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GEOHYDROLOGY OF THE ANTLERS AQUIFER (CRETACEOUS), SOUTHEASTERN OKLAHOMA

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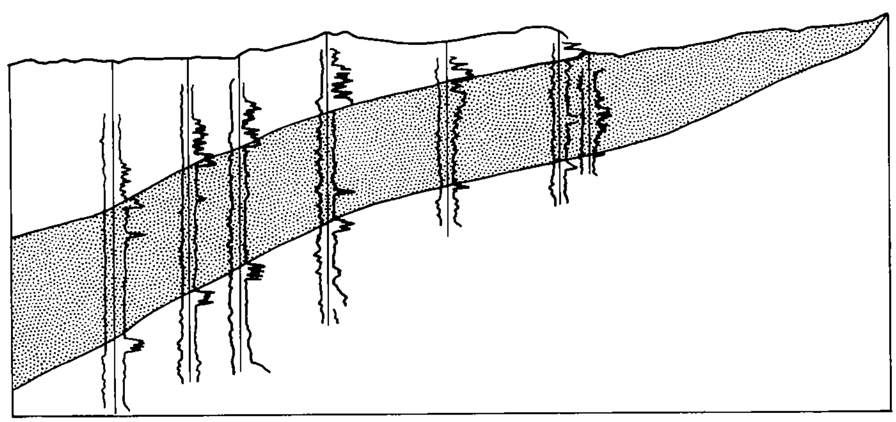
Prepared by the United States Geological Survey in cooperation with the Oklahoma Geological Survey



The University of Oklahoma
Norman
1981

Title Page Illustration

Cross section of Antlers Sandstone (stippling), from south to north, across McCurtain County, southeastern Oklahoma (section *C–C'* of plate 1, in pocket). In this section the Antlers crops out to the north (at right) and dips southward into the subsurface, reaching a depth of more than 1,600 feet. Ink diagram by Roy D. Davis, from scribed copy prepared by Marion E. Clark.

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SUMMARY OF INFORMATION REQUIRED TO MEET OKLAHOMA GROUND-WATER LAW

This section of the report is included as agreed upon by the U.S. Geological Survey, the Oklahoma Geological Survey, and the Oklahoma Water Resources Board. The information is provided in order for the Oklahoma Water Resources Board to meet the requirements of Oklahoma State Law (82 Oklahoma Statutes Supp. 1973, paragraph 1020.1 et seq.). This law requires that the Oklahoma Water Resources Board make a determination of the maximum annual yield of each ground-water basin for a minimum 20-year life based on the following:

1. The total land area overlying the basin or subbasin.
2. The amount of water in storage in the basin or subbasin.
3. The rate of natural recharge to the basin or subbasin and total discharge from the basin or subbasin.
4. Transmissivity of the basin or subbasin.
5. The possibility of pollution of the basin or subbasin from natural sources.

According to determinations made by the Oklahoma Water Resources Board, the total amount of ground water established under prior rights* is estimated to be approximately 12,058 acre-ft per year, and the total amount of land covered by prior rights is approximately 13,689 acres.

Based on this study, the following information is provided to assist the Oklahoma Water Resources Board in meeting the requirements of Oklahoma ground-water law:

1. The total land area overlying that part of the basin in this study is 2,816,000 acres. "Ground-water basin," by Oklahoma law, means a distinct underground body of water overlain by contiguous land and having substantially the same geologic and hydrologic characteristics and yield capacities. As used in this report, "basin" refers to the area between the northernmost outcrop of the aquifer and the Red River.
2. The amount of water in storage in the "basin" was estimated at 45,100,000 acre-ft as of July 1, 1973; of this amount, an estimated 13,500,000 acre-ft contains more than 1,000 mg/L dissolved solids and may not be suitable for some purposes.
3. The rate of natural recharge to the "basin" is estimated to be 600,000 acre-ft per year. Total discharge from the basin is estimated to be about equal to recharge. If the hydrologic system remained completely static except for recharge, and if all the water available from storage could be removed over the 20-year life of the "basin," the amount of water that could be withdrawn is estimated at 1 acre-ft per acre per year.
4. The transmissivity of the "basin" ranged from 390 to 2,560 ft^2/day and averaged 1,480 ft^2/day.
5. The principal source of natural pollution is brackish or salty water that occurs in the deeper parts of the "basin" along the Red River. However, except for these areas near the River, pollution by natural sources would probably be of limited extent.

*"Prior rights," as defined by the Oklahoma Water Resources Board, is the right to use ground water established by compliance with the laws in effect prior to July 1, 1973, the effective date of the Ground Water Act.

GEOHYDROLOGY OF THE ANTLERS AQUIFER (CRETACEOUS), SOUTHEASTERN OKLAHOMA

DONALD L. HART, JR.,[1] AND ROBERT E. DAVIS[2]

Abstract—The Antlers aquifer, which consists of as much as 900 feet of friable sandstone, silt, clay, and shale, crops out in an area of 1,860 square miles and underlies about 4,400 square miles in southeastern Oklahoma. Precipitation ranges from 34 to 50 inches per year across the outcrop area, which is well suited to allow high rates of infiltration. The aquifer contains an estimated 31,600,000 acre-feet of water having less than 1,000 milligrams per liter dissolved solids. The average saturated sand thickness is 250 feet. Aquifer tests in the confined part of the aquifer give an average storage coefficient of 0.0005 and an average transmissivity of 1,480 feet squared per day. The estimated specific yield of the unconfined part of the aquifer is 0.15; the transmissivity has not been determined. Large-capacity wells tapping the aquifer commonly yield 100 to 500 gallons per minute; the maximum measured yield is 1,700 gallons per minute. Water usage from the aquifer is very small owing to the availability of an abundance of surface water. Water quality throughout the central and northern part of the aquifer is generally acceptable for municipal use. A few wells, however, yield water containing concentrations of iron and manganese exceeding the limit recommended for municipal use by the National Academy of Sciences and National Academy of Engineering (1972).

INTRODUCTION

The future economy of southeastern Oklahoma (fig. 1) is largely dependent upon wise use and management of the region's water resources. A major source of water in this area is the Antlers Sandstone (Lower Cretaceous),[3] which underlies an area of about 4,400 mi^2. The name Antlers aquifer is used in this report where the hydrologic characteristics of the formation are described. Proper development, use, and management of this aquifer can be best achieved if the hydrologic system is adequately defined and the manner in which the system operates is determined. In order to provide such information, the Oklahoma Geological Survey requested that the U.S. Geological Survey appraise the Antlers aquifer and determine its potential, in terms of quantity and quality, for additional supplies of ground water.

Information used in the study was obtained in the field, from published reports (Davis, 1960; Hart, 1974; Havens and Bergman, 1976), from unpublished files of the U.S. Geological Survey, and from Engineering Enterprises, Inc., Norman, Oklahoma. Geophysical well logs were obtained from the library of the Oklahoma City Geological Society. This report delineates the occurrence and movement of water in the Antlers aquifer and describes the chemical characteristics of that water.

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[3] The stratigraphic nomenclature is that of the Oklahoma Geological Survey and does not necessarily agree with that of the U.S. Geological Survey.

Publication authorized by the director, U.S. Geological Survey.

Conversion Factors

U.S. customary units used in this report may be converted to SI (International System of Units) metric units by the following conversion factors:

U.S. customary unit	Multiply by	Metric unit obtained
in. (inch)	25.4	mm (millimeter)
ft (foot)	0.3048	m (meter)
mi (mile)	1.609	km (kilometer)
ft^2 (square foot)	0.0929	mi^2 (square mile)
acre (acre)	4,407	m^2 (square meter)
mi^2 (square mile)	2.590	km^2 (square kilometer)
acre-ft (acre-foot)	1,233	m^3 (cubic meter)
gal/min (gallon per minute)	0.06308	L/s (liter per second)
(gal/min)/ft (gallon per minute per foot)	0.207	(L/s)/m (liter per second per meter)
ft/d (foot per day)	0.000003528	m/s (meter per second)
ft^2/d (foot squared per day)	0.000001075	m^2/s (meter squared per second)
acre-ft/mi^2 (acre-foot per square mile)	476.06	m^3/km^2 (cubic meter per square kilometer)

Well-Numbering System

The well numbers in this report give the location of wells according to the U.S. Bureau of Land Management system of land subdivisions, as follows: township number, range number, section number, letters designating position within the quarter, quarter-quarter, and quarter-quarter-quarter section and sequence number. This method of well location is shown in figure 2.

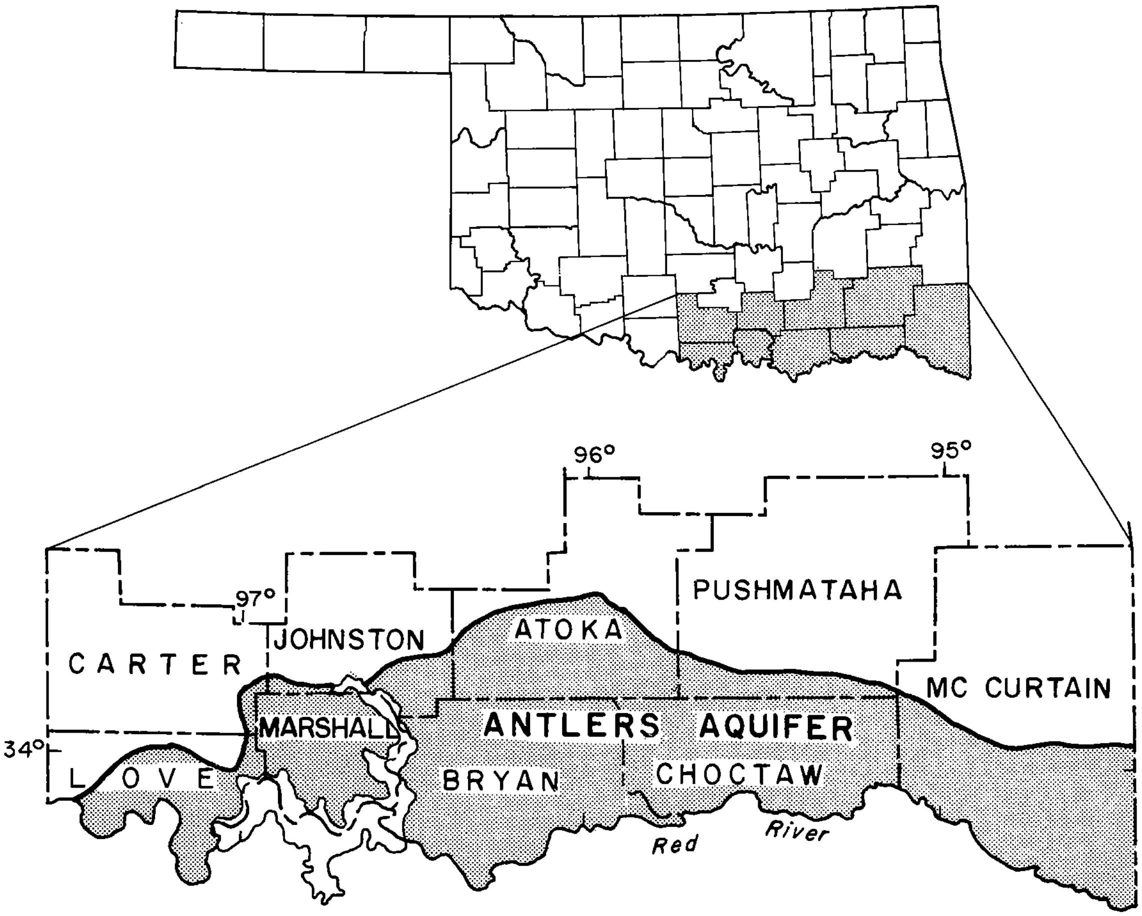


Figure 1. Location of study area.

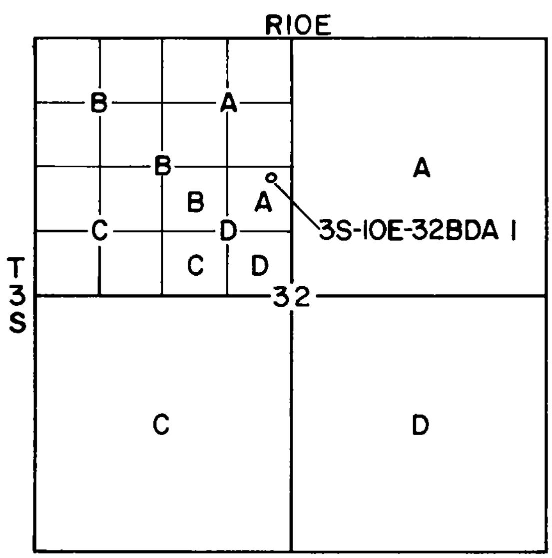


Figure 2. Well-numbering system.

Physiography and Drainage

The Antlers Sandstone and younger Cretaceous rocks underlie the Gulf Coastal Plain Physiographic Province. The area has an average altitude of about 500 ft and consists of about 90 percent plains with about 100 ft of local relief. Several northward-facing escarpments are caused by erosion of southward-dipping beds of limestone.

The area is drained by the Red River and several of its major tributaries, the Little, Kiamichi, Muddy Boggy, Blue, and Washita Rivers. The Red River has a gradient of about 1 ft/mi, and the major tributaries have gradients ranging from 1 to 3 ft/mi. The smaller tributaries generally have gradients of 10 to 20 ft/mi. Drainage patterns of the tributaries are commonly dendritic, which is typical of areas of homogeneous lithology and little topographic relief.

Climate

The Gulf Coastal Plain region has a semihumid to humid climate characterized by hot summers and mild winters. Precipitation in the study area ranges from 34 in. in the west to about 50 in. in the east (U.S. Department of Agriculture, 1932–40; U.S. Department of Commerce, 1941–65, 1966, 1967–70, 1971–75). Average annual lake evaporation ranges from 58 in. in the west to about 50 in. in the east (Oklahoma Water Resources Board, 1969). The greatest precipitation occurs in April and May, and the least in December and January. The distribution of average monthly precipitation and the average annual precipitation are shown in figure 3.

