TEXAS
WATER
DEVELOPMENT
BOARD

Report 136

GROUND-WATER RESOURCES OF MONTGOMERY COUNTY, TEXAS

NOVEMBER 1971

TEXAS WATER DEVELOPMENT BOARD

REPORT 136

GROUND-WATER RESOURCES OF MONTGOMERY COUNTY, TEXAS

By

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in cooperation with the
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GROUND-WATER RESOURCES OF MONTGOMERY COUNTY, TEXAS

ABSTRACT

Ground water in Montgomery County is contained in sands of the Catahoula Sandstone, lower part of the Jasper aquifer, upper part of the Jasper aquifer, Burkeville aquiclude, Evangeline aquifer, and Chicot aquifer. The Chicot, Evangeline, and upper part of the Jasper generally contain fresh water throughout the county. The Catahoula Sandstone and lower part of the Jasper contain fresh and slightly saline water in the northern and central parts of the county. The Evangeline transmits about 10 mgd (million gallons per day) and the upper part of the Jasper transmits about 3.5 mgd. The quality of water in the aquifers is good and can be used for most purposes.

The ground-water resources of the county are practically untapped. In 1966, about 6.2 mgd of ground water was used for all purposes. The principal uses, about 2.6 mgd, were for rural domestic and livestock supplies. Almost all of the water was obtained from the Evangeline and the upper part of the Jasper.

About 80 million acre-feet of fresh ground water is in storage in Montgomery County. However, most of this water cannot be economically produced. Calculations based on the transmission capacity of the Evangeline and upper part of the Jasper indicate that about 65 mgd could be obtained with pumping levels not exceeding 400 feet along an assumed line of discharge in the latitude of Conroe. Probably as much as 150 mgd could be pumped with only moderate water-level declines and land-surface subsidence. If the rejected recharge in the outcrop areas were salvaged, an additional 140,000 acre-feet per year (125 mgd) of water would be available.

GROUND-WATER RESOURCES OF MONTGOMERY COUNTY, TEXAS

INTRODUCTION

Location and Extent of the Area

Montgomery County is in southeastern Texas in the West Gulf Coastal Plain physiographic province (Fenneman, 1938). It is bordered by Walker County on the north, San Jacinto and Liberty Counties on the east, Harris County on the south, and Waller and Grimes Counties on the west. Peach Creek is the boundary with San Jacinto County, and Spring Creek forms most of the boundary with Harris County. Montgomery County, which is adjacent to the Houston metropolitan area, has an area of 1,090 square miles (Figure 1).

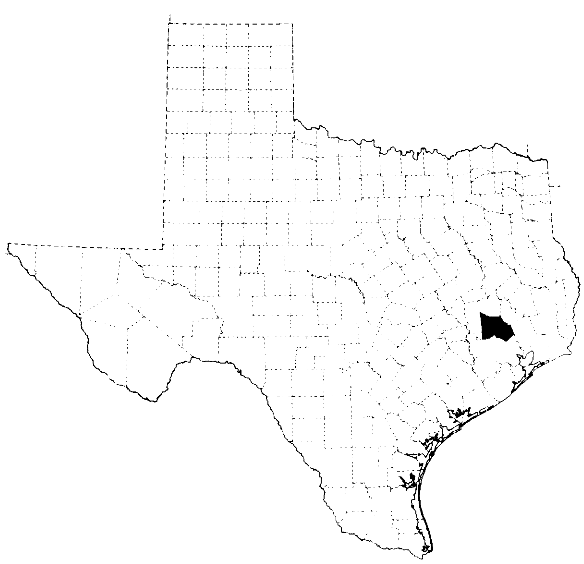

Figure 1.—Location of Montgomery County

Purpose and Scope of the Investigation

The Montgomery County ground-water investigation was started in May 1966 as a cooperative project of the Texas Water Development Board, the San Jacinto River Authority, the Montgomery County Commissioners Court, the city of Conroe, and the U.S. Geological Survey. Its purpose was to determine the occurrence, quality, and quantity of the ground-water resources of Montgomery County and to describe the availability and dependability of sources of water suitable for municipal supply, industrial use, and irrigation. A related purpose was to determine areas of present or potential ground-water pollution.

The study included a determination of: (1) the extent and location of sands containing fresh water (dissolved solids less than 1,000 milligrams per liter) and slightly saline water (dissolved solids of 1,000 to 3,000 milligrams per liter); (2) the quantity of ground water pumped and the effect of pumping on water levels; (3) the hydraulic characteristics of the aquifers; and (4) the quantity of ground water available for development.

Previous Investigations

The first investigation of the ground-water resources of Montgomery County was that of Taylor (1907), who discussed briefly the railroad wells at Dobbin and Conroe. Deussen (1914) discussed the geology and ground-water resources of the county in more detail. Both reports contained records of wells, drillers' logs, and chemical analyses of water samples.

Livingston (1939) inventoried 56 wells in Montgomery County and published chemical analyses and drillers' logs. Rose (1943) described 138 wells and published chemical analyses, drillers' logs, and columnar sections of sands.

Wood (1956) and Wood, Gabrysch, and Marvin (1963) discussed the ground-water supplies potentially available from the principal water-bearing units in the Gulf Coast region of Texas, including Montgomery County. Wood and Gabrysch (1965) discussed the hydrology of the Houston district, including parts of Montgomery County. Measurements of water levels in wells in Montgomery County have been made since 1931 as part of the observation-well program in Texas. Records of these measurements have been published by the Texas Water Development Board and the U.S. Geological Survey (see Rayner, 1959; Sayre, 1957; and Hackett, 1962).

