TEXAS WATER DEVELOPMENT BOARD

REPORT 293

GEOHYDROLOGY OF THE EDWARDS AQUIFER IN THE AUSTIN AREA, TEXAS

By

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FOREWORD

Effective September 1, 1985, the Texas Department of Water Resources was divided to form the Texas Water Commission and the Texas Water Development Board. A number of publications prepared under the auspices of the Department are being published by the Texas Water Commission. To minimize delays in producing these publications, references to the Department will not be altered except on their covers and title pages.

ABSTRACT

The Edwards aquifer in the Austin area includes parts of Hays, Travis, Williamson, and Bell Counties and extends from the town of Kyle to Belton. Austin, Round Rock, and Georgetown are urban centers that lie along the northern segment of this major aquifer.

The Edwards aquifer within an area of 1,150 square miles from Kyle to Belton is capable of supplying water containing less than 3,000 milligrams per liter of dissolved solids. In almost three-fourths of this area the aquifer contains water with less than 1,000 milligrams per liter of dissolved solids. The outcrop of the aquifer, or the approximate recharge zone, occupies 490 square miles and contains water that typically has from 200 to 400 milligrams per liter of dissolved solids.

The depth of the Edwards aquifer varies considerably due to the extensive disruption of the aquifer by intensive faulting in the Balcones fault zone. The top of the aquifer at the deepest point where it still contains water having less than 3,000 milligrams per liter of dissolved solids is 1,200 feet at Taylor and the shallowest point is 150 feet beneath the Colorado River at Austin.

The aquifer is only slightly to moderately developed by wells. Most discharge is from springs, therefore the amount of ground water pumped from the Edwards from Kyle to Belton is comparatively small in relation to total ground-water discharge. In 1980 pumpage was about 15,000 acre-feet or 13 million gallons per day. Ground-water pumping is increasing and is expected to continue to increase because of the rapid growth in population and the accompanying economic activity in parts of the region.

Notwithstanding the increases in ground-water pumping, ground-water recharge to the aquifer is still essentially in balance with discharge from the aquifer. Changes in water levels from Kyle to Belton are still controlled mainly by the amount and frequency of rainfall. Nevertheless, water levels in the aquifer may not remain unaffected by pumping in the future.

Channel-gain and -loss investigations on 10 streams that cross the outcrop of the aquifer show that moderate to large losses in streamflow occur on the outcrop. These losses are large in the vicinity of faults, which facilitate ground-water recharge. Natural ground-water discharge from the Edwards by springflow usually occurs near the eastern margin of the aquifer's outcrop.

Barton Springs is the major site of ground-water discharge in the Austin area. South of the Colorado River, ground water in the Edwards aquifer initially moves eastward and then regionally northward, converging on Barton Springs, where an average 50 cubic feet per second is discharged. North of the Colorado River in the Round Rock and Georgetown areas, the ground water regionally moves eastward with little or no well-developed secondary directions of movement.

Discharge at Barton Springs was considerably below the long-term average of 50 cubic feet per second during 1978, only slightly below average during 1980, and considerably above

average during 1979 and 1981. Near-normal springflow may be expected whenever rainfall is near normal for an extended period of time if, however, pumping of ground water south of the Colorado River remains small.

The degree of mineralization of the water from Barton Springs is not constant but varies with the rate of flow. In general, the higher amounts of dissolved solids are associated with the lower flow rates.

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INTRODUCTION

A project to appraise quantitatively the ground-water resources of the Edwards aquifer in parts of Hays, Travis, Williamson, and Bell Counties, and to provide the data and methodology for present and long-range planning of water use and management began in 1978. The project is jointly funded and conducted by the U.S. Geological Survey and the Texas Department of Water Resources. This report, the first of two, has been prepared to describe the geologic and hydrologic framework of the Edwards aquifer in the Austin area and to present the hydrogeologic data that were collected from 1978 to 1981. Some data that were collected prior to 1978 during the course of other projects also are included. The second report will document and describe the use of a steady-state ground-water flow model of the aquifer which will serve as a tool to aid water planners in the regional development of the aquifer and in the protection of its water supplies.

This report presents the hydrogeologic framework of the Edwards aquifer using hydrogeologic sections which are supplemented by structure and thickness maps of the aquifer. Also presented in the report are hydrologic findings such as the extent of water use, position of water levels in the subsurface and changes in these levels, the quality of the water throughout the Edwards aquifer, and the relationships of streamflow to the aquifer.

Location and Extent of the Area

The Austin area, as used in this report, includes parts of Hays, Travis, Williamson, and Bell Counties where the Edwards aquifer contains water having less than 3,000 mg/l (milligrams per liter) of dissolved solids, the study area extends slightly beyond the Austin area in some places. (See Figure 1.) The southern boundary of the Austin area is near Kyle in Hays County and adjoins the northern extent of the "San Antonio area" as designated by early ground-water investigators (Petitt and George, 1956, p. 3).

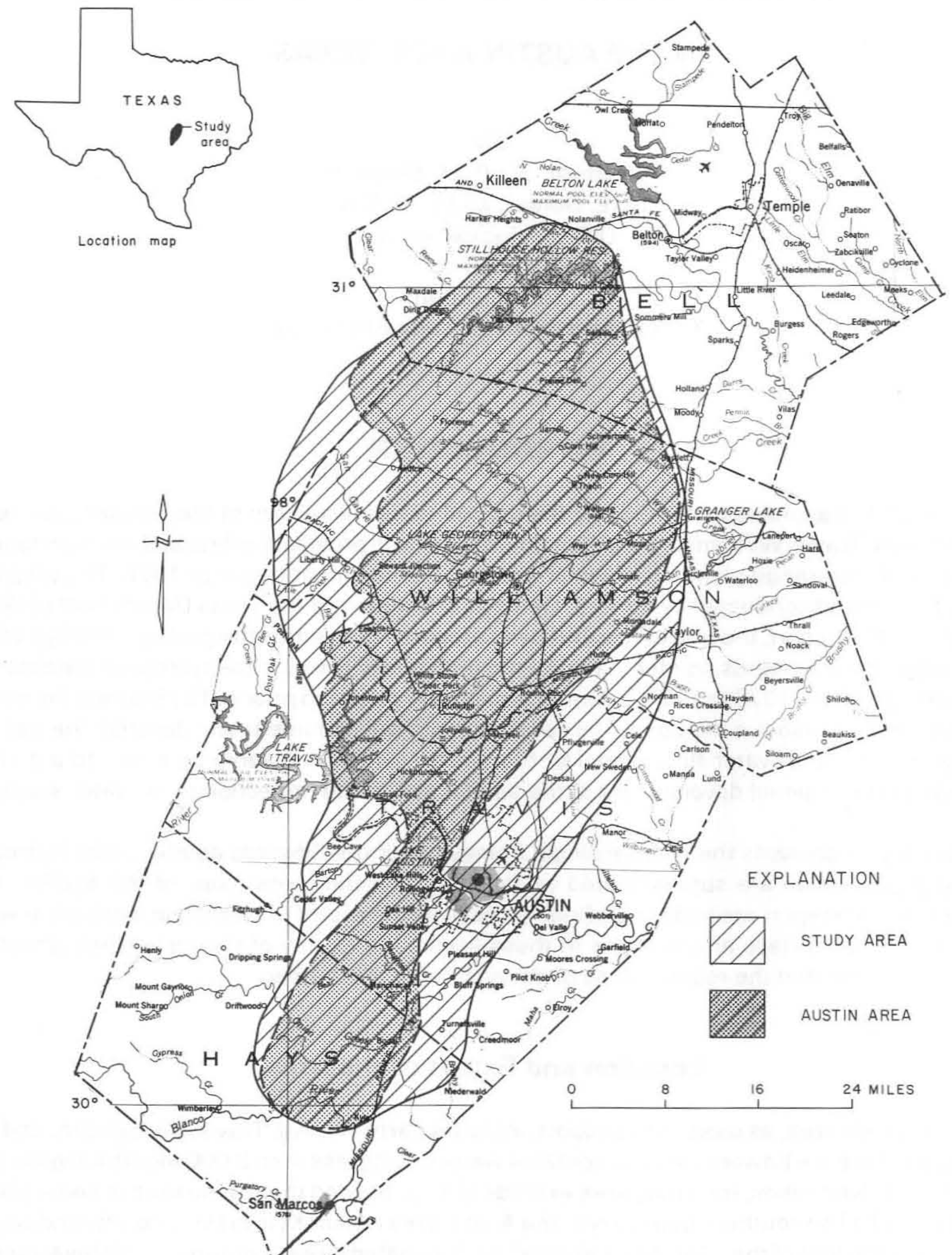


Figure 1

Location of the Study Area and Austin Area

The Austin area extends from near Kyle to near Belton in Bell County, a distance of 80 miles, and has an irregular width of from 4 to 30 miles. The narrow part occurs along the Colorado River in Austin. Total area includes about 1,150 square miles.

Previous Studies

Water-resources data have been gathered by the U.S. Geological Survey and Texas Department of Water Resources as well as other mostly governmental entities in parts of the Austin area during the course of regional, county-wide, or local investigations for the past several decades. A brief review of the more detailed investigations in Travis, Hays, Williamson and Bell Counties and the resulting reports follows.

A well-inventory report on Travis County by George, Cumley, and Follett (1941) contains records of wells and springs that were collected from 1937 to 1940. This report was updated by Arnow (1957), with well data that were collected to 1955. The latest information on wells and springs in Travis County was added during the 1970's, and was followed by an interpretive report on the occurrence, availability, and quality of the ground water (Brune and Duffin, 1983).

The Geological Survey, in cooperation with the Texas Department of Water Resources, began hydrological studies of surface water in the Austin urban area of Travis County in 1954. In cooperation with the City of Austin, the program was expanded in 1975 to include surface-water-quality data, and in 1978, the program was expanded again to include a study of the Edwards aquifer of the south Austin metropolitan area in the Balcones fault zone. These Austin urban studies resulted in a series of annual data reports. Those that include ground-water data are by Slade and others, (1980, 1981, and 1982).

Records of wells and springs collected in 1937 and 1938 in Hays County, were presented by Barnes (1938). These data were later supplemented by similar data collected between 1938 and 1954 and presented by DeCook and Doyel (1955). A report on ground water in the Edwards aquifer in the San Antonio area included data for parts of eastern Hays County (Petitt and George, 1956). However, a detailed investigation was made of the geology and ground-water resources of Hays County during 1954-56, by DeCook (1963). But the most recent published reports on the Edwards aquifer of eastern Hays County are those in the Austin urban studies (Slade and others 1980, 1981, and 1982).

The first county-wide well and spring inventory in Williamson County was made during 1940 by Cumley, Cromack, and Follett (1942). These hydrologic data were supplemented by data that were gathered sporadically during the next 30 years and presented in a report by Klemt, Perkins, and Alvarez (1975 and 1976) for the central Texas region, which included Williamson County.

The only county-wide ground-water investigations in Bell County were made by Klemt, Perkins, and Alvarez (1975 and 1976). These interpretative and basic-data reports were regional in scope, but included much information on Bell County.

Well-Numbering System

The well-numbering system that is used in this report was developed by the Texas Department of Water Resources for use throughout the State. It is based on latitude and longitude and consists of a two-letter county-designation prefix plus a seven-digit well number. The two-letter prefix for Travis County is YD, for Hays County LR, for Williamson County ZK, and for Bell County AX.

Each 1-degree quadrangle in the State is given a number consisting of two digits from 0 through 89. These are the first two digits of the well number. Each 1-degree quadrangle is divided into 7½-minute quadrangles which are given two-digit numbers from 01 through 64. These are the third and fourth digits of the well number. Each 7½-minute quadrangle is divided into 2½-minute quadrangles which are given a single-digit number from 1 through 9. This is the fifth digit of the well number. Each well or spring that is located within a 2½-minute quadrangle is given a two-digit number beginning with 01, according to the order in which it was inventoried. These are the last two digits of the numbering system.

Only the last three digits of the well-numbering system are shown on the maps of the well, spring, and test hole sites; the second two digits are shown in or near the northwest corner of each 7½-minute quadrangle; and the first two digits are shown by large block numbers. For example, one of the Manville Water Supply Corp. wells that is designated as ZK-58-35-306 is shown in Figure 27 with the number 306 beside the well symbol in the 7½-minute quadrangle that bears the number 35. The large block number 58 designates the 1-degree quadrangle.

Metric Conversions

For those readers interested in using the metric system, factors for converting inch-pound units to metric equivalents are given in the following table:

From	Multiply by	To obtain
acre-foot	1,233	cubic meter (m^3)
	.001233	cubic hectometer (hm^3)
cubic foot per second (ft^3/s)	.02832	cubic meter per second (m^3/s)
foot	.3048	meter (m)
foot per mile (ft/mi)	.189	meter per kilometer (m/km)
gallon per minute (gal/min)	.06309	liter per second (l/s)
inch	25.4	millimeter (mm)

From	Multiply by	To obtain
micromho per centimeter (μ mho/cm)	1.000	microsiemens per centimeter (μ S/cm)
mile	1.609	kilometer (km)
million gallons per day (Mgal/d)	.04381	cubic meter per second (m^3/s)
square mile	2.590	square kilometer (km^2)

Temperature data in this report are in degrees Celsius (°C) and may be converted to degrees Fahrenheit (°F) by the following formula:

$$°F = 1.8\ (°C) + 32.$$

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 mean sea level. NGVD of 1929 is referred to as sea level in this report.

HYDROGEOLOGIC FRAMEWORK

This discussion of the hydrogeology in the Austin area is limited to an evaluation of the hydrogeologic framework of the Edwards aquifer. Other geologic and hydrologic units that overlie and underlie the Edwards are discussed in less detail and are referred to collectively as formations younger or older than the Edwards aquifer. However, a description of the rocks from the land surface down through the Edwards aquifer, including rocks younger and older than the Edwards, is presented by lithologic logs of test holes and drillers' logs of wells in Tables 1 and 2.

Hydrogeologic Outcrop

The location of the outcrop of the geologic formations comprising the Edwards aquifer is shown in Figure 2. The outcrop includes the Edwards Limestone, the underlying Comanche Peak Limestone, and the overlying Georgetown Limestone all of early Cretaceous age. The outcrop is considerably wider in Williamson and Bell Counties as well as in Hays County than it is in Travis County where a combination of intense faulting and large topographic variations has narrowed the aquifer's exposure. In places on the north side of the Colorado River in Austin the outcrop has been completely removed by faulting, whereas along the Williamson and Bell County line the outcrop is about 10 miles wide.

The total area that is occupied by the outcrop of the Edwards aquifer is 490 square miles. This is slightly less than one-half of the area (outcrop and subcrop) where the aquifer contains water having less than 3,000 mg/l (milligrams per liter) of dissolved solids. The outcrop of the Edwards

aquifer approximates the recharge area for the aquifer, although locally the boundary of the recharge area differs from the outcrop. This is, in part, because in some places slightly east of the outcrop on rock formations younger than the Edwards aquifer streamflow and rainfall may percolate downward into the aquifer, especially where these younger rocks are faulted.

The Edwards aquifer is bounded on the west by older Cretaceous rocks. These rocks include the Walnut Clay and the underlying Glen Rose Limestone. These rocks yield relatively little water when compared to the Edwards aquifer. Nevertheless the Glen Rose Limestone, which yields small to moderate amounts of water to wells, is an important aquifer where the Edwards aquifer is not present.

Cretaceous rocks younger than those of the Edwards aquifer adjoin the aquifer on its eastern boundary and extend eastward at the surface. These rocks include from oldest to youngest, the Del Rio Clay, Buda Limestone, Eagle Ford Shale, Austin Chalk, Taylor Marl, and Navarro Group. They yield little or no water or a very small amount of water to mostly shallow dug wells.

Soils formed on the outcrop of the Edwards aquifer are typically dark brown, grayish brown, and reddish brown, silty to clayey loams. These soils developed from limestone and marl that comprise the aquifer. The soils usually range in thickness from less than 5 inches to as much as 5 feet. In some places, however, soils have eroded away, such as on steep slopes, leaving the bedrock exposed.

The bedrock of the Edwards aquifer outcrop consists mostly of hard to soft limestone with some interbedded marl present both at the outcrop and in the subsurface. The limestone and dolomite at the outcrop is typically dense, grayish to white, and massive. In some areas, thin beds create the appearance of flagstones. Chert is common in the limestone as hard nodules. In zones of intense weathering, honeycombing is characteristic, and in a few areas sinkholes and caves or caverns are present.

Solution features, such as honeycombing, sinkholes, and caverns, allow for rapid infiltration of water at the outcrop as well as for rapid movement of ground water within the aquifer. The intense faulting at the outcrop is an important feature that allows many of the solution features to develop.

Aerial photographs of the outcrop of the Edwards aquifer are shown in Figures 3 through 6. Various natural geologic and hydrologic features are present on the limestone terrain, which constitute a recharge zone to the Edwards aquifer.

Hydrogeologic Sections

Vertical profiles through the Edwards aquifer in Travis, Williamson, Hays, and Bell Counties show the position of the aquifer in the subsurface and the associated faulting. These profiles are shown by four strike sections and five dip sections in Figures 7 through 15. In addition, the dissolved-solids content of the water is shown as well as the height to which water rose in wells in the aquifer during January-February 1981. Water-quality zones indicated are the dissolved-solid concentrations of less than 1,000 mg/l, dissolved-solids concentrations from 1,000 to 3,000 mg/l, and those greater than 3,000 mg/l.