GEOLOGY

The Antlers Sandstone is a Lower Cretaceous transgressive sheet of sand that becomes progressively younger northward and is the basal Cretaceous formation in southeastern Oklahoma, except in McCurtain County, where it is underlain in the subsurface by the DeQueen Limestone and the Holly Creek Formation. The Antlers is believed to be equivalent to the upper part of the Trinity Group as recognized in Texas (Huffman and others, 1975). The formation consists of sand, clay, conglomerate, and limestone deposited over an erosional surface of Paleozoic rocks, which are mostly shale, siltstone, and sandstone. The Antlers crops out in an east-west band, 3 to 15 mi wide, extending from the Arkansas border north of Idabel to near Ardmore, and then swings southward to Texas near Marietta (plate 1, in pocket). The outcrop generally dips to the south and southeast at 30 to 80 ft/mi. In the subsurface, the maximum dip is about 200 ft/mi. The outcrop area is generally heavily vegetated and highly weathered. Younger deposits of alluvium and terrace materials are present along the Red River and its major tributaries.

The sediments of the Antlers Sandstone represent materials derived from a nearby shoreline of a slowly advancing sea (Davis, 1960; Fredrickson and others, 1965; Huffman and others, 1975). In most areas, the basal unit is composed of clay- and silt-size material. Locally, the basal unit consists of conglomerate or calcareous-cemented sandstone. The conglomeratic material is mostly chert, quartz, and limestone pebbles derived from the underlying Paleozoic strata. Conglomerate also occurs locally in lenslike bodies throughout the lower part of the Antlers. The upper part of the Antlers consists of beds of sand, weakly cemented sandstone, sandy shale, silt, and clay; crossbedded sand is common. The color of the Antlers ranges from white to yellow and maroon, with red and yellow shades predominating. Locally the sand is well indurated by ferruginous cement, forming hard, dark-red lenses.

Figures 4 and 5 show structure contours of the base and the top of the Antlers Sandstone. The strike of both the base and the top is in a general east-west direction from the Oklahoma-Arkansas border to near Durant, where the strike changes to a general north-south orientation. The base and the top have a similar configuration, although the base dips more steeply than the top in most areas.

The geohydrologic sections in plate 1 show the general southward dip and downdip thickening of the Antlers. Also shown on these sections are the potentiometric surface and the water quality as interpreted from geophysical logs and water analyses.

Figure 6 shows that the greatest percentage of sand to total thickness of the aquifer is in and just south of the outcrop area, where the sand makes up as much as 80 percent of the total thickness; the remaining 20 percent is clay. South and southeast of the outcrop, the percentage of the sand to total thickness decreases to less than 40. The Antlers also thickens southward, as shown in figure 7, so even though the overall percentage of sand decreases the composite thickness of sand increases southward.

GROUND WATER

Hydrologic Properties of Water-Bearing Materials

The quantity of ground water that an aquifer can yield to wells depends upon the hydrologic properties of the aquifer. The capacity of an aquifer to transmit water is measured by its transmissivity (**T**), which is the rate at which water of the prevailing temperature is transmitted through a unit width of the aquifer under a unit hydraulic gradient expressed in feet squared per day (ft^2/day)(Lohman and others, 1972, p. 13). The hydraulic conductivity (**K**) of an aquifer is the volume of water at the existing temperature that will move in unit time under a unit hydraulic gradient through a unit area measured at right angles to the direction of flow expressed in feet per day (ft/d) (Lohman and others, 1972, p. 4). Hydraulic conductivity can be thought of as transmissivity divided by the saturated thickness of the aquifer. The storage coefficient (**S**) of an aquifer is the volume of water it releases from or takes into storage per unit surface area of the aquifer per unit change in head (Lohman and others, 1972, p. 13) and is a dimensionless figure. Under water-table conditions the storage coefficient is practically equal to the specific yield of the aquifer, which is defined as the ratio of the volume of water a saturated material will yield by gravity in proportion to its own volume (Lohman and others, 1972, p. 12).

The specific capacity of a well is the rate of discharge of water from the well divided by the

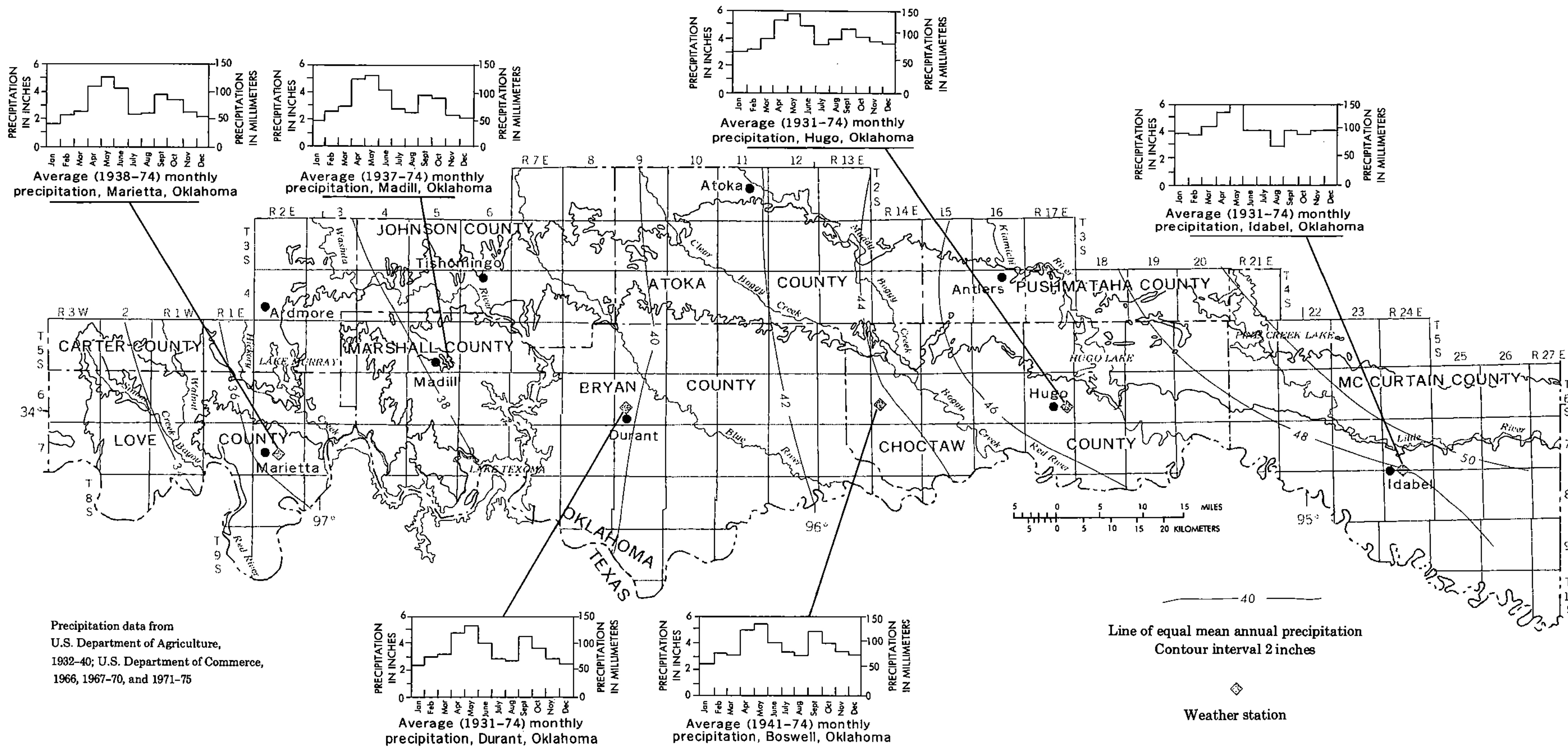
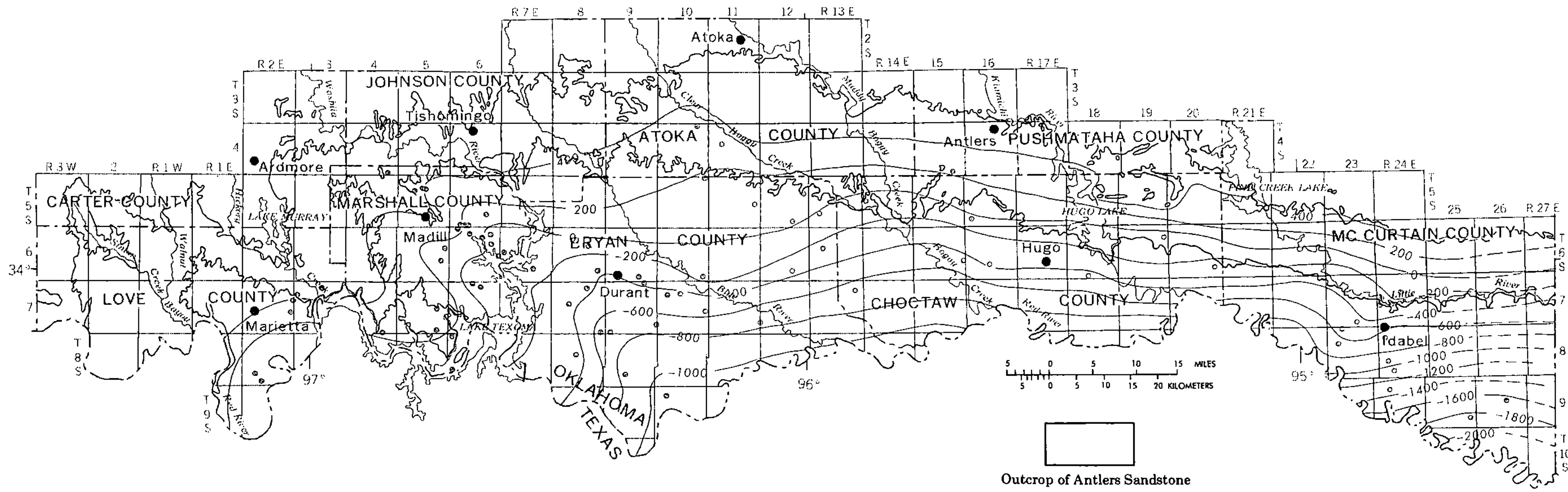


Figure 3. Precipitation map.



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Structure contour

Shows altitude of base of Antlers Sandstone. Dashed where approximate. Contour interval 200 feet. Datum: mean sea level

Control point

Geophysical log used to determine base of Antlers Sandstone.

Figure 4. Structure-contour map showing base of Antlers Sandstone.

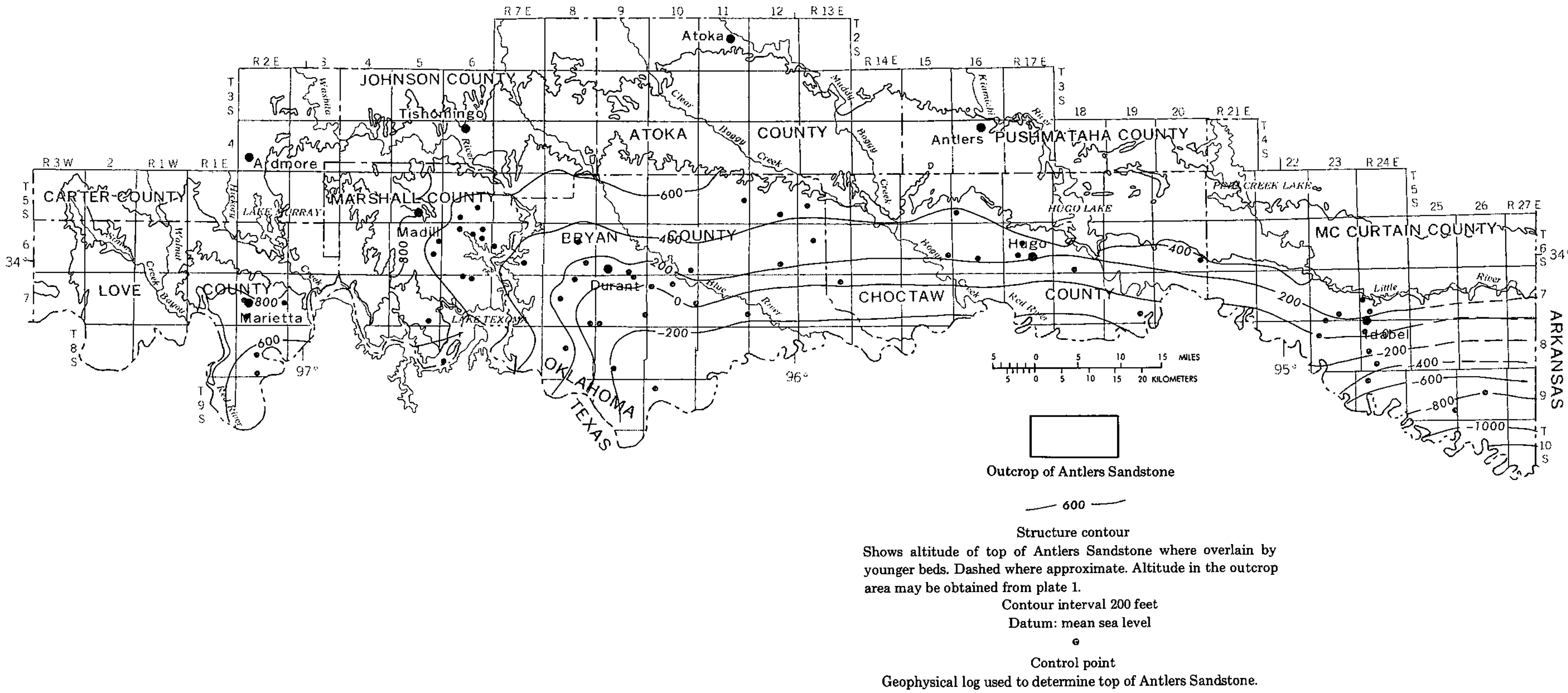


Figure 5. Structure-contour map showing top of Antlers Sandstone.