Methods of Investigation

The investigation of the ground-water resources of Montgomery County included an inventory of 497 wells in the county and 81 wells in adjacent counties, including all industrial, public supply, and irrigation wells, and a representative number of livestock and domestic wells (Table 7).

Figure 25 shows the location of inventoried wells and test holes. Electrical logs of test holes were used to correlate and evaluate the subsurface characteristics of the water-bearing sands. Drillers' logs (Table 8), electrical logs of selected test holes, and analyses of samples of water collected from a large number of wells (Table 10) were used to determine the chemical quality of the water and the total thickness of sands containing fresh to slightly saline water.

Field analyses of water from selected wells were made to determine pH at the time of sampling (Table 11). Pumping test data (Table 4) were collected to determine the hydraulic characteristics of the fresh water-bearing sands. Measurements of water levels in wells and records of past measurements were used to determine the effects of pumping. Pumpage of ground water for municipal supply, industrial use, and irrigation was inventoried. Elevations of water wells were determined from U.S. Geological Survey topographic maps. Climatological records and streamflow records were collected and analyzed.

Well-Numbering System

The well-numbering system used in this report is a statewide system adopted by the Texas Water Development Board.

A 2-letter prefix to the well number is used to identify each county. The prefix assigned to Montgomery County is TS. Prefixes assigned to adjacent counties are:

COUNTY	PREFIX	COUNTY	PREFIX
Grimes	KW	San Jacinto	WU
Harris	LJ	Walker	YU
Liberty	SB	Waller	YW

Under this system, each one-degree quadrangle in the State is given a number consisting of two digits from 01 to 89. These are the first two digits in the well number. The one-degree quadrangles are divided into 7½-minute quadrangles which are given two-digit numbers from 01 to 64. These are the third and fourth digits of the well number. Each 7½-minute quadrangle is subdivided into 2½-minute quadrangles which are given a single digit number from 1 to 9. This is the fifth digit of the well number. Each well within a 2½-minute quadrangle is given a two-digit number in the order in which it is inventoried, starting with 01. These are the last two digits of the well number.

All of Montgomery County is within the 1-degree quadrangle 60. The second two digits are shown in the upper left corner of each 7½-minute quadrangle on the well location map (Figure 23); the last three digits appear at the well location.

In order to facilitate the use of well data from other reports, the previously inventoried wells were assigned new State numbers. The old and new numbers are cross-referenced in Table 1.

Acknowledgments

The author acknowledges the assistance of those who contributed data and helped with the preparation of this report. Particular thanks are due the officials of Humble Oil and Refining Company; Texaco, Incorporated; Tennessee Gas and Transmission Company; and the City of Conroe for their assistance in supplying records of their wells and oil and gas tests.

Drillers of water wells generously supplied drillers' logs, electrical logs, and well-completion data. Layne-Texas Company and Con-Tex Water Wells were especially helpful. Property owners granted access to their lands, wells, and records. The active and retired employees of Humble Oil and Refining Company, Superior Oil Company, Sun Oil Company, and Tidewater Oil Company gave generous field assistance in locating many of the old flowing water wells in the Conroe and Lake Creek oil fields.

Population and Economy of the Area

Montgomery County had a population of 2,384 in 1850. By 1900, the population had increased to 17,067. The oil boom in the 1930's did not substantially increase the county population because the city of Humble, in Harris County, served as the operation headquarters. During the period 1950-70, the population increased from 24,504 to 46,950. Conroe, with a population of 10,931 in 1970, is the county seat. Willis, Montgomery, and Cut and Shoot are among the smaller communities.

The county serves as a recreational center for much of the Houston area. The Sam Houston National Forest, the W. Goodrich Jones State Forest, the Boy Scout camp (Camp Strake), and numerous lakes, camps, and country clubs are integral parts of the county's recreational facilities. Lake Conroe, the 32.8 square-mile lake under construction on the West Fork San Jacinto River, will add to these facilities.

Table 1.—Well Numbers Used in This Report and Corresponding Numbers Used in Older Reports