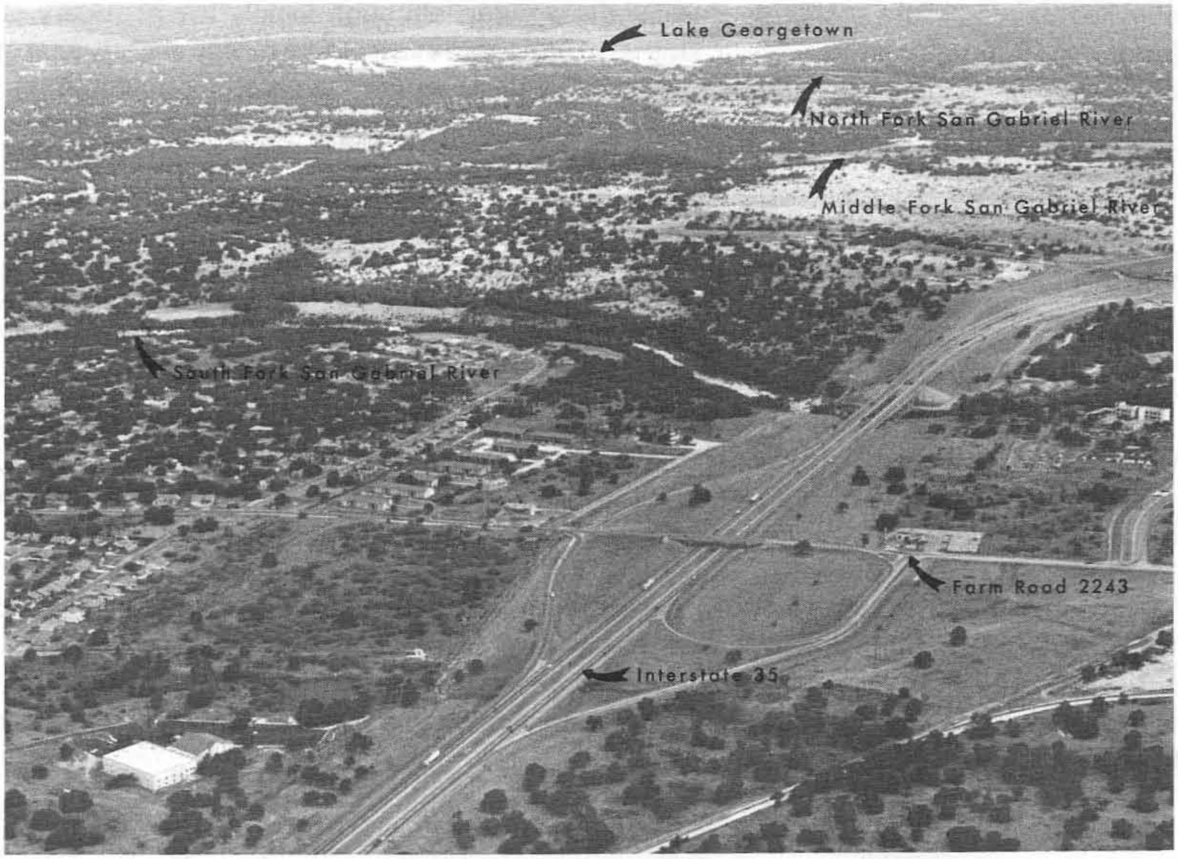


Figure 3.—Outcrop of the Edwards Aquifer at City of Georgetown

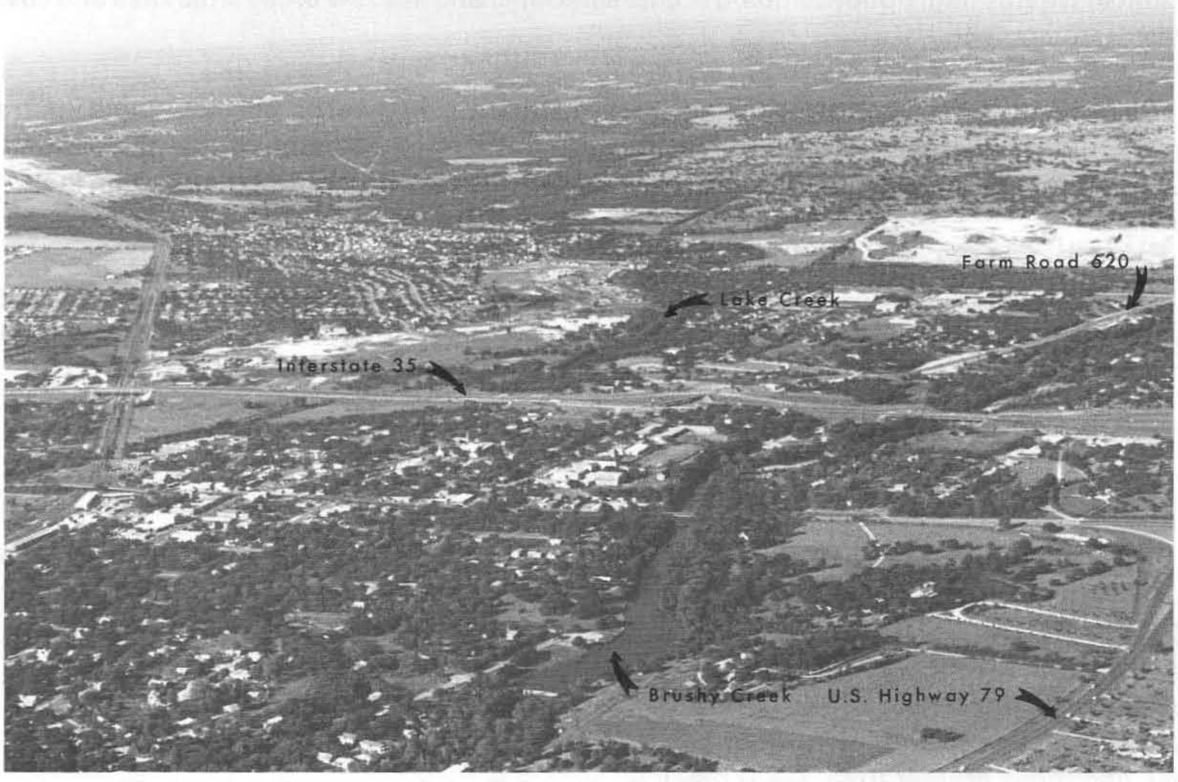


Figure 4.—Outcrop of the Edwards Aquifer at City of Round Rock

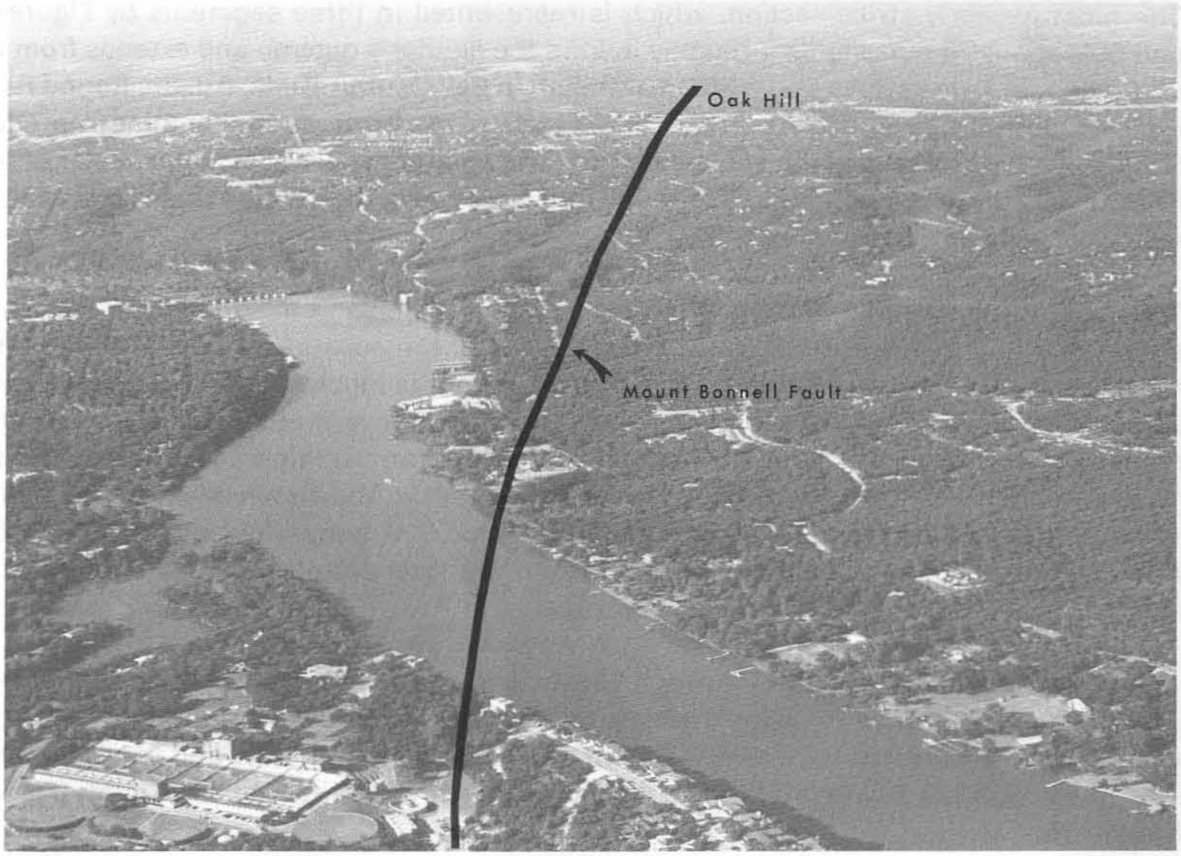


Figure 5.—Outcrop of the Edwards Aquifer at City of Austin

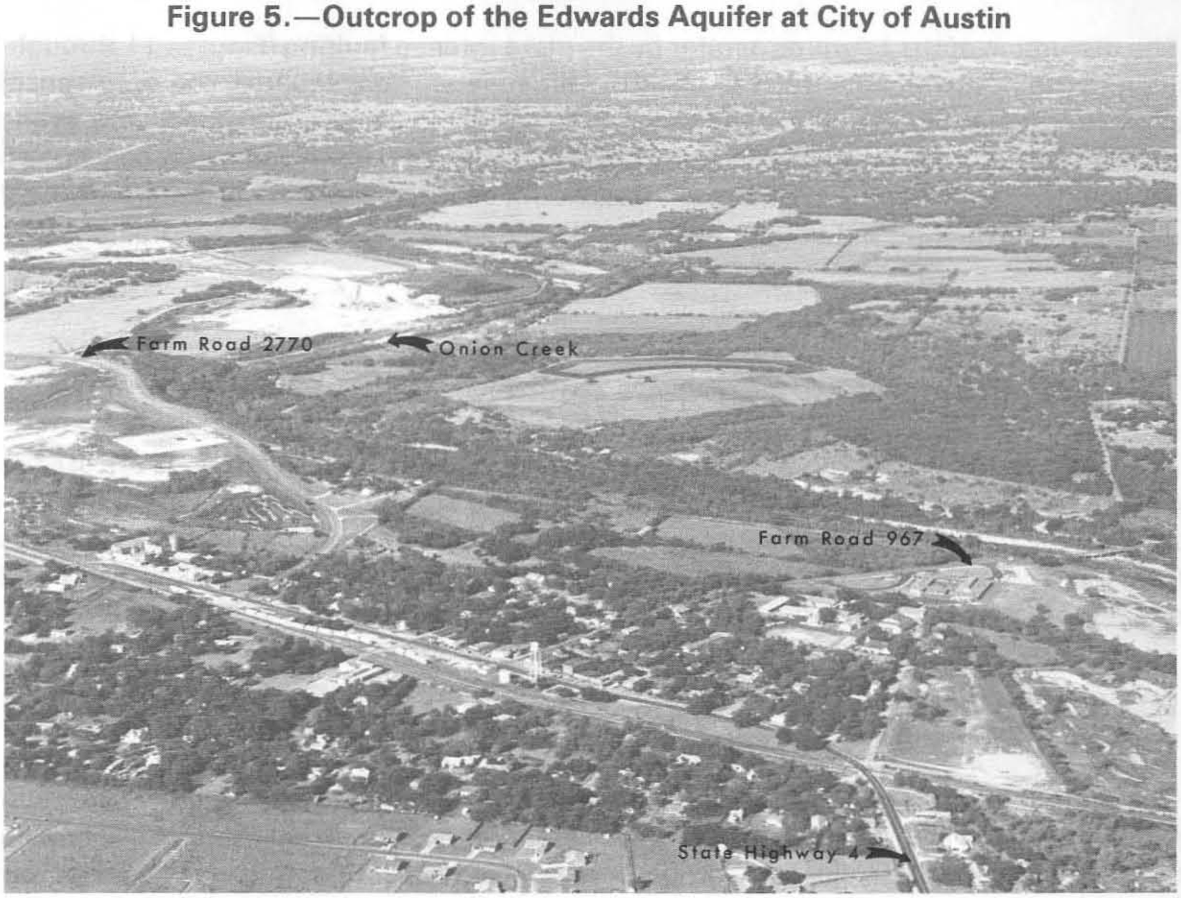


Figure 6.—Outcrop of the Edwards Aquifer at City of Buda

The most westerly strike section, which is represented in three segments by Figures 7 through 9, is about 75 miles long. It roughly follows the aquifer's outcrop and extends from the Blanco River near Kyle in Hays County to near Belton in Bell County. Buda, Austin, Round Rock, Georgetown, Jarrell, and Salado are on or near the section. The Edwards aquifer thins from south to north. Faulting decreases in the same direction. The aquifer generally contains water of less than 1,000 mg/l dissolved-solids concentration in the area near the outcrop that is represented by these westerly strike sections.

The most easterly strike section G-G', extends from Coupland in Williamson County to Holland in Bell County (Figure 10). This vertical profile of the subsurface passes through the towns of Taylor, Granger, and Bartlett. The Edwards aquifer is much deeper along this section than it is to the west. It is cut by fewer faults because the area is several miles east of the Balcones fault zone axis. Also, the Edwards aquifer contains water that is more mineralized here where the aquifer is deep than it is to the west where the aquifer is shallow. The dissolved-solids concentration of water in the Edwards aquifer along the line of section G-G' generally ranges from 1,000 to 3,000 mg/l, but near the extremities of the section the total dissolved-solids concentration exceeds 3,000 mg/l.

The five dip sections (Figures 11 through 15) show the position of the Edwards aquifer from its outcrop on the west 7 to 20 miles downdip to the east. The intensity of the faulting that is associated with the Balcones fault zone is shown on the dip sections in Hays and Travis Counties (Figures 11 through 13). Fewer faults affect the aquifer northward in Williamson County (Figures 14 through 15).

The disruption of the Edwards aquifer by the more intense faulting (Figures 11 through 13) has limited the occurrence of fresh to slightly saline water. Consequently the occurrences of water having generally less than 1,000 mg/l dissolved-solids concentration, and even the occurrences of water having generally from 1,000 to 3,000 mg/l dissolved-solids concentration, are restricted to a smaller area in Hays and Travis Counties where the faulting is more severe than in Williamson and southern Bell Counties.

Position of the Edwards Aquifer in the Subsurface

The Edwards aquifer within the report area varies in depth. These variations are gradual in most places but are abrupt in others, especially in areas of intense faulting where the aquifer occurs at significantly different depths over short distances. Knowledge of the elevation and depth to the top and base of the aquifer provides a practical guideline for drilling wells and, in general, for properly managing the orderly development and protection of the aquifer.

Top of the Aquifer

The altitude of the top of the Edwards aquifer throughout the report area is illustrated in Figure 16. The depth to the top is given at well locations, based on available data. An approximate depth to the top at any particular location can be determined by subtracting the altitude of the top of the aquifer as estimated from contour lines on the map from the altitude of the land surface at that particular location. The outcrop of the Edwards aquifer, as shown on the map, represents the aquifer's eroded top that is exposed at the land surface.

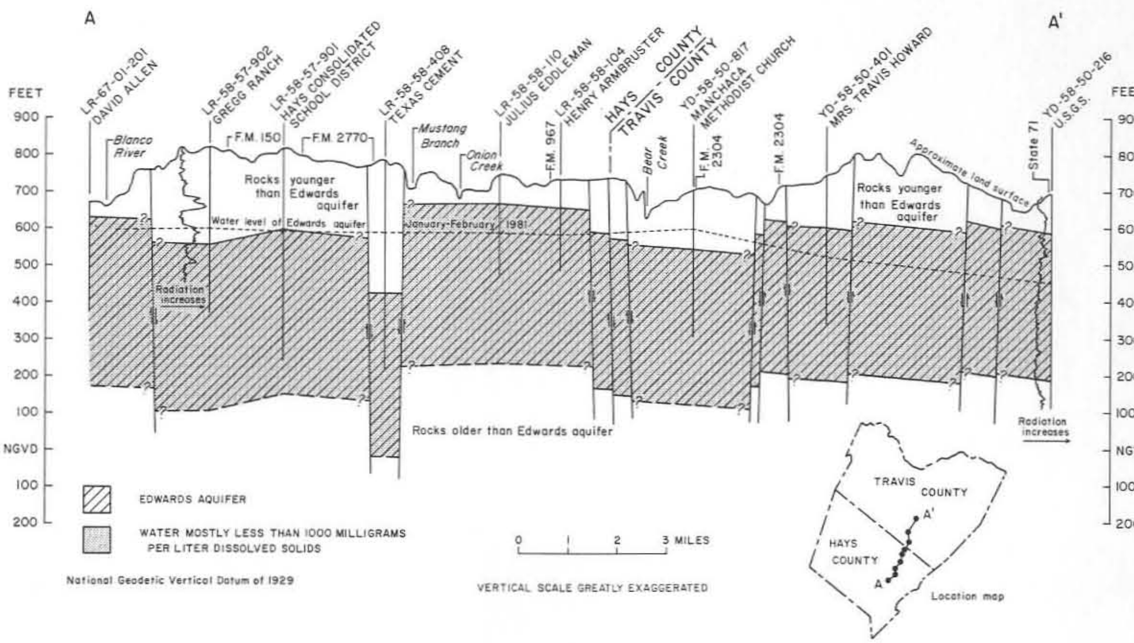


Figure 7.—Hydrogeologic Section A-A' Through Northern Hays and Southern Travis Counties

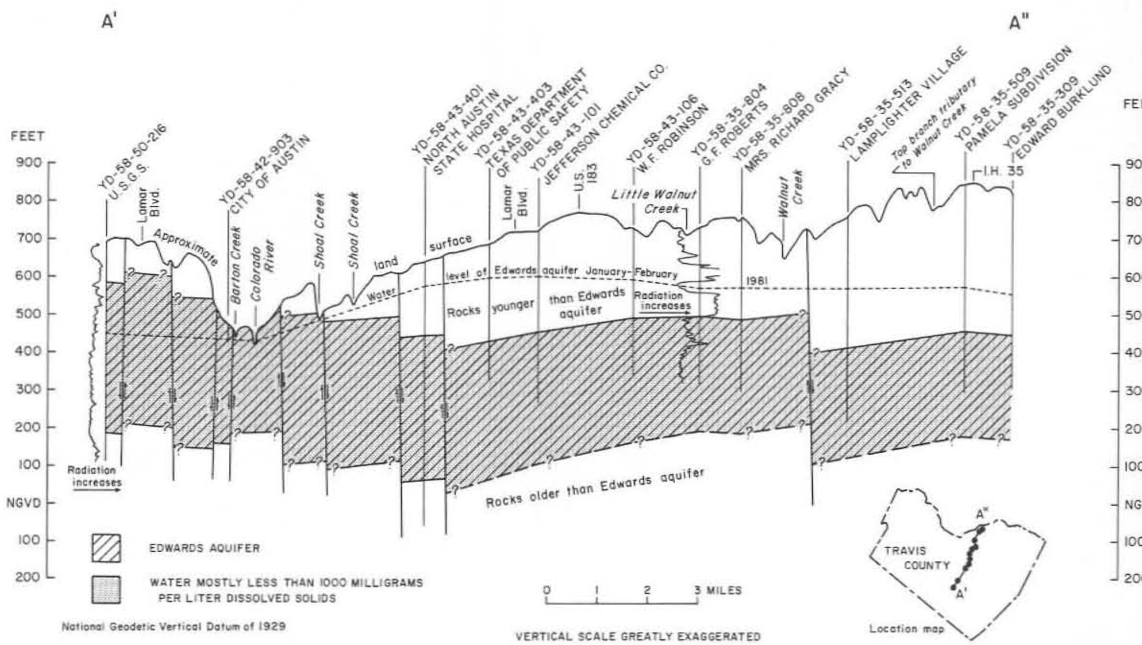


Figure 8.—Hydrogeologic Section A'-A" Through Central and Northern Travis County

The aquifer dips to the east-southeast at an average slope of 70 to 75 ft/mi (feet per mile). The slope of the aquifer surface, as well as its depth and elevation, varies significantly over short distances in areas of intense faulting. The faulting has caused the aquifer surface to be highly irregular, but generally stair-stepped downward in the dip direction.

[illegible]

Figure [illegible] Hydrogeologic Section A-A'. [illegible] Northern [illegible] and Southern Travis County

[illegible] Travis County

[illegible]

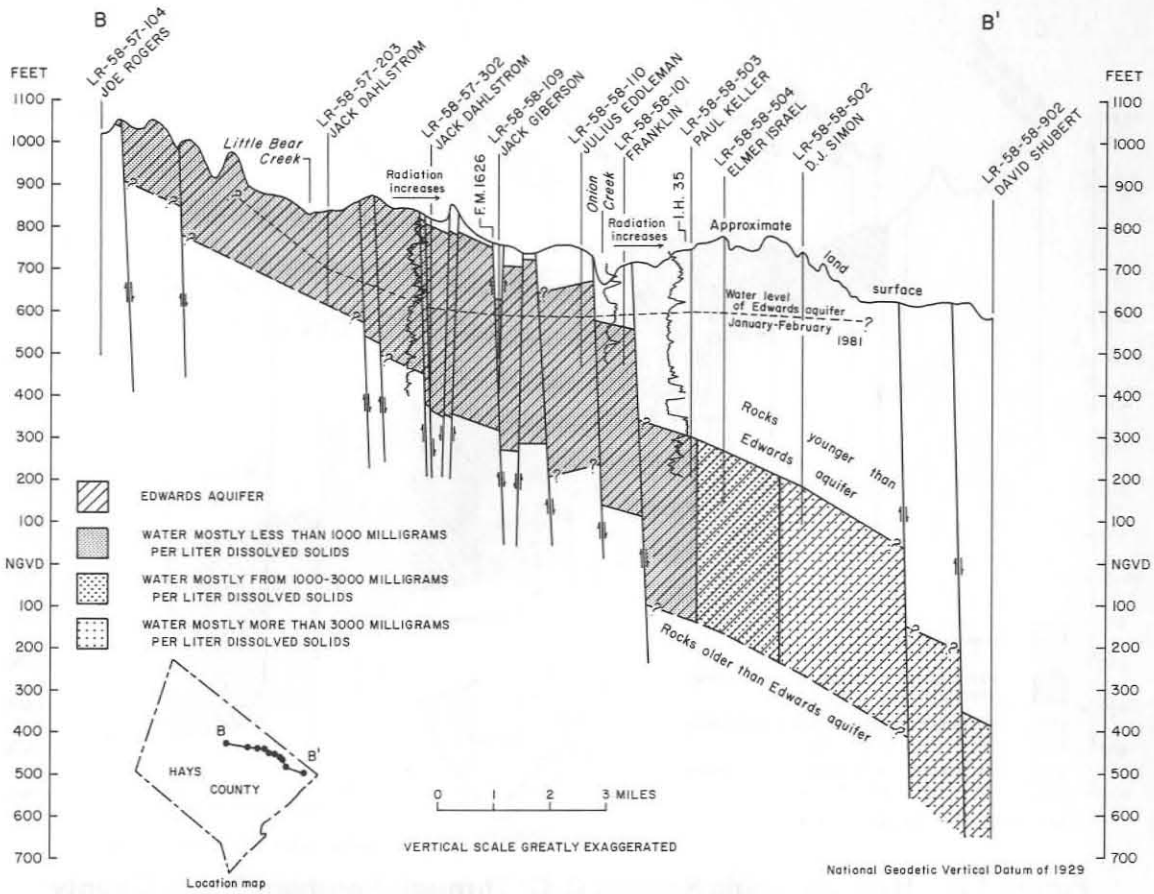


Figure 11.—Hydrogeologic Section B-B' Through Northern Hays County

The greatest depth to the top of the Edwards aquifer, where it still contains water having generally less than 3,000 mg/l of dissolved solids, is approximately 1,200 feet below land surface at Taylor in eastern Williamson County. The shallowest occurrence of water having generally 3,000 mg/l or more of dissolved-solids concentration occurs midway between I.H. 35 and the Barton Creek confluence with the Colorado River. At this location, the top of the aquifer is only about 150 feet deep.

The top of the aquifer is identified in the subsurface by an abrupt change in the character of the rocks. Drillers' logs and geophysical logs of boreholes show a marked change in lithology at the contact of the overlying Del Rio Clay, which is 60 to 75 feet thick, and the hard Georgetown Limestone at the top of the aquifer.

Base of the Aquifer

The configuration of the base of the Edwards aquifer is shown in Figure 17. The base, which dips towards the east-southeast at a slope of 70 to 75 ft/mi, is cut by numerous faults. These faults have caused the base to be offset a few feet to several hundreds of feet along the fault planes. The individual faults extend laterally for distances ranging from a fraction of a mile to more than 10 miles.

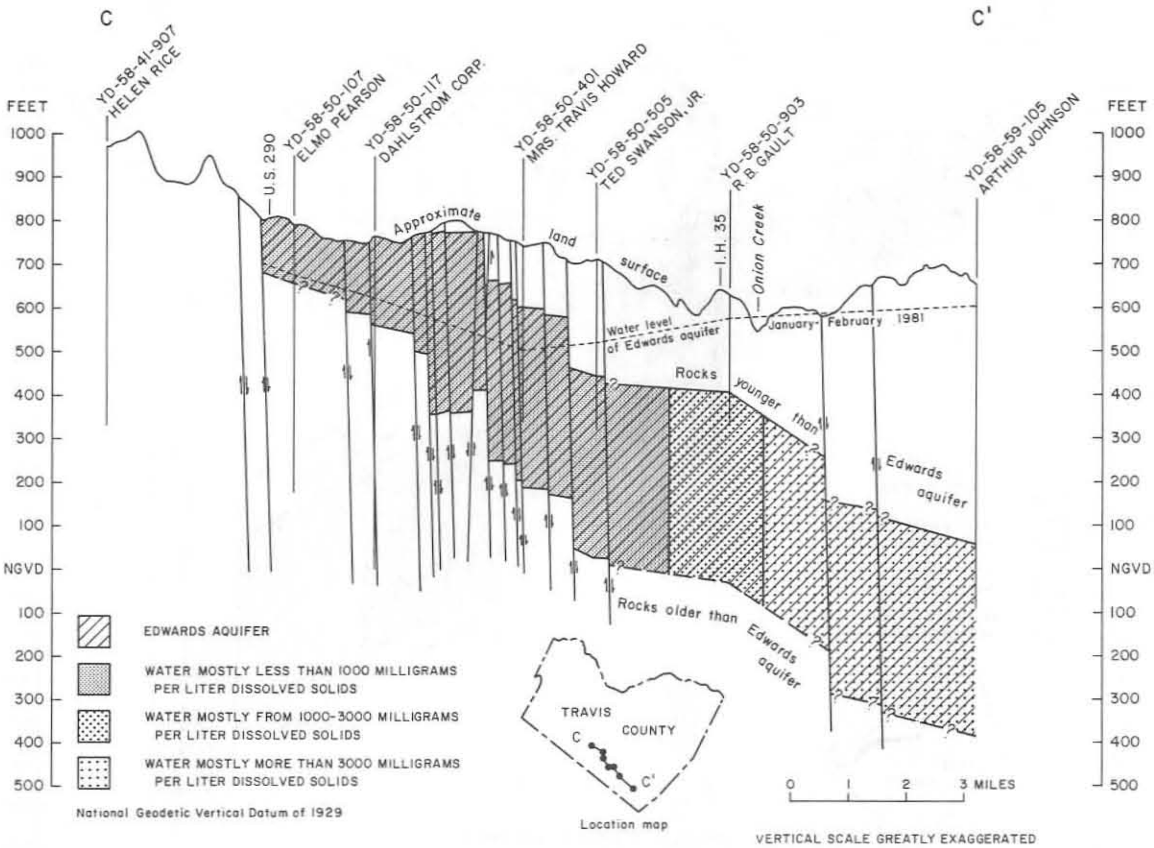


Figure 12.—Hydrogeologic Section C-C' Through Southern Travis County

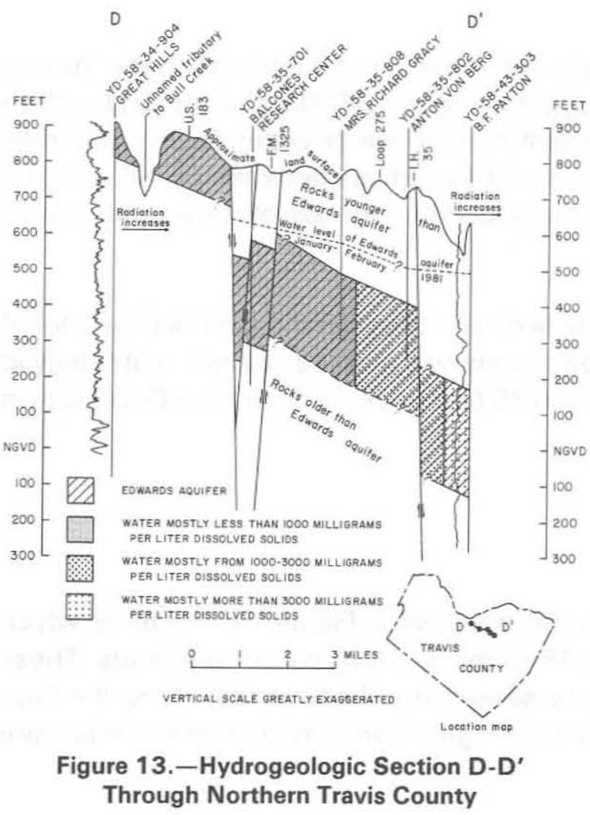


Figure 13.—Hydrogeologic Section D-D' Through Northern Travis County

The base of the Edwards aquifer extends from the land surface at many places along the western edge of the aquifer's outcrop to depths of hundreds of feet east of the outcrop. The depth of the base, where the aquifer contains water having generally 3,000 mg/l or more of dissolved-solids ranges from about 1,500 feet below land surface at Taylor to about 550 feet about 1 mile west of Interstate (I.H.) 35 at the Colorado River in Austin.

The base of the aquifer is less discernible than the top in the subsurface. For example, drillers' logs and geophysical logs of the boreholes do not show a sharp break in the lithologic character of the rocks. The rocks underlying the Edwards aquifer—the Walnut Clay or its various members—are of marly limestone and, thus, are somewhat similar in lithology to the aquifer in Williamson and Bell Counties. In Travis and Hays Counties, these underlying units are thinner and more difficult to identify in the subsurface.

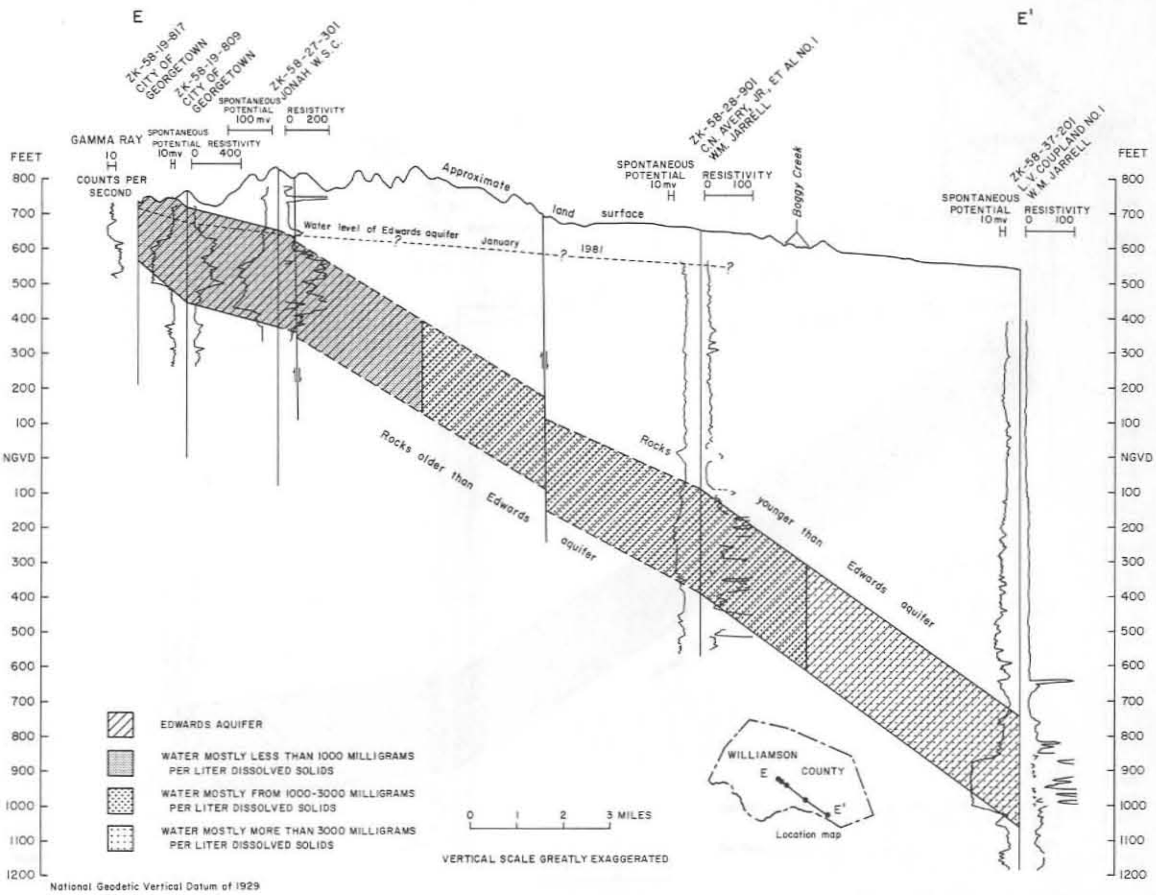


Figure 14.—Hydrogeologic Section E-E' Through Southern Williamson County

The Edwards aquifer yields water much more readily than the underlying rocks because of its greater secondary permeability. Consequently, the base of the Edwards aquifer is defined as the base of the rocks having the greater water-yielding capabilities.