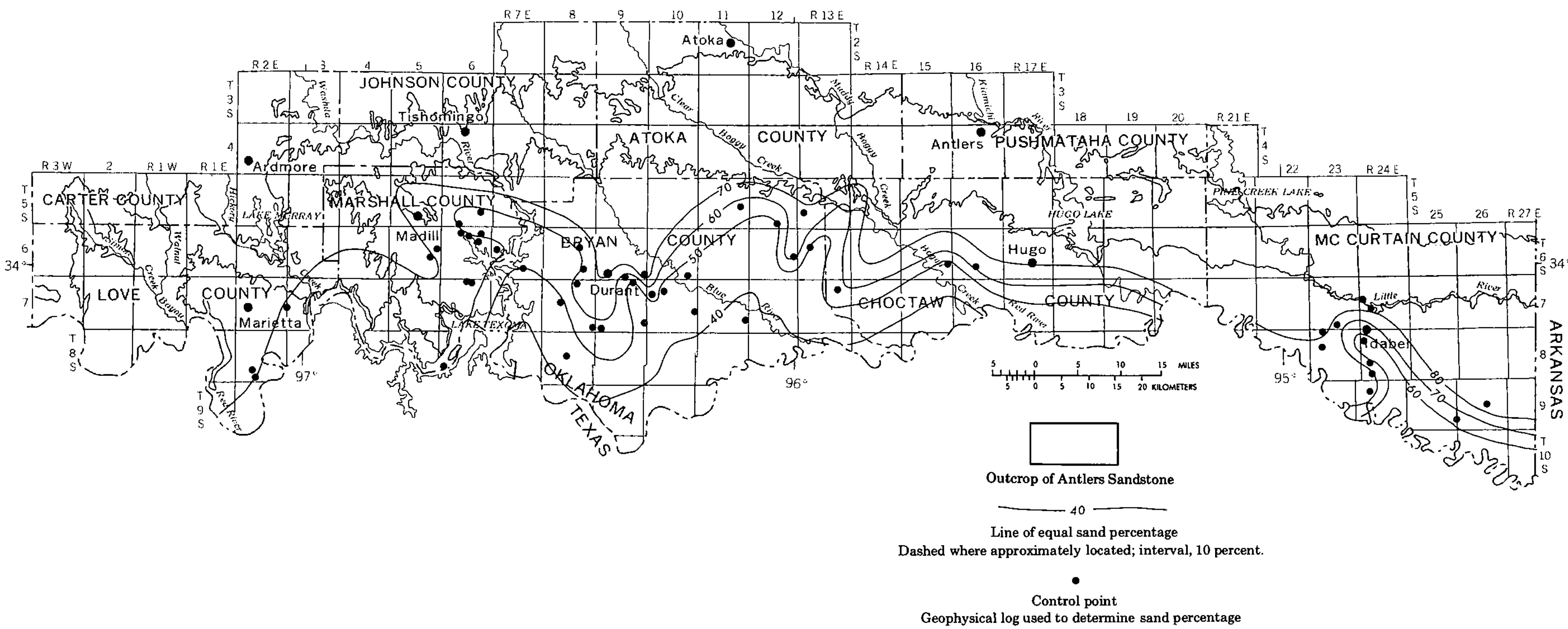


Figure 6. Map showing percentage of sand in Antlers Sandstone.

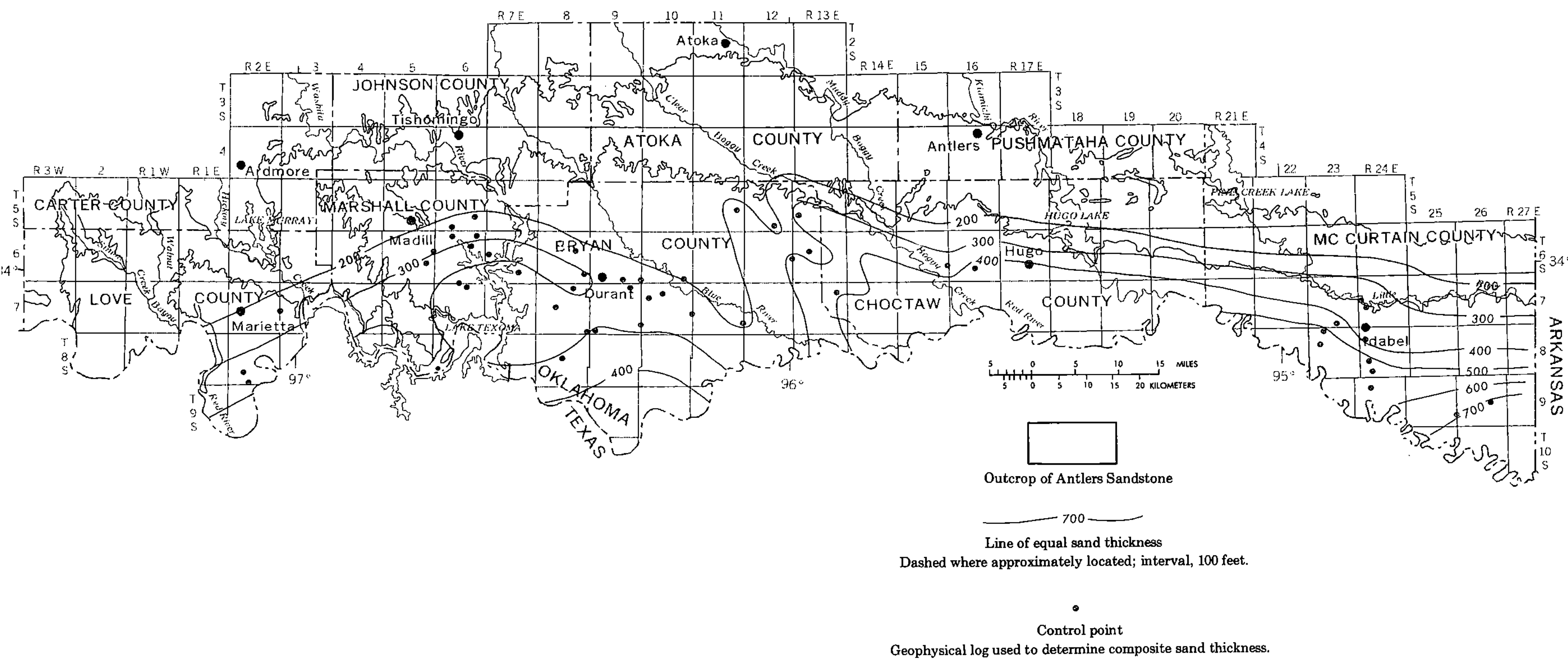


Figure 7. Map showing composite sand thickness of Antlers Sandstone.

drawdown of water level within the well. Specific capacity varies slowly with duration of discharge (Lohman and others, 1972, p. 11).

The hydrologic properties described commonly are determined from aquifer tests, and these tests may be used in conjunction with water-level contour maps to estimate the quantity of ground water moving laterally through the water-bearing formations. Hydrologic coefficients can be used to estimate storage, changes in storage (the quantity of water removed from or added to the ground-water reservoir), and amount of local recharge.

A total of 21 tests were available to determine some of the aquifer properties for the Antlers aquifer. Where several tests were made in a relatively small area, the test results were averaged in order to evaluate the aquifer characteristics. The results are as follows:

Test vicinity	Number of tests	Average transmissivity (ft^2/d)	Average storage coefficient (dimensionless)	Average specific capacity [(gal/min)/ft]	Average duration of test (hours)
Valliant	1	1,900	0.0004	10	3
Fort Towson	2	2,560		11.1	3
Hugo	6	2,020	.00013	5.1	2
Durant	9	510	.00055	3.2	—
Kingston	3	390	.0010	4.5	12
Average		1,480	0.0005	6.8	

Appended to this report are three tables (see Appendix) that present basic hydrologic data for the Antlers aquifer, including records of wells, test-holes, and springs (table 4); water analyses (table 5); and low-flow discharge measurements for selected streams (table 6).

Occurrence and Movement

Water in the Antlers aquifer is contained in the voids or interstices in the zone of saturation. Water in the outcrop area is unconfined, and the upper limit of the zone of saturation is the water table. Where the Antlers is saturated and overlain by the Goodland Limestone or where the Antlers has an extensive upper clay unit, the aquifer is confined, and water will rise above the upper confining layer when the aquifer is tapped by a well. If the altitude of the land surface at a well site is lower than the water level in the aquifer at that site, the pressure will be sufficient to cause the water to flow naturally from the well. The depth to water below land surface in numerous wells is shown in plate 1.

Although numerous clay units separate the productive water-bearing sands in the aquifer, the clays are not continuous and the individual sands are hydrologically connected.

Under natural conditions the water table or potentiometric surface is near equilibrium, and the quantity of water stored in ground-water reservoirs is relatively constant, varying slightly in response to changes in annual precipitation, streamflow, and evapotranspiration. However, pumping large quantitites of water will disturb the natural equilibrium, causing water levels to decline. The operation of a ground-water reservoir is based on the following relationship:

Change in storage = recharge-discharge.

Although each of the terms consists of several components, the relation between them is simple and direct. When recharge exceeds discharge, the quantity of water in storage increases and the water level rises. Conversely, when discharge exceeds recharge, the quantity of water in storage decreases and the water level declines. Pumpage for municipal water supplies from the Antlers has caused the development of cones of depression near Marietta, Bokchito, and Hugo, but potential recharge to the system is far greater than the present usage and no significant reduction in ground-water storage has been observed. In most areas, the aquifer is saturated to near its maximum capacity; much of the potential recharge is rejected, running off to nearby streams or seeping from the aquifer to contribute to base flow of streams.

Figure 8 shows the approximate altitude of the potentiometric surface in the Antlers aquifer. Movement of water through the aquifer is from points of higher head to points of lower head. The areas of higher head are generally in the outcrop area, and from here the head decreases generally southward and southeastward. Locally, the pattern is modified by streams incised into the water table. The general direction of water movement in the aquifer can be determined by constructing flow lines at right angles to the water-level contours.

Measurements used in constructing the potentiometric map were made over several years. Measurements in selected wells in each county were made again in 1975 to determine if a significant change in water level had occurred. Most measurements showed that the water level had changed less than 1 ft, indicating that the earlier

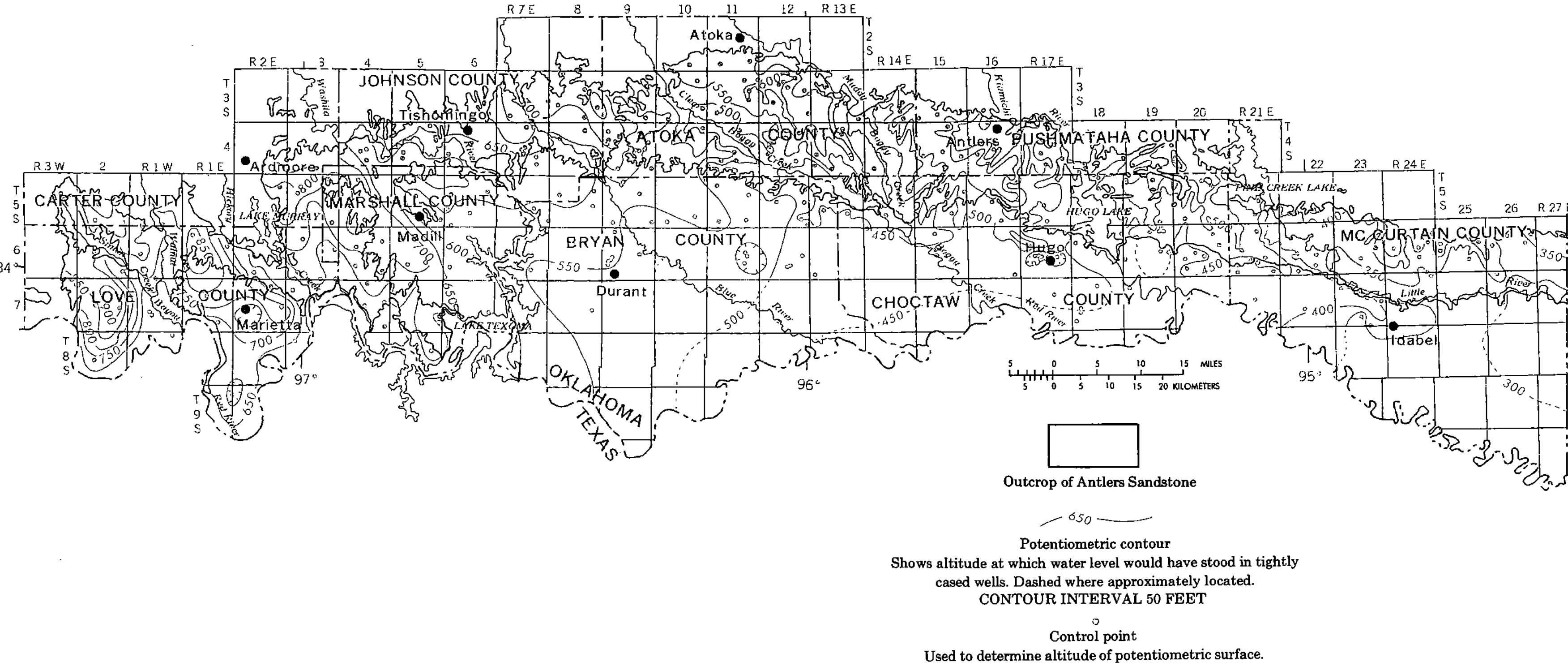


Figure 8. Potentiometric map of Antlers aquifer, 1975.

water-level measurements could be used to construct the 1975 map.

Recharge

Recharge to the Antlers aquifer is from precipitation on the outcrop, by seepage from lakes or other bodies of surface water, and by vertical and lateral movement of water from one underground reservoir to another. The latter process is not a primary source of recharge but incidental to the main movement of ground water. The soil mantle and outcropping sand provide an excellent catchment for recharge to the aquifer. During periods of precipitation, a part of the water runs off to the streams, part is evaporated, part enters the soil zone and is transpired by vegetation, and any remaining water percolates downward to the saturated zone. Recharge is most effective during periods of extended, moderate to heavy rainfall when the requirements of evaporation and transpiration are quickly satisfied. Recharge from precipitation may occur in any month of abundant rainfall but is least likely in July, August, and September because of the usual soil-moisture deficiency during those months. The potentiometric surface is most likely to show a rise, resulting from recharge, during April, May, and June, when rainfall is greatest, soil moisture is adequate, and transpiration is not excessive.

In addition to recharge from precipitation, water can enter the aquifer by infiltration from lakes impounded on the outcrop or by streams flowing over the outcrop. Lake Texoma, the largest surface-water reservoir in the study area, covers part of the outcrop of the Antlers Sandstone and contributes water to or receives water from the Antlers, depending on the lake stage and the part of the lake considered.

