
| (D-01-17)21ddd | 9.5 | 20 | 0.7 | 22 | 1.9 | -- | 160 | 7.5 | 20 |
| (D-01-18)12dcd2 | 14 | 110 | 4 | 64 | 1.1 | -- | 353 | 38 | 26 |
| (D-01-18)25dab1 | 17 | 77 | 3 | 46 | 2.5 | -- | 276 | 61 | 37 |
| (D-01-18)36ddd | 22 | 73 | 2 | 40 | 3.4 | -- | 289 | 38 | 77 |
| (D-01-19)30cdb | 21 | 79 | 2 | 44 | 2.7 | -- | 320 | 39 | 69 |
| (D-01-23)10bdc | 7.9 | 7.8 | 0.4 | 15 | 2.8 | -- | 90 | 25 | 5.1 |
| (D-01-25)13bbb2 | 5.8 | 9.3 | 0.4 | 14 | 10 | -- | 142 | 5.5 | 2.8 |
| (D-02-18)21cbc | 13 | 21 | 0.7 | 20 | 2.3 | -- | 192 | 7.0 | 15 |
| (D-02-20)11abb | 17 | 20 | 0.6 | 17 | 4.6 | -- | 237 | 11 | 11 |
| (D-02-21)25dac | 5.2 | 54 | 2 | 40 | 6.5 | -- | 181 | 9.7 | 87 |
| (D-03-18)05cdc | 16 | 73 | 2 | 45 | 3.7 | -- | 342 | 33 | 18 |
| (D-03-19)11cac | 0.94 | 140 | 20 | 96 | 1.7 | 15 | 244 | 84 | 10 |
| (D-03-21)28abc | 16 | 36 | 1 | 30 | 1.4 | -- | 250 | 31 | 12 |
| (D-03-22)18cbc | 98 | 1,200 | 15 | 67 | 16 | -- | --- | 680 | 2,200 |
| (D-03-22)25ccd | 25 | 18 | 0.6 | 15 | 6.8 | -- | --- | 7.9 | 10 |
| (D-03-22)30ddd | 100 | 980 | 12 | 59 | 12 | -- | 421 | 820 | 1,800 |
| (D-03-26)20cac | 17 | 18 | 0.7 | 20 | 2.1 | -- | 190 | 7.0 | 5.5 |
| (D-04-22)26dbd | 5.0 | 52 | 2 | 53 | 1.1 | -- | 148 | 44 | 44 |
| (D-04-23)19bbc | 6.5 | 79 | 3 | 56 | 1.2 | -- | --- | 69 | 51 |
| (D-05-21)36bcb | 0.35 | 100 | 13 | 94 | 0.90 | -- | --- | 22 | 20 |

Table 4.--Chemical analyses of water from selected wells--Continued

| Local well number | Fluoride, dissolved (mg/L as F) | Silica, dissolved (mg/L as $SiO_2$) | Solids, sum of constituents, dissolved (mg/L) | Nitrogen, NO2+NO3 dissolved (mg/L as N) | Phosphorous ortho, dissolved (mg/L as P) | Aluminum, dissolved (µg/L as Al) | Arsenic, dissolved (µg/L as As) | Barium, dissolved (µg/L as Ba) | Boron, dissolved (µg/L as B) |
|---|---|---|---|---|---|---|---|---|---|
| (A-01-18)17acb | 0.40 | 31 | 367 | 0.630 | 0.020 | <10 | 16 | 47 | 40 |
| (A-01-18)28cad | 0.20 | 26 | 254 | 0.860 | <0.010 | <10 | 5 | 56 | 40 |
| (A-02-17)34bba | 0.30 | 31 | 350 | 1.30 | <0.010 | <10 | <1 | 22 | 30 |
| (D-01-17)10abb | 0.40 | 20 | 283 | 1.10 | <0.010 | <10 | 9 | 51 | 110 |
| (D-01-17)21ddd | 0.30 | 32 | 242 | 5.10 | <0.010 | <10 | <1 | 9 | 20 |
| (D-01-18)12dcd2 | 1.0 | 30 | 434 | 2.10 | 0.160 | <102 | 76 | 40 | 220 |
| (D-01-18)25dab1 | 0.40 | 26 | 423 | 2.80 | 0.030 | <101 | 5 | 62 | 140 |
| (D-01-18)36ddd | 0.40 | 33 | 449 | 0.330 | 0.070 | <10 | 8 | 69 | 80 |
| (D-01-19)30cdb | 0.40 | 35 | 453 | 0.910 | 0.060 | <10 | 9 | 43 | 90 |
| (D-01-23)10bdc | 0.10 | 51 | 171 | 0.900 | 0.070 | <10 | 1 | <2 | 20 |
| (D-01-25)13bbb2 | 0.20 | 36 | 175 | 0.510 | 0.030 | <102 | 2 | 21 | 10 |
| (D-02-18)21cbc | 0.40 | 31 | 267 | 7.80 | 0.010 | <10 | 2 | 48 | 30 |
| (D-02-20)11abb | 0.20 | 66 | 317 | 2.70 | 0.020 | <10 | 3 | 3 | 30 |
| (D-02-21)25dac | 1.3 | 38 | 357 | 0.900 | <0.010 | <10 | <1 | 6 | 50 |
| (D-03-18)05cdc | 0.20 | 39 | 417 | 3.20 | <0.010 | <10 | 7 | 6 | 70 |
| (D-03-19)11cac | 2.9 | 13 | 384 | <0.100 | 0.030 | 10 | 230 | 32 | 220 |
| (D-03-21)28abc | 0.20 | 30 | 301 | 0.900 | <0.010 | <10 | <1 | 150 | 120 |
| (D-03-22)18cbc | 1.1 | 44 | 4,850 | 0.490 | <0.010 | <10 | 9 | <100 | 1,100 |
| (D-03-22)25ccd | 2.2 | 58 | 306 | 1.20 | <0.010 | ---- | <1 | 8 | 40 |
| (D-03-22)30ddd | 1.2 | 48 | 4,460 | 3.80 | 0.040 | 10 | 6 | <100 | 900 |
| (D-03-26)20cac | 0.60 | 31 | 222 | 3.00 | <0.010 | <10 | 1 | 2 | 30 |
| (D-04-22)26dbd | 1.0 | 25 | 263 | 0.390 | 0.020 | <10 | 2 | 36 | 40 |
| (D-04-23)19bbc | 1.5 | 29 | 380 | 1.20 | 0.030 | ---- | --- | ---- | 50 |
| (D-05-21)36bcb | 13 | 15 | 250 | <0.100 | <0.010 | ---- | 3 | <2 | 210 |