Thickness of the Edwards Aquifer

The uneroded thickness of the Edwards aquifer decreases from south to north along the strike and increases from west to east downdip (Figure 18). This is consistent with regional trends. In Kinney County, 175 miles southwest of Austin, the thickness of the Edwards aquifer is greater than 1,000 feet. However, this thickness diminishes northward and eastward through the San Antonio area to about 500 feet in Hays County at the eastern end of the San Antonio area (Petitt and George, 1956, pl. 2).

Within the Austin area from Kyle to Belton the uneroded thickness of the Edwards aquifer continues to decrease from about 450 feet in eastern Hays County to about 225 feet in southern Bell County. This decrease in thickness is illustrated in the hydrogeologic strike sections A-A', A'-A'', and A''-A''' (Figures 7, 8, and 9).

The increase in total thickness of the aquifer from west to east is relatively slight, usually less than 50 feet within any one county, when compared to the change in thickness in a north-south

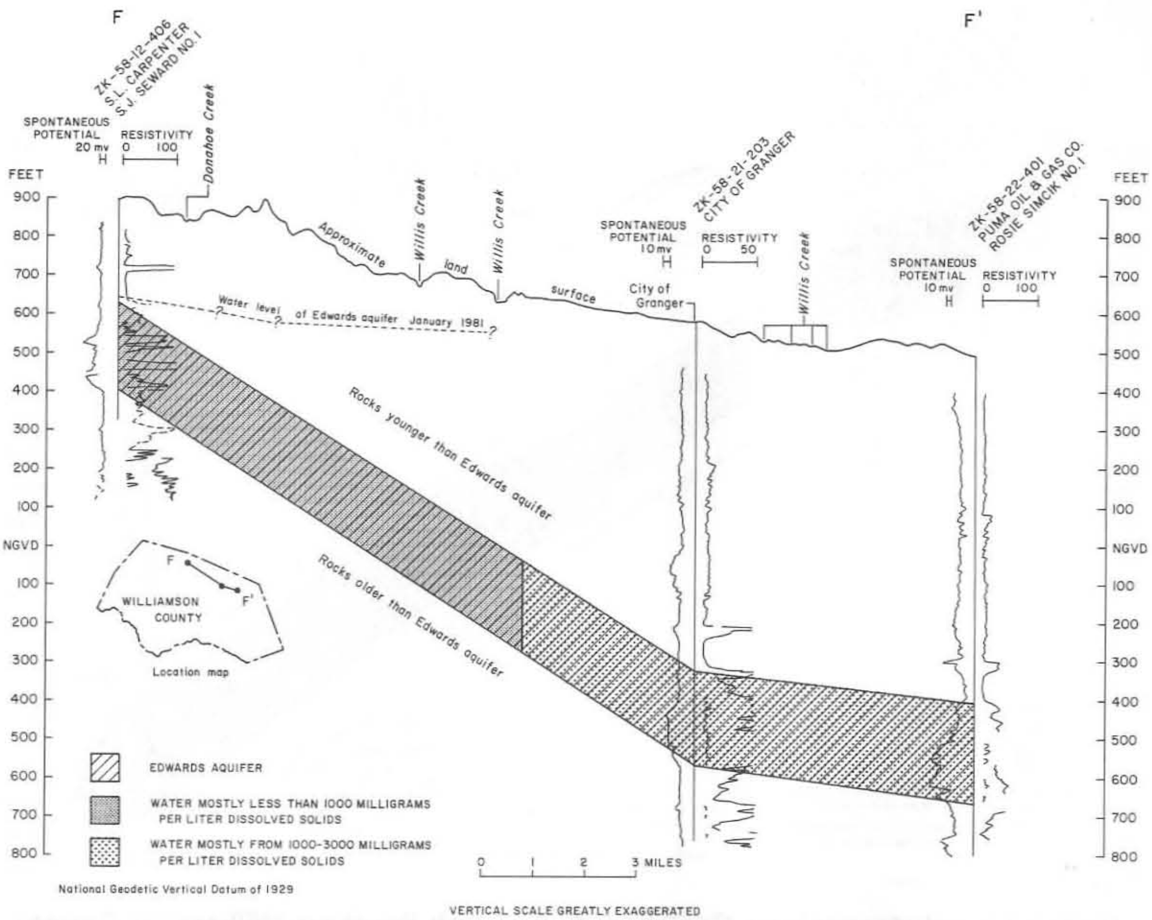


Figure 15.—Hydrogeologic Section F-F' Through Northern Williamson County

direction. The increase in thickness in the downdip direction is shown on the hydrogeologic dip sections (Figures 11 through 15).

The Edwards aquifer varies in thickness along the outcrop. Here the aquifer's thickness is influenced by erosion and faulting, which causes the thickness to range from zero to a maximum of about 450 feet.

DEVELOPMENT AND DISCHARGE OF GROUND WATER

Locations of selected water wells, test holes, springs, and oil tests in Hays, Travis, Williamson, and Bell Counties are shown in Figures 25 through 28. The well locations shown represent only selected wells that tap the Edwards aquifer. The hydrologic data, obtained from the inventory of these selected wells, provide the basic information needed to understand the hydrology of the aquifer. These data are presented in Table 3.

The Edwards aquifer in the Austin area is slightly to moderately developed by wells. In the San Antonio area, for example, pumping from the Edwards aquifer by the city of San Antonio and by irrigators is intensive, whereas, in the Austin area the aquifer is not pumped for municipal use by the city of Austin or used extensively for irrigation. Consequently the total amount of ground water discharged by wells in the Edwards aquifer from Kyle to Belton is comparatively small.

The amount of ground water that was discharged annually from the Edwards aquifer during 1978-80 is given in Figure 19. The quantities shown include water from wells and springs except for Williamson and Bell Counties where only the discharge from wells was determined. Well discharge includes water withdrawn for municipal, industrial, irrigation, domestic, and livestock use.

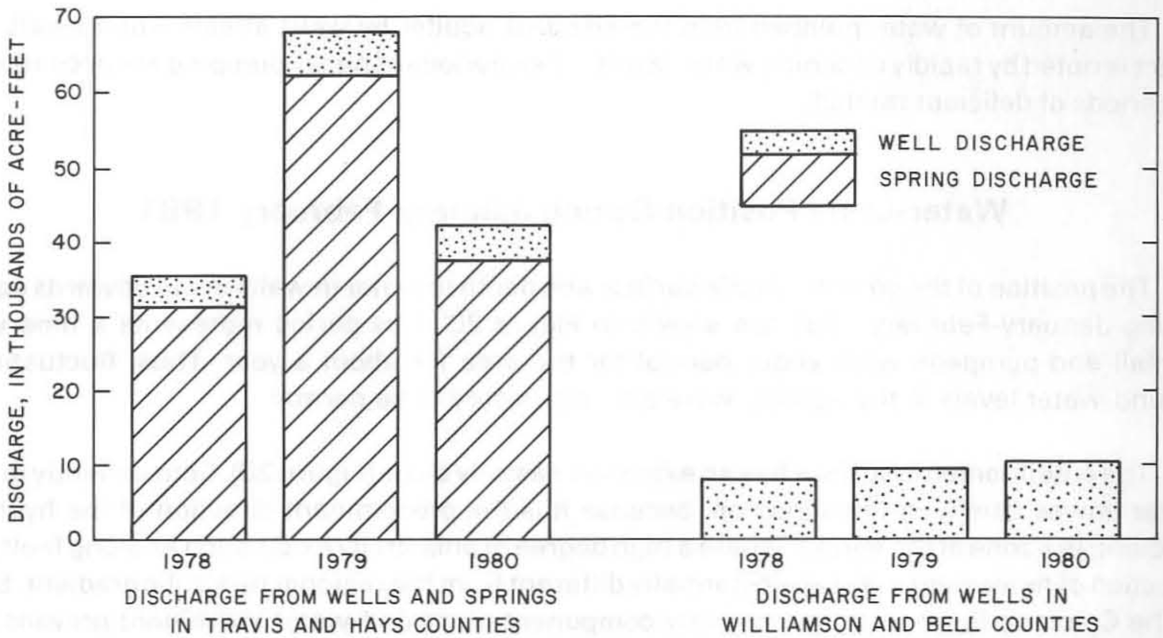


Figure 19.—Amount of Ground Water Discharged From the Edwards Aquifer, 1978-80

In Travis and Hays Counties, the total amount of ground water that was discharged annually varied from about 35,500 acre-feet in 1978 to 68,000 acre-feet in 1979 and to 64,000 acre-feet in 1980. About 90 percent of the total water that was discharged during each of the 3 years was from springs, predominantly Barton Springs. Others, such as Cold and Deep Eddy Springs, flow about 2,900 acre-feet per year. The larger springflow in 1979 is due to higher rainfall in 1979 than in 1978 and 1980. The 4,000 to 6,000 acre-feet of water pumped from wells in Travis and Hays Counties came mostly from municipal and industrial wells.

In Williamson and Bell Counties the amount of ground water discharged by wells from the Edwards aquifer ranged from 8,100 acre-feet in 1978 to 10,400 acre-feet in 1980. Pumpage by the cities of Round Rock and Georgetown account for most of the combined total ground water withdrawn by wells in these counties. The increases in municipal pumpage from 1978 to 1980 are due to population increases. Although annual springflow was not determined in Williamson and Bell Counties, it can be a significant part of the total discharge from the aquifer especially during wet years. For example, Salado Springs, the largest spring in Bell County, flowed 17 ft^3/s (cubic feet per second) on May 15, 1981, whereas Berry Springs, the largest spring in Williamson County, flowed 3 ft^3/s on April 24, 1978, and 10 ft^3/s on February 15, 1979.

WATER LEVELS

Water levels in the Edwards aquifer fluctuate in response to changes in the amounts of water recharged to and discharged from the aquifer. In relatively wet years, higher than normal additions of water to the aquifer exceed the discharge and cause water levels to rise. This recharge water comes from infiltration of rainfall directly on the outcrop of the aquifer and by streamflow entering the outcrop from the stream channels. During relatively dry years, discharge exceeds the lower-than-normal recharge and causes the quantity of ground water that is stored in the aquifer to decrease, which is shown by a decline in water levels.

The amount of water pumped from the Edwards aquifer by wells affects water levels. This effect is noted by rapidly declining water levels when periods of heavy pumping are accompanied by periods of deficient rainfall.

Water-Level Position During January-February 1981

The position of the potentiometric surface and depth to water in wells in the Edwards aquifer during January-February 1981 are shown in Figure 20. This period represents a time when rainfall and pumpage were about normal for the area for about a year. Thus, fluctuation in ground-water levels in the aquifer, were also considered to be normal.

The potentiometric surface has an extensive easterly slope (Figure 20). Consequently ground water moves chiefly in this direction, because it is the predominant direction of the hydraulic gradient. In a zone of the aquifer where a high degree of anisotropy exists such as along faults, the direction of movement may be substantially different from the regional hydraulic gradient. South of the Colorado River a strong northerly component of ground-water movement prevails from Buda to the Barton Springs area near the Colorado River. North of the Colorado River a moderate southerly component indicates that ground water is moving south to the river from the north-central part of the city of Austin. North of the city of Austin in Round Rock, Georgetown, Jarrell, and Salado areas, water moves basically eastward.

Figure 20 is useful as a guide to estimate the depth at which water will stand in wells drilled to the Edwards aquifer. This can be determined from the difference in the altitude of the water levels at any place on the map with respect to the altitude of the land surface at that same place. Records indicate that depths to water in wells range from at or near land surface for wells that are located in topographic lows to about 200 feet in wells that are located in topographic highs.

Changes in Water Levels at Selected Sites

Water levels in wells in the Edwards aquifer fluctuate over a wide range in most of the area. This is attributed to the fairly rapid rate of seasonal recharge to the aquifer during wet periods and, to a lesser extent, to variations in the annual discharge rate.

In order to monitor changes and trends in the water levels, an extensive network of wells extending from Kyle to Belton was selected for observation. About 200 wells were monitored annually. Sixty-eight of these wells were monitored on a monthly basis. Three wells in Travis County and two wells in Williamson and Bell Counties were equipped with recorders to monitor the water levels continuously.

Hydrographs of 13 wells that are representative of water-level changes in the study area are shown in Figures 21 and 22. The period of record ranges from 4 years (1978-81) to 39 years

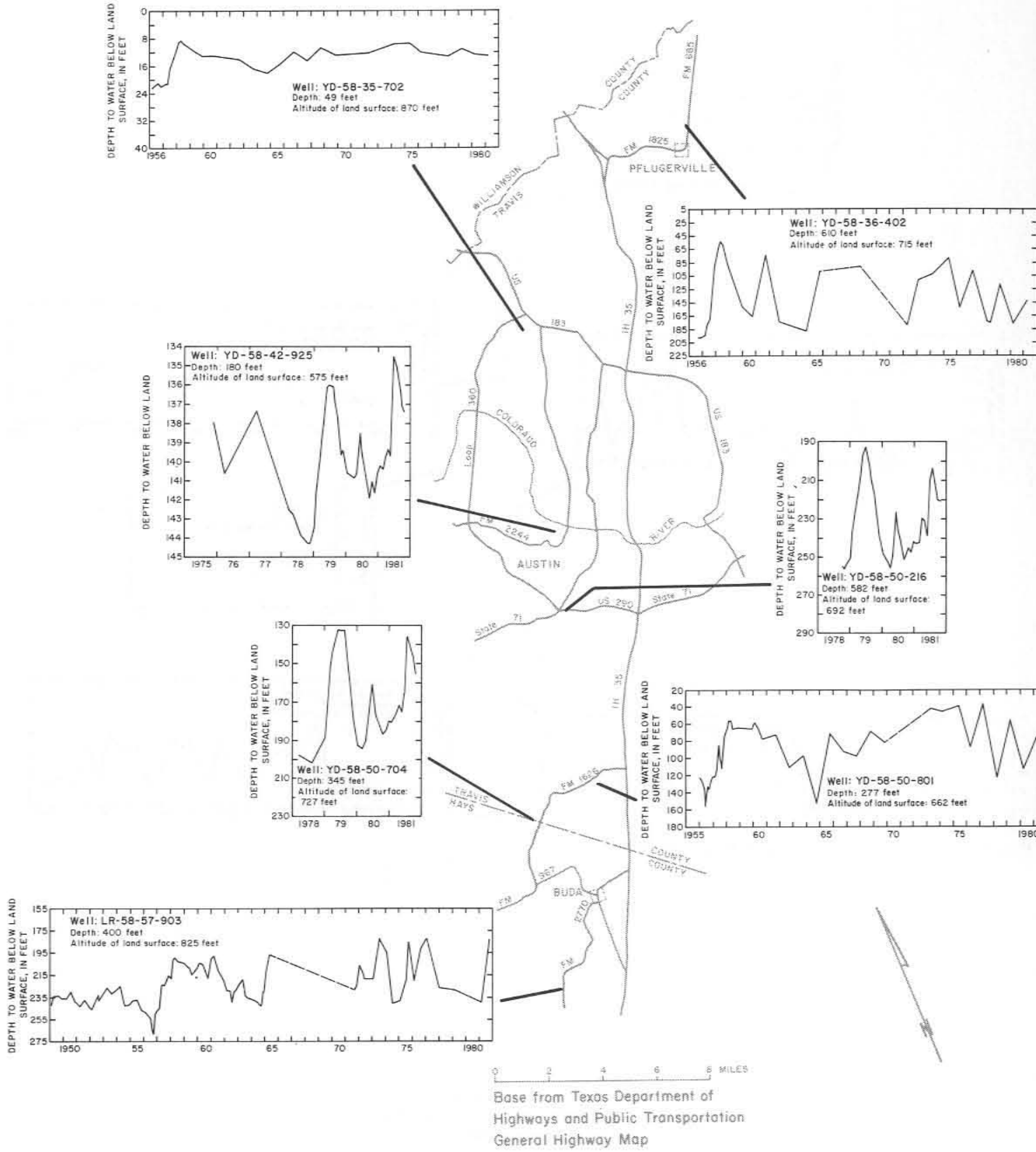
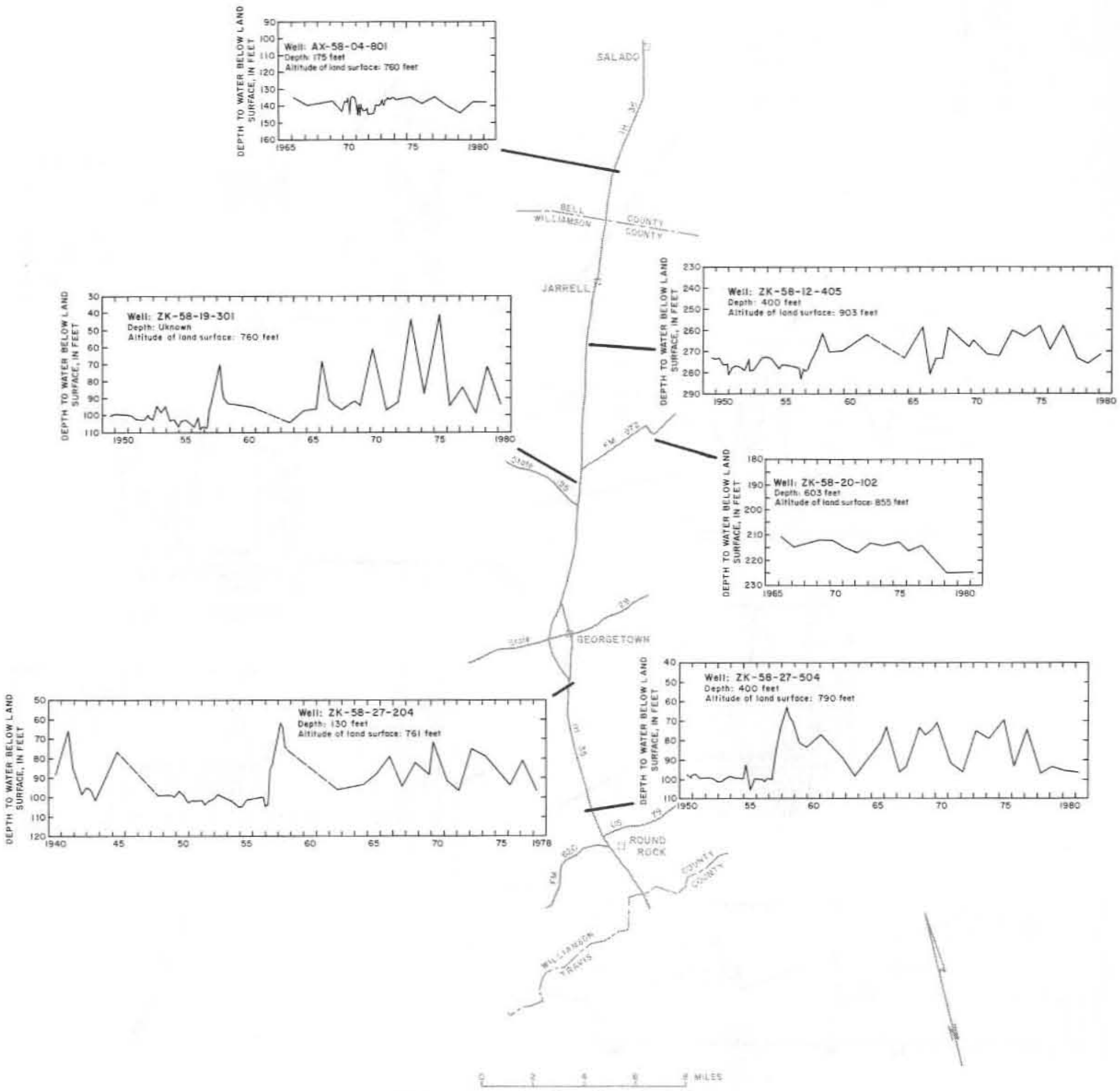


Figure 21

Hydrographs for Selected Wells in Travis and Hays Counties



Base from Texas Department of
Highways and Public Transportation
General Highway Map

Figure 22

Hydrographs for Selected Wells in Williamson and Bell Counties

(1940-78). Depths of the observation wells range from 49 feet on the outcrop area where water-table conditions exist to 610 feet in the artesian part of the aquifer. Additional data on water-level changes are given in Table 4 for other observation wells.

Well LR-58-57-903 in Hays County, and south of Buda shows typical water-level response to recharge from rainfall. Water levels in this well, which is about a mile from the Edwards outcrop, fluctuated over a range of about 85 feet from 1949 to 1981. The below-normal rainfall from 1950 through 1956 is reflected by the low water levels for that period. The high peaks on the hydrograph correspond to high-rainfall periods.

Hydrographs of six wells in the Edwards aquifer in Travis County, show a pattern similar to that of the Hays County well. The six wells range in depth from 49 to 610 feet. Wells YD-58-35-702 and YD-58-42-925 are on the outcrop of the Edwards aquifer, whereas the other four wells are deeper and pass through geologic formations that overlie the Edwards.

Although the two shallow wells on the outcrop show relatively small changes in water levels, the levels fluctuate in response to rainfall. The small fluctuation in well YD-58-42-925 is attributed largely to the fact that the well is near Town Lake which tends to stabilize ground-water levels in this area of natural ground-water discharge.

Large changes in water levels of about 65 to 145 feet are indicated by the hydrographs of the deeper wells in Travis County. All fluctuations are basically in response to wet and dry periods. Wells YD-58-36-402 and YD-58-50-801 had low water levels near the end of the drought in 1956 but these levels rose 100 to 150 feet by 1958. At no time since the drought of the 1950's have the water levels dropped to the 1956 lows, although a noticeable decline occurred in 1964 when rainfall was considerably below average.

Changes in water levels in Williamson County are represented by the hydrographs of five wells in the Edwards aquifer. All of the wells are along or near I.H. 35 (Figure 22). Well depths range from 130 to 603 feet.

Two of the five wells, ZK-58-27-204 in Georgetown and ZK-58-27-504 near Round Rock, are at the edge of the outcrop of the aquifer where water-table or semi-artesian conditions prevail. The drought of the 1950's is clearly indicated by the consistently low water levels through 1956. After the drought, sharp rises of 40 to 45 feet occurred in response to the more than 50 inches of rainfall during 1957. Increases in pumping for public supply and industrial purposes probably are responsible for the low water levels since 1977 in well ZK-58-27-504.

Two wells, ZK-58-12-405 and ZK-58-19-301, which are north of Georgetown in northern Williamson County, fluctuate in response to rainfall. Both show the typically low water levels during the drought of the 1950's, and the rapid water-level recovery immediately thereafter.

The water levels in well ZK-58-20-102 in Walburg show the influence of municipal pumping and only a slight response to recharge from rainfall. During the 16 years from 1966 to 1981, the water level has trended slightly downward in this 603-foot deep well that is about 5 miles east of the recharge area.

Water-level fluctuations in southern Bell County are represented by a livestock well AX-58-04-801 near Prairie Dell (Figure 22). This 175-foot deep well, which is less than a mile east of the recharge area of the Edwards aquifer, indicates that the water levels changed only slightly over the period of record. From 1966 to 1981 the maximum fluctuation in water levels has been only 11 feet. Variations in annual rainfall may be largely responsible for the water-level fluctuations.

Ground-water recharge to the Edwards aquifer is still essentially in balance with discharge from the aquifer as shown by the hydrographs. From Kyle to Belton the water-level changes are controlled predominantly by the amount and frequency of rainfall. Springflow, the principal means of ground-water discharge, is directly related to rainfall. Pumpage of ground water by wells is an added stress on the aquifer, but prior to at least 1981, pumpage has not had significant regional effects on the water levels.

Ground-water pumping, however, is expected to increase because of the extremely rapid growth in population and attendant economic activity in parts of the region. For this reason, current water-level trends are not expected to continue into the future. Continued water-level monitoring and evaluation of the Edwards aquifer will be necessary for predictive purposes.

QUALITY OF WATER

The quality of water in the Edwards aquifer is directly affected by the total environment of the water from its origin as rainfall to its ultimate discharge from wells and springs in the aquifer. Most of the dissolved matter in the ground water is from the solution of substances in the rocks that compose the aquifer. Other constituents found in water from the Edwards aquifer originate outside the aquifer between the time the relatively pure rainfall falls upon the earth and its later entry into the aquifer. During this time various constituents, possibly including human-related contaminants, are carried by the recharge water into the aquifer.

Sulfate, chloride, and dissolved-solids concentrations in water at specific sites in the Edwards aquifer are given in Figure 23. The map serves as a quick and practical guide to concentrations of these important chemical constituents as well as to the sum of all of the dissolved constituents from place to place.

The quality of water from the Edwards aquifer varies throughout the entire Austin area. Mineralization of the water increases from the recharge areas on the west to the downdip areas on the east. The dissolved-solids concentration increases from typically 200 to 400 mg/l in the recharge zone to 1,000 mg/l and then 3,000 mg/l at variable distances to the east. Water having less than 1,000 mg/l dissolved-solids concentration is almost always available from the Edwards aquifer in an area of 825 square miles. In an area of 325 square miles, water generally has a dissolved-solids concentration of 1,000 to 3,000 mg/l.

The increase in mineralization with distance from the recharge area is much more rapid in Travis and Hays Counties than in Williamson and Bell Counties. Intensive faulting of the ground-water reservoir in Hays and Travis Counties has created numerous barriers to ground-water movement in an easterly direction. This retardation of ground-water movement has caused the dissolved-solids concentration of the water to reach the 1,000 and 3,000 mg/l limits from as near as 1 to 2 miles east of the Edwards aquifer outcrop near the Colorado River in Travis County. In Williamson and Bell Counties, where faulting is less severe, the Edwards aquifer contains water having less than 3,000 mg/l of dissolved solids greater distances downdip. In Williamson County, water having generally less than 1,000 mg/l dissolved-solids concentration extends as much as 10 miles east of the aquifer outcrop, and water having generally from 1,000 to 3,000 mg/l extends beyond this limit an additional 10 to 12 miles in places.