Low-flow discharges of streams are an indication of rejected recharge. Studies by Westfall (1963) and Laine (1963) show an increase in low-flow discharge along reaches of streams in the Kiamichi and Muddy Boggy River basins (plate 1) across the outcrop of the Antlers Sandstone. Additional measurements of low-flow stream discharge were made during the winter of 1975–76 on Little Hauani, Davis, Dumpling, and Gates Creeks (see table 6 in Appendix). These data are used to estimate recharge to the aquifer. Low-flow contributions per square mile of drainage area tend to increase from west to east and range from 55 to 440 (acre-ft/mi^2)/year. The west-to-east increase probably is due to the eastward increase in annual precipitation (fig. 3). The average low-flow contribution is 170 (acre-ft/mi^2)/year, or 3.2 in./year, which is approximately 7 percent of the precipitation that falls on the outcrop. This amount most likely represents a minimum recharge volume, because some water is evaporated or transpired from the aquifer where water levels are near the surface, some water may leak to adjacent formations, and some may leave the area as underflow to Texas. Actual recharge rates are estimated to be about 300 (acre-ft/mi^2)/year, or 6 in./year, which represents about 15 percent of the average annual precipitation of about 42 in. The total recharge to the aquifer from precipitation is estimated to be 600,000 acre-ft of water annually.

Discharge

Water in the Antlers aquifer in Oklahoma is discharged naturally through springs and seeps, evaporation, transpiration by plants, underflow out of Oklahoma to the south and southeast, and, in the artesian part of the reservoir, by upward movement of water through less permeable confining strata. Estimates of the natural discharge rates to streams are given in the section on recharge (see also table 6 in Appendix).

Water is discharged artificially by means of pumpage and by flowing artesian wells. The estimated gound-water withdrawals from the Antlers aquifer (1975) are:

Use	Quantity (acre-ft)
Public	3,100
Irrigation	2,340
Industrial	190
Rural	1,370
Total	7,000

Water use for municipal, industrial, and rural purposes can be expected to increase in southeastern Oklahoma because the area is rapidly attracting industries that need moderate quantities of good-quality water. Some of these industries will develop surface-water supplies, but many may depend on ground water. Demand for irrigation water is likely to be very limited because of the relatively large amount of precipitation that falls in the Coastal Plain area. Rural water usage may increase rapidly as industry develops in the area, but rural wells will be widely spaced and will usually pump for only short periods at rates of 5 to 10 gal/min; recharge induced from precipitation will nullify most of the effects of pumping.

Water Quality

Water samples obtained over several years from about 50 wells tapping the Antlers aquifer were analyzed to determine common chemical characteristics of the water in this aquifer. In addition, nine water samples were analyzed for trace constituents, and four water samples were analyzed for selected radiochemical parameters. For detailed tabulations, see also table 5 in Appendix.

In general, water quality tends to degrade downdip (fig. 9, plate 1). In some areas, water in the upper part of the aquifer contains less than 1,000 mg/L dissolved solids, whereas water in the lower part contains more than 1,000 mg/L dissolved solids.

Water from the Antlers aquifer is variable in its chemical composition. The water is usually of the sodium bicarbonate type in the outcrop area and in the areas directly downdip of the outcrop, although locally it may be of the calcium bicarbonate or calcium sulfate type. As the water moves downdip, it changes to a sodium chloride type. Based on the analyses available, most of the wells yield water with a dissolved-solids concentration of less than 500 mg/L (table 1).

Figure 10 shows the relationship between the dissolved-solids concentration and the specific conductance of water samples from the Antlers, as determined by linear regression analysis. Because the samples had been analyzed during a 30-year period, specific conductance of water samples from additional wells was spot-checked in the field to determine if significiant water-quality changes had occurred in the aquifer. Very little change in water quality was noted based on comparisons of specific conductance or dissolved solids. Site selection for collecting additional water samples was based on these spot-checks and the available analyses.

Water was collected in March 1975 from four wells in the study area. The water samples were analyzed by the U.S. Geological Survey for radioactive substances (table 2). Gross alpha activities are expressed in this report as micrograms per liter (μg/L) of natural uranium. Gross beta activities of cesium-137 and strontium-90 are expressed in picocuries per liter (pCi/L). The analyses show that none of the water samples exceeded the limits as defined by the U.S. Environmental Protection Agency for public water supplies. In drinking water the primary regulation limit for gross alpha activity is 22 μg/L (15 pCi/L) expressed as natural uranium; the primary regulation limit for gross beta is 50 pCi/L expressed as strontium-90 (U.S. Environmental Protection Agency, 1976). The values for gross beta as cesium-137 are approximately 25 percent higher than the values for gross beta as strontium-90 as a result of the different calibration isotope, but in essence they measure the same activity. All analyses for gross beta include potassium-40 (V. J. Janzer, oral communication, 1977).

Table 3 gives concentrations of selected trace elements in water samples collected in October 1975 from wells at or near towns in the study area. Concentrations of most constituents were lower than the maximum limits allowed by the U.S. Environmental Protection Agency (1975) or the maximum limits recommended by the National Academy of Science and National Academy of Engineering (1972) for municipal supply. However, a few wells yielded water containing concentrations of iron and manganese greater than the limits recommended by the National Academy of Science and National Academy of Engineering (1972).

Well Design

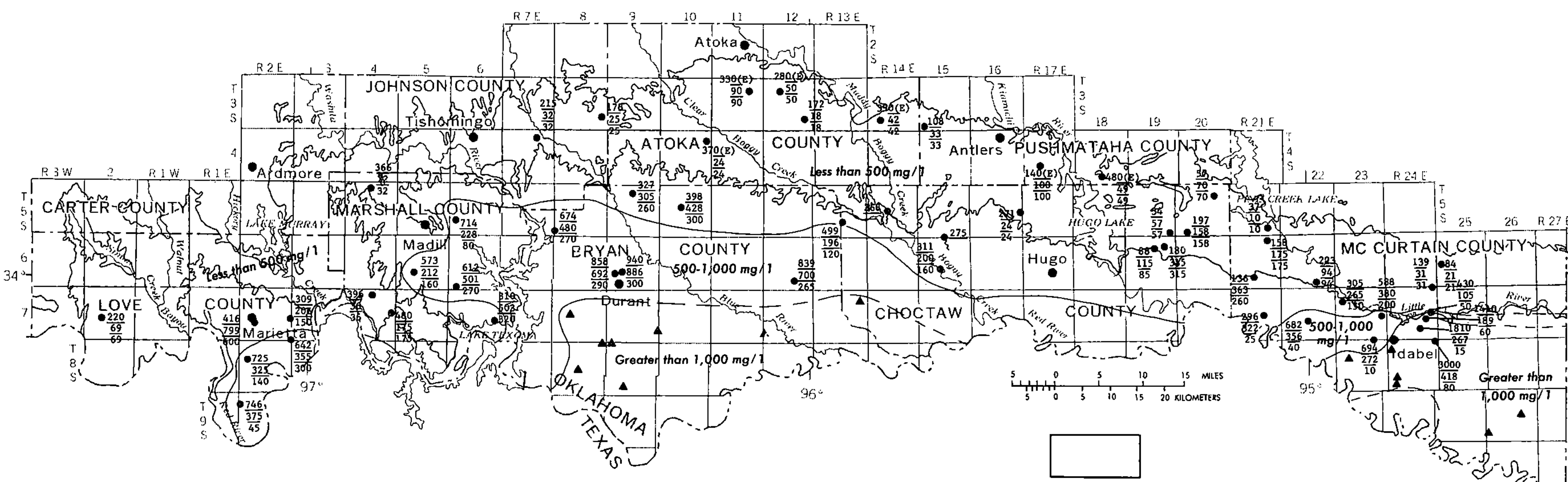
Many wells in the Antlers aquifer yield 20 to 100 gal/min, which is generally adequate for the intended purpose. A problem common to many wells is that improper construction allows fine-grained sand from the Antlers to move through the well screens, perforations, or casing slots and into the well, causing rapid wear of the pump assembly, reduced well yields, and eventual plugging of the well. Properly constructed wells provide greater well yields and reduced pumping lift and are less likely to pump sand. Generally, the most successful wells fully penetrate the aquifer and are completed with well screens designed for the sand sizes penetrated. Well screens of the proper size are placed opposite favorable sand zones, and the well is packed with sand or gravel of suitable size. The pack used in many wells is far too coarse, allowing the fine-grained sand of the aquifer to move through the porous space of the pack and into the well. Wells using proper construction techniques have produced nearly 1,700 gal/min.

Antlers Aquifer as a Source of Water

The largest quantity of recoverable water in the confined part of the aquifer is along the southern boundary of the study area, where the composite sand thickness is greatest (fig. 7). However, the water in this area generally has a dissolved-solids concentration of 1,000 mg/L or more and may be unsuitable for some uses (fig. 9).

North of this area the aquifer contains water having a dissolved-solids concentration of generally less than 1,000 mg/L. Properly constructed and developed wells may produce as much as 2,500 gal/min. This estimate is based on a specific capacity of 4 gal/min/ft, assuming little or no drawdown below the top of the aquifer. The specific capacity was determined by averaging the results of tests on the artesian part of the aquifer.

The estimated quantity of water stored in the water-table part of the aquifer is 44.6 million acre-ft, based on a specific yield of the sand of 0.15, an average saturated thickness of 250 ft, and an outcrop area of about 1.2 million acres. The estimated quantity of water stored in the confined part of the aquifer is 0.5 million acre-ft, based on an average storage coefficient of 0.0005, an average saturated thickness of 600 ft, and an area of 1.6 million acres. The total estimated quantity of water in storage, therefore, is slightly more than 45 million acre-ft. About 30 percent of the water in storage has a dissolved-solids concentration of 1,000 mg/L or



327
305
200

Sampling site

Top number is dissolved-solids concentration in milligrams per liter, (E) denotes site where dissolved-solids concentration was estimated from specific conductance measurement. Middle number is well depth in feet. Bottom number is thickness of Antlers aquifer penetrated by the well, in feet.

275

Spring sampling site

Top number is dissolved-solids concentration in milligrams per liter.

▲

Site where dissolved-solids concentration was determined from geophysical logs to be greater than 1,000 mg/l in the entire aquifer.

Line of equal dissolved-solids concentration

Dashed where approximately located. In some areas, only the upper part of the aquifer contains water having the indicated dissolved-solids concentration. The lower parts may contain water having a higher dissolved-solids concentration.

Figure 9. Map showing dissolved-solids concentration in water from Antlers aquifer, 1975.

TABLE 1.—SUMMARY OF PHYSICAL PROPERTIES AND CHEMICAL ANALYSES FOR COMMON CONSTITUENTS IN WATER FROM ANTLERS AQUIFER

Constituent	Units	Concentration			Number of Samples
		Minimum	Maximum	Median	
Calcium	mg/L	1.2	146	18	41
Magnesium	mg/L	0.4	35	5.5	41
Sodium and potassium	mg/L	1.0	1,100	99.4	55
Bicarbonate	mg/L	9	612	276	55
Sulfate	mg/L	1.6	471	38.5	54
Chloride	mg/L	2.6	1,300	20	55
Fluoride	mg/L	0.0	3.0	0.15	28
Nitrate (as NO_3)	mg/L	0.0	100	1.0	53
Total hardness	mg/L	4	508	90	55
Dissolved solids	mg/L	34	3,000	396	55
Specific conductance	µmho/cm @ 25°C	40	5,090	617	47

TABLE 2.—RADIOCHEMICAL ANALYSES OF WATER FROM SELECTED SITES

Constituent or property	Reporting units	Limit[1]	Concentration			
			7S-2E-20ADD1 Marietta, Love Co.	5S-10E-16BDB1 Caddo, Bryan Co.	6S-17E-21DAC1 Hugo, Choctaw Co.	6S-22E-30DAC1 Millerton, McCurtain Co.
Dissolved gross alpha, U(natural)	[2]µg/L	22 µg/L	<7.4	<9.3	8.9	6.4
Dissolved gross beta, Ce	[3]pCi/L	—	3.2	3.7	4.5	3.2
Dissolved gross beta, Sr^{90}	pCi/L	50 pCi/L	2.7	3.0	3.7	2.5
Dissolved K^{40}	pCi/L	—	0.7	0.2	0.9	0.4
Depth of well	feet	—	805	404	429	82
Thickness of Antlers aquifer penetrated	feet	—	700	300	100	82

[1]Limits as required by the U.S. Environmental Protection Agency, 1975.
[2]Micrograms per liter (µg/L).
[3]Picocuries per liter (pCi/L).

TABLE 3.—CHEMICAL ANALYSES AND PHYSICAL PROPERTIES OF WATER FROM SELECTED WELLS TAPPING ANTLERS AQUIFER AT OR NEAR PRINCIPAL TOWNS IN STUDY AREA

(Concentrations are in micrograms per liter (ug/L) or milligrams/per liter (mg/L) as indicated by limits)

Constituent or property	Limit for public supply	Concentration								
		7S-2E-20ADD1 Marietta, Love Co.	4S-4E-16DBB1 Mannsville, Johnston Co.	6S-6E-30BDC2 Kingston, Marshall Co.	5S-10E-16BDB1 Caddo, Bryan Co.	6S-12E-27CBA1 Bennington, Bryan Co.	6S-17E-21DAC1 Hugo, Choctaw Co.	6S-19E-24ABD1 Fort Towson, Choctaw Co.	6S-22E-30DAC1 Millerton, McCurtain Co.	6S-25E-28DDC1 Broken Bow, McCurtain Co.
Arsenic	[1]50 ug/L	1	1	0	0	0	0	0	0	0
Cadmium	[1]10 ug/L	0	1	0	0	0	0	0	0	1
Chromium	[1]50 ug/L	0	0	0	0	0	4	0	4	4
Mercury	[1]2 ug/L	0	0	0	0	0	0.1	0	0	0
Selenium	[1]10 ug/L	0	0	0	0	0	0	0	0	0
Barium	[1]1,000 ug/L	100	100	0	0	0	100	100	100	0
Copper	[2]1,000 ug/L	4	5	0	0	2	3	0	35	19
Fluoride										
[3]Temperature °F / °C	[2]Limit, mg/L									
53.7 & below / 12.0 & below	2.4									
53.8 to 58.3 / 12.1 to 14.6	2.2									
58.4 to 63.8 / 14.7 to 17.6	2.0	0.4	0.3	0.3	0.3	1.3	0.2	0.1	0.1	0.1
63.9 to 70.6 / 17.7 to 21.4	1.8									
70.7 to 79.2 / 21.5 to 26.2	1.6									
79.3 to 90.5 / 26.3 to 32.5	1.4									
Iron	[2]300 ug/L	20	10	30	90	10	40	440	20	0
Lead	[2]50 ug/L	2	0	0	0	1	1	0	0	2
Manganese	[2]50 ug/L	0	0	0	5	0	120	60	10	4
Zinc	[2]5,000 ug/L	10	20	20	6	20	4	6	30	8
pH	—	8.5	6.8	8.8	9.2	9.3	6.7	6.8	4.9	5.0
Specific conductance at 25°C	—	790	580	880	1,120	1,120	560	410	49	30
Temperature °C	—	24	19	20	18	22	21	24	20	21
Well depth (feet)	—	805	45	500	404	750	429	35	82	80
Thickness of Antlers aquifer penetrated by well (feet)	—	700	45	210	300	340	100	35	82	80

[1]Limits as required by the U.S. Environmental Protection Agency, 1975.
[2]Recommended limits for public supply as established by the national Academy of Science, National Academy of Engineers, 1972.
[3]Annual average of the maximum daily air temperature of the location.