Montgomery County

ROSE 1943	LIVINGSTON 1939	RAYNER 1959	SAYRE 1957	HACKETT 1962	DEUSSEN 1914	THIS REPORT
2	–	–	–	–	–	TS-60-34-602
3	2	–	–	–	–	60-42-306
4	–	–	–	–	–	60-42-304
5	5	–	–	–	784	60-42-305
6	–	–	–	–	–	60-42-303
7	3	–	–	–	783	60-42-307
8	–	–	–	–	–	60-42-809
9	–	–	–	–	–	60-35-804
10	–	–	–	–	–	60-35-805
11	–	–	–	–	–	60-35-806
12	–	–	–	–	–	60-43-201
13	–	–	–	–	–	60-35-901
14	–	–	–	–	–	60-36-502
15	6	–	–	–	–	60-36-401
–	16	16	–	–	–	60-45-106
20	–	–	–	–	–	60-37-408
21	–	–	–	–	–	60-37-102
22	22	22	22	–	–	60-45-505
23	–	–	–	–	–	60-36-302
24	–	–	–	–	–	60-29-701
26	–	–	–	–	–	60-37-303
27	–	–	–	–	–	60-37-302
28	–	–	–	–	–	60-37-301
29	29	29	29	29	–	60-45-803
–	–	30	–	–	–	60-45-801
31	–	–	–	–	–	60-37-503
36	–	144	–	36	–	60-37-401
43	–	–	–	–	–	60-44-402
44	–	–	–	–	–	60-44-403
45	45	45	–	–	–	60-53-503
46	46	46	46	46	–	60-53-504
47	–	–	–	–	–	60-44-501
48	–	–	–	–	–	60-44-502
49	–	–	–	–	–	60-44-601
50	–	–	–	–	–	60-44-602
51	–	–	–	–	–	60-45-403
53	–	–	–	–	–	60-45-510
54	21	–	–	–	790	60-45-506
55	–	–	–	–	–	60-45-502
56	23	145	–	56	–	60-45-504
57	–	57	57	–	–	60-45-104
59	24	–	–	–	–	60-45-511
60	28	–	–	–	–	60-45-408
61	–	–	–	–	–	60-45-401
63	–	–	–	–	–	60-45-611
64	–	–	–	–	–	60-45-609
68	–	–	–	–	–	60-47-608
69	–	–	–	–	–	60-47-607
70	–	–	–	–	781	60-47-606
71	–	–	–	–	–	60-47-605
72	–	–	–	–	–	60-54-201
73	–	–	–	–	–	60-54-103
74	–	–	–	–	–	60-46-801
75	–	–	–	–	–	60-46-709
81	–	–	–	–	–	60-45-903
83	–	–	–	–	–	60-46-706
85	–	–	–	–	–	60-53-308
86	–	–	–	–	–	60-53-309
88	–	–	–	–	–	60-53-601
89	–	–	–	–	–	60-53-304

Table 1.—Well Numbers Used in This Report and Corresponding Numbers Used in Older Reports—Continued

ROSE 1943	LIVINGSTON 1939	RAYNER 1959	SAYRE 1957	HACKETT 1962	DEUSSEN 1914	THIS REPORT
90	—	—	—	—	—	TS-60-53-305
91	—	—	—	—	—	60-53-306
92	—	—	—	—	—	60-53-307
93	—	—	—	—	—	60-53-303
94	35	—	—	—	—	60-53-201
95	—	—	—	—	—	60-45-706
96	—	—	—	—	—	60-45-702
98	—	—	—	—	—	60-44-801
99	—	—	—	—	—	60-52-106
101	—	—	—	—	—	60-52-101
102	—	—	—	—	—	60-52-104
104	—	—	—	—	—	60-51-306
105	—	—	—	—	—	60-51-302
110	41	—	—	—	—	60-50-302
111	—	—	—	—	—	60-50-605
112	—	—	—	—	—	60-50-606
113	—	—	—	—	—	60-51-403
114	—	—	—	—	—	60-51-401
115	—	—	—	—	—	60-51-502
116	—	—	—	—	—	60-51-901
117	—	—	—	—	—	60-51-905
118	—	—	—	—	—	60-52-403
121	54	—	—	—	—	60-61-206
122	50	—	—	—	—	60-53-706
123	47	—	—	—	—	60-53-806
124	48	—	—	—	—	60-53-502
125	49	—	—	—	—	60-53-501
129	—	—	—	—	—	60-54-603
131	—	—	—	—	—	60-55-301
132	—	—	—	—	—	60-55-505
133	—	—	—	—	—	60-55-805
134	—	—	—	—	—	60-55-701
139	56	—	—	—	—	60-62-601
—	—	140	140	140	—	60-45-107
—	—	141	—	—	—	60-45-409
—	—	142	—	—	—	60-35-201
—	—	143	—	—	—	60-35-202
—	—	146	—	—	—	60-45-108
—	8	—	—	—	—	60-37-704
—	28	—	—	—	—	60-45-408
—	30	—	—	—	—	60-45-801
—	42	—	—	—	—	60-52-204

Grimes County

CROMACK 1943	TURNER 1939	THIS REPORT
36	—	KW-60-18-701
51	—	60-26-205
64	—	60-26-702
65	—	60-26-703
66	—	60-26-704
67	—	60-26-705
68	—	60-26-706
194	—	60-34-101
206	—	60-34-801
205	—	60-42-101
209	—	60-42-502
210	—	60-42-103
216	—	60-42-702
217	—	60-42-801
218	—	60-42-802

Table 1.—Well Numbers Used in This Report and Corresponding Numbers Used in Older Reports—Continued

Harris County

WHITE AND OTHERS 1944	LIVINGSTON AND TURNER 1939	THIS REPORT
93	93	LJ-60-61-504
298	—	65-06-305

Walker County

WINSLOW 1950	THIS REPORT
I-34	YU-60-26-201
J-18	60-27-601
J-19	60-28-401
K-11	60-29-705
K-18	60-29-803
L- 6	60-29-902

Waller County

FLUELLEN 1952	THIS REPORT
D-14	YW-60-58-203

Montgomery County derives its income principally from the petroleum and timber industries. Farming, dairying, gravel production, and beef cattle production also contribute to the economy of the area. The discovery of oil near Conroe in 1931 was the beginning of large-scale oil production. Over 400 million barrels of oil were produced in the county prior to 1966. Consequently, petrochemical industries and refineries have been established.

Physiography and Drainage

The topographic surfaces vary from almost flat near the larger streams and in the southern part of the county to hilly in the northern part. Altitudes range from about 45 feet above mean sea level in the southeastern corner of the county to about 440 feet in the northwestern corner.