Sulfate and chloride concentrations, like those of dissolved solids, increase from west to east. For example at the recharge zone when the dissolved-solids concentrations are about 200 to 400 mg/l, sulfate and chloride are 10 to 30 mg/l. Moving eastward from the recharge zone, sulfate and chloride concentrations increase to 200 mg/l as dissolved solids increase to 1,000 mg/l. At the eastern extremes of the aquifer where dissolved solids are near 3,000 mg/l, sulfate and chloride concentrations may exceed 800 and 500 mg/l.

Additional data on the water quality at 226 sites in the Edwards aquifer are presented in Tables 5, 6, and 7. Biologic, nutrient, pesticide, minor element, and some tritium analyses are presented as well as standard chemical constituents.

Repetitive sampling at some sites was done to determine if water quality was changing with time or in relation to antecedent conditions. On the basis of sampling of various wells , it appears that water quality, as measured by calcium plus magnesium, sodium plus potassium, bicarbonate plus sulfate, and chloride plus fluoride, does not vary greatly in percentage composition with changes in water levels in the wells.

Tables 8 and 9 are presented as aids in interpreting the chemistry of the water. Table 8 summarizes the regulations for selected water-quality constituents and properties for public water systems. Table 9 gives the source and significance of selected constituents and properties commonly reported in water analyses.

SURFACE-WATER AND GROUND-WATER RELATIONSHIPS

The ground-water and surface-water subsystems are closely related, especially in the outcrop of the Edwards aquifer where there is an interchange of surface water and ground water. In some localities where streams cross the outcrop, surface water as streamflow is lost to the aquifer and becomes ground water. This process constitutes most of the total recharge to the aquifer. In other localities such as at Barton Springs, Salado Springs, and at other sites where springs occur, the Edwards aquifer discharges ground water, which then becomes streamflow.

Gains and Losses in Streamflow

Channel-gain and -loss investigations were made on 10 streams that cross the Edwards aquifer outcrop. These streams are Salado and Berry Creeks, North and South Forks San Gabriel River, and Brushy, Barton, Williamson, Slaughter, Bear, and Onion Creeks. The first five streams are in Bell and Williamson Counties. Four investigations were made on these streams. The remaining five streams are in Travis and Hays Counties and had from one to three investigations each. Locations of the measurement sites along each of the 10 streams are shown in Figure 29, and the pertinent data, for the sites are summarized in Tables 10 through 19.

The primary objective of the investigations was to determine changes in the quantity of the streamflow throughout the reaches that were studied, with a secondary objective being to determine changes in the quality of the stream. Some of the streams were studied during periods when flow was low or nonexistent at certain sites. Others were studied when there was sufficient runoff to provide flow throughout the reach of the channel. From these studies the recharge and discharge zones of the Edwards aquifer were defined more accurately.

The four Salado Creek investigations were made in April and August 1978, and in February and August 1979 (Table 10). About 26 miles of the main channel and additional tributary mileage were studied under different flow conditions. Evapotranspiration losses were probably minimal during the February and April investigations, but were probably substantial during August of both years. Data collected in 1979 identified substantial losses of streamflow between the confluence of North and South Salado Creeks and site 6, which is 3.5 miles downstream from the confluence. These losses are attributed to at least two faults that cut the Edwards aquifer in the streambed in this reach. Downstream from the faults the streamflow increases from ground-water discharge for the next 14 miles. At Salado, streamflow increased substantially from the discharge of Salado Springs, which issues from the Edwards aquifer.

The four Berry Creek investigations were made in April and August 1978 and in February and August 1979 (Table 11). About 30 miles of the main channel and some tributary reaches were studied. Flow was zero at most of the measurement sites during the two 1978 investigations, but at site 18 near the confluence with the San Gabriel River, streamflow increased sharply, owing to the flow of Berry Springs. Berry Springs, at the eastern edge of the Edwards aquifer outcrop, is a major discharge site for ground water in the area. During the 1979 investigations, flow was mostly continuous through the 30-mile reach. Streamflow consistently increased downstream in the main channel except for a loss in about 2.9 miles between sites 10 and 13. These losses are attributed to a fault that underlies the channel between the two sites.

The four North Fork San Gabriel River investigations were made in April and August of 1978 and in February and August of 1979 (Table 12). About 28 miles of the main channel and additional tributary mileage were included in the study although the channel was cut into rocks older than Edwards aquifer for about the first half of the total reach. The stream increased its flow with distance downstream during all four investigations, except for small reductions in flow in a few subreaches. During the February and August 1979 investigations, small losses in streamflow occurred in a 1.4 mile reach of the channel where it crosses the Edwards aquifer outcrop just west of Georgetown. Ground-water discharge from the faulted eastern edge of the Edwards aquifer at Georgetown Springs within the city of Georgetown adds significantly to the streamflow after the North Fork joins the South Fork. Thus the Edwards aquifer gains water from infiltration of streamflow in a portion of its outcrop but loses ground water as springflow at the eastern end of the outcrop. Table 12 includes a description of each measuring site and a summary of the data collected.

The four investigations of the South Fork San Gabriel River were made in April and August 1978 and in February and August 1979 (Table 13). About 30 miles of the main channel and additional tributary mileage were investigated. The investigations began several miles west of Liberty Hill near the upper reach of the channel where it cuts into rocks older than the Edwards aquifer and terminated at Georgetown, the eastern edge of the aquifer's outcrop. Except for minor reductions in flow in a few subreaches during the April 1978 investigation, the streamflow gradually increased over the reach investigated.

The four Brushy Creek investigations were made in April and August 1978 and in February and August 1979 (Table 14). About 20 miles of the main channel and additional tributary mileage were studied during different rates of streamflow. The investigations began about 4 miles west of Leander where Brushy Creek cuts below the Edwards aquifer and ended about four miles east of Round Rock on rocks above the Edwards aquifer. Throughout the reach, the stream increases in flow with the exception of the subreach between sites 16 and 18 where losses of a part of its flow occurred during the April 1978 and February 1979 investigations. Within a 1-mile reach between sites 16 and 18, which is in Round Rock, the streamflow crosses a major fault that has cut the Edwards aquifer. The losses observed are attributed to flow into the aquifer at the fault.

Channel-gain and -loss investigations were made on Barton Creek in May 1980 and in February and April 1981 during considerably different rates of streamflow (Table 15). Whereas the 1980 study covered 21 channel-miles from State Highway 71 to Barton Springs, the two 1981 investigations concentrated on the 3.5-mile reach from Loop 360 to a point about a mile upstream from Barton Springs. The 1980 investigation showed that streamflow gradually increased at virtually every successive site downstream where the channel is cut into the older rocks west of the Edwards aquifer outcrop. After the stream crosses the Mount Bonnell fault between sites 8 and 9, the Edwards aquifer is exposed in the channel throughout the remainder of the investigated reach, and a considerable amount of flow was lost in the next 5 to 6 channel-miles by infiltration into the aquifer. Then, in a subreach from a point between sites 14 and 15 to site 17 at Barton Springs—a distance of about 2 channel-miles—streamflow gradually increased until Barton Springs was reached. Here streamflow was greatly increased by ground-water discharge from the Edwards aquifer. The February and April 1981 investigations showed large-percentage losses in streamflow to the Edwards aquifer in the 2-mile reach from site 12 at Loop 360 to site 14. These two investigations were made when streamflow was considerably less than that of the 1980 study.

Investigations were made on Williamson Creek in May 1980 and March 1981 at different rates of streamflow (Table 16). About 14 channel-miles were included in the 1980 investigation, which extended from about 1 mile upstream from U.S. Highway 290 at Oak Hill to about 1 mile upstream from the point where Williamson Creek joins Onion Creek. The investigations began about 1 mile west of the Edwards aquifer boundary in rocks older than the Edwards, included numerous measurement sites in places on the aquifer, and ended east of the outcrop of the aquifer in younger rocks. Large losses in streamflow occurred over 4 channel-miles between sites 3 and 10 on the aquifer's outcrop. During the 1980 study, the stream was flowing at 11.3 ft^3/s at the upstream end of the Edwards aquifer outcrop. The flow decreased across the outcrop to zero at site 10, and most or all of the water was lost to the aquifer. During the 1981 study, about 12 ft^3/s of streamflow was lost to the aquifer out of 19 ft^3/s that was flowing at the upstream end of the Edwards aquifer outcrop. In addition small amounts of streamflow continued to be lost for about 2 miles east of the main outcrop of the Edwards aquifer, where a series of faults exposing younger rocks, allow streamflow to move downward into the aquifer.

Investigations were made on Slaughter Creek during May 1980 and March 1981 when streamflow rates were significantly different (Table 17). The 9 miles of channel investigated in 1980 started about 1 mile west of the outcrop of the Edwards aquifer and ended about 3 miles east of the aquifer's outcrop. The entire 11.8 ft^3/s of flow at the upstream end of the study reach was lost in about the first 2 miles of channel cut into the outcrop of the aquifer. The 1981 investigation confirmed large losses to the aquifer when streamflow decreased from 58 ft^3/s at the upstream end of the reach to 10.7 ft^3/s at site 7 near the eastern end of the aquifer's outcrop. Losses in streamflow continued for an additional 1.5 miles east of the outcrop where numerous faults have cut younger rocks. Beyond this point to the end of the investigated reach streamflow ceased to be lost or gradually increased.

A 10-mile reach of Bear Creek was studied in May 1980 (Table 18). The study began 2 miles west of the outcrop of the Edwards aquifer and terminated about 3 miles east of the outcrop. Streamflow increased to a maximum of about 50 ft^3/s near the western edge of the Edwards outcrop and lost about half of that amount in the nearly 5 channel-miles over the aquifer's outcrop. The numerous faults and fractures that cut the channel in this 5-mile reach, facilitate large losses and rapid recharge to the Edwards aquifer. The stream continued to lose water, but at a lesser rate, over the remaining 2 miles of the investigated reach east of the outcrop, which is also cut by faults.

An investigation was made on Onion Creek in May 1980 (Table 19). About 35 miles of channel, including additional tributary mileage, were studied. The investigation began about 2 miles west of the outcrop of the Edwards aquifer where the channel is cut into rocks older than the Edwards aquifer. Discharge measurements were made at 7 sites along an 11-mile reach where the stream flows on the outcrop of the Edwards aquifer, and 10 additional flow measurements were made in a 22-mile reach east of the outcrop. Onion Creek began to lose water to the Edwards aquifer shortly after the flow passed the western edge of the outcrop. Flow continued to be lost on the outcrop, especially on the western two-thirds where rapid losses occurred. For example, the flow went from 100.3 ft^3/s to 0 on the outcrop after flowing about 10 miles and crossing several faults. East of the Edwards aquifer outcrop the stream resumed flow, increasing to 19.4 ft^3/s at the downstream end of the investigated reach at U.S. Highway 183.

During most field visits to the low-flow investigation sites, temperature and specific conductance measurements were made. These data are given in Tables 10-19. At selected sites, samples were collected and analyzed for selected chemical constituents and physical parameters. These data are given in Table 20. Except near effluent-discharge points, the water is generally constant in quality and has low concentrations of measured chemical constituents.

Flow at Barton Springs

Water that enters the Edwards aquifer from precipitation and from streamflow south of the Colorado River in parts of Travis and Hays Counties moves through underground cavities toward Barton Springs and other smaller springs. The ground water discharges at Barton Springs along a major fault as springflow from this natural and conspicuous "leak" in the aquifer. This springflow then sustains the flow of Barton Creek, which empties into Town Lake on the Colorado River.

Barton Springs is important to the citizens of Austin and central Texas. Besides being the major point of discharge of the Edwards water, Barton Springs serves as a dependable source of water for recreational use. Additionally, the springflow augments Town Lake, which is one of the sources of drinking water for the city of Austin.

Measurements of the flow from Barton Springs have been made by the Geological Survey since November 1894. Most of the measurements through February 1978 have been at irregular intervals. However, since February 1978, spring discharge has been determined daily. The minimum measured discharge was 9.6 ft^3/s on March 29, 1956, and the maximum measured discharge was 166 ft^3/s on May 10, 1941.

The average discharge of all the springs that compose Barton Springs is 50 ft^3/s for 1917-81. This figure was derived by averaging the annual-mean flows from Barton Springs during this period. The annual-mean flows were derived using 746 measurements of flow and estimating the springflow between the time of each measurement using rainfall data. Between 1894 and 1916 a total of 20 springflow measurements were made, but because of the infrequency of these measurements they were not used in computing the average flow.

Fluctuations of the discharge of Barton Springs and periodic measurements of dissolved-solids concentrations of the water for 1978 through 1981 are shown in Figure 24. Monthly mean rainfall in the Barton Creek watershed, as recorded at rain gages in the watershed, also is indicated.

Springflow varied widely during 1978-81. Discharge was considerably below the long-term average during 1978 (about 29 ft^3/s), only slightly below average during 1980 (46.8 ft^3/s), and considerably above average during 1979 (81.2 ft^3/s) and 1981 (74.7 ft^3/s).

That springflow responds to rainfall in the Barton Creek watershed is indicated by the fact that below-average rainfall leads to below-average springflow. Likewise, above-average rainfall leads to above-average springflow. Thus, near-normal springflow may be expected whenever rainfall is near normal for an extended period of time. This relationship is predicated, however, on the basis that withdrawals of ground water from the Edwards aquifer by wells in the Austin area south of the Colorado River remain minimal. Thus far, pumpage from the Edwards has been small in relation to the springflow. Public supply and industrial pumpage during 1978-80 has only been about 10 percent or less of the total water discharged from the aquifer.

The chemical quality of the water from Barton Springs is not constant but varies with the rate of flow. In general, the higher amounts of dissolved solids are associated with the lower flow rates. As an example, during 1978—a year that was characterized by much lower-than-average flow of the springs—the dissolved-solids concentrations were as much as 414 mg/l when the flow was 20 ft^3/s (Figure 24 and Table 7). On the other hand, relatively low amounts of dissolved solids occur during periods of higher-than-average flow. At these times, the dissolved-solids concentrations usually are less than 350 mg/l and have dropped below 300 mg/l during some high-flow periods. These variances are partly related to the different lengths of time that the water from recharge is in transit in the aquifer before being discharged. In the case of extended periods of below-normal flow, the increased mineralization is due to increased proportions of more highly mineralized water being contributed to the springflow from the nearby zone of poorer-quality water in the aquifer.

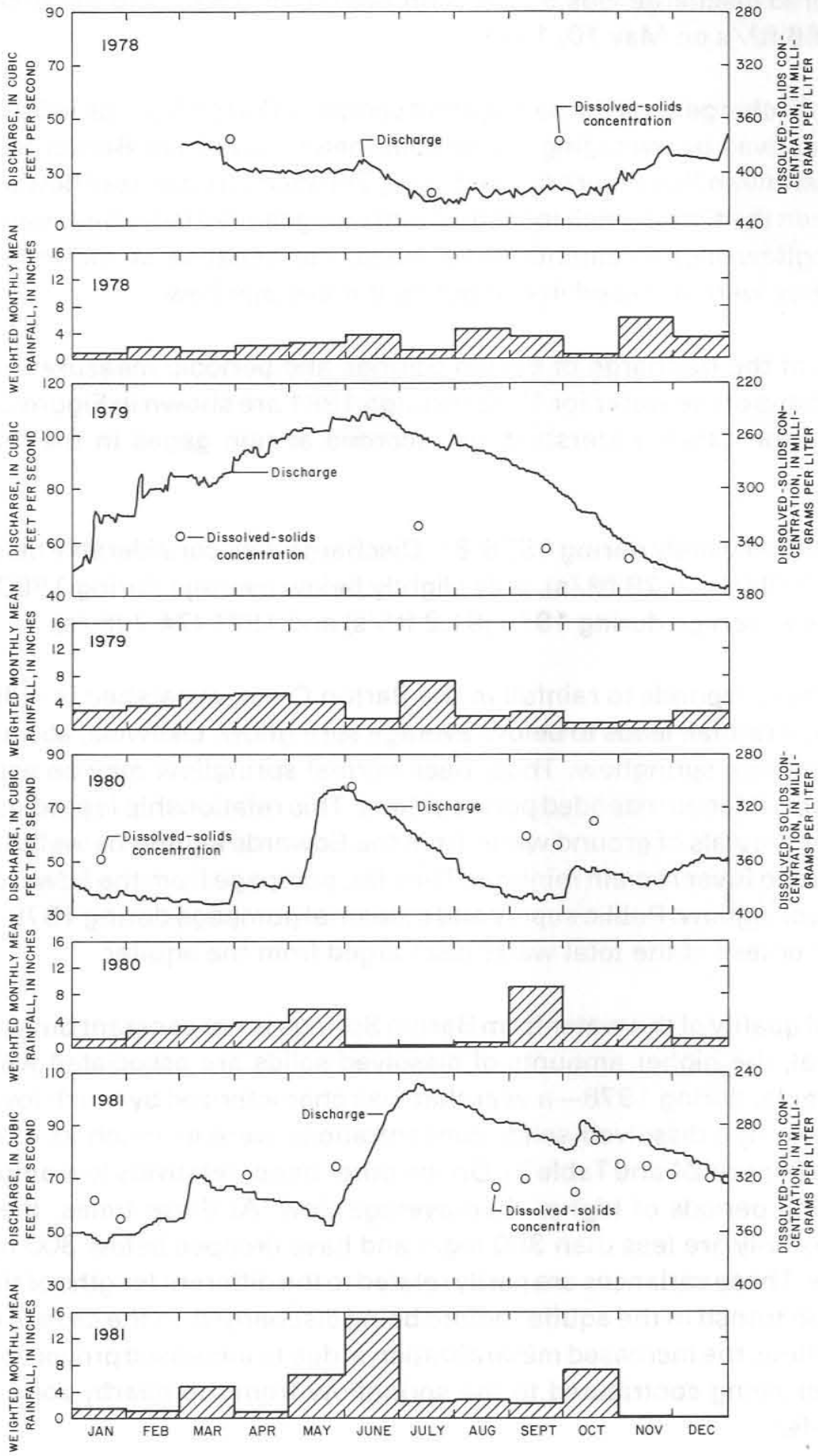


Figure 24

Discharge and Periodic Dissolved-Solids Concentrations of Barton Springs and Monthly Mean Rainfall in the Barton Creek Watershed, 1978-1981

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Table 1.—Lithologic Logs of Test Wells

Travis County

	Thickness (feet)	Depth (feet)
Well YD-58-42-817		
Owner: The State of Texas Described by: T. A. Small, Geologist, USGS, San Antonio, Texas		
Rockbit cuttings—not examined	31	31
Limestone, light gray-dirty white, hard, dense, crystalline, medium soft, very finely sucrosic limestone, cavernous, cave deposits common, red-brown and amber cave travertine in channels at 40, 41, 42, 48, and 49, vuggy zones at 32, 34, 35, 45, 47, 48 and 51, red-brown cave popcorn at 48	22	53
Limestone, light gray, very finely sucrosic, medium soft, vuggy, estimated porosity 20-30%, high angle fracture at 55, gray-white opaque chert nodule at 55, vuggy (cavernous) at 57, vuggy, fossil molds mostly at 58, 62-65	12	65
Sandstone, calcareous, light gray, angular, very fine-grained, very poorly indurated. It is made up of very fine calcite crystals—probably is a very finely sucrosic crystalline limestone that is very poorly cemented—some of it falls apart during handling—last several feet is represented by individual calcite crystals, probably very poor recovery from a cave here. Estimated porosity 40-50%	9	74
Limestone, light gray, hard, dense, chert common, cave type deposits common, vugs common, light gray opaque chert bed at 75 (½ inch), 76 (4 inch) and 77, cavity at 76, channel vugs with cave popcorn lining at 77, 79 to 81.	7	81
Limestone, light gray, hard, dense, crystalline, vuggy, some vugs lined with cave type deposits, others filled with terra rosa filling, terra rosa in vugs at 82, 83 and 87, travertine on channel walls at 86, honeycombs at 87, white opaque chert bed at 87	8	89
Limestone, light gray-light tan, medium hard, very finely sucrosic, chert common, vugs common, estimated porosity 20-30%, light gray opaque chert nodules at 90, 91, and 94, calcite breccia in terra rosa at 94, 2-inch stromatolite zone at 95	20	109
Limestone, light tan, hard, dense, crystalline, algal mats, evaporite zones common, few fractures, terra rosa and travertine at 109, vuggy evaporite zones at 111, 112 and 113, stromatolite and/or algal mats at 112 and 113, high angle fracture at 115	12	121
Limestone, light tan, hard-medium hard, variably dense, variably fossiliferous, vuggy, channel vug at 122 and 125, oyster shell fragments at 123 and 125	6	127
Limestone, white, medium hard, coquina, estimated porosity 20-30%, fossil fragment and miliolid grainstone, fractured	2	129
Well YD-58-42-817—Continued		
Limestone, light gray, hard, dense, fractured, cavernous, chert nodules common, breccia zone with orange clay and sparry calcite at 129, chert nodules and lenses at 130, stromatolite zone at 130, cavernous zone, terra rosa filled vugs at 132 and 141, high angle fracture 143 and 148	20	149
Limestone, light tan, very finely sucrosic, medium hard, vuggy, fractured, estimated porosity 30%, high angle fracture at 149, 156 and 159	19	168
Limestone, tan, hard, dense, variably fossiliferous, fractured at 169 and 171, terra rosa on fracture at 169	4	172
Limestone, white, hard, dense, fossiliferous, miliolid and fossil fragment grainstone, ½-inch algal mat at 174, estimated porosity 20-30%	10	182
Limestone, light tan, hard, dense	4	186
Limestone, light tan, very finely sucrosic, medium soft, vuggy, estimated porosity 30%, light gray chert nodule at 188, fossil molds abundant at 190, algal mat at 194, high angle calcite healed fracture at 194	9	195
Limestone, light tan to dirty white, hard, dense, chalky, variably fossiliferous, wispy shale common, algal mat at 197, low angle stylolite at 198, rudist fragments 198-200, wispy shale at 201	7	202
Limestone, light tan to dirty white, very finely sucrosic, vuggy, estimated porosity 30%, high angle fracture at 204 and 205, algal mat at 206	4	206
Limestone, light tan, hard, dense, wispy shale scattered throughout, gray opaque chert nodules at 209 and 210, wispy shale zone at 211 and 212, high angle fracture at 212	7	213
Limestone, white, medium hard, very fossiliferous, fossil fragment grainstone, vuggy, fossil molds common, estimated porosity 30-40%, fossil fragment coquina at 215, caprinid reef 218-228, high angle fracture with terra rosa at 222, 223, 225 and 228	16	229
Limestone, light tan, very finely sucrosic, medium soft, vuggy, stylolitic, wispy shale scattered throughout, estimated porosity 30%	5	234
Gap—core missing	2	236
Limestone, tan, hard, dense, fossiliferous, wispy, stylolitic	3	239
Gap—core missing	1	240
Limestone, light tan-light gray, medium hard, dense, slightly fossiliferous, variably burrowed, wispy shale common, stylolites common, wispy shale zone at 243-248, stylolites at 243 to 248, fossil fragment zone at 248	8	248

Table 1.—Lithologic Logs of Test Wells—Continued

Travis County—Continued

	Thickness (feet)	Depth (feet)
Well YD-58-42-817—Continued		
Limestone, gray, medium hard, chalky, fossiliferous, wispy shale scattered throughout, stylolites at 249, 250, and 252, circular mudclasts common at 250 to 252	4	252
Gap—core missing	1	253
(Top Walnut about 252)		
Limestone, gray, medium hard, chalky, fossiliferous, wispy shale common, black rotund body zones at 253-254, 256-258, 262-264, burrowed 257-258, dictyoconus type forams common 257-262, high spired gastropods at 264, wispy shale zones at 254-259, 260, 262, 263, and 265	13	266
Well YD-58-50-216		
Owner: State of Texas Driller: Texas Department of Water Resources Described by: T. A. Small, Geologist, USGS, San Antonio, Texas		
(Core starts at 144 feet)		
Limestone, light gray, medium hard, chalky, variably pyritic, wispy shale zone scattered throughout, stylolites at 148 and 153, disseminated pyrite at 149 and 153, oyster fragments at 154	12	156
Limestone, light gray, medium hard, chalky, pyritic, slightly glauconitic, wispy shale zones scattered, variably burrowed, pyrite at 157, 159 and 162, glauconite at 156 and 159, oyster fragments at 162, high angle fracture at 162	6	162
Limestone, light tan to very light gray, medium hard, chalky, variably fossiliferous, variably vuggy, weakly burrowed, limonite nodules at 164 and 166, 1 foot of fossil fragment coquina, excellent porosity (estimated 25% porosity at 163), oyster fragments at 166 and 168, pyrite at 171, high angle fracture at 179, stylolite zone at 180	22	184
Limestone, light tan, medium soft, clayey, wispy shale common, mottled (resembles Regional Dense Member of San Antonio area)	4	188
Limestone, light tan, medium soft, finely sucrosic, crystalline evaporitic, variably very vuggy, vugs very small—about 0.1 mm in diameter, estimate 20-30% porosity	6	194
Limestone, light tan, medium soft, clayey mottled, wispy shale, scattered pyrite at 195, black chert nodule at 199, vertical fracture at 200	13	207
Gap, core missing	1	208
Limestone, light gray, medium soft, clayey, wispy shale common	1	209
Gap, core missing	3	212
Well YD-58-50-216—Continued		
Limestone, light gray, medium soft, clayey, wispy shale common, resembles Regional Dense Member of San Antonio area, pyrite at 219, flat oval mudballs at 220, soft shale seams at 225	14	226
Limestone, light gray, medium soft, slightly chalky, wispy shale scattered throughout, fossils rare, stylolites rare, oyster at 228, disseminated pyrite at 230, soft shale seams in 4-inch zone at 230, stylolite zones at 229, 230, 233 and 238	12	238
Limestone, light tan, medium hard, slightly chalky, crystalline, fossiliferous, very vuggy, vugs very small (about 1 mm), estimated porosity 20-30%	3	241
Limestone, light tan, medium hard, chalky, slightly fossiliferous, stylolitic, wispy shale rare but scattered, oyster fragments at 242, high angle fracture at 247 and 248, black chert at 253	13	254
Limestone, light tan, medium hard, very finely sucrosic, crystalline, vuggy, estimated porosity 20-30%, vertical calcite, fracture at 265	11	265
Limestone, light tan-buff, medium hard, very finely sucrosic, crystalline, with abundant irregular sparry calcite inclusions to about 268, variably fossiliferous, fossil molds mostly excellent moldic porosity (estimated 30-40%) at 272, algal mat at 275, high angle calcite, hooked fracture at 275, gray chert at 280, 282	17	282
Gap—core missing	18	300
Limestone, tan, medium hard, very finely sucrosic, crystalline, vuggy, sparry calcite at 302 and 318, high angle fractures at 305, 306, 310, 315, 317, and 319, open dessication cracks at 312, 314 and 320	30	330
Gap—core missing	4	334
Limestone, light tan, very finely sucrosic, crystalline, very vuggy, vugs mostly small—about 0.1 mm in diameter, estimated porosity 20-30%, high angle fractures at 342 and 344, algal mat at 348 and 358	24	358
Gap—core missing	1	359
Limestone, light tan, very finely sucrosic, crystalline, vuggy, vugs mostly very small, estimated 20-30% porosity, gray chert at 360, ovoid-flattened mudballs at 364, mold coquina at 364 and 366	8	367
Well YD-58-50-217		
Owner: State of Texas Driller: Texas Department of Water Resources Described by: T. A. Small, Geologist, USGS, San Antonio, Texas		
(Core starts at 20 feet)		
Limestone, light tan, hard, dense, high angle calcite healed fracture at 21	1	21