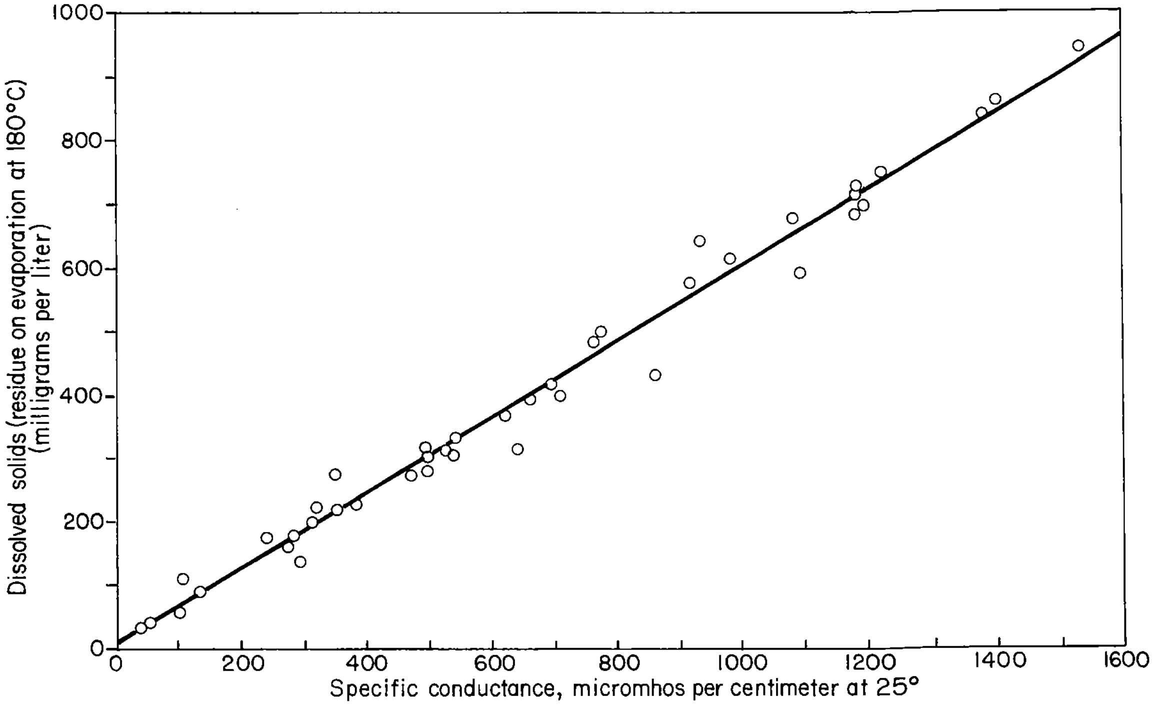


Figure 10. Relationship between specific conductance and dissolved-solids concentration of water from Antlers aquifer.

more, making the net quantity of water having less than 1,000 mg/L dissolved solids approximately 31.6 million acre-ft.

In order to tap the unconfined part of the aquifer at a given site, wells must be drilled to below the potentiometric surface (fig. 8). To fully penetrate the aquifer at a site, wells must be drilled to the base of the aquifer (fig. 4).

In order to tap the artesian part of the aquifer at a given site, wells must be drilled to below the top of the aquifer (fig. 5). Water-quality considerations may necessitate tapping only the upper parts of the aquifer (figs. 4, 9). An example is a potential well site in sec. 15, T. 6 S. R. 13 E., having a land-surface altitude of 650 ft. The altitude of the top of the aquifer is about 275 ft; the altitude of the base of the aquifer is about −300 ft. Above an altitude of about 50 ft, the water has a dissolved-solids concentration less than 1,000 mg/L. A well at this site would have to be deeper than 375 ft to reach the top of the aquifer. To fully penetrate the aquifer, the well would have to be 950 ft deep. To obtain only water having a dissolved-solids concentration less than 1,000 mg/L, the well should be drilled no deeper than 600 ft.

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APPENDIX

TABLE 4.—RECORDS OF WELLS, TEST-HOLES, AND SPRINGS

ATOKA COUNTY

WELL LOCATION	OWNER OR USER	YEAR DRILLED	WELL DEPTH (FT)	WATER USE	WELL DIAMETER (IN)	DEPTH TO WATER (FT)	DATE MEASURED (MO-YR)	WELL YIELD (GAL/MIN)	AQUIFERS	ALTITUDE OF LAND SURFACE (FT)
02S-10E-34AAA 1	WEBSTER,R		20 0	H	42	16 A	8-68		BK	610
02S-11E-26DDD 1	DELAY,C.	1963	101 0	H	6	10 A	8-68	2 0	BK	600
02S-11E-32BAA 1	MCINICH,J.L.	1955	48 0	H		29 A	8-68	1 0	BK	610
02S-12E-30CCB 1	SMITH,EARL	1971	60 3	H		5 D		6	BK	560
03S-09E-35AAD 1	KING,E		32 0	U	42	5 A	8-68		BK	650
03S-10E-02DDD 1	DETWILER,E.G.	1966	75 6	H	6	32 A	8-68	2 0	BK	605
03S-10E-25BAB 1	MCCUSTER,C.		105 0	H		61 A	8-68	1 0	BK	530
03S-10E-32BDA 1	HOWARD,P.D.	1963	44 0	H	42	39 A	8-68	1 0	BK	642
03S-11E-01DDD 1	HOPPS,C.		92 0	H	6	83 A	3-50		BK	610
03S-11E-11BBB 1			90 1	S		43 A	10-77		BK	
03S-11E-11DC 1	LEWIS, SINA		180 3	H	5	40 D		22	BK	640
03S-11E-23ABB 1	JACOBS,DANIEL	1972	70 3	H		20 D		5	BK	620
03S-11E-29BCC 1	CROSBY,W.C.	1968	90 0	H	6	60 A	8-68		BK	520
03S-12E-03ADD 1	WILLIAM,C.		15 0	H	72	10 A	3-50		BK	610
03S-12E-03BBB 1	DANDRIDGE,J.D.		115 3	H	5	21 D		5	BK	575
03S-12E-04ABB 1	JONES,W.		46 0	H	6	22 A	3-50		BK	605
03S-12E-08AAA 1	WOODS		50 6	H		7 G			BK	582
03S-12E-09ADC 1	UPDEGRAFF,H.		87 6		10	10 G	3-49		BK	630
03S-12E-10CBB 1	MCCONNELL,B.		64 0	S	6	44 A	3-50		BK	630
03S-12E-13BBB 1	KEENON,W.	1943	110 6	H	8	95 G	3-50		BK	610
03S-12E-13DDA 1	SHEFFIELD,RAY		35 0	H	36	28 A	5-70	8	BK	565
03S-12E-20CAB 1	BESSENT, E.		18 0	H	20	12 G	3-50		BK	600
03S-12E-25DDD 1			63 0	T	5	6 A	5-70		BK	580
03S-13E-18ACC 1			74 0	U	6	11 A	5-70		BK	570
03S-13E-22DC 1	BREWER,WINNIE		85 3	H	5	26 D		8	BK	550
03S-13E-22DD 1	NICHOLAS,RAYSON	1971	60 3	H		23 D		5	BK	540
03S-13E-28ABB 1	BUTLER SCHOOL		20 0	U	8	13 A	5-70		BK	564
03S-13E-36CCC 1			34 0	U	36	25 A	5-70		BK	505
03S-14E-26BBB 1		1970	66 0	H	6	15 A	5-70		BK	575
03S-14E-26BCC 1	SMITH, GRAYLAR	1974	162 3	H	5	20 D		8	BK	540
03S-14E-29CBC 1	STRICKLAND,O.	1938	40 0	H	72	39 A	3-48		BK	542
03S-14E-35BBB 1			38 0	H	6	13 A	4-70		BK	600
03S-14E-35CCC 1			40 0	U	6	24 A	5-70		BK	595
04S-09E-08ACA 1	GOLDEN,GRADY	1971	75 3	H		8 D			BK	760
04S-09E-13BBA 1	BAUGHMAN,H	1965	186 6	H	5	56 A	8-68	1 0	BK	655
04S-09E-14DDA 1	HUGHES,H.	1972	80 3	H	5	28 D		20	BK	635
04S-09E-17BAA 1	SMITH,M.C.		19 0	H	42	14 A	8-68		BK	730
04S-09E-25DCC 1	JENKINS,D.		125 0	H	4	97 A	8-68	5 0	BK	655
04S-09E-29DDC 1	INGELLS,B.		160 0	H		77 A	8-68	2 0	BK	728
04S-10E-01CCD 1	BREWSTER		24 1	S		20 A			BK	
04S-10E-01DCC 1	EMERT		20	H	24	16	3-48	<1	BK	

TABLE 4.—*Continued*

ATOKA COUNTY

WELL LOCATION	OWNER OR USER	YEAR DRILLED	WELL DEPTH (FT)	WATER USE	WELL DIAMETER (IN)	DEPTH TO WATER (FT)	DATE MEASURED (MO-YR)	WELL YIELD (GAL/MIN)	AQUIFERS	ALTITUDE OF LAND SURFACE (FT)
04S-10E-09BAA 1	HARBICK,R.L.	1968	62 0	H	6	36 A	8-68		BK	605
04S-10E-20DDD 1	FAUDREE,R.	1931	92 0	H	6	38 A	8-68	5 0	BK	612
04S-10E-25DAA 1	REEVES,C.G.	1956	190 3	H	6	127 A	8-68	40 0	BK	605
04S-11E-03DAD 1			42 0	H	6	22 A	8-68		BK	555
04S-11E-07DAA 1	WHISMAN,C.R.		54 0	H	6	45 A	8-68		BK	595
04S-11E-22BB 1	UNKNOWN	1971	60 3	H		19 D		5	BK	560
04S-11E-25AAA 1	BAGBY,R.R.	1967	70 0	H	6	33 A	8-68		BK	
04S-11E-27BB 1	KEEL,MARLENE	1971	80 3	H	5	18 D		5	BK	550
04S-11E-29BAA 1		1968	85 0	H		33 A	8-68	2 0	BK	580
04S-12E-02CDD 1	MAYO,H.L.	1968	100 0	H	6	21 A	8-68		BK	620
04S-12E-08CC 1	FARMER,TROY	1971	180 3	H				5	BK	550
04S-12E-18B 1			60			48		<1	BK	
04S-12E-18DAD 1	SNELL,DOYLE	1971	62 3	H		18 D		14	BK	560
04S-12E-19DAA 1	BLAYLOCK,W.H.	1967	120 6	H		53 A	8-68	2 0	BK	540
04S-12E-21DCC 1	RAINS,IRMA	1972	160 3	H	5	53 D		8	BK	715
04S-12E-26BBB 1			90 0	H		41 A	8-68		BK	528
04S-13E-03CCD 1		1968	60 0	H	6	15 A		5	BK	550
04S-13E-07BBC 1			18	U	24	11 A	5-70		BK	570
04S-13E-10BBB 1	PRATER,HOLLIE	1971	140 3	H	5	106 D		12	BK	540
04S-13E-19CCC 1	PAGE,M.	1966	60 0	H	6	25 A	5-70	5	BK	550
04S-13E-23CBC 1	BECKETT,J		44 0	H	8	15 A	5-70		BK	610
04S-13E-30CCC 1			52 0	U	6	37 A	5-70		BK	485
04S-13E-32DAB 1		1936	58 0	H	6	17 A	5-70	5	BK	530
04S-14E-08BBB 1		1966	63 0	H	6	14 A	5-70	7	BK	520
04S-14E-12AAD 1			30 0	H	8	22 A	5-70		BK	610
04S-14E-15ABA 1			59 0	H	6	15 A	5-70	7	BK	575
04S-14E-22DAD 1			50 0	U	6	41 A	5-70		BK	495
04S-14E-31AAD 1			54 0	H	6	12 A	5-70		BK	500