The county is in the San Jacinto River drainage basin in which the primary drainage trends from northwest to southeast. The larger streams are the West Fork San Jacinto River, Peach, Spring, Stewart, and Caney Creeks. Secondary drainage which is roughly west to east is principally by Lake and Spring Creeks. The primary drainage is controlled by the southeasterly slope of the land surface while the secondary drainage is controlled to a large extent by the occurrence of alternating outcrops of sand and clay.

West Fork San Jacinto River has a stream gradient of about 5 feet per mile in the northern part of the county and about 3 feet per mile in the central and southern parts. Caney Creek has a gradient of 8 to 12 feet per mile in the northern part of the county and about 5 feet per mile in the central and southern parts. Spring Creek has a gradient of about 5 feet per mile in the southwestern part of the county and about 3 feet per mile in the southeastern part.

Climate

Montgomery County has a warm humid climate. Precipitation averages about 47 inches annually (Figures 2 and 3). Droughts occur infrequently and generally are not prolonged. The average annual gross lake surface evaporation rate from 1940 through 1965 was 49.5 inches (Kane, 1967).

The average annual temperature at Conroe (Figure 4) is about 20°C (68°F). Temperatures below freezing occur on the average of only 22 days per year; temperatures above 38°C (100°F) are unusual. The mean date for the first frost is November 30; the mean date for the last frost is March 7. The county has a growing season of about 268 days.