Table 1.—Lithologic Logs of Test Wells—Continued

Travis County—Continued

	Thickness (feet)	Depth (feet)
Well YD-58-50-217—Continued		
Gap—core missing	3	24
Limestone, light gray, hard, dense, fossiliferous fractured, miliolids at 25, 26, 29 and 30, high angle fracture at 25, 26, 29, 30 and 31	7	31
Limestone, light tan, hard, dense miliolid and fossil fragment coquina, fractured	1	32
Limestone, light gray, hard, dense, wispy shale, scattered, fractured with brown clay on most fracture faces, stylolite at 33, high angle fracture at 33, 34, 35, 36 and 37	5	37
Limestone, light tan, hard, dense, slightly fossiliferous, wispy shale scattered, fractured, 0.4 foot brown clay seams at 38, fractures at 39, 40, 44, 48, 49, 50, 51 and 52	16	53
Limestone, light tan, hard, dense, fractured, fossil fragment coquina	1	54
Limestone, light tan, hard dense, wispy shale scattered, fractured oyster shell fragments at 57, fractures at 55, 56, 57, 58 and 60, vuggy zone in sparry calcite at 58	7	61
Limestone, light gray, hard dense, slightly fossiliferous, mottled, fractured, rudist fragments at 61 and 66, limonite at 62, high angle fracture at 63, 65 and 66, sparry calcite zone at 65, brecciated at 66.4	6	67
Limestone, light tan to light gray, hard, dense, variably fossiliferous, stylolites at 68, rudist shell fragments at 69, chert nodule at 73, high angle fracture at 72 and 73	11	78
Limestone, light gray, hard, dense, fossiliferous, rudist fragments and molds in coquina at 79, miliolid grainstone at 81	4	82
Limestone, light tan to light gray, hard, dense, fractured, core badly broken and mostly in fragments	5	87
Limestone, light tan to dirty white, hard, dense, fractured, fossiliferous, tightly cemented miliolid and fossil fragment grainstone, core mostly in fragments, (poor recovery-about 10 feet), 1-inch gray opaque chert lens at 98, 5-inch bed at 103	35	122
Limestone, light tan to light gray, hard, dense, crystalline, mostly sparry calcite and some finely sucrosic evaporites and crystallized fossil fragment grainstone, fractured (poor recovery-about 10 feet)	35	157
Limestone, light tan, medium soft, very finely sucrosic, slightly chalky, slightly fossiliferous, some sparry calcite, fractured, (poor recovery-about 10 feet)	27	184
Limestone, light tan, medium soft, very finely sucrosic, wispy shale rare, stylolites rare, high angle stylolite at 189 with clay on partings, more stylolites to 190	6	190
Limestone, light gray, medium hard, chalky, variably burrowed, wispy shale and stylolites rare, fractured, high angle stylolite at 192, high angle calcite healed fracture at 192-193	10	200
Limestone, light gray, medium hard, slightly chalky, weakly burrowed, fractured, detrital zone at 200 and 202, calcite healed high angle fractures at 202, 203, 204, 209, 210 and 212, fossil fragment grainstone at 204, recrystallized grainstone at 207, very finely sucrosic with excellent vuggy porosity at 208	14	214

Table 1.—Lithologic Logs of Test Wells—Continued

Williamson County

	Thickness (feet)	Depth (feet)
Well ZK-58-11-602		
Owner: State of Texas Driller: Texas Department of Water Resources		
Dirt, black, interbedded with clay	3	3
Limestone, tan, weathered limestone and yellow clay, very soft	4	7
Clay, yellow, interbedded with limestone, some fossil fragments	43	50
Limestone, white to tan, very shaley, soft, very broken	30	80
Limestone, white to tan, very fine grained, some iron stains, sucrosic, tight, low porosity	10	90
Limestone, white, very fine grained, slight iron staining, chalky but breaks with sharp edges	5	95
Limestone, white to buff, white chips—very fine grained, buff chips more coarse grained, iron staining, buff chips show evidence of porosity	5	100
Limestone, tan to buff, fine to coarse grained, some chert chips, visible porosity	5	105
Limestone, white to tan to buff, fine to coarse grained, some chert and dense limestone chips, more visible porosity	15	120
Limestone, white to tan, mostly fine grains, hard sharp edged chips, slight visible porosity	10	130
Limestone, white to tan, fine to coarse grains, soft rounded edges, visible porosity, lost circulation at 130 feet	10	140
Limestone, gray to tan, vugular, calcite, lost 60 percent of core due to cavernous portion in 150- to 157-foot interval, sucrosic, porosity in porous cavities, lateral movement of ground in this section	21	161
Limestone, gray blue, fine grains, increase in shale content	3	164
Limestone, tan, fine grained, shaley, calcite crystals, low porosity	9	173
Well ZK-58-11-603		
Owner: State of Texas Driller: Texas Department of Water Resources		
Dirt, black, very clayey	2	2
Clay, yellow to tan, some thin lime beds interbedded, became limey around 23 feet	24	26
Limestone, black, interbedded with gray clay at 29 feet, white limestone interbedded with black shale from 43 to 48 feet, iron pyrite from 68 to 73 feet	57	83
Marl, light to dark gray, interbedded with hard crystalline limestone	25	108
Marl, gray, interbedded with tan granular limestone	5	113

	Thickness (feet)	Depth (feet)
Well ZK-58-11-603—Continued		
Limestone, tan, fine grained	7	120
Limestone, white to tan, very fine grained, some calcite crystals, iron stains, silty, no visible porosity	14	134
Limestone, tan, more granular, appears to contain water between grains, some silty layers, sucrosic, yellow clay from 140 to 150 feet, some black chert from 142 to 143 feet, lost circulation at 155 feet	25	159
Limestone, tan, vugular, caramel colored, calcite crystals in voids, more honeycombed and porous, cavities, core from 160 to 168 feet was very porous and broken, core from 178 to 188 feet had very many cavities, calcite crystals present from 178 to 187 feet	28	187
Limestone, tan, fractures filled with red clay and caramel calcite crystals, more massive, estimated porosity 10 percent	7	194
Limestone, tan to brown, more porous, honeycombed, sucrosic, granular, white calcite crystals	9	203
Limestone, gray, harder to drill, not as many cavities	37	240
Limestone, black to gray, very hard, massive, crystalline, no visible porosity	22	262
Well ZK-58-11-704		
Owner: State of Texas Driller: Texas Department of Water Resources		
Surface dirt, dark brown	2	2
Limestone, white to buff, crystalline, very hard to drill	6	8
Limestone, brown to caramel, cavity from 8 to 10 feet, calcite, red iron stains, more clay around 12 feet, chert pebbles	12	20
Limestone, tan to caramel, 2-inch to 3-inch cavity from 23 to 26 feet, cavity from 28 to 29 feet, very broken up, 3-inch chert layer at 25 feet, very porous, seems to contain water, granular, sucrosic, visible porosity 10 percent	29	49
Limestone, white to tan, silty to very fine grained, moldic porosity, sucrosic, appears to contain water between grains, interbedded calcite layers, fossil hash	32	81
Limestone, tan to brown, vugular, very porous and broken, very fine grained, sandy or sugary appearance, voids filled with clay, visible porosity 15 percent, cavity from 90 to 92 feet	14.5	95.5
Limestone, brown, no vugs or voids, very porous and granular, appears to have water between grains, sandy appearance	2.5	98
Limestone, brown, more consolidated, sucrosic matrix	18	116
Limestone, gray, mottled with black shale, no visible porosity	22	138

Williamson County—Continued

Well ZK-58-18-903

Owner: State of Texas
Driller: Texas Department of Water Resources

	Thickness (feet)	Depth (feet)
Dirt, red	2	2
Limestone, tan to white, very hard, hit a layer of red clay from 5 to 6 feet	5	7
Clay, red	1	8
Limestone, tan to buff, interbedded with brown chert, honeycombed, cavity from 8 to 10 feet	12	20
Limestone, tan to caramel, interbedded with calcite crystals, vugular, vugs filled with red clay, chalky in appearance, estimated total porosity 40 percent	10	30
Limestone, white to buff, massive, very few vugs, crystalline, iron stains, fractures filled with calcite, cavity from 43.5 to 44.5, chert pebbles	33	63
Limestone, brown to caramel, vugular, some connecting vugs, chert pebbles, voids filled with red clay, very tight and massive	10	73
Limestone, gray, laminated and mottled, black shale layers, massive, no visible porosity	15	88

Well ZK-58-19-205

Owner: State of Texas
Dr ller: Texas Department of Water Resources

	Thickness (feet)	Depth (feet)
Limestone, tan to buff, interbedded with clay	15	15
Clay, gray	5	20
Limestone, white, horizontal fractures, tight, granular, some fractures filled in with yellow clay, silty, no vugs or voids, sandy or sugary appearance, 6-inch gray shale layer at 21 feet	20	40
Limestone, tan to white, interbedded with layers of yellow clay and siltstones, 6-inch layer of chert at 48 feet, very few vugs	25	65
Limestone, tan, layers of siltstones and chert, siltstone from 61 to 71 feet, lost circulation at 69 feet, sucrosic, cavity from 79 to 81 feet	20	85
Limestone, tan, fractures filled with calcite crystals, appears to have water between grains, granular, sandy or sugary appearance, cavities from 88 to 91 feet and 91 to 94 feet	6	91
Limestone, tan, very porous and broken up, vugular, granular, sucrosic, estimated total porosity 50 percent	15	106
Limestone, gray, mottled, interbedded with black shale, has big calcite crystals	20	126

Well ZK-58-19-206

Owner: State of Texas
Driller: Texas Department of Water Resources

	Thickness (feet)	Depth (feet)
Limestone, tan to buff, massive, crystalline, iron stained, interbedded with some yellow clay	15	15
Limestone, tan to white, crystalline, honeycombed, cavity from 28 to 29 feet, abundant black chert from 25 to 30 feet	15	30
Limestone, brown, granular, some siltstone, chert ledges from 30 to 40 feet, honeycombed for 35 to 40 feet, lost circulation at 48 feet, voids filled with yellow clay, silty from 50 to 60 feet, abundant fossil molds and casts, very broken up, estimated total porosity 10 percent	30	60
Limestone, tan to light brown, silty, fine grained, sample completely broken, some molds and casts, yellow stained	8	68
Limestone, tan to buff, granular, fossil molds and casts, less than 10 percent moldic porosity, yellow stained	6	74
Limestone, white to buff and yellow, fossils, sand and gravel at bottom (fossil hash), coarse toward the bottom, mixed granular and moldic porosity, estimated porosity 10 percent	10	84
Limestone, white to light tan, fossil hash, finer at the bottom, moldic porosity, estimated porosity 15 percent	10	94
Limestone, white to light tan, very fine grained at bottom 3 feet, light brown at bottom, fine grained, no visible porosity	10	104
Limestone, light brown, very fine grains, very hard at the top, no visible porosity, fossil molds from 110 to 111 feet, moldic porosity	10	114
Limestone, light brown, some moldic vugs, no visible porosity	10	124
Limestone, light brown, mottled gray bands, estimated porosity 5 percent	10	134
Limestone, light gray to gray brown, mottled, no visible porosity	10	144
Limestone, light gray to gray brown, mottled, no visible porosity, interbedded with a few thin streaks of very silty brittle limestone	20	164

Well ZK-58-19-403

Owner: State of Texas
Driller: Texas Department of Water Resources

	Thickness (feet)	Depth (feet)
Limestone, white, interbedded with tan clay	5	5
Limestone, white to tan, silty	10	15

Table 1.—Lithologic Logs of Test Wells—Continued

Williamson County—Continued

	Thickness (feet)	Depth (feet)
Well ZK-58-19-403—Continued		
Limestone, tan to dark brown, interbedded with white clay, honeycombed	3	18
Limestone, tan to yellow, 5-inch chert layer, calcite, fractured, interbedded with red clay layers, massive, very consolidated, sucrosic, no visible porosity	11	29
Limestone, tan to yellow, interbedded with tan clay, alternating soft white to hard tan limestone, granular, massive sucrosic, estimated total porosity 10 percent	3	32
Limestone, brown, honeycombed, and very broken up, some siltstone, very many fossil casts and molds, some fossil remains filled with tan clay, oolitic, moldic, granular, chert layers, fine to medium grained, estimated total porosity 60 percent	22	54
Limestone, white to tan, tighter, interbedded with calcite crystals, yellow clay, cavity from 59.5 to 60 feet, very few vugs, alternating hard and soft layers	20	74
Limestone, brown, silty, soft, very moist, granular, sucrosic, no voids or vugs, 5-inch chert nodule at 79 feet	6	80
Limestone, white, chalky, silty, very soft, broken up, fractures filled with calcite crystals, unable to estimate porosity	15	95
Limestone, white to tan, mottled, granular, sucrosic, very broken up, very few vugs, estimated total porosity 10 percent	13	108
Limestone, brown to chocolate, honeycombed, very porous, some oil stains inside core, vugular, fractures filled with calcite, very moist, estimated total porosity 30 percent	8	116
Limestone, gray, mottled, very hard, massive, interbedded with black shale	21.5	137.5

Well ZK-58-19-404

Owner: State of Texas
Driller: Texas Department of Water Resources

	Thickness (feet)	Depth (feet)
Dirt, black	1	1
Limestone, tan to buff, massive, hard, interbedded with chert, honeycombed from 10 to 15 feet	14	15
Limestone, brown, interbedded with red clay, very many cavities, honeycombed	5	20
Limestone, brown, honeycombed, vugular, vugs filled in with caramel calcite, tan clay and chert, crystalline, estimated total porosity 40 percent	11	31
Limestone, tan to light gray, vugular, vugs filled with calcite and red clay, crystalline to sucrosic matrix, very honeycombed, estimated total porosity 40 percent, cavities from 53 to 56 feet and 56 to 58 feet	9	40
Well ZK-58-19-404—Continued		
Limestone, tan to buff, red clay stains, voids filled with abundant calcite crystals, crystalline, vugular, estimated total porosity 50 percent	29	69
Limestone, brown to gray, granular, porous, sucrosic, appears to have water between grains, unable to estimate porosity	7	76
Limestone, tan to white, oolitic matrix, very porous from 78 to 80 feet, looks like a conglomerate	12	88
Limestone, white, mottled, very silty, very broken up and porous, sucrosic, no vugs or voids, estimated total porosity 10 percent	18	106
Limestone, dark brown, very porous, honeycombed, fractures filled with calcite crystals, sucrosic, very moist	6	112
Limestone, gray, mottled, interbedded with black shale, dull, earthy appearance	19	131

Well ZK-58-19-702

Owner: State of Texas
Driller: Texas Department of Water Resources

	Thickness (feet)	Depth (feet)
Limestone, white to tan, chert pebbles interbedded, cavity at 6.5 feet	6.5	6.5
Clay, tan to red	2.5	9
Limestone, white to tan, chert, interbedded with clay layers	6	15
Limestone, tan, iron stains, purple chert, interbedded with red clay layers, cavity at 16 feet	5	20
Limestone, tan to caramel, interbedded with chalky silt, honeycombed, red clay in voids, vertical fractures, large calcite crystals, very porous	12	32
Limestone, white, silty, massive, vugular, cavity from 34 to 36 feet, dull, earthy, estimated total porosity 10 percent	4	36
Limestone, tan, layers of calcite—some up to 6 inches in width, honeycombed, voids iron stained, very porous	6	42
Clay, red, interbedded with limestone	3	45
Limestone, tan to white, vugular, voids stained with red clay, sucrosic, estimated total porosity 25 percent	3	48
Limestone, tan to white, vugular, hard, massive, voids filled with tan clay, crystalline, calcite layers, estimated total porosity 50 percent, chert pebbles	12	60
Limestone, white, very hard, vugular, vugs filled with tan silt, some calcite filling voids, sucrosic, estimated total porosity 10 percent, chert nodules	9	69

Table 1.—Lithologic Logs of Test Wells—Continued

Williamson County—Continued

	Thickness (feet)	Depth (feet)
Well ZK-58-19-702—Continued		
Limestone, tan to caramel, very porous and broken, vugs, massive, dense, very hard, estimated total porosity 50 percent, cavity from 79 to 80 feet, some large calcite crystals in voids	12	81
Limestone, tan, very tight, massive, very few vugs, crystalline, no visible porosity	6	87
Limestone, gray to tan, dense, hard, crystalline, nodular, mottled, interbedded with shale layers, no visible porosity	19	106
Well ZK-58-19-703		
Owner: State of Texas Driller: Texas Department of Water Resources		
Limestone, tan to buff, very hard, dense, crystalline	5	5
Clay, tan to red	3	8
Limestone, tan, very hard, interbedded with gray chert layers	1	9
Limestone, white, chalky, honeycombed, cavities from 9.5 to 10 feet and 23 to 25 feet	16	25
Limestone, tan, silty, dull, earthy appearance, honeycombed, vugular, some of the voids are iron stained, estimated total porosity 10 percent	13	38
Limestone, white to gray, unconsolidated, earthy or chalky appearance, silty, no vugs or visible porosity	12	50
Limestone, tan, 4-inch chert nodule, very broken and unconsolidated, red iron stains, sucrosic, horizontal fractures filled with calcite	23	73
Limestone, tan to buff, crystalline, dense, vugular, unconsolidated, voids filled with red clay	12	85
Limestone, tan to caramel, crystalline, hard, dense, very broken up, fractures filled with calcite, more silty at the bottom	8	93
Limestone, gray, mottled, interbedded with black shale, massive, nodular	15	108
Well ZK-58-27-102		
Owner: State of Texas Driller: Texas Department of Water Resources		
Limestone, tan, interbedded with red clay, very hard	3	3
Limestone, white, very hard, cavities from 4 to 5 feet and 5 to 10 feet, no returns	7	10
Limestone, tan, honeycombed, very hard, no returns	10	20
Limestone, tan to buff, honeycombed, vugular, calcite crystals, crystalline, vugs filled in with red clay and iron stains, estimated total porosity 20 to 30 percent	17	37

	Thickness (feet)	Depth (feet)
Well ZK-58-27-102—Continued		
Limestone, white, massive, dull to earthy appearance, interbedded with chert nodules, some gray limestone layers, no visible porosity	6	43
Limestone, gray, abundant calcite crystals, red clay stains in vugs, some vugs 2 inches in diameter, sucrosic, some very big, chert interbedded	4	47
Limestone, white, interbedded with red clay, vugular, some vertical fractures, crystalline, chert nodules, moldic fabric, calcite crystals, estimated total porosity 20 percent	10	57
Limestone, white, vugs filled in with red clay, massive, some calcite crystals, chert, mottled, estimated total porosity 5 percent	15	72
Limestone, tan to caramel, vugular, vugs filled with red clay, crystalline, estimated total porosity 30 percent	11	83
Limestone, white, massive, vertical and horizontal fractures, no visible porosity	5	88
Limestone, gray to white, mottled, very hard, black shale layers, massive, no visible porosity	8	96
Limestone, white to gray, interbedded with shale, laminated	10	106
Well ZK-58-27-103		
Owner: State of Texas Driller: Texas Department of Water Resources		
Surface dirt, red	2	2
Limestone, white to tan, very hard, chert stringers with red clay layers	11	13
Limestone, tan to caramel, chert, rounded white limestone rock, very hard, honeycombed from 20 to 30 feet, vugular, vugs filled with large calcite crystals, crystalline, dense, porous cavities from 37½ to 38 feet, 38½ to 39 feet, 5-inch chert layer at 35 feet	23	36
Limestone, tan to white, vugular, crystalline, hard, dense, vugs filled with calcite crystals and red clay, chert, very porous	11	47
Limestone, tan to white, massive, very few vugs, mottled, interbedded with tan clay, estimated total porosity 5 percent	3	50
Limestone, tan to caramel, very crystalline, vugular, vugs filled with tan to yellow clay, estimated total porosity 45 percent	18	68
Limestone, tan, large washed out pore openings, some voids filled with red and yellow clay, sucrosic, very porous, estimated total porosity 45 percent	8	76
Limestone, tan to white, very massive, no voids or vugs, vertical fractures filled with iron stains, sucrosic, no visible porosity	3	79

Table 1.—Lithologic Logs of Test Wells—Continued

Williamson County—Continued

Well ZK-58-27-103—Continued

	Thickness (feet)	Depth (feet)
Limestone, white to gray, mottled with worm burrows and black shale layers, massive, very hard, no visible porosity, shale layer from 93 to 94 feet	29	108

Well ZK-58-27-217

Owner: State of Texas
Driller: Texas Department of Water Resources

	Thickness (feet)	Depth (feet)
Limestone, white to tan, very hard, crystalline	6	6
Limestone, tan to red, very hard, chert nodules	2	8
Limestone, gray to tan, very hard, interbedded with chert nodules	5	13
Limestone, tan, honeycombed	5	18
Limestone, tan to gray, very hard, crystalline, several cavities from 19 to 20 feet	4	22
Limestone, tan, interbedded with red clay, honeycombed, crystalline, dense	6	28
Limestone, white, very hard, crystalline, some chert mixed in with cuttings	5	33
Limestone, tan to white, crystalline, a little softer, honeycombed, cavities from 35 to 36 feet and 37 to 37½ feet	9	42
Limestone, tan, alternating from soft to hard, vugular, more honeycombed, cavities from 42 to 43 feet, 69 to 70 feet, 70½ to 71 feet, 71 to 72 feet, 72½ feet to 73½ feet, 74 to 79 feet	37	79
Limestone, tan, vugular, honeycombed with several cavities	17	96
Limestone, gray to white, mottled, hard, laminated with shale layers	25	121

Well ZK-58-27-305

Owner: State of Texas
Driller: Texas Department of Water Resources

	Thickness (feet)	Depth (feet)
Clay, yellow to tan	23	23
Clay, dark gray, very moist (Eagle Ford), hit black calcareous shale at 27 feet	4	27
Shale, black calcareous	18	45
Limestone, gray, fossil debris (Buda Limestone)	16	61
Clay, dark gray and yellow plastic, fossils *Exogyra arietina* (Del Rio Clay)	77	138
Limestone, gray, iron pyrite from 145 to 150 feet	12	150
Limestone, gray, iron pyrite, chert fossil chips	15	165
Limestone, gray, some yellow clay	35	200
Limestone, gray with black streaks, massive and unbroken	30	230

Well ZK-58-27-305—Continued

	Thickness (feet)	Depth (feet)
Limestone, gray to white, black streaks, but from 234 to 240 feet becomes harder and more crystalline	10	240
Limestone, gray to white, 2-inch black shale break at 240 feet	10	250
Limestone, tan, coarsely crystalline, porosity less than 3 percent	6	256
Limestone, tan, sucrosic, dolomitic	1	257
Limestone, tan, thinly banded, hard, crystalline, dolomitic, sucrosic, broken	3	260
Limestone, dark gray, banded, porous	10	270
Limestone, tan, dolomitic, sucrosic, porous	20	290
Limestone, gray, hard	13	303
Limestone, tan, vugular, dolomitic, some chert at 316 feet	18	321

Well ZK-58-34-305

Owner: State of Texas
Driller: Texas Department of Water Resources

	Thickness (feet)	Depth (feet)
Soil, black clayey	2.5	2.5
Clay, red, mixed with caliche and hard white limestone	13.5	16
Limestone, white, interbedded with red clay and chert	12	28
Limestone, white to tan, very hard, crystalline, hit small cavities	7	35
Limestone, tan to buff, crystalline, hard, honeycombed from 35 to 38 feet, vugular, interbedded with red clay, hit a little water at 39 feet, cavity from 41 to 43 feet, estimated total porosity 10 percent	10	45
Limestone, gray to white, mottled, very hard, dense, laminated with shale	20	65

Well ZK-58-35-110

Owner: State of Texas
Driller: Texas Department of Water Resources

	Thickness (feet)	Depth (feet)
Limestone, tan, very hard	5	5
Caliche, mixed with red and yellow clay	7	12
Limestone, tan to buff, crystalline, honeycombed, hit cavities at 12 and 16 feet, hard, dense, breaks with sharp edges	4	16
Limestone, gray to tan, chert, crystalline	6	22
Limestone, tan to white, very hard, red clay, chert chips	6	28
Limestone, gray to tan, crystalline, calcite chips, dense, very hard	7	35
Clay, gray, chert chips, honeycombed	20	55
Limestone, white, interbedded with clay stringers, chert, honeycombed	15	70