TABLE 4.—RECORDS OF WELLS, TEST-HOLES, AND SPRINGS—*Continued*

BRYAN COUNTY

WELL LOCATION	OWNER OR USER	YEAR DRILLED	WELL DEPTH (FT)	WATER USE	WELL DIAMETER (IN)	DEPTH TO WATER (FT)	DATE MEASURED (MO-YR)	WELL YIELD (GAL/MIN)	AQUIFERS	ALTITUDE OF LAND SURFACE (FT)
05S-07E-23CC 1	COLBERT,DOUGLAS	1972	345 3	H	5	125 D		15	BK	710
05S-07E-36AA 1	ABBOTT,W.	1947	480 6	H	5	110 D	9-47		BK	684
05S-08E-12BCC 1	NORMAN JR.,J.E.	1952	230 6	H	6	90 A	8-68	10	BK	682
05S-08E-23AB 1	ALLEN,DOYLE	1972	225 3	H	5	90 D		25	BK	740
05S-08E-32BDD 1	HICKS,A.		608 6	S					BK	755
05S-09E-04DBC 1	KENEFIC,OK	1915	170 6	P	5	60 G		6	BK	660
05S-09E-04DBC 2	KENEFIC,OK	1947	305 3	P	6	112 G	9-47	10	BK	660
05S-09E-11CDC 1			300 0	H	6	142 A	8-68	1	BK	708
05S-09E-32BBB 1	SIMS,J.H.		375 0	H	6	67 A	8-60	1	BK	638
05S-09E-36AAA 1	HARDING,C.B.	1948	342 6	H	4	132 G	3-48		BK	645
05S-10E-01CAA 1	MUGLER,PETE	1952	300	U	4	87 A	8-68		BK	
05S-10E-16BBA 1	CADDO,OK		406 6	P	8			40	BK	
05S-10E-16BDB 1	CADDO,OK	1941	404 6	P	8			55	BK	725
05S-10E-16BD 2	CADDO,OK	1941	428	P	6			45	BK	725
05S-10E-26ACC 1	BAXTER,FLOSSIE		280 0	H	6	87 A	8-68	5	BK	650
05S-10E-32BBA 1	THORNTON,W.L.	1936	252 0	H	4	110 A	8-68	10	BK	645
05S-11E-05CCC 1	AMMONS,HAZEL	1941	260 0	H		94 A	9-68	2	BK	622
05S-11E-14ABA 1		1957	280 0	H	5	84 A	8-68	5	BK	610
05S-11E-32BAB 1	WELLS,J.R.	1960	300 0	H	5	79 A	9-68	2	BK	662
05S-11E-35BAB 1	HALL,ALICE M.	1943	300 0	H	3	27 A	9-68		BK	652
05S-12E-08CAA 1	HOLLIDAY,JIM	1938	75 0	H		32 A	9-68	5	BK	
05S-12E-13CCC 1			84 0	H	5	65 A	4-70		BK	550
05S-12E-17DD 1	LEFLORE,THOMAS	1973	225 3	H	5	40 D		25	BK	565
05S-12E-35AA 1	DUNEGAN,DONALD		446 3	H	5	165 D			BK	620
05S-12E-36DC 1	FLEMING,WALLACE	1969	378 3	H	5	100 D		15	BK	700
05S-13E-20DC 1	JACKSON,LEONARD	1973	205 3	H	5	100 D		15	BK	550
06S-07E-27D 1	MOORE,P.L.	1947	507		4	152			BK	650
06S-09E-05BAA 1	LYDAY,E.M. JR.	1972	360 3	H	5	60 D		20	BK	635
06S-09E-14CCD 1	PATE, VICTOR	1973	555 3	H	5	150 D		35	BK	660
06S-09E-19DCB 1	DURANT,OK		692 6	P	10	89 G		190	BK	
06S-09E-19DCB 2	DURANT,OK		654 6	P	10	86 G	1-47	300	BK	650
06S-09E-20BBB 1	DURANT,OK	1947	663 3	U	8	73 A	12-53	375	BK	680
06S-09E-20CBA 1	DURANT,OK	1945	646 6	P					BK	645
06S-09E-20CBC 1	DURANT,OK	1946	886 6	P	10	65 G	11-46	300	BK	639
06S-11E-14CDC 1	KNIGHT, COY	1972	410 3	H	5	70 D		10	BK	545
06S-11E-23BA 1	JEFFREYS,JUDGE	1972	415 3	H	5	70 D		20	BK	550
06S-11E-23CDC 1	BABB,ANDREW	1968	460 0	H	5	72 A	9-68	60	BK	568
06S-12E-23AAB 1	DEWITT,F.T.	1972	480 3	H	5	105 D		15	BK	650
06S-12E-27 2	BENNINGTON, OK		700	P				20	BK	
06S-12E-27BCA 1	BENNINGTON,OK	1953	700 0	P	10	40		80	BK	625
06S-12E-27CBA 1	BENNINGTON,OK		750	P	8	75 G		26	BK	625

TABLE 4.—*Continued*

BRYAN COUNTY

WELL LOCATION	OWNER OR USER	YEAR DRILLED	WELL DEPTH (FT)	WATER USE	WELL DIAMETER (IN)	DEPTH TO WATER (FT)	DATE MEASURED (MO-YR)	WELL YIELD (GAL/MIN)	AQUIFERS	ALTITUDE OF LAND SURFACE (FT)
06S-12E-27CBA 2	BENNINGTON,OK	1975	707 6	U	8	27 A	4-75		BK	
06S-12E-27CBA 3	BENNINGTON,OK	1946	488	P	9				BK	623
06S-13E-31CC 1	HAMBY,JOE	1973	596 3	H		150 D		20	BK	595
07S-08E-24BCC 1	CALERA,OK		980 6	P		100 G		45	BK	720
07S-12E-28CCC 1	CALHOUN,DAWSON	1962	1400 6	H		F A	9-68	50	BK	

CAPTER COUNTY

WELL LOCATION	OWNER OR USER	YEAR DRILLED	WELL DEPTH (FT)	WATER USE	WELL DIAMETER (IN)	DEPTH TO WATER (FT)	DATE MEASURED (MO-YR)	WELL YIELD (GAL/MIN)	AQUIFERS	ALTITUDE OF LAND SURFACE (FT)
05S-01W-34DDA 1	RICHARDSON R.		53 0	H	6	38	4-48		BK	803
05S-02W-21BCC 1	BLACK JACK SCH		39	M	24	24	4-48		BK	970
05S-02W-32AAA 1			125 0	H	6	37 A	2-69		BK	910
05S-03W-10DDD 1	KEATH FLOYD		75 0	H		45 A	12-68		BK	905
04S-02E-35BDA 1	NOBLE FOUDATION		281	T		37		40	BK	875
04S-03E-27CCC 1			160 0	H	6	23 A	12-68		BK	805
05S-02E-12BBB 1			35 0	H	6	17 A	12-68		BK	815
05S-03E-07DDD 1			70 0	H	6	44			BK	840
05S-03E-29AAA 1			126 3	H	6	29 A	12-60		BK	748

TABLE 4.—RECORDS OF WELLS, TEST-HOLES, AND SPRINGS—*Continued*

CHOCTAW COUNTY

WELL LOCATION	OWNER OR USER	YEAR DRILLED	WELL DEPTH (FT)	WATER USE	WELL DIAMETER (IN)	DEPTH TO WATER (FT)	DATE MEASURED (MO-YR)	WELL YIELD (GAL/MIN)	AQUIFERS	ALTITUDE OF LAND SURFACE (FT)
05S-13E-27BBB 1			196 0	P		74 A	4-70	3	BK	525
05S-14E-06BCB 1	BAKER,T.M.	1930	40 0	H	6	22 A	4-70		BK	550
05S-14E-13BBB 1	BUCKHORN SCHOOL		58 0	T	6	36 A	3-70	8	BK	555
05S-14E-14AA 1	MCKEE,BURL	1972	160 3	H	5			30	BK	530
05S-14E-21BAC 1	MULBERRY SPRING			U		F		<1	BK	490
05S-14E-28DAD 1	TYSON	1952	113 0	U	6	71 A	4-70	5	BK	510
05S-15E-08DAD 1	HERMAN,FLOYD		200 3	H				30	BK	590
05S-15E-13ABB 1	NELSON CENTER		65 0	P	6	48 A	3-70		BK	620
05S-15E-16ABA 1			36 0	U	6	28 A	3-70		BK	570
05S-15E-26CBB 1	SUGAR CREEK SCH		85 0	T	6	38 A	4-70	5	BK	530
05S-15E-33DCC 1				S		A	4-70	20	BK	480
05S-16E-12BAA 1			26 0	S	40	12 A	3-70		BK	545
05S-16E-13CD 1	DUNLAP,JAMES	1972	200 3	H	5				BK	580
05S-16E-15CCB 1	STATE SCHOOL		76 0	T	6	46 A	3-70		BK	620
05S-16E-24ABB 1			24 0	U	40	11 A	4-70		BK	560
05S-16E-34DAA 1	BARNES,L.L.		150 0	H	6	67 A	4-70	4	BK	570
05S-17E-12AAA 1			15 0	U	36	5 A	4-70		QT	430
05S-17E-21D 1	WILLIAMS,REPHY	1974	200 3	H		10 D		10	BK	480
05S-17E-34CBC 1	BROCK	1946	23 0	U	36	10 A	4-70		BK	450
05S-18E-04DAA 1			25 0	H	36	14 A	4-70		BK	455
05S-18E-09DDD 1	APPLE SCHOOL		52 0	U	6	17 A	4-70		QT	450
05S-19E-03DDA 1			57	H		16	3-70		BK	
05S-19E-07BAB 1			44 0	U	6	13 A	4-70		BK	515
05S-19E-10BBB 1	HERTZ,TED	1974	110 6	H		25 G	8-74	30	BK	590
05S-19E-30CBB 1		1964	100 0	H	6	76 A	4-70		BK	540
05S-19E-35DDA 1		1970	57 0	H	6	16 A	4-70		BK	480
05S-20E-03CCC 1			47 0	U	30	45 A	3-70		BK	620
05S-20E-11BCC 1	HALL,R.C.	1962	70 0	H	5	35 A	3-70	10 3	BK	640
05S-20E-31DAC 1			158 0	S	10	F A	3-70	15	BK	440
06S-14E-06BAB 1			240 0	U	6	94 A	4-70		BK	480
06S-15E-04CCC 1			51 0	U	5	19 A	4-70		BK	
06S-15E-16CCD 1	EDGE,HENRY	1930	150	H	10	F	4-70		BK	460
06S-15E-16DBC 1	HODGEN,BILLY	1970	180 0	H	8	F A	4-70	20 1	BK	445
06S-15E-21CAB 1	CLARK,W.B.	1930	200 0	H	6	F A	4-70	1 0	BK	455
06S-16E-36CBB 1	ELLIOT,DICK	1963	404 0	H	5	34 A	5-70	5 0	BK	500
06S-17E-17BBC 1			103 0	H	5	10 A	5-70		BK	565
06S-17E-20DCA 1	HUGO,OK WELL 6	1947	398 3	P	8	105 D	7-47		BK	530
06S-17E-21CBC 1	HUGO OK WELL 5	1947	328 3	P	8	94 D	6-47	50 0	BK	530
06S-17E-21CCA 1	HUGO OK WELL 4		326 3	P	8	88 D		190	BK	550
06S-17E-21DAC 1	HUGO, OK WELL 8		429 6	P					BK	
06S-17E-21DBC 1	HUGO OK WELL 3		335 3	P	8	92 D		235	BK	550

TABLE 4.—*Continued*

CHOCTAW COUNTY

WELL LOCATION	OWNER OR USER	YEAR DRILLED	WELL DEPTH (FT)	WATER USE	WELL DIAMETER (IN)	DEPTH TO WATER (FT)	DATE MEASURED (MO-YR)	WELL YIELD (GAL/MIN)	AQUIFERS	ALTITUDE OF LAND SURFACE (FT)
06S-17E-21DBD 1	HUGO,OK WELL 2	1947	355 3	P	8	113 D	6-47	228	BK	560
06S-17E-21DDD 1	HUGO,OK WELL 1	1946	553 3	P	10	137 D	4-46	225	BK	570
06S-17E-22CCA 1	HUGO,OK WELL 7	1953	392 3		8	100 D	10-53	450	BK	530
06S-17E-22DC 1	WORTHAMIS BKRY.		282 0	U	8	111 A	12-44		BK	540
06S-17E-29BCC 1	GRANT,OK RWD 1	1967	455 3	P	8	165 D	12-67	65	BK	600
06S-18E-12ABB 1			45 3	U	6	36 A	4-70		BK	430
06S-18E-18BBB 1			60 0	U	6	20 A	4-70		BK	465
06S-19E-02CCD 1	WEYERHAEUSER CO	1975	376 0	I	16	69 A	4-75	1700	BK	560
06S-19E-02CDD 1	WEYERHAEUSER CO	1977	340 0	I	16	82	1-77	1500	BK	
06S-19E-03DDD 1	WEYERHAEUSER CO	1974	315 0	I	10	50 A	7-74	650 5	BK	545
06S-19E-04DDC 1	ATKINS		43 0	H	6	23 A	4-70		BK	520
06S-19E-08DC 1	DAVID,WYNDLE	1972	115 3	H	5			15	BK	510
06S-19E-14CCC 1			28 0	U	5	0 A	3-70		BK	495
06S-19E-24ABD 1	FT TOWSON,OK		35	P		F	5-75	10	BK	
06S-19E-24ABD 2	FT TOWSON,OK		188	P		F	5-75	10 0	BK	
06S-19E-24ABD 3	FT TOWSON,OK			P					BK	
06S-19E-30BCB 1	MOORE,DR.J.D.		280 0	H	4	F		5 0	BK	390
06S-20E-10DAA 1			14 0	U	36	11 A	3-70		QT	500
06S-20E-14DAA 1			28 0	H	40	25 A	3-70		BK	495
06S-20E-20DAA 1		1970	100 0	S	5	65 A	3-70		BK	490
06S-20E-27BAB 1			107 0	U	6	42 A	3-70		BK	485
06S-20E-30AAA 1		1930	130 0	U	5	43 A	3-70		BK	455
06S-20E-31AAA 1	STATE PARK	1967	350	P	6	62 A	4-70	20	BK	510
07S-17E-11BB 1	BELL,DAVIS	1972	326 3	H	5			20	BK	500
07S-17E-15AAB 1	GRANT,OK RWD	1968	530 0	P	8	F D		5 3	BK	480
07S-18E-09ABA 1	BROCK,EDGAR	1969	404 0	H	6	F A	3-70	<1	BK	485
07S-18E-19DBD 1	WYCHE,DR.J.C.		1023	C		F		50 0	BK	
07S-18E-19DCB 2	WYCHE,DR.J.C.	1954	1000 0	H		F		5	BK	430
07S-18E-31BBA 1	GRANT,OK RWD 1	1968	505 0	P	8	F D	7-68	60 0	BK	410
07S-19E-07ACC 1	DOUGHTY,LOYD W	1970	275 0	H	6	F A	4-70		BK	415