Table 4.--Chemical analyses of water from selected wells--Continued

| Local well number | Cadmium dissolved (μg/L as Cd) | Chromium, hexavalent, dissolved (μg/L as Cr) | Iron, dissolved (μg/L as Fe) | Lead, dissolved (μg/L as PB) | Lithium dissolved (μg/L as Li) | Manganese, dissolved (μg/L as N) | Selenium, dissolved (μg/L as Se) | Strontium, dissolved (μg/L as Sr) | Mercury dissolved (μg/L AS Hg) |
|---|---|---|---|---|---|---|---|---|---|
| (A-01-18)17acb | <1 | <1 | 18 | <5 | 25 | 1 | <1 | 300 | <0.1 |
| (A-01-18)28cad | <1 | <1 | 4 | <5 | 78 | <1 | 2 | 320 | <0.1 |
| (A-02-17)34bba | <1 | <1 | 26 | <5 | 14 | 3 | <1 | 300 | <0.1 |
| (D-01-17)10abb | <1 | 1 | 7 | 7 | 42 | <1 | <1 | 330 | <0.1 |
| (D-01-17)21ddd | 1 | 1 | 38 | <5 | 22 | 6 | <1 | 180 | <0.1 |
| (D-01-18)12dcd2 | 1 | 3 | 5 | <5 | 72 | <1 | 2 | 250 | <0.1 |
| (D-01-18)25dab1 | <1 | 2 | 10 | <5 | 75 | <1 | <1 | 570 | <0.1 |
| (D-01-18)36ddd | <1 | 1 | 10 | <5 | 44 | 190 | <1 | 380 | <0.1 |
| (D-01-19)30cdb | <1 | <1 | 7 | <5 | 46 | <1 | <1 | 380 | <0.1 |
| (D-01-23)10bdc | 1 | 2 | 67 | <5 | 5 | 10 | <1 | 120 | <0.1 |
| (D-01-25)13bbb2 | 2 | <1 | 23 | <5 | 6 | 68 | <1 | 140 | <0.1 |
| (D-02-18)21cbc | 2 | 1 | 29 | <5 | 41 | 6 | <1 | 190 | <0.1 |
| (D-02-20)11abb | 2 | <1 | 30 | <5 | 19 | 4 | <1 | 250 | <0.1 |
| (D-02-21)25dac | 2 | <1 | 57 | <5 | 36 | 6 | <1 | 230 | <0.1 |
| (D-03-18)05cdc | <1 | <1 | 9 | <5 | 71 | <1 | <1 | 270 | <0.1 |
| (D-03-19)11cac | <1 | 1 | 27 | <5 | 110 | 2 | <1 | 80 | <0.1 |
| (D-03-21)28abc | 2 | 1 | 33 | <5 | 29 | 2 | 1 | 260 | <0.1 |
| (D-03-22)18cbc | <1 | <1 | 60 | <5 | 640 | 620 | 8 | 3,900 | 0.3 |
| (D-03-22)25ccd | <1 | 4 | 13 | <5 | 220 | 5 | -- | 130 | ---- |
| (D-03-22)30ddd | <1 | 1 | 70 | <5 | 410 | 1,900 | 2 | 4,000 | 0.5 |
| (D-03-26)20cac | 1 | <1 | 15 | <5 | 31 | 9 | <1 | 240 | <0.1 |
| (D-04-22)26dbd | 2 | 2 | 8 | <5 | 96 | <1 | <1 | 290 | <0.1 |
| (D-04-23)19bbc | -- | -- | <3 | -- | -- | <1 | -- | -- | ---- |
| (D-05-21)36bcb | <1 | <1 | 79 | <10 | 71 | 4 | -- | 49 | ---- |