Table 1.—Lithologic Logs of Test Wells—Continued

Williamson County—Continued

	Thickness (feet)	Depth (feet)
Well ZK-58-35-110—Continued		
Limestone, tan to brown, interbedded with black clay layers and calcite crystals, vugular, estimated total porosity 3 to 5 percent, vertical fractures at 74 feet	4	74
Limestone, brown to buff, oolitic, abundant calcite crystals, iron pyrite, vitreous, hard fractures and vugs, estimated total porosity 5 to 10 percent	4	78
Limestone, white, softer than 74- to 78-foot interval, abundance of calcite crystals, crystalline, hard, dense, vugular, estimated total porosity 10 to 15 percent	2	80
Limestone, tan to buff, honeycombed, vugs, very soft, estimated total porosity 15 to 20 percent	2	82
Well ZK-58-35-110—Continued		
Limestone, tan, white nodules, very hard, shaley zones, no visible porosity	6	88
Limestone, white to gray, interbedded with shale, very hard, dull, earthy or chalky appearance, no visible porosity, may be the Comanche Peak Limestone	2	90
Limestone, white to gray, mottled, worm burrows, massive, dense, very hard, laminated, no visible porosity	10	100
Limestone, white to gray, mottled, massive, dense, very hard, laminated with black shale layers, large calcite crystals, no visible porosity	31	131

Table 1.—Lithologic Logs of Test Wells—Continued

Bell County

	Thickness (feet)	Depth (feet)
Well AX-58-04-311		
Owner: State of Texas Driller: Texas Department of Water Resources		
Limestone with soil, tan, weathered	5	5
Clay, yellow, calcareous, soft	5	10
Limestone, gray to dark gray, fine grained, granular, many thin lenticular angular chips, medium hard	5	15
Limestone, gray, fine grained, angular chips, some subangular chips less than 1 mm in size	5	20
Limestone, gray to dark gray, softer than above, subangular chips	5	25
Limestone, gray, medium soft, medium grained	10	35
Limestone and clay, gray limestone and dark gray clay, soft, subangular to angular chips	5	40
Limestone, tan, fine grained, chert, medium soft	5	45
Limestone, white to tan, fine grained, medium soft	10	55
Limestone, tan, soft, some chert, small chips predominate	8	63
Limestone, tan, medium fine grained, soft	7	70
Limestone, tan to buff, soft, some chert, visible porosity, oolitic	10	80
Limestone, grayish tan, very porous, very fine grained, looks like some moisture between grains, sandy or sugary appearance (sucrosic), some small vugs present	4	84
Limestone, dark gray, interbedded with black shale, crystalline, uneven fractures in the core sample, some black chert present, some layers of porous limestone	11	95
Limestone, light gray, mottled with black shale layers, crystalline, hard and dense	13	108
Well AX-58-04-620		
Owner: State of Texas Driller: Texas Department of Water Resources		
Dirt, black	1	1
Limestone, white to tan, some black chert, iron stained, some interbedded brown clay	4	5
Limestone, white, some iron stains, interbedded with gray clay	10	15
Clay, dark gray	10	25
Limestone, dark gray, some clay layers, very soft, has some iron pyrite crystals, oily smell in cuttings, marly, some thin white to tan limestone layers	82	107
Well AX-58-04-620—Continued		
Limestone, tan, calcite crystals present, abundant amount of black chert, very fine grained	15	122
Limestone, tan to brown, very porous and broken, sucrosic appearance, very granular, some black and white calcite crystals, some black limestone interbedded with laminated shale layers, unable to estimate porosity	15	137
Limestone, white to brown, very porous and broken, sucrosic, honeycombed, vugular porosity, some white and caramel calcite crystals, black chert	11	148
Limestone, brown, very porous and washed out, moldic fabric, some fossil casts and molds, conglomerate appearance, oolitic type matrix, estimated 5 percent total porosity	6	154
Limestone, brown, laminated with black limestone layers, a 6-inch piece of black chert at 156, very hard drilling, some parts of core are silty, moldic, very dirty appearance	16	170
Limestone, black to dark gray, hard, massive, crystalline, mottled, no visible porosity	29	199
Well AX-58-04-702		
Owner: State of Texas Driller: Texas Department of Water Resources		
Limestone, white to tan, fine to medium grains, calcite, sharp to rounded edged chips	15	15
Limestone, tan to brown, fine to coarse grains, calcite, some visible porosity	10	25
Limestone, buff, fine grained, some calcite, hard, large cuttings with angular edges, some open pores less than 1 mm in size	5	30
Limestone, white to brown, fine to coarse grained, much smaller cuttings and softer, visible porosity	5	35
Limestone, white to gray, fine to coarse grained, calcite, soft, porous material	5	40
Limestone, buff, fine grained, large cuttings, visible porosity	20	60
Limestone, gray, fine grained, slightly vugular but not continuous connections, sucrosic appearance of crystals	9	69
Limestone, gray to tan, vugular with calcite crystals in vugs, iron staining, loss of core	15	84
Limestone, rust to gray, fine grained, shaley (oxidized zone at contact of base of Edwards and top of Comanche Peak)	1	85
Limestone, light gray to gray, shaley, fine grained (Comanche Peak), low porosity	10	95

Table 2.—Drillers' Logs of Selected Wells

Hays County

	Thickness (feet)	Depth (feet)
Well LR-58-57-104		
Owner: Joe Rogers Driller: James B. Tucker, Jr.		
Surface	1	1
Rock	1	2
Yellow clay	1	3
Rock	3	6
Gray lime	3	9
Brown seep	1	10
Brown shale	1	11
Soft blue shale	6	17
Hard light gray	1	18
Hard light brown	7	25
Hard light gray	5	30
Light brown	5	35
Light gray—seepy	5	40
Cave	6	46
Light brown	14	60
Light gray	6	66
Medium	4	70
Light gray	40	110
Soft medium gumbo	5	115
Medium	5	120
Brown	5	125
Light gray	20	145
Medium	15	160
Light gray	25	185
Shaley gumbo	2	187
Light gray	23	210
Light gray gumbo	5	215
Light gray	21	236
Medium	124	360
Light and medium	110	470
Medium with caliche strips	5	475
Soft medium gumbo	2	477
Broken light brown and gray	40	517
Clay	1	518
Broken water at 60 gal/min	3	521
Hard light brown base	6	527
Well LR-58-57-203		
Owner: Jack Dahlstrom Driller: Raymond Whisenant		
Yellow fault clay and rock	20	20

	Thickness (feet)	Depth (feet)
Well LR-58-57-203—Continued		
Blue lime	33	53
Blue gray lime	33	86
Shallow water		86
Gray white lime	40	126
White lime	57	183
Gray white lime	30	213
Water rock	2	215
White rock	10	225
Well LR-58-57-302		
Owner: Jack Dahlstrom Driller: W. H. Glass		
Surface	10	10
Yellow rock	116	126
Tan rock	118	244
White rock	41	285
Water rock	21	306
Light tan rock	109	415
Well LR-58-57-901		
Owner: Hays Consolidated School Dist. Driller: Emmett A. Glass		
Surface	2	2
Yellow clay and rock	58	60
Austin Chalk	40	100
Eagle Ford shale	35	135
Buda Limestone	35	170
Del Rio Clay	50	220
Georgetown Limestone	50	270
Edwards Limestone	305	575
Well LR-58-57-904		
Owner: Pedernales Electric Coop. Driller: James B. Tucker, Jr.		
Caliche	10	10
Hard lime	5	15
Austin Chalk	33	48
Shale	1	49
Lime	2	51
Shale	1	52
Lime	7	59
Shale	1	60
Lime	13	73
Shale	1	74

Table 2.—Drillers' Logs of Selected Wells—Continued

Hays County—Continued

	Thickness (feet)	Depth (feet)
Well LR-58-57-904—Continued		
Hard lime	26	100
Soft light gray	38	138
Medium	7	145
Del Rio Clay	30	175
Soft gray	15	190
Hard gray	30	220
Del Rio Clay	55	275
Light gray	35	310
Brown sandstone	1	311
Hard brown	1	312
Brown sandstone	8	320
Brown water at 6 gpm	5	325
Brown sandstone	25	350
Broken brown with flint stripe	20	370
Hard brown	20	390
Brown sandstone dolomite water at 15 gpm	20	410
Brown sandstone	10	420
Hard light brown base	8	428

Well LR-58-58-109

Owner: Jack Giberson
Driller: Frankie A. Glass

	Thickness (feet)	Depth (feet)
Surface	2	2
Yellow clay	23	25
Eagle Ford Shale	30	55
Buda Limestone	10	65
Del Rio Clay	65	130
Fault	80	210
Edwards Limestone	60	270

Well LR-58-58-110

Owner: Julius Eddleman
Driller: Thomas Arnold

	Thickness (feet)	Depth (feet)
Caliche	30	30
Blue clay	50	80
Gray lime	60	140
Brown lime	40	280

Well 58-58-406

Owner: Texas Cement
Driller: Forrest S. Tatum

	Thickness (feet)	Depth (feet)
Caliche	10	10
Austin Chalk	184	194
Eagle Ford Shale	45	239

	Thickness (feet)	Depth (feet)
Well LR-58-58-406—Continued		
Buda Limestone	16	255
Del Rio Clay	49	304
Georgetown Limestone	6	310
Edwards Limestone	30	340
Water in crevices	80	420
Hard brown lime	15	435
Water in crevices	90	525

Well LR-58-58-408

Owner: Texas Cement
Driller: Forrest S. Tatum

	Thickness (feet)	Depth (feet)
Caliche	15	15
Austin Chalk	210	225
Eagle Ford Shale	35	260
Buda Limestone	35	295
Del Rio Clay	65	360
Georgetown Limestone	40	400
Edwards Limestone	165	565

Well LR-58-58-501

Owner: Goforth Water Supply Corp.
Driller: J. M. Wright

	Thickness (feet)	Depth (feet)
Black topsoil	3	3
Brown clay	4	7
Yellow clay	19	26
Gray shale	39	65
Gray lime	49	114
White lime	156	270
Dark gray shale	24	294
Brown shale	40	334
Gray limestone	126	460
Flint brown limestone with soft layers	118	578
Layers of flint and soft brown limestone	71	649

Well LR-58-58-502

Owner: D. J. Simon
Driller: C. L. Tyler

	Thickness (feet)	Depth (feet)
Soil	2	2
Yellow clay	24	26
Blue shale	170	196
Marl and blue shale	35	231
Chalk	196	427
Black shale	32	459
Buda Limestone	44	503

Table 2.—Drillers' Logs of Selected Wells—Continued

Hays County—Continued

	Thickness (feet)	Depth (feet)
Well LR-58-58-502—Continued		
Del Rio Clay	59	562
Georgetown Limestone	35	597
Edwards Limestone	53	650

Well LR-58-58-503

Owner: Paul Keller
Driller: Dick Sanders

	Thickness (feet)	Depth (feet)
Black dirt	5	5
Well LR-58-58-503—Continued		
Yellow clay	40	45
Taylor Marl	30	75
Austin Chalk	235	310
Eagle Ford Shale	40	350
Buda Limestone	48	398
Del Rio Clay	57	455
Georgetown Limestone	40	495
Edwards Limestone	45	540

Table 2.—Drillers' Logs of Selected Wells—Continued

Travis County

Well YD-58-35-309

Owner: Edward Burklund
Driller: W. Hugh Glass

	Thickness (feet)	Depth (feet)
Surface	1	1
Austin Chalk	232	233
Eagle Ford Shale	37	270
Buda Limestone	27	297
Del Rio Clay	75	372
Georgetown Limestone	88	460
Edwards Limestone	33	493
Edwards sand	22	515

Well YD-58-35-509

Owner: Pamela Subdivision
Driller: C. T. Sterzing

	Thickness (feet)	Depth (feet)
Topsoil	2	2
Chalk	8	10
Austin Chalk	230	240
Eagle Ford Shale	43	283
Buda Limestone	34	317
Del Rio Clay	71	388
Georgetown Limestone	90	478
Edwards Limestone	7	485
Edwards sand water	97	582

YD-58-35-513

Owner: Lamplighter Village
Driller: Thomas Arnold

	Thickness (feet)	Depth (feet)
Gray lime	190	190
Black shale	30	220
Blue clay	11	231
White lime	31	262
Blue clay	83	345
Gray lime	35	380
Brown lime	160	540

YD-58-35-804

Owner: George F. Roberts
Driller: Robert L. Crouch

	Thickness (feet)	Depth (feet)
Limestone	90	90
Clay	20	110
Limestone	35	145
Clay	105	250
Limestone and clay	50	300
Limestone	115	415

Well YD-58-35-808

Owner: Mrs. Richard Gracy
Driller: A. R. Roggenkamp

	Thickness (feet)	Depth (feet)
Caliche	22	22
Gray lime	118	140
Black shale	50	190
Lime	27	217
Blue shale	58	275
Lime	130	405
Edwards Limestone	55	460

Well YD-58-41-907

Owner: Helen Rice
Driller: Dick Sanders

	Thickness (feet)	Depth (feet)
Dirt	1	1
Blue lime	24	25
White lime	95	120
Blue lime	120	240
White lime	90	330
White water sand (3½ gpm)	5	335
Blue lime	25	360
Gray lime	120	480
Blue lime	110	590
Dark blue lime	35	625
Water	5	630
Blue lime	10	640

Well YD-58-42-812

Owner: W. F. Guyton
Driller: Sterzing

	Thickness (feet)	Depth (feet)
Caliche, fossil fragments, limonite, calcite	10	10
No samples	10	20
Eagle Ford Shale		
Limestone and calcareous sandstone; pieces of fish teeth	5	25
No samples	5	30
Buda Limestone		
Sandy fossiliferous limestone, limonite, fish teeth	5	35
Very fossiliferous, cream-colored limestone	10	45
Caliche and speckled fossiliferous limestone	5	50
Very fossiliferous limestone, cream-colored, speckled	5	55

Travis County—Continued

	Thickness (feet)	Depth (feet)
Well YD-58-42-812—Continued		
Fossiliferous limestone, cream-colored, buff and black specks	5	60
Much yellow mud, speckled limestone	5	65
Grayson Shale		
Sticky blue clay, few foraminifera and fragments of larger fossils in washed sample	5	70
Sticky blue clay, fossil fragments, pyrite, calcite and limonite, pieces of Buda Limestone	5	75
Sticky blue clay, fossil fragments mostly *Exogyra arietina* (Ram's horns) replaced by pyrite, abundant near bottom	50	125
Georgetown Limestone		
Cream-colored clay and limestone; *Exogyra arietina* abundant; pyrite, calcite, shell fragments	5	130
Cream to buff-colored limestone, forams and fossil fragments abundant	15	145
Cream-colored limestone and white limestone, fossil fragments abundant	5	150
Predominately blue-gray limestone and shale; some buff-colored limestone; shell fragments abundant	5	155
Blue-gray limestone and shale, shell fragments	15	170
Gray to buff limestone, pieces of ironstone (?) hard as flint; shell fragments	5	175
Pale buff to white dense limestone, miliolids	10	185
Light buff to gray limestone, lithographic	5	190
Light buff to light gray and white limestone, brittle, fragments sharp	10	200
Pink to yellowish mud; washed sample white to pink limestone, some fossiliferous, mostly lithographic	5	205
Pink to buff mud; washed sample contains small pieces of dense white limestone	5	210
Hard, dense, yellowish to gray-white limestone; fossiliferous; unwashed sample contained yellowish white mud	5	215
Hard, dense, yellowish to gray-white limestone	5	220
Edwards Limestone		
Gray to yellowish white limestone, fossiliferous, some secondary calcite	5	225
Hard gray-white limestone, partly miliolid	5	230
Hard brownish gray limestone and white miliolid limestone	5	235
Hard brownish gray limestone with some pieces of softer and whiter foraminiferal limestone; few pieces of calcite	5	240

	Thickness (feet)	Depth (feet)
Well YD-58-42-812—Continued		
Hard dense brownish gray limestone mixed with softer miliolid limestone; much secondary calcite	5	245
Brownish gray, dense, brittle limestone	5	250
Hard gray limestone and some softer porous limestone; all fragments small	5	255
Mostly brownish gray, dense, limestone with sharp fragments; some pieces of softer and whiter, miliolid limestone	5	260
Dense gray limestone, few fossils; one piece is vuggy with lining of white lime; fragments large; cavity reported at 262 feet	5	265
Mostly hard dense gray and yellowish gray limestone—some travertine (?)	5	270
Mixture of hard gray, brittle limestone and soft porous foraminiferal limestone	5	275
Soft foraminiferal (miliolid) limestone; gray, porous; some travertine, calcite	5	280
Relatively soft porous, miliolid (?) limestone, light brownish gray; few fragments of dense brittle rock	5	285
Limestone, hard brittle fragments shale, light brownish gray; scattered forams (Nodosaria ?), lithographic; some secondary calcite crystals and travertine, few stains from weathered pyrite	5	290
No sample	5	295
Light buff limestone—calcite and flint also divided limestone or somewhat rounded "sand"	8	303
Buff to gray limestone; flint	10	313
Hard, brittle, light buff to gray limestone; calcite	12	325
Pink, buff, gray, and white limestone, few pieces with miliolid; some material from cave, including lime dust or "sand"	5	330
Mostly hard, blue gray brittle limestone	5	335
Light buff to gray limestone, calcite	5	340
Hard gray limestone	5	345
Pink, buff, and gray limestone; much calcite	5	350
No sample	5	355
Gray to white, hard, brittle limestone	5	360
Cream-colored and white limestone; microfossils abundant	5	365
Buff to pink limestone; much calcite; probably porous	10	375

Table 2.—Drillers' Logs of Selected Wells—Continued

Travis County—Continued

	Thickness (feet)	Depth (feet)
Well YD-58-43-101		
Owner: Jefferson Chemical Co. Driller: Layne-Texas Co., Inc.		
Soil	3	3
Chalk, soft	8	11
Chalk	67	78
Chalk, soft broken	15	93
Chalk	8	101
Shale, hard	49	150
Shale, harder	16	166
Limestone	41	207
Clay, hard	28	235
Clay, blue	31	266
Limestone	11	277
Limestone, hard	23	300
Limestone and few layers of shale	47	347
Hard, sticky shale	4	351
Lime and shale	4	355
Lime	35	390
Hard layers lime	5	395
Lime, medium hard layers	8	403
Lime	4	407
Lime, hard	4	411
Lime, soft	5	416
Lime, hard and rock	4	420
Lime, soft	3	423
Rock	2	425
Lime, hard	12	437
Lime, soft and rough	2	439
Lime, hard	2	441
Lime, soft	1	442
Lime, soft and rough	2	444
Lime, hard	4	448
Lime, soft and rough	2	450
Lime, soft (water 402 to 458 ft)	8	458
Well YD-58-43-106		
Owner: W. F. Robinson Driller: W. Watson		
Austin Chalk	100	100
Clay and limestone of Eagle Ford Shale	35	135
Buda Limestone	40	175

	Thickness (feet)	Depth (feet)
Well YD-58-43-106—Continued		
Grayson Shale (Del Rio Clay)	65	240
Georgetown Limestone and Edwards Limestone (water at 350 ft)	155	395
Well YD-58-43-303		
Owner: B. F. Payton Driller: B. F. Payton		
Surface material	18	18
Lime, blue	66	84
Chalk	231	315
Shale	35	350
Limestone	40	390
Shale	70	460
Limestone	460	920
Limestone and shale	536	1,456
Well YD-58-43-401		
Owner: North Austin State Hospital Driller: H. McGillvray		
Shale, dark	80	80
Limestone, very hard (Buda Limestone)	25	105
Marl, blue (Grayson Shale of Del Rio Clay)	90	195
No record	910	1,105
Limestone and alternations of limestone, marl and sand (Fort Worth Limestone 70 ft, Edwards Limestone 250 ft, Comanche Peak Limestone and Walnut Clay beds 60 ft, Glen Rose Formation 475 ft, and Travis Peak Formation 250 ft)	195	1,300
Sand, water-bearing (Travis Peak)	15	1,315
Limestone	60	1,375
Shale, rotten	50	1,425
Limestone	60	1,485
Sand, water-bearing; principal flow; contains many shale beds (Travis peak)	315	1,800
Shale or marl, blue; no limestone (possibly pre-Cretaceous)	175	1,975
Well YD-58-43-403		
Owner: State of Texas Driller: Texas Water Wells		
Surface soil	2	2
Sandy Austin Chalk	2	4
Hard Austin Chalk	46	50
Soft Austin Chalk	3	53
Hard Austin Chalk	41	94

Table 2.—Drillers' Logs of Selected Wells—Continued

Travis County—Continued

	Thickness (feet)	Depth (feet)
Well YD-58-43-403—Continued		
Soft Austin Chalk	2	96
Hard Austin Chalk	16	112
Soft Austin Chalk	3	115
Eagle Ford Shale	35	150
Buda Limestone	32	182
Del Rio Clay	73	255
Georgetown Limestone (water 270-275, 290-294)	45	300
Hard shaley sand	5	305
Hard shaley lime	3	308
Sand (water)	2	310
Hard Edwards Limestone cap	1	311
Sand (water)	1	312
Hard limestone	1	313
Sand (water)	3	316
Hard flinty lime with pyrite	8	324
Sandy lime and shale (water)	4	328
Hard bluish gray lime with pyrite	7	335
Brown sandy lime (water)	1	336
Hard brownish gray lime	4	340
Comanche Peak Limestone (fine sand, water)	13	353
Well YD-58-50-107		
Owner: Elmo Pearson Driller: C. T. Sterzing		
Fault	16	16
Cave	2	18
Flint	22	40
Red flint	29	69
Yellow flint	21	90
White hard rock	15	105
Red hard rock	28	133
Blue lime	67	200
Gray water sand (1 gpm)	5	205
Gray lime	3	208
Gray water sand (½ gpm)	3	211
Blue lime	194	405
Gray lime	25	430
Dark gray lime	55	485
Light gray lime	100	585
Gray water sand	15	600
Gray lime	15	615

	Thickness (feet)	Depth (feet)
Well YD-58-50-117		
Owner: Dahlstrom Corp. Driller: Electro-Mechanics Company		
Broken hard lime	20	20
Broken hard lime	15	35
Broken hard lime	30	65
Broken hard lime	20	85
Broken hard lime	20	105
Broken hard lime	35	140
Broken hard lime	25	165
Broken hard lime	40	205
Gray lime	359	564
Gray hard lime	176	740
Sand	20	760
Shale	7	767
Well YD-58-50-305		
Owner: Ralph Lowry Driller: Nance and Bailey		
Austin Chalk, Eagle Ford Shale, and Buda Limestone	262	262
Del Rio Clay	65	327
Georgetown Limestone and Edwards Limestone	423	750
Comanche Peak Limestone and Walnut Clay	30	780
Glen Rose Limestone	0	780
Well YD-58-50-401		
Owner: Travis Howard Driller: Glass		
Surface	2	2
Yellow clay	33	35
Buda Limestone	37	72
Del Rio Clay	72	144
Fault rock	101	245
Blue lime	19	264
Water rock, Edwards Limestone	140	404
Well YD-58-50-505		
Owner: Ted Swanson, Jr. Driller: C. T. Sterzing		
Topsoil	2	2
White rock	25	27
Austin Chalk	105	132
Eagle Ford Shale	45	177

Travis County—Continued

	Thickness (feet)	Depth (feet)
Well YD-58-50-505—Continued		
Buda Limestone	35	212
Del Rio Clay	58	270
Georgetown Limestone	42	312
Edwards Limestone	78	390

Well YD-58-50-706

Owner: R. W. Wallace
Driller: C. T. Sterzing

	Thickness (feet)	Depth (feet)
Topsoil	3	3
Yellow clay	12	15
Eagle Ford Shale	40	55
Buda Limestone	35	90
Del Rio Clay	70	160
Gray lime	110	270
Water sand	35	305

Well YD-58-50-817

Owner: Manchaca Methodist Church
Driller: C. T. Sterzing

	Thickness (feet)	Depth (feet)
Del Rio Clay	55	162
Georgetown Limestone	48	210
Well YD-58-50-817—Continued		
Edwards Limestone	10	220
Edwards sand	80	300
Hard lime	35	335
Water sand	10	345
Hard lime	15	360
Water sand	23	383
Hard rock	7	390
Water sand	7	397
Hard rock	3	400

Well YD-58-59-105

Owner: Arthur Johnson
Driller: Dixie Oil Co.