TABLE 4.—RECORDS OF WELLS, TEST-HOLES, AND SPRINGS—*Continued*

JOHNSTON COUNTY

WELL LOCATION	OWNER OR USER	YEAR DRILLED	WELL DEPTH (FT)	WATER USE	WELL DIAMETER (IN)	DEPTH TO WATER (FT)	DATE MEASURED (MO-YR)	WELL YIELD (GAL/MIN)	AQUIFERS	ALTITUDE OF LAND SURFACE (FT)
03S-06E-25CBC 1	HENSON,L.H.		27 0	H	42	12 A	10-68	10	BK	738
03S-07E-24AAD 1	CONVERSE,B.B.	1966	85 0	H	6	35 A	10-68		BK	774
03S-07E-32BBB 1	HENDERSON,I.	1968	85 0	H	6	46 A	10-68		BK	742
03S-07E-35CCC 1		1966	80 6	H	6	17 A	12-68		BK	
03S-08E-05DDD 1			26 0	H	42	18 A	10-68	5	BK	794
03S-08E-15AAA 1		1967	59 0	H	6	19 A	10-68		BK	735
03S-08E-20CDC 1	GREENE,H.V.		40			25 G	6-68	2	BK	740
03S-08E-25BBB 1	JACKSON,W.T.		25 6	H		20 G			BK	
03S-08E-34AAA 1	BENGER,FRED,L.	1963	103 0	H	6	36 A	10-68		BK	709
04S-04E-16CCC 1	JAMES,TED	1961	47 0	H	4	23 A	10-68	20	QA	
04S-04E-16DBB 1	MANNSVILLE,OK		45 6	P	8	15 G			BK	
04S-04E-22CAD 1	MANNSVILLE SCH.		65			50 G	6-68	3	BK	745
04S-05E-02BBD 1	ARMSTRONG,M.M.		65			28 G	6-68		BK	755
04S-05E-11DAA 1	CANADA,H.	1965	46 0	H	5	25 A	10-68	10	QT	
04S-05E-17CCD 1	FORGUSON,C.B.	1953	16 0	H	36	11 A	10-68	10	BK	
04S-05E-19DDD 1	CHAPMAN,F.		32			28		2	BK	711
04S-06E-15BBD 1	BAKER,R.G.	1952	28		2	8 G		70	BK	648
04S-06E-19BAD 1	AYERS,R.		30			25 G		2	BK	673
04S-07E-02BBB 1	CREECY,U.		155 6			50 G		5	BK	
04S-07E-03AC 1	BROWNLEE,EARL		32 6	H	06	16 G			BK	
04S-07E-14DCA 1			115			90			BK	814
04S-07E-26ABB 1	KROPP,C.L.	1962	307 0	H	7	132 A	10-68	10	BK	750
04S-08E-03ADD 1	WEEDHAM,H.		65 0	H	5	41 A	10-68		BK	730
04S-08E-06DDD 1		1967	115 0		5	47 A	10-68	50	BK	712
04S-08E-25BCC 1		1938	90 0	H	6	30 A	10-68	5	BK	660
04S-08E-29DDA 1		1942	300 0	H	6	122	10-68	20	BK	740

TABLE 4.—*Continued*

LOVE COUNTY

WELL LOCATION		OWNER OR USER	YEAR DRILLED	WELL DEPTH (FT)	WATER USE	WELL DIAMETER (IN)	DEPTH TO WATER (FT)	DATE MEASURED (MO-YR)	WELL YIELD (GAL/MIN)	AQUIFERS	ALTITUDE OF LAND SURFACE (FT)
06S-01W-13CCC	1	MCGUMERY M	1964	100 0	H	6	30 A	1-68	10	BK	767
06S-01W-17CCC	1	HEMBREE O		135 3	H	5	40 A	1-69	8	BK	875
06S-01W-34CBC	1			109 0	H	4	9 A	1-69		BK	715
06S-02W-17DDC	1	NEWELL,WAYMOND	1965	78 6	H	6	43 A	1-69	2	BK	915
06S-02W-35AAA	1	MORTON L.F.	1951	37 0	H	5	28	1-69	5	BK	795
06S-03W-02DDD	1			170 0	H	6	72	1-68		BK	965
07S-01W-21CA	1	TURNER,W.	1955	401 6	P	10	76	9-55	240	BK	755
07S-01W-21CD	1	TURNER, W.		401 6	P		60 A	9-55	112	BK	750
07S-02W-17DDD	1			69 3	H	5	60 A	4-48		BK	905
07S-02W-23ABA	1	BARRICK J.R.	1957	82 3	H		42 A	1-68	8	QT	955
08S-01W-02ABB	1	BROWN	1964	102 0	H	6	27 A	1-69	10	BK	738
08S-02W-20AAA	1			140 0	H	6	60	1-69		BK	792
06S-01E-05CCB	1			82 3	H	5	1	1-69		BK	860
06S-01E-13BBB	1	COLESON J.B.		100 6	H	05	60 A	1-69	10	BK	792
06S-03E-08AAD	1			56 0	H	42	48 A	1-69		BK	768
06S-03E-34D	1	HARRIS A.F.	1964	20 0	H		10 A	8-64	7 1	BK	678
06S-03E-36	1	COPELAND R.		340 0	H	6	120	4-68	10	BK	720
07S-01E-09DCC	1			92 3	H	6	36 A	1-69		BH	886
07S-01E-11AAD	1			112 0	U		73 A	1-69		BK	930
07S-02E-02BCC	1			104 0	H	8	81 A	1-69	5	BK	772
07S-02E-13DCD	1	GREEN L.M.		206	S	8	34 A	4-48		BK	820
07S-02E-20ADD	1	MARRIETTA OK		805 6	P					BK	
07S-02E-20BDD	1	MARIETTA OK	1944	799 0	M	10	165 A	4-48	140	BK	845
07S-02E-36	1	COPELAND, COY	1964	355		6	120	8-64	10	BK	
07S-03E-07ACB	1	TEXACO		267 6	N		188 G		50	BK	797
07S-03E-09	1	JOHNSON		70 6						BK	
08S-02E-07DCD	1	WISEMAN, R.	1926	325 6	H	5				BK	835
08S-03E-06DDA	1	PARKER, KENNITH		32 0	H	6	6 A	1-69	7	QT	653
09S-01E-01DDD	1	THACKERVILLE,OK	1947	375 6	P	8	235 G	4-48	16	BK	866

TABLE 4.—RECORDS OF WELLS, TEST-HOLES, AND SPRINGS—*Continued*

MARSHALL COUNTY

WELL LOCATION	OWNER OR USER	YEAR DRILLED	WELL DEPTH (FT)	WATER USE	WELL DIAMETER (IN)	DEPTH TO WATER (FT)	DATE MEASURED (MO-YR)	WELL YIELD (GAL/MIN)	AQUIFERS	ALTITUDE OF LAND SURFACE (FT)
05S-03E-02 1	JOHNSON,SWINEY		235 3	H		80 D		10	BK	800
05S-03E-35AAB 1	MARRIS,SALLIE	1953	127 0		5	84 A	10-68		BK	820
05S-04E-04B 1	COLBERT,R.J.		32 0	H	5	28 A	3-48		BK	800
05S-04E-28DCB 1	GOODWIN,R.	1965	135 0	H	5	65 A	10-68	3	BK	850
05S-05E-16AB 1	SINCLAIR OIL CO		453		9			30	BK	863
05S-05E-16AD 1	MADILL,OK	1956	430 6	P	14	200 G		135	BK	790
05S-05E-25CD 1	NEFF,M.A.	1947	448 6		4	200 G	3-48		BK	712
05S-05E-34 1			470 6						BK	
05S-06E-07DCC 1			225 0	H		176	10-68		BK	804
05S-06E-11ADD 1			375 0	H	8	90	10-68		BK	707
05S-06E-19CDD 1		1947	228 6	H	4	140 G	3-48		BK	750
05S-06E-28AAB 1	BENTON,J.E.	1940	300 0	H	5	78 A	10-68	10	BK	
05S-06E-31DB 1	WHITE,L.	1947	167 6	H	4	90			BK	723
06S-03E-13BDA 1		1964	175 0	H	5	124 A	10-67	100	BK	720
06S-04E-08DDD 1			48 0	H	5	36 A	10-68	1	BK	820
06S-04E-11AAD 1	JONES,W.E.		250 6	H		108 A	10-68	30	BK	832
06S-04E-26DDD 1	RUSHING,D.		360 0	H	5	103 A	10-68	5	BK	805
06S-04E-29AAA 1	COX,C.H.	1950	95 0	H	5	37 A	10-68		BK	700
06S-05E-07AAD 1	KAUFMAN,E.G.	1920	340 6	I		40 A	12-52	35	BK	880
06S-05E-20DDD 1		1947	212 6	H	6	120 G	3-48		BK	830
06S-05E-22DAD 1			400 0	H	5	129 A	10-68		BK	855
06S-06E-30BDC 2	KINGSTON,OK	1955	500 6	C	10	200 G	10-68	400	BK	820
06S-06E-30CAA 1	KINGSTON,OK	1955	500 6	C	10			400	BK	
06S-06E-30CAA 2	KINGSTON,OK	1962	510 6	C	7			90	BK	810
06S-06E-31BBB 1	KINGSTON,OK		505 6	U					BK	
06S-06E-31BDB 1	EVANS,W.B.		501 6	P	6	416 G	3-48	20 6	BK	
06S-06E-36DA 1	DURANT BOAT CL.		300 6	P	4	50 G		5	BK	655
07S-04E-03BBB 1	PAGE,C.J.	1946	36 0	H	6	32 A	4-48		BK	710
07S-04E-13B 1	JEFFREY,A.A.	1948	175 6	H	8	55 G	1-64		BK	685
07S-04E-22AAA 1	MAGAHE,BOB		68 0	H		38 A	10-68	3	QT	635
07S-04E-36BBB 1	CRYER,HOMER		38 0	H	48	25 A	10-68		QT	770
07S-05E-04BCC 1			180 6	H		119 A	10-68	40	BK	890
07S-05E-25CA 1	NEUSTADT		114 0			101			BK	655
07S-05E-32ACC 1	TEXOMA CHR.CAMP	1943	180 0	H	6	91 A	10-68	30	BK	710
07S-06E-24BBA 1	MCBRIDE,C.	1948	503 6	U	6	150 A	3-48		BK	680
08S-05E-14ABB 1	LANDGRAF,G.	1961	250 0	H	5	37 A	10-68	3	QT	735

TABLE 4.—*Continued*

MCCURTAIN COUNTY

WELL LOCATION	OWNER OR USER	YEAR DRILLED	WELL DEPTH (FT)	WATER USE	WELL DIAMETER (IN)	DEPTH TO WATER (FT)	DATE MEASURED (MO-YR)	WELL YIELD (GAL/MIN)	AQUIFERS	ALTITUDE OF LAND SURFACE (FT)
05S-21E-23BDC 1	US CE	1967	80 0	U	6	6 A	3-70	20	BK	470
05S-21E-34BCB 1			10 0	H	40	0 A	2-70		BK	480
05S-22E-27CAA 1	BIBBS,OLLIE,SR.	1969	144 0	H	5	38 A	5-70	3 3	BK	
05S-22E-29CDD 1	WATKINS,ELSOM	1969	144 0	H	6	16 A	7-70	8 3	BK	415
05S-22E-31CBA 1		1922	22 0	U	40	15 A	2-70		BK	425
05S-22E-32ACA 1			20 0	H	40	14 A	2-70		QT	420
06S-21E-02BBB 1			17 0	H	36	11 A	2-70		BK	410
06S-21E-03DDC 1	HARVEY,R.	1964	175 6	H	4	84 A	2-70	20	BK	490
06S-21E-10BCB 1			26 0	H	36	19 A			QT	
06S-21E-20BDB 1			90 0	H	5	33 A			BK	530
06S-21E-27AAA 1	MCDOUGAL,MARVIN		120 0	U	6	70 A	9-60		BK	540
06S-21E-27D 1			363						BK	
06S-21E-28DAA 1	HOPEJOY,B.F.	1969	80 0	H	5	32 A	2-70	20	BK	505
06S-21E-28DB 1	VALLIANT,OK	1938	363 3	P	12	90 G		200	BK	510
06S-21E-30DDD 1			95 0	H	4	40 A	2-70		BK	480
06S-21E-31DDC 1	MCLAUGHLIN,W		330	U		F A	1-70	50	BK	400
06S-21E-36CCC 1	HARTSELL,C.	1960	92 0	H	6	48 A	1-70	5	BK	495
06S-22E-07CCC 1	FELLER BAPT.CH.		16 0	T	36	7 A	2-70	2	QT	420
06S-22E-20DDD 1			33 0	H	36	11 A	2-70		QT	400
06S-22E-22DDC 1	THOMAS,W		38 0	H		14 A	12-70	10	BK	390
06S-22E-30DAC 1	MILLERTON RWD 2		82 6	P					BK	
06S-22E-30DBC 1			46 0	H	6	36 A	2-70		BK	470
06S-22E-31ADB 1			42 0	H	30	33 A			BK	485
06S-22E-32DDD 1	STOREY LUM.CO.	1912	138 6	N	6	70 G	12-44	15	BK	485
06S-22E-34ACA 1	WHELLOCK IND.AC		94 0	T	6	44 A	2-70	15	BK	442
06S-23E-23A 1	COLBERT, JAMES	1973	141 3	H	5	25 D			BK	440
06S-23E-28DDC 1	WESTLY,L.		25 0	H	30	18 A	1-50		BK	382
06S-24E-12DAB 1			150 0	H		54 A	2-70	1	BK	480
06S-24E-14ABD 1	HATCHERY	1970	200 0	C	10	20 A		50	BK	
06S-24E-14DAD 1	OK DA	1957	133 0	I	6	4 A	6-70	30	BK	415
06S-24E-20BBC 1			42 0	H	6	11 A	5-70		BK	490
06S-24E-20CC 1			28		24	20	1-51		BK	
06S-24E-22DAA 1		1970	87 0	H	6	15 A	5-70	5	BK	420
06S-24E-26ADC 1	SANDERS, WANDA	1973	3140 3	H	05			15	BK	440
06S-24E-27DAA 1			28 0	U	40	2 A	5-70		BK	385
06S-25E-19CCC 1	LANE,J	1947	21 0	H	30	8 A	3-48		BK	445
06S-25E-20BBC 1	LEWIS,RAYMOND	1972	180 3	H	5	80 D		10	BK	440
06S-25E-23ABD 1	BATTIEST,ISAAC	1972	190 3	H	5	175 D		10	BK	420
06S-25E-27DDD 1	BRANTLY		26 0	S	80	6 A	2-50		BK	440
06S-25E-28DDC 1	WHITEHEAD, JOHN		80						BK	
06S-25E-36CCD 1	GOING, WILLIE	1973	140 3	H	5			20	BK	395