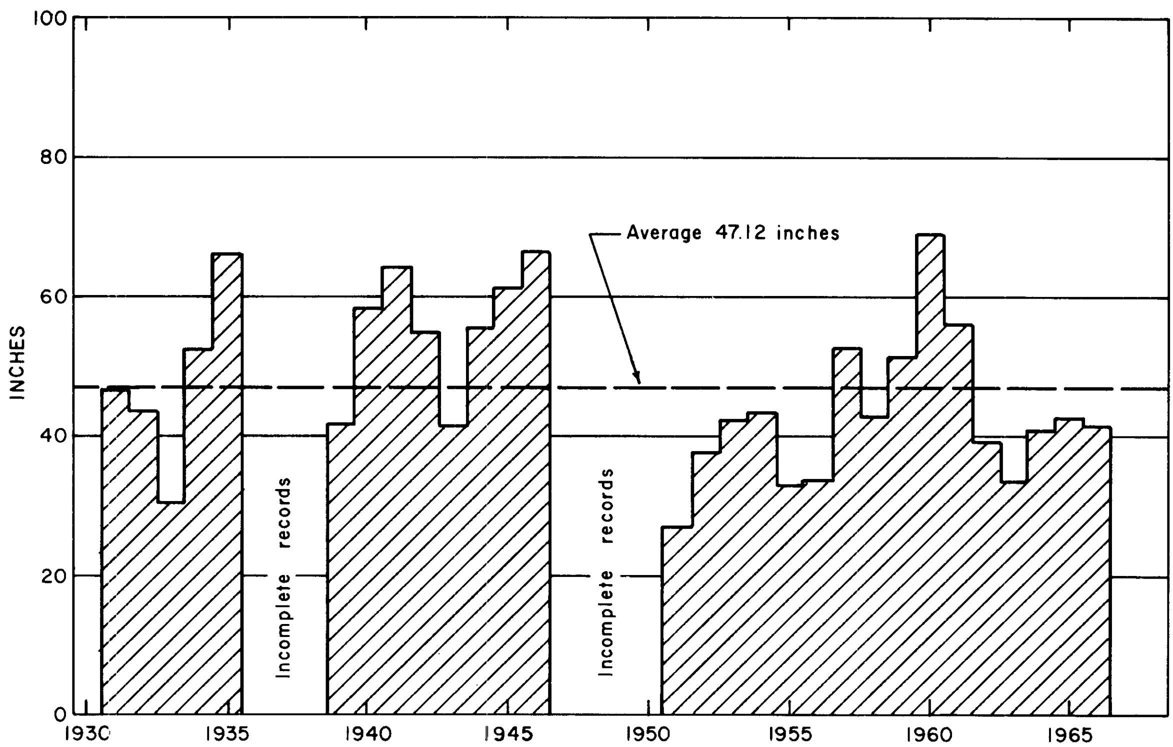

Figure 2.—Annual Precipitation at Conroe, 1931-66

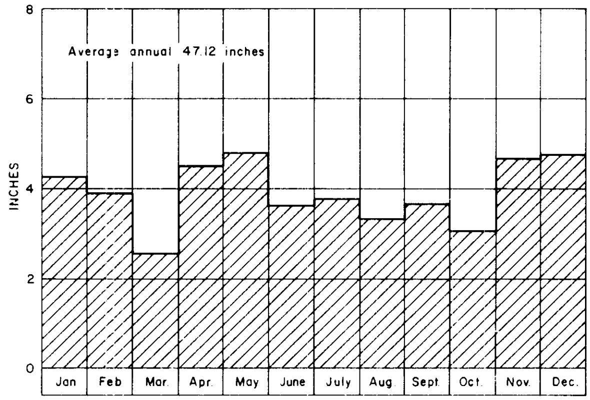

Figure 3.—Average Monthly Precipitation at Conroe, 1931-66

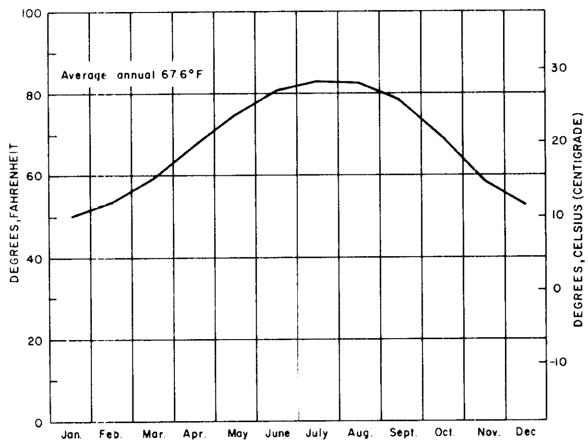

Figure 4.—Average Monthly Temperature at Conroe, 1931-66

GROUND-WATER HYDROLOGY

General Geology

The geologic units that contain fresh to slightly saline water in Montgomery County are, from oldest to youngest: the Catahoula Sandstone of Miocene age; the Fleming Formation of Miocene age; the Goliad Sand of Pliocene age; the Willis Sand of Pliocene(?) age; the Bentley Formation, Montgomery Formation, and Beaumont Clay of Pleistocene age; and the alluvium of Holocene age (Table 2). These units consist of alternating beds of sand and clay with minor amounts of gravel. Local occurrences of limestone are reported in some drillers' logs.

Except for the Catahoula Sandstone and most of the Goliad Sand, all of these geologic units are exposed within the county. The Catahoula crops out north of Montgomery County. The Goliad Sand of Pliocene age, which dips at a rate of 40 feet per mile, is overlapped by the Willis Sand of Pliocene(?) age, which dips at a rate of 10 feet per mile; consequently, the Goliad is exposed only in the deeper stream valleys. The units crop out in belts that are approximately parallel to the coast. The younger units, which crop out nearer the coast, form a plain composed of remnants of terraces; the older units, which crop out farther inland at higher elevations, form cuestas or sand hills.

The formations dip toward the Gulf at an angle greater than the slope of the land surface, and the dip increases with depth. For example, the base of the Catahoula Sandstone dips about 90 feet per mile while the base of the Willis Sand dips about 10 feet per mile. Intermediate beds dip at rates ranging from 85 to 40 feet per mile.

The major structural features are the deep-seated Conroe Dome and the northern flanks of the highly faulted, deep-seated Tomball Dome and the Piercement Humble Dome, which are mostly in adjacent Harris County. These domes cause a flattening of the regional dip and thinning of the overlying water-bearing units.

More detailed discussions of the geology of the area can be found in the publications of Deussen (1914), Sellards, Adkins, and Plummer (1932), Doering (1935), Michaux and Buck (1936), Fisk (1940), Metcalf (1940), Weeks (1945), Bernard, LeBlanc, and Major (1962), and Bernard and LeBlanc (1965a and 1965b). Table 2 correlates the geologic units and the hydrologic units used in this and other reports. Montgomery County is included in the Beaumont sheet of the Geologic Atlas of Texas (Bureau Economic Geology, 1968).

Source and Occurrence of Ground Water

The principal source of ground water in Montgomery County is rainfall within the county and in adjoining areas to the north. Most precipitation runs off, evaporates, or is transpired by plants. Only a small part of it percolates through the soil and into the underlying rocks.

Ground water in Montgomery County occurs under two conditions—water-table and artesian. Water-table conditions exist where the water is under atmospheric pressure only and the water table is free to rise or fall in response to changes in the volume of water stored. Water-table conditions occur in the outcrop areas of the water-bearing rocks.

Artesian conditions exist where an aquifer, or water-bearing unit, is overlain by a less permeable bed that confines the water under hydrostatic pressure. Artesian conditions occur downdip from the outcrops of the aquifers. Under these conditions, water in wells will rise above the top of the aquifer. If the pressure head is

Table 2.--Hydrogeologic Units Used in This Report and in Reports on Adjacent Counties

HYDROGEOLOGIC UNITS USED IN OTHER REPORTS				UNITS USED IN THIS REPORT			
Walker County, Winslow (1950, plate 2)	Houston District, Lang and Winslow (1950, plate 1)	Houston District, Wood and Gabrysch (1965, figure 3)	San Jacinto County, Sandeen (1968) 1/	System	Series	Geologic Unit	Hydrologic Unit
	Beaumont Clay and Alta Loma Sand	Beaumont Clay and Alta Loma Sand	Alluvium	Quaternary	Holocene	Alluvium	Chicot aquifer
			Chicot aquifer		Pleistocene	Beaumont Clay Montgomery Formation Bentley Formation	
Willis Sand				Tertiary	Pliocene (?)	Willis Sand	
(Absent)	Zone 3, 4, 5, 6, 7	Heavily pumped layer	Evangeline aquifer		Pliocene	Goliad Sand	Evangeline aquifer
Lagarto Clay	Zone 2	Zone 2	Burkeville aquiclude		Miocene	Fleming Formation	Burkeville aquiclude
Oakville Sandstone	Zone 1	Zone 1	Jasper aquifer				Upper part of Jasper aquifer
Catahoula Sandstone							Lower part of Jasper aquifer
			Catahoula Sandstone			Catahoula Sandstone	Catahoula Sandstone
Jackson Group, undifferentiated			Jackson Group		Eocene	Jackson Group	

1/ Also, Liberty County (Anders and others, 1968) and Austin and Waller Counties (Wilson, 1967).