	Thickness (feet)	Depth (feet)
Taylor Marl	213	213
Austin Chalk	275	488
Eagle Ford Shale and Buda Limestone	69	557
Del Rio Clay	41	598
Georgetown Limestone	46	644
Edwards Limestone (core at 644 feet)	101	745

Table 2.—Drillers' Logs of Selected Wells—Continued

Williamson County

	Thickness (feet)	Depth (feet)
Well ZK-58-11-201		
Owner: Bill Culbert Driller: Robert N. Wolfe		
Topsoil	1	1
Clay rock (yellow)	36	37
Lime and flint rock	58	95
Honeycomb rock	7	102
Gray shale	48	150
Well ZK-58-11-702		
Owner: Otis Gore Driller: Verley Hunt		
Hard brown rock, some yellow clay, and caves	80	80
Brown sandy rock, some water	30	110
Blue rock	90	200
Well ZK-58-11-902		
Owner: H. F. McLarren Driller: Dale Faught		
Caliche	18	18
Gray shale	72	90
Gray sand rock	16	106
Tan lime, soft	32	138
Gray sand rock	6	144
Brown lime	24	168
Gray shale	2	170
Well ZK-58-11-905		
Owner: Ray Schubert Driller: Thomas Arnold		
Yellow clay	21	21
Blue clay	74	95
Gray lime	95	190
Brown lime	90	280
Well ZK-58-12-407		
Owner: Jarrell-Schwertner W.S.C. Driller: Hervey Meadows and Sons		
Soil	1	1
Chalk rock	2	3
White rock	12	15
Yellow clay	6	21
Rock and clay	33	54
Blue shale	65	119
Black shale	90	209

	Thickness (feet)	Depth (feet)
Well ZK-58-12-407—Continued		
White lime	100	309
Brown lime	58	367
Brown and white lime	17	384
White lime	6	390
Well ZK-58-12-408		
Owner: Wilson Raven Driller: W. F. Gibson		
Chalk	175	175
Blue shale	55	230
Buda Limestone, white hard	7	237
Clay blue—Del Rio	101	338
Lime gray—Georgetown	87	425
Brown lime and water	25	450
Sand—Lime (water)	30	480
Well ZK-58-12-409		
Owner: Jarrell-Schwertner W.S.C. Driller: A. R. Roggenkamp		
Clay	25	25
Gray lime	50	75
Black shale	30	105
Gray shale	25	130
Buda Limestone	30	160
Gray shale	70	230
Georgetown Limestone	95	325
Edwards Limestone	72	397
Well ZK-58-12-502		
Owner: Paul Knapek Driller: W. F. Gibson		
Topsoil, black	2	2
Yellow clay	6	8
Hard rock, white coarse	2	10
Austin Chalk, hard gray	240	250
Eagle Ford Shale, blue, black	115	365
Buda Limestone, white hard	2	367
Del Rio Clay, gray gumbo	75	442
Georgetown Limestone, hard brown (570 small supply water)	138	580
Clay, gray	10	590
Edwards Limestone—hard with embedded flint—hard gray (water at 605)	20	610

Williamson County—Continued

Well ZK-58-12-701

Owner: Stanley Danek
Driller: Thomas Arnold

	Thickness (feet)	Depth (feet)
Caliche lime	25	25
Gray lime	145	170
Black shale	60	230
Blue clay	20	250
Buda Limestone	10	260
Blue clay, lime streaks	80	340
Gray lime	100	440
Edwards Limestone	60	500

Well ZK-58-12-702

Owner: Eric Domel
Driller: W. F. Gibson

	Thickness (feet)	Depth (feet)
Chalk, coarse, white blue	212	212
Shale, dark blue	75	287
Lime, white hard (Buda)	7	294
Del Rio Clay, blue fine	77	371
Lime, gray, blue fine—Georgetown Limestone 465	99	470
Lime, brown, hard—water, sand, 20 ft. coarse	40	510

Well ZK-58-12-703

Owner: James King
Driller: Thomas Arnold

	Thickness (feet)	Depth (feet)
Clay	11	11
Gray lime and shale	69	80
Black shale	70	150
Lime	3	153
Blue clay	12	165
Lime	10	175
Blue clay	80	255
Lime	95	350
Edwards Limestone	90	440

Well ZK-58-12-801

Owner: John Nemic
Driller: W. F. Gibson

	Thickness (feet)	Depth (feet)
Chalk (Austin)	240	240
Blue shale (Eagle Ford)	90	330
Lime, white (Buda)	5	335
Blue clay (Del Rio)	60	395
Lime, gray (Georgetown)	32	427
Lime, gray (water)	133	560
Brown lime (Edwards)	20	580

Well ZK-58-13-502

Owner: City of Bartlett
Driller: Layne-Texas Co.

	Thickness (feet)	Depth (feet)
Soil	3	3
Clay and gravel	53	56
Green shale	153	209
Hard shale with pyrites of iron	75	284
Hard shale or chalk	15	299
Rock	29	328
Lime rock	107	435
Rock	72	507
Lime rock	81	588
Rock	52	640
Lime with hard layers	125	765
Brown shale	78	843
Rock	37	880
Shale	65	945
Rock	26	971
Hard lime	9	980
Rock	12	992
Lime	6	998
Rock	5	1,003
Lime	38	1,041
Lime rock	10	1,051
Lime	31	1,082
Lime rock	31	1,113
Lime	24	1,137
Lime rock	10	1,147
Lime and shale	17	1,164
Lime	18	1,182
Rock	67	1,249
Rock and layers of shale	36	1,285
Lime rock	46	1,331
Rock with layers of shale	19	1,350
Lime	36	1,386
Rock	38	1,424
Lime	62	1,486
Shale and rock	109	1,595

Well ZK-58-19-201

Owner: Wilford Schneider
Driller: W. H. Glass

	Thickness (feet)	Depth (feet)
Surface	1	1
Yellow rock	13	14
Blue lime	26	40

Table 2.—Drillers' Logs of Selected Wells—Continued

Williamson County—Continued

	Thickness (feet)	Depth (feet)
Well ZK-58-19-201—Continued		
Yellow lime	38	78
Water	5	83
White lime	22	105
Blue lime	8	113
Well ZK-58-19-202		
Owner: Hullon Smith Driller: Verley Hunt		
Soil	4	4
Yellow clay	16	20
Hard gray rock	60	80
Hard brown sandstone	42	122
Honeycomb rock, sand, brown, water	33	155
Well ZK-58-19-203		
Owner: 4-T Ranch Driller: Justin F. Smart		
Layer of rock and clay	14	14
Very hard lime	3	17
Hard and soft lime	15	32
Flint and lime	4	36
Flint	4	40
Hard lime	25	65
Hard lime tan and white	57	122
Hard gray lime	78	200
Gray shale	20	220
Well ZK-58-19-302		
Owner: —Caddell Driller: Thomas Arnold		
Clay	3	3
Brown lime	32	35
Shale	40	75
Clay	60	135
Gray lime	155	290
Gray and brown lime—water	30	320
Well ZK-58-19-303		
Owner: Donald Hoyle Driller: Verley Hunt		
Topsoil	5	5
Yellow clay and gravel	13	18
Georgetown Limestone	102	120
White rock	15	135
Soft brown rock, some sand, water, strips of hard rock	40	175

	Thickness (feet)	Depth (feet)
Well ZK-58-19-304		
Owner: Walter E. Mickan Driller: Thomas Arnold		
Yellow clay	25	25
Blue clay	7	32
Black shale	5	37
Gray lime	2	39
Black clay	17	56
Gray clay	70	126
Gray lime	114	240
Gray lime—broken, water	30	270
Well ZK-58-19-401		
Owner: Clyde Krause Driller: R. B. Bonnet		
Surface	2	2
Hard rock	2	4
Caliche	4	8
Hard rock	3	11
Red clay	6	17
White limestone and caves	47	64
Blue limestone	10	74
Honeycomb with water	2	76
Gray limestone	19	95
Blue limestone	136	231
Sandstone, little water	4	235
Hard white limestone	32	267
Well ZK-58-19-502		
Owner: Wanda Urabel Driller: R. B. Bonnet		
Surface	1	1
Caliche	4	5
Alternating limestone	25	30
Honeycomb	4	34
Alternating limestone	46	80
Water (Edwards Sand)	20	100
Alternating limestone	24	124
Well ZK-58-19-503		
Owner: Thomas G. Sams Driller: Thomas Arnold		
Broken white lime	4	4
White lime	18	22
Blue lime	7	29
Sandy lime, flint streaks	65	94

Table 2.—Drillers' Logs of Selected Wells—Continued

Williamson County—Continued

	Thickness (feet)	Depth (feet)
Well ZK-58-19-503—Continued		
Broken lime, water	6	100
Broken formation, water	80	180
Well ZK-58-19-507		
Owner: City of Georgetown Driller: Byron D. Boucher		
Rocky soil	1	1
Firm white limestone	11	12
Firm gray limestone	24	36
Firm white limestone	4	40
Soft gray shale	1	41
Firm white limestone	14	55
Chert in white limestone	2	57
Tan and white, firm hard limestone	10	67
Tan limestone	8	75
Honeycomb—losing some return	0	75
Softer gray limestone	32	107
Honeycombed—lost circulation	13	120
Very hard—water return at 127 ft, estimated 75 gal/min	7	127
Cave	25	152
Hard multi-colored limestone, estimated 200 gal/min at 167 ft.	15	167
Hard gray limestone	13	180
Well ZK-58-19-508		
Owner: City of Georgetown Driller: Byron D. Boucher		
Black clayey soil	3	3
Firm white limestone	33	36
Firm yellow limestone	2	38
Firm white limestone	9	47
Chert	1	48
Cavernous—lost circulation	3	51
Firm	11	62
Cave	2	64
Cavernous and honeycombed	21	85
Honeycombed	2	87
Cave	3	90
Drilled smooth—soft to firm	20	110
Firm to hard	17	127
Hard	8	135
Honeycombed	1	136
Soft	3	139
Well ZK-58-19-508—Continued		
Hard	6	145
Hard	10	155
Transition to soft	5	160
Ledges of soft to hard	40	200
Well ZK-58-19-610		
Owner: Leroy Buckhorn Driller: Thomas Arnold		
Clay	2	2
Caliche	6	8
Yellow clay	32	40
Blue clay	50	90
Gray lime	100	190
Brown lime (Edwards—water)	80	270
Well ZK-58-19-611		
Owner: John Hoyle Driller: Verley Hunt		
Light yellow clay and gravel	35	35
Hard gray rock (Georgetown)	135	170
Brown honeycomb rock, sand, water	30	200
Well ZK-58-19-612		
Owner: Leroy Homair Driller: Thomas Arnold		
Clay and gravel	12	12
White lime	28	40
Blue clay	20	60
Gray lime	60	120
Brown lime	60	180
Well ZK-58-19-803		
Owner: City of Georgetown Driller: Layne-Texas Co.		
Topsoil	5	5
Clay and limestone	7	12
Blue shale and limestone	36	48
Limestone and shale breaks	23	71
Limestone	13	84
Limestone, lost returns	16	100
Hard, no returns	3	103
Porous limestone	1.5	104.5
No returns	3	107.5
Porous limestone	1.5	109
No returns	2	111

Table 2.—Drillers' Logs of Selected Wells—Continued

Williamson County—Continued

	Thickness (feet)	Depth (feet)
Well ZK-58-19-803—Continued		
Porous limestone	1	112
Hard	1.5	113.5
Porous limestone	1.5	115
Hard	4	119
Porous limestone	3	122
Hard	2	124
Porous limestone	3	127
Hard	2	129
Porous limestone	10	139
Hard	10	149
Porous limestone	6	155
Hard	4	159
Porous limestone	27	186
Well ZK-58-19-804		
Owner: City of Georgetown Driller: Layne-Texas Co.		
Topsoil	3	3
Clay	6	9
Limestone	61	70
Limestone, lost circulation	57	127
Porous limestone	12.67	139.67
Crack	.33	140
Limestone	18	158
Porous limestone	7	165
Hard limestone	10	175
Soft limestone	35	210
Well ZK-58-19-805		
Owner: City of Georgetown Driller: Layne-Texas Co.		
Surface soil and gravel	12	12
Clay and lime	11	23
Hard lime	107	130
Lime and hard flint	45	175
Well ZK-58-19-812		
Owner: City of Georgetown Driller: J. M. Wright		
Caliche	10	10
Blue shale	40	50
Hard white limestone	83	133
Cavernous limestone	2	135
Hard tan limestone	15	150
Cavernous limestone	19	169

	Thickness (feet)	Depth (feet)
Well ZK-58-19-812—Continued		
Hard tan limestone	11	180
Cavernous limestone	35	215
Hard white limestone	10	225
Well ZK-58-19-902		
Owner: Norman Domel Driller: Thomas Arnold		
Clay and gravel	10	10
Yellow clay	18	28
Blue lime	12	40
Blue shale	95	135
Gray lime	135	270
Broken gray lime, Edwards water	30	300
Well ZK-58-19-903		
Owner: W. T. Conlee Driller: R. B. Bonnet		
Topsoil	2	2
Clay	4	6
Blue clay (with little limestone)	50	56
Gray limestone	45	101
Hard white limestone	120	221
White river sand	24	245
Brown sand (medium)	35	280
Edward's sand and little honeycomb	20	300
Well ZK-58-20-103		
Owner: Jonah W. S. C. Driller: J. L. Meyers Co.		
Lime	20	20
Chalk rock	174	194
Shale	168	362
Lime	14	376
Clay and shale	104	480
White lime	100	580
Brown lime	22	602
White lime	14	616
Hard white lime	26	642
Hard brown lime	63	705
Lime and shale	27	732
Well ZK-58-20-201		
Owner: Adolph Neitsch Driller: W. F. Gibson		
Chalk gray	260	260

Table 2.—Drillers' Logs of Selected Wells—Continued

Williamson County—Continued

	Thickness (feet)	Depth (feet)
Well ZK-58-20-201—Continued		
Shale, blue, Eagle Ford	44	304
Buda Limestone, white hard	11	315
Clay, blue, Del Rio	80	395
Lime, gray, Georgetown (water)	115	510
Lime, gray and brown sand, Edwards water	55	565
Well ZK-58-20-402		
Owner: Jimmy Jordan Driller: Bob J. Smith		
Topsoil	2	2
Gravel with yellow clay	29	31
Blue clay with lime	59	90
Gray lime	142	232
White lime and water sand	11	243
Well ZK-58-20-403		
Owner: Victor H. Knauth Driller: W. F. Gibson		
Black topsoil	4	4
Chalk (Austin)	80	84
Blue shale (Eagle Ford)	75	159
Buda Limestone, hard white	8	167
Blue clay (Del Rio)	141	308
Georgetown, water, lime, gray	122	430
Edwards, water, lime	10	440
Well ZK-58-20-404		
Owner: Rex Anderson Driller: Thomas Arnold		
Clay and caliche	25	25
Black shale	20	45
Blue shale	16	61
White lime	15	76
Blue clay	84	160
Gray lime	120	280
Brown lime	60	340
Well ZK-58-20-501		
Owner: Lamar Zrubch Driller: Central Texas Drilling Co.		
Topsoil	1	1
Austin Chalk	119	120
Austin Chalk and stringers of clay	70	190
Eagle Ford Shale	35	225
Buda Limestone	31	256
Del Rio Clay	104	360

	Thickness (feet)	Depth (feet)
Well ZK-58-20-501—Continued		
Georgetown Limestone	5	365
Edwards Limestone	81	446
Well ZK-58-20-701		
Owner: Carl Buckhorne Driller: R. B. Bonnet		
Topsoil	3	3
Caliche	17	20
Brown mud, clay	90	110
Flintstone	11	121
Blue mud and clay	89	210
Alternating limestone	95	305
Edwards sand	46	351
Well ZK-58-20-703		
Owner: Blomquist Bros. Driller: R. B. Bonnet		
Surface	1	1
Caliche	18	19
Brown and green mud and clay	41	60
Hard flintstone	10	70
Brown mud and blue clay	90	160
Alternating limestone	130	290
Edwards sand, lots of water	21	311
Well ZK-58-20-705		
Owner: John F. Woodhull Driller: W. H. Glass		
Surface	10	10
Broken formation, clay and gravel	30	40
Eagle Ford Shale	35	75
Buda Limestone	15	90
Del Rio Clay	98	188
Georgetown Limestone	107	295
Edwards sand—water	31	326
Well ZK-58-20-902		
Owner: Joe Edgar Driller: Thomas Arnold		
Topsoil	2	2
Gravel	4	6
Caliche and clay	12	18
Gray lime	82	100
Clay streaks	100	200
Gray lime	60	260

Table 2.—Drillers' Logs of Selected Wells—Continued

Williamson County—Continued

	Thickness (feet)	Depth (feet)
Well ZK-58-20-902—Continued		
Gray lime and clay streaks	20	280
Gray lime	140	420
Dark gray lime	20	440
Black shale	53	493
Lime	2	495
Blue clay	13	508
White lime	15	523
Blue clay	87	610
Gray lime	100	710
Brown lime—Edwards	70	780
Well ZK-58-21-203		
Owner: City of Granger Driller: J. L. Myers sons		
Surface soil	4	4
Clay and sand	56	60
Shale	165	225
Lime and shale	166	391
Broken lime	369	760
Lime	256	1,016
Sand and shale	79	1,095
Lime	795	1,890
Broken shale	185	2,075
Broken lime	344	2,419
Sand	96	2,515
Sand, broken, with lime streaks	75	2,590
Hard lime	16	2,606
Well ZK-58-27-213		
Owner: J. C. Chambers Driller: W. F. Gibson		
Black topsoil	10	10
Gray lime, Georgetown Limestone	155	165
Brown lime—water	5	170
Brown lime and water, sand, Edwards Limestone	35	205
Well ZK-58-27-301		
Owner: Jonah W. S. C. Driller: J. L. Meyers Co.		
Surface soil	3	3
Lime	13	16
Shale	65	81
Lime	14	95
Shale	92	187

	Thickness (feet)	Depth (feet)
Well ZK-58-27-301—Continued		
Broken lime	51	238
Lime	81	319
Soft lime	19	338
Hard lime	8	346
White and gray lime	113	459
Shale	44	503
Well ZK-58-27-303		
Owner: Virgil Barnes Driller: W. H. Glass		
Surface	2	2
Broken formation	12	14
Eagle Ford Shale	10	24
Buda Limestone	24	48
Del Rio Clay	102	150
Georgetown Formation	130	280
Edwards sand—water	26	306
Well ZK-58-27-304		
Owner: Samuel Hullum Driller: Thomas Arnold		
Caliche	12	12
Yellow clay	8	20
Black shale	12	32
Lime	2	34
Black shale	24	58
Blue clay	12	70
White lime	15	85
Blue clay	70	155
Gray lime	115	270
Edwards Limestone	70	340
Well ZK-58-27-505		
Owner: Texas Highway Dept. Driller: Forrest S. Tatum		
Fill dirt	15	15
Gravel	11	26
Brown rock (fault)	84	110
Water, sand	23	133
Sandy brown rock	27	160
Brown rock	25	185
Water	5	190
Gray lime	160	350
Gray lime with crevices	55	405
Gray lime	49	454

Table 2.—Drillers' Logs of Selected Wells—Continued

Williamson County—Continued

Well ZK-58-27-508

Owner: City of Round Rock
Driller: Wright Water Wells

	Thickness (feet)	Depth (feet)
Black sandy clay	4	4
Black shale	3	7
Yellow clay	11	18
White clay with gravel	9	27
White limestone	17	44
Gray limestone	109	153
Gray limestone	12	165
Tan limestone	48	213
Tan limestone with small fractures	20	233
Hard gray limestone	67	300

Well ZK-58-27-510

Owner: Texas Crushed Stone
Driller: W. H. Glass

	Thickness (feet)	Depth (feet)
Surface	31	31
Yellow rock	35	66
White rock	31	97
Yellow rock, honeycomb (water-bearing)	5	102
Yellow rock	54	156

Well ZK-58-27-522

Owner: City of Round Rock
Driller: Byron Boucher

	Thickness (feet)	Depth (feet)
Black soil	4	4
Gray shale	1	5
Brown shale	5	10
Yellow shale	6	16
White limestone	3	19
Gray shale	1	20
Gray limestone	27	47
Lighter gray limestone	40	87
Brown limestone	60	147
Dark gray limestone	10	157
Gray limestone	87	244

Well ZK-58-27-602

Owner: Jack Thomison
Driller: Jerry Faught

	Thickness (feet)	Depth (feet)
Black	3	3
Caliche, white and yellow	20	23
Gray shale	12	35
Gummy dark gray clay	60	95

Well ZK-58-27-602—Continued

	Thickness (feet)	Depth (feet)
Light gray limestone	26	121
Gummy gray sandy clay	73	194
Gray shale	57	251
Sandy gray shale	49	300
Brown lime rock	25	325
Brown lime rock (water)	45	370

Well ZK-58-27-603

Owner: Rudolph Wallin
Driller: Thomas Arnold

	Thickness (feet)	Depth (feet)
Caliche and clay	20	20
Gray lime	35	55
Black shale	50	105
White lime	19	124
Blue clay	66	190
Gray lime	105	295
Brown lime, water	85	380

Well ZK-58-27-706

Owner: Garland Walsh
Driller: Byron D. Boucher

	Thickness (feet)	Depth (feet)
Black rocky topsoil	2	2
Caliche	6	8
Red clay	1	9
Cavernous white limestone	55	64
Firm limestone	661	725

Well ZK-58-27-713

Owner: Leon Behrens
Driller: A. E. Samford

	Thickness (feet)	Depth (feet)
Red mud	5	5
Red mud and white limestone	34	39
Water and gravel	2	41
White limestone rock	49	90
Blue rock	110	200
White limestone rock	20	220
Blue rock	95	315

Well ZK-58-27-801

Owner: City of Round Rock
Driller: Miles Robertson

	Thickness (feet)	Depth (feet)
Del Rio Clay	20	20
Georgetown Limestone	125	145
Edwards Limestone	77	222

Table 2.—Drillers' Logs of Selected Wells—Continued

Williamson County—Continued

Well ZK-58-27-805

Owner: City of Round Rock
Driller: J. M. Wright

	Thickness (feet)	Depth (feet)
Rocky black topsoil	8	8
Hard limestone	2	10
Yellow clay	12	22
Blue clay	26	48
Light gray limestone	110	158
Hard gray limestone with chert	34	192
Broken limestone and water	43	235
Hard limestone	10	245

Well ZK-58-27-806

Owner: City of Round Rock
Driller: J. M. Wright

	Thickness (feet)	Depth (feet)
Black rocky topsoil	10	10
Yellow clay and gravel	14	24
Blue shale	21	45
Firm gray limestone and shale	115	160
Hard gray limestone	38	198
Hard tan limestone with fractures	32	230

Well ZK-58-27-818

Owner: City of Round Rock
Driller: J. M. Wright

	Thickness (feet)	Depth (feet)
Black topsoil	8	8
Yellow clay	32	40
Gray shale	45	85
Gray limestone—firm	110	195
Tan limestone	52	247
Open cavity	3	250
Firm	2	252
Open cavity	3	255
Honeycomb	8	263
Hard gray limestone	37	300

Well ZK-58-27-822

Owner: —Garey
Driller: Central Texas Drilling Co.

	Thickness (feet)	Depth (feet)
Topsoil	2	2
Clay and rock	38	40
Broken Edwards Limestone	70	110
Water, broken Edwards Limestone	30	140

Well ZK-58-27-824

Owner: Williamson County MUD #2
Driller: Central Texas Drilling Co.

	Thickness (feet)	Depth (feet)
Topsoil	1	1
Clay and rock	5	6
Lime	4	10
Caliche and fractures	10	20
Clay and fractures	20	40
Fractures	8	48
Limestone, hard	9	57
Fractures, water	9	66
Limestone	8	74
Fractures, water	26	100
Solid lime	8	108
Fractures	4	112
Lime	4	116
Fractures	6	122
Limestone	13	135

Well ZK-58-27-830

Owner: Hy-land-joint-venture
Driller: Central Texas Drilling Co.