TABLE 4.—RECORDS OF WELLS, TEST-HOLES, AND SPRINGS—*Continued*

MCCURTAIN COUNTY

WELL LOCATION		OWNER OR USER	YEAR DRILLED	WELL DEPTH (FT)	WATER USE	WELL DIAMETER (IN)	DEPTH TO WATER (FT)	DATE MEASURED (MO-YR)	WELL YIELD (GAL/MIN)	AQUIFERS	ALTITUDE OF LAND SURFACE (FT)
06S-26E-13BC	1	HUDSON,EDNA	1972	180 3	H	5	145 D			BK	430
06S-26E-17ADD	1		1969	34 0	P	8	16 A	7-70	16	BK	350
06S-26E-19DB	1	DIERKS INC	1960	464 6	N		14 G		7	BK	
06S-26E-23ACD	1	BOHANAN,THEODOR		158 3	H		105 D		5	BK	385
07S-21E-22AAA	1	US GS	1951	322 0	U	6	7 A	5-51	34 3	BK	435
07S-21E-22ABA	1		1967	370 0	H	6	F A	2-70	20	BK	415
07S-21E-22ABB	1			310			F		1	BK	397
07S-22E-28AB	1	US GS		356 6	U		3 A	5-51		BK	
07S-23E-07DCC	1	GARVIN,OK		265 0	P	6	89 A		22	BK	492
07S-23E-23BAC	1		1949	200 0	H	10	70 A	6-70	50	BK	490
07S-23E-23BBB	1	MC. LUMBR. CO.	1949	201 6	H	6	100 A	6-49		BK	498
07S-23E-24BCB	1		1964	380 0	H	4	133 G		20	BK	495
07S-23E-34BBB	1		1951	347 0		6	128 A			BK	465
07S-24E-01BB	1	MURDOCK		19 0	H	24	3 A	2-50		BK	376
07S-24E-01BDD	1	JOHNSON,J.		31 0	H	24	29 A	12-44		BK	390
07S-24E-12BBB	1	HONEY CR.FRYERS		205 6	C			4-70	35	BK	
07S-24E-23AA	1	JACKSON,J.C.	1940	105 6	H	4				BK	405
07S-24E-23ACC	1	GEORGE,W.M.	1951	142 0	U	6	98 A	12-70		BK	445
07S-24E-23CD	2	BYRNE,W.	1943	150 6	H	5	63 A	12-49		BK	445
07S-24E-23CDD	1			189 0		8	101 A	12-49		BK	405
07S-24E-27DC	1	STANLEY,N.	1949	267 6	H					BK	480
07S-26E-05BCC	1			26 0	U	48	19	2-70		BK	415
07S-26E-20DDD	1	US GS	1951	173 0		6	165 A	5-51	2	BK	
07S-26E-20DDD	2	US GS	1951	262 0	T		70 A	5-51		BK	370
07S-27E-06CAA	1	JONES,WILTON		162 3	H	5			30	BK	330
07S-27E-29BCC	1	US GS	1951	180 0	T					BK	368
08S-23E-02BBB	1	HURN,O.L.	1947	272	H	6	65			BK	451
08S-24E-01B	1	KIAMICHI,STA.	1949	418 6		8	00 G			BK	
10S-26E-24AAD	1			2000	U		F	1-70	2	BK	320

TABLE 4.—*Continued*

PUSHMATAHA COUNTY

WELL LOCATION	OWNER OR USER	YEAR DRILLED	WELL DEPTH (FT)	WATER USE	WELL DIAMETER (IN)	DEPTH TO WATER (FT)	DATE MEASURED (MO-YR)	WELL YIELD (GAL/MIN)	AQUIFERS	ALTITUDE OF LAND SURFACE (FT)
03S-15E-31CBC 1	DUDLEY,L.B.		34 0	H	36	15 A	3-48		BK	
03S-15E-33CBB 1		1947	27 0	U	48	9 A	6-70		BK	
03S-15E-36BBB 1			51 0	H	5	13 A	6-70	3	BK	
04S-15E-03CDC 1			45 0	H	5	17 A	6-70		BK	
04S-15E-18CCC 1			48 0	U	6	14 A	4-70		BK	580
04S-15E-21ADD 1	BLAN,VIRGIL	1972	108 3	H	5	40 D		8	BK	635
04S-15E-26AAA 1			31 0	U	40	20 A	4-70		BK	600
04S-15E-30ABB 1			60 0	H	10	9 A	4-70		BK	580
04S-16E-04BDB 1	BAKER,ROBERT	1971	71 3	H	5	20 D		5	BK	520
04S-16E-12DCC 1			56 0	H	6	12 A	5-70	5	BK	
04S-16E-13BCC 1			16 0	U	36	11 A	5-70		BK	
04S-16E-16ADA 1			56 0	U	6	9 A	4-70		BK	500
04S-16E-19DCD 1	HALL BAPT.CH.		17 0	P	48	3 A	4-70		BK	590
04S-16E-21ADA 1	MACK, RICKY	1972	80 3	H	5	41 D		15	BK	535
04S-16E-28CCC 1			19 0	H	36	3 A	4-70		BK	510
04S-17E-15ADD 1			47 0	H	30	17 A	5-70	2	BK	
04S-17E-21CC 1	ROSENTHAL,T.J.	1971	100 3	H	5	25 D		8	BK	490
04S-17E-26ADD 1	EVANS,D.M.	1955	32 0	H	30	10 A	5-70		BK	460
04S-17E-33AAA 1			38 0	U	6	8 A	5-70		BK	
04S-18E-28CBC 1			49 1	U		8 A	10-77		BK	
04S-18E-32ABA 1	WILLIAMS	1969	65 0	H	6	13 A	5-70	5	BK	430
04S-18E-32BBB 1	SORRELLS,C.	1973	340 3	H	5	20 D		5	BK	460
04S-19E-13CCC 1			80 0	H	6	10 A	5-70		BK	610
04S-19E-23BB 1	THOMAS,MCNEW	1972	64 3	H	5	15 D		12	BK	640
04S-19E-25CAA 1	THREEBULLS,L.		50 0	H	8	13 A	5-70		BK	600
04S-19E-31ABC 1			36 0	H	36	27 A	5-70		BK	510
04S-20E-31DDA 1	LAWLESS,G.	1912	30 0	H	38	12 A	5-70	5	BK	665

Table 5.—Concentrations of Common Constituents and Physical Properties of Water from Antlers Aquifer

Location	Date	Dissolved Calcium (Ca) (mg/L)[1]	Dissolved Magnesium (Mg) (mg/L)	Dissolved Sodium & Potassium (Na+K) (mg/L)	Dissolved Bicarbonate (HCO_3) (mg/L)	Dissolved Sulfate (SO_4) (mg/L)	Dissolved Chloride (Cl) (mg/L)	Dissolved Fluoride (F) (mg/L)	Dissolved Nitrate (NO_3) (mg/L)	Hardness (Ca, Mg) (mg/L)	Dissolved solids (mg/L)	Specific conductance (µmho/cm @25°C)
ATOKA COUNTY												
3S-12E-20CAB1	1950	18	11	7.1	9	22	10	--	75	90	172	238
BRYAN COUNTY												
5S-07E-36AA 1	1948	3.7	1.1	277	571	35	19	0.2	0.0	14	674	1080
5S-09E-04DBC2	1948	48	10	60	237	56	19	0.0	1.0	161	327	540
5S-10E-16BD 2	1944	2.3	0.6	155	315	41	10	0.2	1.2	8	398	--
6S-09E-19DCB1	1946	2.5	0.8	325	555	44	60	--	0.0	9.6	858	--
6S-09E-19DCB2	1947	2.8	1.2	308	514	20	82	--	0.0	12	830	--
6S-09E-20BBB1	1947	4.0	2.5	342	530	63	75	--	0.2	20	844	--
6S-09E-20CBC1	1946	23	1.4	351	546	53	135	0.7	0.5	64	943	--
6S-12E-27BCA1	1948	3.3	1.7	343	560	39	88	1.0	3.0	15	839	1370
6S-12E-27CBA1	1944	5.9	1.3	255	549	51	58	--	1.2	152	803	--
6S-12E-27CBA3	1951	1.2	0.4	338	603	38	74	1.3	0.4	4	824	1380
7S-08E-24BCC1	1951	28	13	91	269	63	20	0.1	0.1	124	356	593
CHOCTAW COUNTY												
5S-13E-27BBB1	1970	--	--	93	250	175	17	--	0.0	208	499	776
5S-14E-21BAC1	1970	--	--	28	276	9.0	4.0	--	1.4	236	268	473
5S-15E-33DCC1	1970	--	--	6.2	288	24	4.6	--	0.0	254	275	497
5S-16E-24ABB1	1970	--	--	17	20	17	56	--	41	108	271	344
5S-17E-12AAA1	1970	--	--	9.0	92	31	6.4	--	1.5	98	158	238
5S-19E-03DDA1	1970	--	--	3.4	18	5.0	2.6	--	0.0	16	34	40
5S-20E-11BCC1	1970	--	--	2.8	16	21	8.0	--	0.0	40	57	101
5S-20E-31DAC1	1970	--	--	16	40	96	9.0	--	0.0	110	197	313
6S-15E-21CAB1	1970	--	--	41	284	37	8.0	--	0.0	192	311	522
JOHNSTON COUNTY												
3S-08E-25BBB1	1948	14	5.7	29	33	3.2	56	0.0	16	58	173	279
4S-07E-03AC 1	1948	27	8.7	15	21	62	8.0	0.0	0.0	103	215	356
LOVE COUNTY												
7S-02E-13DCD1	1948	48	11	54	202	60	38	0.0	1.0	165	309	635
7S-02E-20BDD1	1948	14	5.0	139	327	25	20	0.3	3.0	56	416	690
7S-02E-36 1	1964	--	--	184	478	17	12	--	--	26	642	934
8S-02E-07DCD1	1948	2.0	1.1	312	565	62	55	2.8	3.0	9.5	725	1180
9S-01E-01DDD1	1948	2.4	1.4	308	569	77	22	0.9	3.0	12	746	1220
7S-02W-17DDD1	1948	35	9.1	5.2	71	8.5	20	0.2	50	125	220	318

[1]Milligrams per liter (mg/L).

TABLE 5.—*Continued*

Location	Date	Dissolved Calcium (Ca) (mg/L)[1]	Dissolved Magnesium (Mg) (mg/L)	Dissolved Sodium & Potassium (Na+K) (mg/L)	Dissolved Bicarbonate (HCO_3) (mg/L)	Dissolved Sulfate (SO_4) (mg/L)	Dissolved Chloride (Cl) (mg/L)	Dissolved Fluoride (F) (mg/L)	Dissolved Nitrate (NO_3) (mg/L)	Hardness (Ca, Mg) (mg/L)	Dissolved solids (mg/L)	Specific conductance (µmho/cm @25°C)
MARSHALL COUNTY												
5S-04E-04B 1	1948	8.2	12	129	366	21	18	--	3.0	70	366	617
5S-06E-19CDD1	1948	6.0	7.4	294	579	47	60	0.1	0.5	45	714	1180
6S-05E-20DDD1	1948	56	11	140	314	136	38	0.0	18	185	573	909
6S-06E-31BDB1	1948	3.5	3.1	236	400	87	21	0.1	1.0	22	612	982
7S-04E-03BBB1	1948	41	21	76	264	5.9	20	0.5	100	189	396	655
7S-04E-13B 1	1964	--	--	160	408	59	16	0.5	--	72	480	759
7S-06E-24BBA1	1948	9.2	0.6	107	261	22	14	0.2	1.0	25	310	497
McCURTAIN COUNTY												
5S-21E-34BCB1	1970	--	--	6.7	20	3.0	6.4	--	7.4	20	37	56
6S-21E-03DDC1	1970	--	--	15.1	160	6.2	8.0	--	0.0	116	158	268
6S-21E-27D 1	1951	45	7.5	7.3	180	5.2	3.5	0.1	0.0	143	161	290
6S-21E-28DB 1	1948	40	7.2	1.0	125	5.3	16	0.0	0.0	130	136	293
6S-22E-34ACA1	1949	65	5.2	11	228	--	9.5	--	0.5	184	223	381
6S-25E-19CCC1	1948	13	2.1	20	49	3.0	22	0.0	14	41	84	136
7S-21E-22AAA1	1951	58	7.4	43	280	20	12	--	1.1	175	296	494
7S-22E-28AB 1	1951	30	11	202	278	88	170	--	0.8	120	682	1180
7S-23E-07DCC1	1944	13	3.6	99	227	43	16	1.0	2.2	48	305	--
7S-23E-24BCB1	1970	--	--	196	220	40	208	--	0.0	88	588	1090
7S-24E-01BDD1	1944	21	3.0	8.7	60	2	7.0	--	20	65	139	--
7S-24E-23AA 1	1948	39	7.4	113	169	51	127	0.1	2.0	128	430	859
7S-24E-23ACC1	1949	82	14	93	325	53	101	--	0.0	262	523	923
7S-24E-23CDD1	1949	146	35	289	493	459	181	--	0.2	508	1410	2060
7S-24E-27DC 1	1949	12	3.1	656	562	471	365	--	4.5	43	1810	2850
8S-23E-02BBB1	1948	94	10	123	96	17	300	0.1	30	276	694	1190
8S-24E-01B 1	1949	29	13	1140	612	222	1320	3.0	4.0	126	3000	5090
PUSHMATAHA COUNTY												
3S-15E-31CBC1	1948	4.0	3.3	9.4	10	1.6	15	0.0	16	24	108	107

[1]Milligrams per liter (mg/L).

TABLE 6.—LOW-FLOW DISCHARGE MEASUREMENTS FOR SELECTED STREAMS

Station name	Location	Drainage area, mi^2	Date	Discharge, ft^3/s	Specific conductance, µmhos/cm @ 25°C
Little Huauni Creek near Lebanon, OK	6S-4E-17CCC	25.0	10/28/75	2.7	550
			11/17/75	2.6	590
			12/11/75	3.0	605
			1/21/76	3.3	675
Davis Creek at Caney, OK	4S-10E-01CDD	14.2	10/29/75	0.4	450
			11/17/75	0.6	470
			12/11/75	1.1	510
			1/21/76	1.1	530
Dumpling Creek near Antlers, OK	4S-16E-22DDC	24.2	10/29/75	0.7	110
			11/18/75	2.4	60
			12/12/75	4.8	130
			1/22/76	4.2	130
West Branch of Gates Creek near Fort Towson, OK	6S-18E-06BDB	18.9	10/29/75	3.5	40
			11/18/75	4.0	38
			12/12/75	5.2	36
			1/22/76	4.7	31

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