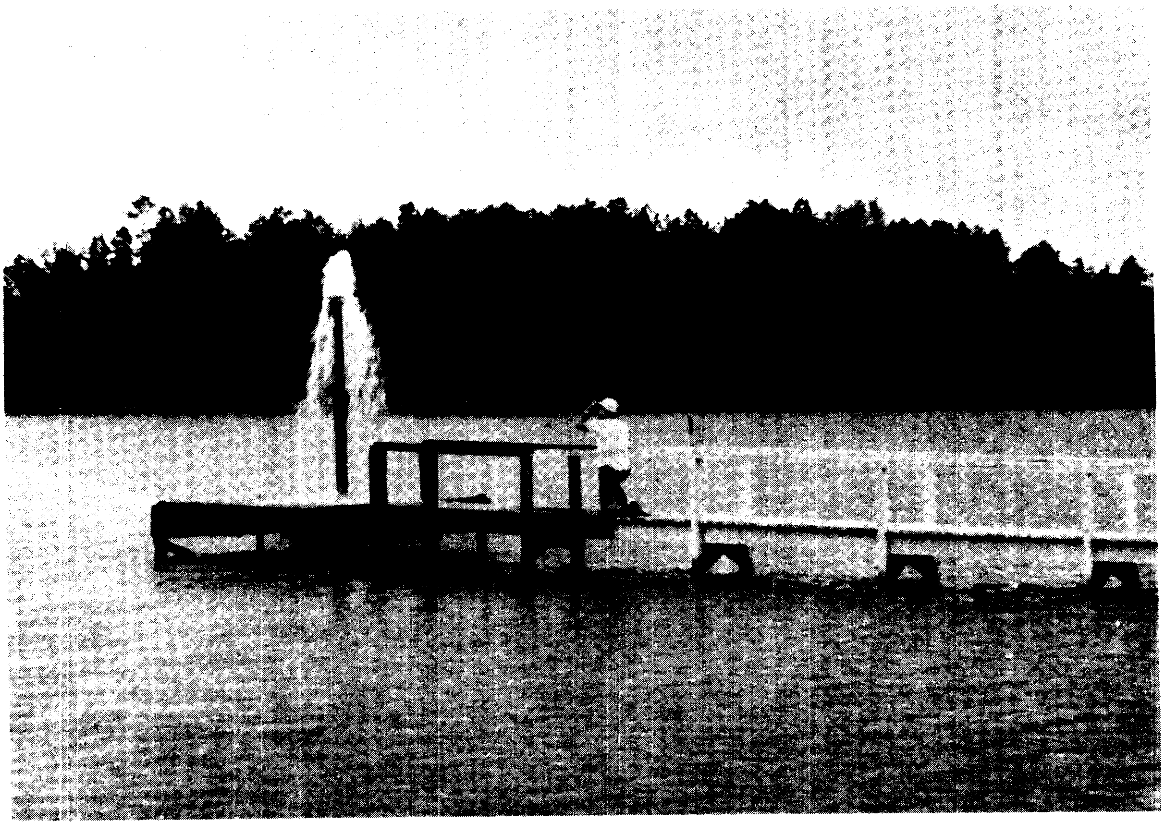

Figure 5.—Well TS-60-53-502, the Largest Capacity Flowing Well in Montgomery County

high enough, water in a well may rise to an altitude greater than that of the land surface, causing the well to flow. Figure 5 is a recent photograph of the largest capacity flowing well in Montgomery County (460 gallons per minute from end of casing 8 feet above land surface, August 19, 1966).

Hydrologic Units

Two types of hydrologic units considered in ground-water studies are aquifers and aquicludes. An aquifer is a geologic formation, group of formations, or a part of a formation that contains and transmits water. An aquiclude is a relatively impermeable formation, group of formations, or part of a formation that may contain water but is relatively impermeable or incapable of transmitting significant quantities in comparison to the adjacent aquifers.

In Montgomery County, the aquifers consist of semi-consolidated or unconsolidated sand, interbedded with clay; the aquicludes consist of clay that in some places includes sand. Six hydrologic units are recognized: the Catahoula Sandstone, the lower part of the Jasper aquifer, the upper part of the Jasper aquifer, the Burkeville aquiclude, the Evangeline aquifer, and the Chicot aquifer. The relationship of these units to those in adjacent areas is shown in Table 2. Characteristics of these units in Montgomery County are given in Table 3. Hydrologic sections are shown on Figures 26, 27, 28, and 29.

Catahoula Sandstone

The Catahoula Sandstone, which consists of sand overlain by clay, is the deepest fresh water-bearing unit in the county. Figure 6 shows the approximate altitude of the base of the Catahoula, which extends from about 1,500 feet below sea level in the northwestern corner of the county to more than 5,000 feet below sea level in the southeastern part. Figure 6 also shows the extent of the fresh and slightly saline water in the aquifer.

Lower Part of the Jasper Aquifer

The lower part of the Jasper aquifer is separated from the upper part mainly on the basis of lithology. The upper part is mostly massive sand, composing 50-80 percent of the aquifer; the lower part is mostly interbedded sand and clay, with the sand composing 30-60 percent of the aquifer.