	Thickness (feet)	Depth (feet)
Topsoil	2	2
Caliche	4	6
Gray lime	9	15
Fractures and clay	70	85
Hard brown lime	15	100

Well ZK-58-28-101

Owner: Y. W. Kimbro
Driller: Verley Hunt

	Thickness (feet)	Depth (feet)
Black dirt	3	3
Austin Chalk	77	80
Eagle Ford Shale	51	131
Buda Limestone, hard rock	14	145
Del Rio Clay, blue shale	70	215
Georgetown Limestone, hard blue rock	155	370
White, mixed with brown sand, some water	10	380
Soft brown sand, honeycomb rock, water	20	400

Well ZK-58-28-102

Owner: Norman Pecht
Driller: Thomas Arnold

	Thickness (feet)	Depth (feet)
Clay	2	2
Sand	21	23

Table 2.—Drillers' Logs of Selected Wells—Continued

Williamson County—Continued

	Thickness (feet)	Depth (feet)
Well ZK-58-28-102—Continued		
Gray lime	70	93
Blue shale	17	110
Gray lime	40	130
Black shale	60	190
White lime	18	208
Gray shale	72	280
Gray lime	150	430
Broken gray lime, Edwards water	30	460
Well ZK-58-28-201		
Owner: Kruger Dairy Driller: Thomas Arnold		
Caliche	6	6
Gray lime	184	190
Black shale	70	260
White lime	30	290
Blue clay	180	470
Gray lime ·	100	570
Brown lime	70	640
Well ZK-58-28-401		
Owner: Marshall Ford Driller: Forrest S. Tatum		
Surface	3	3
Austin Chalk	353	356
Buda Limestone	22	378
Eagle Ford Shale	67	445
Del Rio Clay	15	460
Georgetown Limestone	50	510
Edwards Limestone, water in crevices	120	630
Well ZK-58-28-402		
Owner: Rodney Hobart Driller: Thomas Arnold		
Fault	4	4
Clay	20	24
Brown lime	19	43
Gray lime	87	130
Brown lime	17	147
Shale	32	179
Gray lime	26	205
Shale	70	275
Gray lime	102	377
Edwards Limestone	27	404
Water	56	460

	Thickness (feet)	Depth (feet)
Well ZK-58-28-502		
Owner: City of Hutto Driller: Sterzing Drilling Co.		
Surface	4	4
Hard white caliche	38	42
Blue Taylor Marl	28	70
Austin Chalk	345	415
Eagle Ford Shale	65	480
Buda Limestone	25	505
Del Rio Clay	80	585
Georgetown Limestone	98	683
Edwards Limestone	104	787
Well ZK-58-28-503		
Owner: Curtis Culp Driller: Thomas Arnold		
Caliche	18	18
Blue and gray lime	302	320
Blue-green shale	43	363
Hard gray lime	45	408
Soft gray lime	172	580
Well ZK-58-28-504		
Owner: Alvin Hanusch Driller: Thomas Arnold		
Caliche	12	12
Gray lime	368	380
Black shale	60	440
Gray lime	25	465
Blue shale	65	530
Gray lime	125	655
Brown lime, water, Edwards	45	700
Well ZK-58-28-701		
Owner: James Jordan Driller: Thomas Arnold		
Caliche	15	15
Gray lime	45	60
Clay and lime	20	80
Gray lime	150	230
Clay and lime	15	245
Gray lime	25	270
Black shale	47	317
White lime	23	340
Blue clay	60	400
Gray lime	80	480
Brown lime	80	560

Table 2.—Drillers' Logs of Selected Wells—Continued

Williamson County—Continued

	Thickness (feet)	Depth (feet)
Well ZK-58-28-704		
Owner: R. J. Woytek Driller: Thomas Arnold		
Caliche	9	9
Gray lime	161	170
Black shale	40	210
Lime	28	238
Blue shale	72	310
Lime	105	415
Edwards Limestone	45	460
Well ZK-58-28-705		
Owner: Roy R. Kay Driller: Thomas Arnold		
Lime and caliche	15	15
Brown clay	6	21
Blue lime	59	80
Blue shale	4	84
Blue lime	226	310
Black shale	85	395
Gray lime	35	430
Blue shale	65	495
Shale and lime	65	560
Gray lime	70	630
Brown lime, Edwards, water	50	680
Well ZK-58-28-706		
Owner: Tim Knippa Driller: Thomas Arnold		
Caliche	12	12
Gray lime	188	200
Black shale	30	230
Blue clay	10	240
White lime	39	279
Blue clay	81	360
Gray lime	100	460
Brown lime	60	520
Well ZK-58-29-501		
Owner: J. A. Bigon Driller: James T. Franklin		
Surface	4	4
Yellow clay	14	18
Sand and gravel	6	24
White and yellow clay	41	65

	Thickness (feet)	Depth (feet)
Well ZK-58-29-501—Continued		
Blue shale	255	320
White chalk, sandstone	25	345
Gray shale and rock	65	410
White chalk and sand, rock, broken	10	420
Broken rocks	10	430
Chalk	320	750
Blue shale	55	805
Soft, dark blue clay and shale	45	850
Hard limestone boulders	30	880
Blue shale	80	960
White limestone	95	1,055
Sand and rock	58	1,113
Hard rock	2	1,115
Well ZK-58-29-604		
Owner: City of Taylor Driller: Layne-Texas Co.		
Surface	3	3
Clay and gravel	5	8
Clay	26	34
Gray shale	195	229
Gray shale and gravel	101	330
Gray shale	204	534
Chalk	66	600
Lime and chalk	23	623
Chalk	375	998
Shale	14	1,012
Lime and shale	153	1,165
Lime	721	1,886
Lime and shale	24	1,910
Lime	291	2,201
Sandy lime	75	2,276
Lime	267	2,543
Lime and shale	159	2,702
Sandy shale	20	2,722
Sandy lime	17	2,739
Sandy lime and shale	157	2,896
Sand and shale streaks	14	2,910
Sandy lime	9	2,919
Lime	7	2,926
Sandy lime	27	2,953
Sandy lime and shale	113	3,066

Table 2.—Drillers' Logs of Selected Wells—Continued

Williamson County—Continued

	Thickness (feet)	Depth (feet)
Well ZK-58-29-604—Continued		
Sandy lime (hard)	32	3,098
Sandy lime	9	3,107
Sand and shale streaks	23	3,130
Sandy lime	31	3,161
Sandy lime and shale	107	3,268
Sandy lime	20	3,288
Sandy shale	12	3,300
Lime	6	3,306
Sandy lime	39	3,345
Red shale	11	3,356
Well ZK-58-35-109		
Owner: J. F. Taylor Driller: R. B. Bonnet		
Topsoil	2	2
Caliche	18	20
Honeycomb	6	26
Blue limestone	154	180
White limestone	31	211
Blue limestone	65	276
Honeycomb	14	290
Hard white limestone	21	311
Well ZK-58-35-204		
Owner: City of Round Rock Driller: Smith and Bradshaw		
Surface formation	25	25
Del Rio Clay	75	100
Georgetown Limestone	140	240
Edwards Limestone	100	340
Glen Rose Limestone	30	370
Well ZK-58-35-213		
Owner: George Blessing Driller: W. H. Glass		
Surface	15	15
Gray lime	65	80
Tan lime	50	130
Water, sand	13	143
Tan lime	7	150
Well ZK-58-35-305		
Owner: Robert A. Ledbetter Driller: Thomas Arnold		
Clay	20	20
Lime	6	26

	Thickness (feet)	Depth (feet)
Well ZK-58-35-305—Continued		
Blue clay	189	215
Gray lime	10	225
Brown lime, water	75	300
Well ZK-58-35-306		
Owner: Manville Water Supply Corp. Driller: Thomas Arnold		
Topsoil	2	2
Caliche	9	11
Gray lime	229	240
Black shale	65	305
Buda Limestone	25	330
Blue clay	60	390
Georgetown Limestone	100	490
Edwards Limestone	90	580
Well ZK-58-36-207		
Owner: Robert Klepzig Driller: Thomas Arnold		
Caliche and lime	55	55
Gray lime, shale streaks	340	395
Black shale	50	445
Blue clay	17	462
White lime	33	495
Blue clay	85	580
Gray lime	120	700
Brown lime	80	780
Well ZK-58-36-301		
Owner: Henry Hooper Driller: Sterzing Drilling Co.		
Fault—water	70	70
White lime	10	80
White lime	15	95
White lime	40	135
Shale	40	175
White lime	30	205
Sandy	50	255
Gray lime	15	270
Shale	10	280
White lime	25	305
Gray lime	15	320
White lime	30	350
Water sand	20	370
White lime	40	410

Table 2.—Drillers' Logs of Selected Wells—Continued

Bell County

	Thickness (feet)	Depth (feet)
Well AX-58-04-202		
Owner: C. G. Benson Driller: Warren Lawson		
Dirt	3	3
Shale (gray)	15	18
Shale and limestone	26	44
Sandstone with layers of flint and honeycomb	52	96
Gray shale	6	102
Well AX-58-04-302		
Owner: Betty Madison Driller: Warren Lawson		
Topsoil	3	3
Shale and caliche	13	16
Blue shale	32	48
Gray shale with lime streaks	47	95
Honeycomb with flint streaks	12	107
Honeycomb and porous sandstone with flint streaks	40	147
Gray shale	1	148
Well AX-58-04-304		
Owner: J. C. Bozon Driller: Warren Lawson		
Dirt	3	3
Caliche	15	18
Gray and blue shale with lime streaks	72	90
Honeycomb with flint and sand streaks	50	140
Gray shale	2	142
Well AX-58-04-306		
Owner: Arthur W. Capps Driller: Warren Lawson		
Topsoil	3	3
Caliche with shale layers	15	18
Gray shale and lime	17	35
Honeycomb and sandstone with flint streaks	55	90
Gray shale	2	92
Well AX-58-04-307		
Owner: Jack Thompson Driller: Warren Lawson		
Topsoil with shale	12	12
Gray shale	11	23
Blue shale	37	60
Lime	18	78
Well AX-58-04-307—Continued		
Honeycomb and flint	9	87
Sandstone	38	125
Well AX-58-04-308		
Owner: Donald Frazier Driller: Justin Smart		
Yellow clay	14	14
Blue clay	6	20
Hard gray lime	5	25
Gray shale (firm)	20	45
Tan rock	30	75
Brown lime	25	100
Gray shale	16	116
Well AX-58-04-502		
Owner: Salado I. S. D. Driller: Warren Lawson		
Topsoil	4	4
Chalk rock	11	15
Gray lime	30	45
Sandstone (firm)	10	55
Sandstone (honeycomb)	20	75
Sandstone and limestone mixed porous water	15	90
Well AX-58-04-503		
Owner: Dan Holmes Driller: Warren Lawson		
Caliche, red clay, and gravel	22	22
Cave and flint	1	23
Flint and sandstone	23	46
Honeycomb, quartz, and flint (very rough)	17	63
Gray shale with lime streaks and sand	6	69
Well AX-58-04-507		
Owner: Poweram Oil Co. Driller: Warren Lawson		
Shale rock	6	6
Gray shale and caliche	16	22
Blue shale	30	52
Limestone	30	82
Gray shale with lime streaks	33	115
Honeycomb with sandstone and flint streaks	53	168
Shale	3	171

Table 2.—Drillers' Logs of Selected Wells—Continued

Bell County—Continued

	Thickness (feet)	Depth (feet)
Well AX-58-04-602		
Owner: Salado WSC Driller: Hervey Meadows and Son Well Driller		
Black soil	2	2
Red soil	6	8
White rock	10	18
Blue rock	24	42
Brown water sand	54	96
Blue rock	9	105
Well AX-58-04-604		
Owner: Salado WSC Driller: Lanford Drilling Co.		
Black soil	2	2
Clay	10	12
White rock	10	22
Rock	53	75
Limestone	9	84
Cavity	4	88
Limestone	23	111
Rock	17	128
Well AX-58-04-606		
Owner: Cecil A. Cosper Driller: Warren Lawson		
Caliche	15	15
Shale	7	22
Broken lime	8	30
Sandstone and flint	5	35
Honeycomb and sandstone	49	84
Well AX-58-04-608		
Owner: Mrs. Harvey Copeland Driller: James Adams		
Topsoil	2	2
Chalk and shale	16	18
Blue lime	10	28
Hard gray lime	32	60
Porous lime water	25	85
Hard blue lime	15	100
Well AX-58-04-612		
Owner: Marvin Larsen Driller: Warren Lawson		
Topsoil	3	3
Caliche with shale layers	12	15

	Thickness (feet)	Depth (feet)
Well AX-58-04-612—Continued		
Gray shale and lime	15	30
Honeycomb with sandstone with flint streaks	48	78
Gray shale	4	82
Well AX-58-04-618		
Owner: Dr. Clyde Goodnight Driller: Justin Smart		
Yellow clay	10	10
Gray shale	50	60
Brown lime	5	65
Dark gray with black	15	80
Broken shale	5	85
Quartz	5	90
Dark gray shale	5	95
Light gray shale (water)	25	120
White lime	5	125
Dark gray shale	15	140
Well AX-58-04-701		
Owner: Wayne Klingsporn Driller: Warren Lawson		
Shale, rock, and dirt	3	3
Caliche	15	18
Limestone	37	55
Blue shale	35	90
Lime and shale	230	320
Lime and sand streaks	40	360
Gray shale	22	382
Well AX-58-04-802		
Owner: Texas Highway Dept. Driller: Hervey Meadows and Son Well Driller		
Black dirt	6	6
Clay	10	16
Blue rock	24	40
White and gray lime	49	89
Hard white and brown lime	45	134
Glass and sand	41	175
Hard gray lime	5	180
Well AX-58-04-803		
Owner: Texas Highway Dept. Driller: Hervey Meadows and Son Well Driller		
Black dirt	6	6
Clay	17	23

Table 2.—Drillers' Logs of Selected Wells—Continued

Bell County—Continued

	Thickness (feet)	Depth (feet)
Well AX-58-04-803—Continued		
Hard blue rock	66	89
Hard gray lime	30	119
Hard sand	21	140
Hard glass	35	175
Brown lime	5	180
Well AX-58-04-804		
Owner: Ira Black Driller: James Adams		
Soil and subsoil	6	6
Brown caliche	19	25
Blue lime	45	70
Gray lime	15	85
Yellowish brown lime	7	92
Void	3	95
Flint	2	97
Brown lime	53	150
Blue lime	5	155
Gray lime	45	200
Well AX-58-04-805		
Owner: Tom Gidley Driller: Warren Lawson		
Caliche, dirt, and shale rock	22	22
Gray shale	13	35
Blue shale	45	80
Gray shale with lime streaks	12	92
Honeycomb, sand, flint layers, and crevices	12	104
Sandstone with honeycomb	36	140
Gray shale	1	141
Well AX-58-04-806		
Owner: H. F. Nash Driller: James Adams		
Soil	2	2
Loose rock and caliche	16	18
Brown to light brown lime	12	30
Blue lime	60	90
Light brown lime	65	155
Hard	1	156
Brown lime or sand	14	170
Blue gray lime	5	175
Well AX-58-04-808		
Owner: Jarrell WSC Driller: Hervey Meadows		
Clay	30	30
Blue shale	88	118
White lime	106	224
Brown lime	51	275
White lime	1	276
Well AX-58-04-809		
Owner: J. Louie Bridges Driller: Warren Lawson		
Topsoil	3	3
Clay and caliche	15	18
Dark gray and blue shale	242	260
Lime with sand mixed	40	300
Gray lime	70	370
Sand	20	390
Lime	14	404
Well AX-58-05-102		
Owner: Archie Lee Guyer Driller: Warren Lawson		
Shale and caliche	12	12
Gray shale	33	45
Blue shale	25	70
Lime	32	102
Broken flint, honeycomb, and sandstone	50	152
Well AX-58-05-203		
Owner: Curtis Yount Driller: Warren Lawson		
Topsoil	4	4
Chalk	56	60
Gray, blue, and brown shale mixed (caving)	230	290
Gray lime	90	380
Light colored sandstone, porous—water	10	390

Table 3.--Records of Wells, Test Holes, Springs, and Oil Tests

All wells are drilled unless otherwise noted in remarks column.
Water-bearing unit : Kceb, Edwards Limestone and associated limestones (Balcones fault zone aquifer); Kcgr, Glen Rose Formation undifferentiated; Kcgru, upper member of the Glen Rose Formation; Kcgrl, lower member of the Glen Rose Formation; Kche, Hensell Sand Member of Travis Peak Formation; Kcho, Hosston Formation.
Water levels : Reported water levels given in feet; measured water levels given to the nearest tenth or hundredth of a foot.
Method of lift and type of power: A, air; C, cylinder; Cf, centrifugal; E, electric; G, natural gas, butane, or gasoline; H, hand; J, Jet; N, none; S, submersible; T, turbine; W, windmill.
Use of water : D, domestic; Ind, industrial; Irr, irrigation; N, none; P, public supply; S, livestock.

	WELL	OWNER	DRILLER	DATE COMPLETED	DEPTH OF WELL (ft)	CASING		WATER BEARING UNIT	ALTITUDE OF LAND SURFACE (ft)	WATER LEVEL		METHOD OF LIFT	USE OF WATER	REMARKS
						DIAMETER (in.)	DEPTH (ft)			ABOVE (+) OR BELOW LAND SURFACE DATUM (ft)	DATE OF MEASUREMENT			
								Hays County						
	LR-57-64-601	Joe Gonzales	Davis Drilling Company	1976	192	6	20	Kcgru	995	90.65	Nov. 30, 1977	S, E	D	Cemented 0-20 feet.
	58-49-508	Clara Calhoun	Richard Bible	1960	416	6	20	Kcgru	901	161.75	Feb. 10, 1981	C, W	S	--
	701	Mike Rutherford	--	--	300	7	20	Kcgru	1,079	115.17	Aug. 24, 1978	C, W	S	--
	702	do	--	--	195	7	20	Kcgru	1,020	52.34	do	C, W	S	--
*	801	Clara Calhoun	--Tyler	1942	100	6	20	Kceb	856	36.05	Feb. 9, 1981	S, E	S	1/
	802	Mrs. Bliss Spillar	--	1940's	200	6	--	Kceb	930	136.2	Jan. 26, 1981	C, E	S	1/
	803	Clara Calhoun	--	1954	135	6	9	Kcgru	920	82.7	Jan. 24, 1980	C, W	S	--
	804	do	--	--	243	6	20	Kcgru	880	36.41	May 15, 1978	S, E	D	--
	805	Mike Rutherford	--	--	315	7	315	Kcgru	1,055	142.75	Jan. 30, 1981	C, W	S	--
	806	do	--	--	200	7	--	Kcgru	935	74.8	do	C, W	N	--
	901	P. J. Brewington	Thomas Arnold	1972	400	4	200	Kceb	790	187.9	Jan. 26, 1981	S, E	D	--
	902	Mrs. Bliss Spillar	--	--	200	4	--	Kceb	865	92.69	Apr. 25, 1978	C, W	S	--
*	903	do	--	--	200	4	--	Kceb	830	--	--	C, E	S	--
*	57-101	M. O. Rogers	Harvey Harmon	1930's	125	6	120	Kcgru	992.7	51.8	Jan. 29, 1981	S, E	D	3/
	102	Rutherford Ranch	--	--	200	4	--	Kceb	1,055	136.85	Jan. 29, 1981	C, W	S	1/
	103	do	--	--	200	4	--	Kceb	1,015	139.4	do	C, W	S	1/
	104	Joe Rogers	James Tucker, Jr.	1976	527	6	62	Kcgru	1,020	260	--	S, E	D	2/
	201	Mike Rutherford	--	1945	320	6	--	Kceb	925	163.05	Jan. 23, 1980	C, W	S	1/ 3/
*	202	--Farris	Scarly Glass	--	200	7	200	Kceb	905	21.2	Jan. 29, 1981	S, E	S	1/
	203	Jack Dahlstrom	Raymond Whisenant	1970	225	7	25	Kceb	835	80.4	Jan. 23, 1980	C, W	S	1/ 2/
	204	Cecil Ruby	Hugh Glass	1950	245	6	--	Kceb	800	157.4 136.2	Dec. 5, 1950 Jan. 10, 1978	S, E	S	--
	301	do	T. E. Owens	1937	312	6	83	Kceb	882.4	276.6 259.20	Jan. 9, 1959 Jan. 9, 1978	S, E	S	1/ 3/
	302	Jack Dahlstrom	W. H. Glass	1973	415	12	158	Kceb	809	202.0	Feb. 6, 1981	S, E	S	1/ 2/ 4/
*	303	W. D. Turner	do	1973	315	7	315	Kceb	870	242.12	May 25, 1978	S, E	D	--
*	402	Tom Fairey	James B. Tucker	1976	380	6	55	Kceb	880	93.6	Jan. 30, 1981	S, E	D	1/

See footnotes at end of table.

Table 3.--Records of Wells, Test Holes, Springs, and Oil Tests--Continued

WELL	OWNER	DRILLER	DATE COMPLETED	DEPTH OF WELL (ft)	CASING		WATER BEARING UNIT	ALTITUDE OF LAND SURFACE (ft)	WATER LEVEL		METHOD OF LIFT	USE OF WATER	REMARKS
					DIAMETER (in.)	DEPTH (ft)			ABOVE (+) OR BELOW LAND SURFACE DATUM (ft)	DATE OF MEASUREMENT			
							Hays County--Continued						
LR-58-57-403	Rutherford Ranch	--	1952	350	10	--	Kceb	982	232.29	Nov. 28, 1977	S, E	D	--
* 502	--Hoskins	--Smith	1938	385	5	--	Kceb	885	198.55	Jan. 29, 1981	S, E	D	Deepened to 385 feet by Ed Welge in 1963. 1/
503	Michaelis Ranch	--	Before 1900	180	4	--	Kceb	812	141.10	Aug. 30, 1978	C, W	S	--
601	Cecil Ruby	E. B. Kutscher	1971	390	8-5/8	160	Kceb	792	157.49	Apr. 20, 1978	S, E	S	--
602	do	--	--	150	6-1/2	--	Kceb	792	127.00	Jan. 10, 1978	S, E	S	1/ 3/
801	J. C. Ruby, Jr.	C. L. Tyler	1941	365	6	260	Kceb	938.2	235.89	Jan. 11, 1978	S, E	D	Deepened from 300-365 feet in 1969 by Kutscher.
802	Tom Johnson Estate	--	--	242	6	--	Kceb	838	164.70	do	C, E	S	1/ 3/
* 901	Hays Consolidated School District	E. A. Glass	1968	575	10	235	Kceb	821	--	--	S, E	--	2/
902	Gregg Ranch	--	Before 1943	450	6	--	Kceb	821.55	221.55	Jan. 30, 1981	N	N	Originally an oil test well. 4/
903	Mountain City Ranch	C. L. Tyler	1943	400	6	--	Kceb	822	229.3 232.75	Dec. 3, 1953 Jan. 30, 1981	C, W	S	1/ 3/
904	Pedernales Electric	James B. Tucker	1975	428	5-5/8	290	Kcgru	825	235.06	Aug. 21, 1978	S, E	Ind	2/
58-101	--Franklin	--	1907	243	5	230	Kceb	707.2	106.6 119.45	Dec. 2, 1953 Jan. 29, 1981	N	N	1/ 3/ 4/
104	Henry Armbruster	T. E. Owens	1937	248	6	--	Kceb	730.3	162.9	Oct. 24, 1950	N	N	1/ 3/ 4/
* 105	Joe Lowke	Tom Arnold	1978	477	4	480	Kceb	773	227	Jan. 7, 1978	S, E	D	4/
* 106	City of Buda	do	1977	450	8	--	Kceb	706	115.3	Feb. 5, 1981	S, E	P	1/
108	Jim Ruby	--Kutscher	1971	548	10-3/4	271	Kcgru	757	217.25	Aug. 17, 1978	N	N	4/
109	Jack Giberson	Frankie A. Glass	1971	270	7	215	Kceb	755	--	--	S, E	D	2/
110	Julius Eddleman	Thomas Arnold	1976	280	4	200	Kceb	745	--	--	S, E	D	2/
206	H. B. Granberry	E. A. Glass	1971	415	12	190	Kceb	668	86.6	Jan. 21, 1980	N	N	Cemented 0-45 feet. 1/ 4/
211	Don Rylander	--	1979	462	5	418	Kceb	702	108.4	Feb. 5, 1981	N	N	--
* 403	City of Buda	J. B. Virdell	1954	390	10	222	Kceb	710	148 120.5	Dec. 1954 Feb. 5, 1981	T, E	P	--
406	Texas Cement	F. S. Tatum	1966	525	10	310	Kceb	743	154.7	Jan. 30, 1981	S, E	P	Cemented 0-310 feet. 1/ 2/ 3/
* 407	do	J. T. Johnson	1960	634	12	153	Kceb	750	--	--	T, E	Ind	--
408	do	Forest S. Tatum	1966	565	7	375	Kceb	786	--	--	S, E	D	2/
410	D. J. Simon	Sanders Drilling Company	1978	584	10	--	Kceb	762	167.8	Jan. 25, 1980	N	N	1/ 4/
411	W. I. Dismukes	E. B. Kutscher	1971	510	7	435	Kceb	735	150.7	Feb. 5, 1981	S, E	D	Cemented, 0-435 feet. 1/
501	Goforth Water Supply	J. M. Wright	1970	649	8	500	Kceb	721	--	--	S, E	P	2/

See footnotes at end of table.

Table 3.--Records of Wells, Test Holes, Springs, and Oil Tests--Continued

WELL	OWNER	DRILLER	DATE COMPLETED	DEPTH OF WELL (ft)	CASING DIAMETER (in.)	CASING DEPTH (ft)	WATER BEARING UNIT	ALTITUDE OF LAND SURFACE (ft)	WATER LEVEL ABOVE (+) OR BELOW LAND SURFACE DATUM (ft)	WATER LEVEL DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
							Hays County--Continued						
LR-58-58-502	D. J. Simon	C. L. Tyler	1944	650	6	562	Kceb	742	181.6 144.45	Jan. 9, 1951 Jan. 22, 1980	N	N	1/ 2/ 4/
503	Paul Keller	Dick Sanders	1966	540	7	481.5	Kceb	745	148.0	Feb. 5, 1981	N	N	1/ 2/
504	Elmer Israel	C. T. Sterzing	1962	640	7	514	Kceb	778	182.6	Jan. 30, 1981	S, E	N	1/
701	D. A. Dacy	--	1950	492	8	--	Kceb	711	120.55	Feb. 5, 1981	S, E	S	1/
* 704	O. H. Cullen	E. R. Ownes	1972	532	7	368	Kceb	746	156.4	do	S, E	D	1/ 3/
705	Ted Edwards	C. T. Sterzing	1964	667	7	548	Kceb	725	127.98	Jan. 9, 1978	S, E	D	--
706	Lex Word	--Glass	1959	520	7	300	Kceb	695	135 111.75	1942 Feb. 5, 1981	S, E	N	Pump inoperative. 1/
801	A. W. Whitten	C. L. Tyler	1943	502	7	431	Kceb	712	128	Feb 5, 1981	S, E	N	1
902	David Shubert	Woodward & Company	1955	3,338	6	--	--	--	--	--	--	N	Oil test. 4/
67-01-201	David Allen	--Kutscher	--	300	--	--	Kceb	672	--	--	--	--	4/
304	R. Selvera	Fleming Adair	1934	372	5	340	Kceb	718	133.5 151.6	Dec. 2, 1953 Feb. 5, 1981	N	N	1/ 3/
305	A. A. Hale	J. W. Glass	1959	500	8	310	Kceb	705.32	133.99	Aug. 21, 1978	C, E	D, S	1/ 3/
							Travis County						
YD-58-34-503	--Lemens	--	1964	206	7	--	Kcgru	740	43.1 30.7	July 24, 1972 Jan. 20, 1981	N	N	Abandoned well. 1/
601	J. R. McElroy	--	1935	85	6	30	Kcgru	950	39.8 40.4	June 10, 1940 Jan. 20, 1981	N	N	1/ 3/
613	Dr. Mitchell Wong	--	1945	175	6	--	Kceb	920	38.7 25.0	July 24, 1972 Jan. 20, 1981	N	N	1/ 3/
902	S. D. Williams	--	--	53	--	--	Kceb	902	36.1 31.2	Nov. 15, 1939 Mar. 1, 1978	N	N	5/
904	Great Hills	J. M. Wright	1971	1,122	8-1/2	3	Kcgru Kcgrl	910	193.0	Oct. 31. 1972	--	N	Reported yield 50 gal/min. Caved in to 932 feet before Oct. 31, 1972. 4/
35-201	Lorene Bolt	A. Z. Daniels	1939	270	6	90	Kceb	904	225.2 227.7	Oct. 4, 1940 Mar. 15, 1978	S, E	D, S	1/ 3/
206	Joe Bailey	--Glass	1945	700	6	650	Kceb	820	300 209.7	Nov. 2, 1949 Jan. 20, 1981	N	N	1/
* 210	Vernon Turner	Robertson & McBride	1894	362	5	318	Kceb	860	160 268.0	Nov. 2, 1949 Jan. 20, 1981	S, E	D, S	1/
212	Stuckey Candy Co.	C. T. Sterzing	1962	320	5	147	Kceb	825	120	Feb. 10, 1962	S, E	D	Reported yield 10 gal/min.
* 309	Edward Burklund	W. H. Glass	1970	515	7	377	Kceb	810	249.8	Jan. 20, 1981	S, E	D, Irr	1/ 2/

See footnotes at end of table.