Table 3.—Characteristics of the Hydrologic Units in Montgomery County

HYDROLOGIC UNIT	APPROXIMATE THICKNESS (FEET)	GENERAL DIP OF BASE (FEET PER MILE)	PERCENT SAND	AVERAGE COEFFICIENT OF PERMEABILITY (GPD/FT²)	REMARKS
Chicot aquifer	0- 200	10	60-80	500[a]	Aquifer consists of unconsolidated sands and gravels, often ferruginous. Red sands and gravels in the Chicot overlie white clays and sands in the Evangeline. Chicot and Evangeline aquifers may be distinguished by differences in self potential curve on electrical logs. Aquifer contains very fresh, often acidic and iron-rich water. Small wells developed; large capacity wells may be developed in southeastern part of county.
Evangeline aquifer	0-1300	40	40-70	250[a]	Water levels higher than in the Chicot aquifer, except in southeastern part of county. Contains fresh water. Small wells developed; large capacity wells may be developed except in areas near the upper limit of the outcrop.
Burkeville aquiclude	0- 300	40	0-20	—	Massive blanket clay with thin interbeds of sand to massive silty sands. Small wells developed in a few areas where fresh water is present.
Upper part of Jasper aquifer	100- 400	50	50-80	240	Massive blanket sand with thin interbeds of clay to massive sandy clays. Large wells developed in some areas, but may be developed in all areas except in extreme northwest corner of county. Fresh, often hard water.
Lower part of Jasper aquifer	1100-2200	85	30-60	—	Contains interbedded sands and clays. Lower part of Jasper aquifer and Catahoula Sandstone may be distinguished by differences in self potential curve on electrical logs. Large quantities of slightly and moderately saline water. Moderate quantities of fresh water. Generally, water at base of unit is more saline than at top of Lower Catahoula Sandstone.
Catahoula Sandstone	300- 500	90	30-50	—	Massive sand underlies clay, silty sands, or moderately saline water-bearing sand. Contains moderate quantities of fresh water, and appears to be less consolidated and more permeable than the sands above it.

[a] Estimated from data in adjoining counties.

The lower part of the Jasper aquifer contains only small amounts of fresh water in Montgomery County. Figure 7 shows the approximate altitude of the base of the lower part of the Jasper aquifer and the base of the sand containing fresh water in the aquifer. Figure 8 shows the approximate altitude of the base of the lower part of the Jasper aquifer and the base of the sand containing slightly saline water in the aquifer.

Upper Part of the Jasper Aquifer

The upper part of the Jasper aquifer consists of a massive sand below the base of the Burkeville aquiclude. The aquifer correlates with "Zone 1" in the Houston district (Lang and Winslow, 1950, pl. 1) and with most of the fresh water-bearing sands of the upper part of the Jasper aquifer in San Jacinto (Sandeen, 1968), Liberty (Anders, McAdoo, and Alexander, 1968), and Austin and Waller (Wilson, 1967) Counties. Figure 9 shows the approximate altitude of the base of the upper part of the Jasper aquifer and the areas where slightly saline water is present in the aquifer.

Burkeville Aquiclude

The Burkeville aquiclude consists of a generally massive clay near the top of the Fleming Formation. The aquiclude correlates with "Zone 2" in the Houston district (Lang and Winslow, 1950, pl. 1, and Wood and Gabrysch, 1965, fig. 3). It is the same unit described as the Burkeville aquiclude in reports on Liberty (Anders and others, 1968), Austin and Waller (Wilson, 1967), and San Jacinto (Sandeen, 1968) Counties. Figure 10 shows the approximate altitude of the base of the Burkeville aquiclude.

Evangeline Aquifer

The Evangeline aquifer, which is an important source of water in the Houston area, is composed of a sequence of alternating sands and clays of the Goliad Sand and the part of the Fleming Formation above the Burkeville aquiclude. In the northern part of the county, remnants of the Willis Sand and younger deposits, which are in hydraulic continuity with the Evangeline, are included in the Evangeline aquifer. The base of the aquifer correlates with the base of "Zone 3" in the Houston district (Lang and Winslow, 1950, pl. 1). The Evangeline aquifer is the same hydrologic unit referred to as the "Heavily Pumped Layer" by Wood and Gabrysch (1965, fig. 4). The base of the unit correlates with the base of the Evangeline aquifer as described in reports in neighboring counties.

Figure 11 shows the approximate altitude of the base of the Evangeline aquifer and the thickness of fresh water-bearing sands in the Chicot and Evangeline aquifers.

Chicot Aquifer

The Chicot is a continuous aquifer in the southern part of the county. It consists of the Willis Sand, Bentley and Montgomery Formations, and younger deposits. As previously explained, remnants of these formations in the northern part of the county are included in the Evangeline. The base of the Chicot aquifer is not everywhere the base of the Willis Sand. The Alta Loma Sand in the Houston district (Wood and Gabrysch, 1965, fig. 3) is the basal part of the Chicot aquifer. Figure 12 shows the approximate altitude of the base of the Chicot aquifer and the approximate altitude of water levels in wells screened in the aquifer, 1966-67. The thickness of fresh water-bearing sands in the Chicot and Evangeline aquifers can be seen on Figure 11.

Hydraulic Properties of the Aquifers

"The worth of an aquifer as a fully developed source of water depends largely on two inherent characteristics: its ability to store and its ability to transmit water" (Ferris and others, 1962, p. 70). These characteristics are expressed by the coefficient of storage and the coefficient of transmissibility.

The coefficients of transmissibility and storage are used to predict theoretical drawdown in water levels in wells caused by pumping. Figure 13 shows the theoretical drawdown of water levels in wells at distances up to 10 miles from a well or group of wells pumping 1 mgd for 1 year. Calculations to obtain the curves were based on the different assumptions of coefficients of transmissibility and storage shown on the graph.

Little is known about the hydrologic properties of the Catahoula Sandstone and the lower part of the Jasper aquifer in Montgomery County. A short aquifer test performed on wells tapping the Catahoula Sandstone in the city of Huntsville (Walker County) indicates coefficients of transmissibility, permeability, and storage of 27,400 gpd (gallons per day) per foot, 200 gpd per square foot, and 0.0037, respectively (Winslow, 1950, p. 19).

The coefficient of storage of an aquifer is the volume of water it releases from or takes into storage per unit surface area of the aquifer per unit change in the component of head normal to that surface. Under water-table conditions, the coefficient of storage is nearly equal to the specific yield, which is the amount of water a saturated formation will yield by draining under the force of gravity. The storage coefficients of aquifers under water-table conditions range from about 0.05 to 0.30 while those under artesian conditions range from about 0.00001 to 0.001. Under artesian conditions, the coefficient of storage is a measure of the elasticity of the water and the aquifer. Additionally, in places in Montgomery County where significant water-level

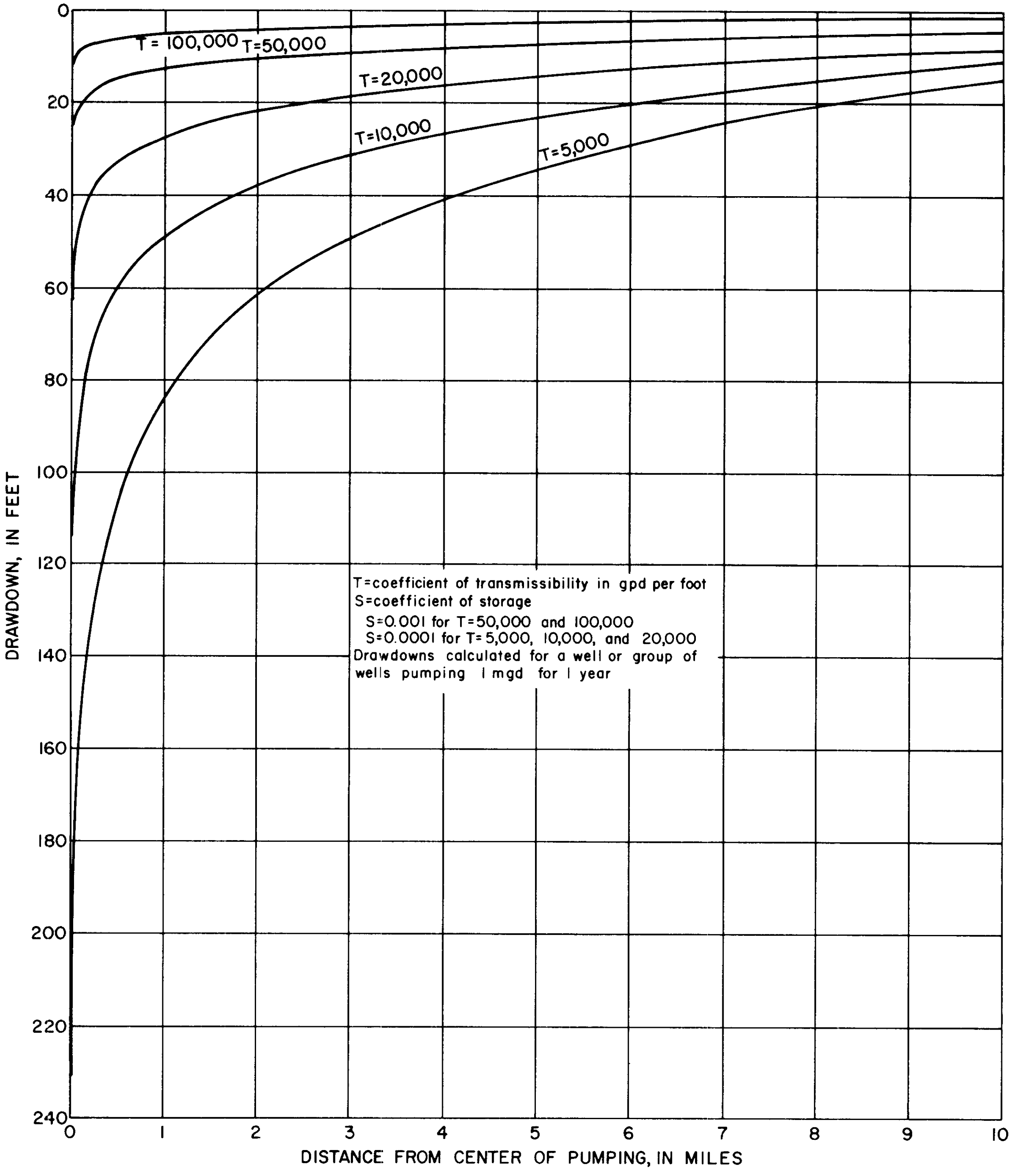

Figure 13.—Relation of Drawdown to Transmissibility and Distance

declines have caused land-surface subsidence, the storage coefficient is also a measure of the water released from compaction of clay beds.

Permeability is a measure of the ability of an aquifer to transmit water. The coefficient of permeability is defined as the rate of flow of water in gallons per day through a cross-sectional area of one square foot under a hydraulic gradient of one foot per foot at a temperature of 16°C (60°F). In field practice, the temperature adjustment is disregarded and the permeability is then understood to be a field coefficient at the prevailing water temperature. The coefficient of transmissibility is the product of the field coefficient of permeability and the saturated thickness of the aquifer.

The coefficients of storage and transmissibility of the upper part of the Jasper aquifer were determined by 9 aquifer tests made in 6 wells near Conroe and at Cleveland (Liberty County). The test data were analyzed by the Theis recovery method (Wenzel, 1942, p. 95-97) or by the Theis recovery method as modified by Cooper and Jacob (1946, p. 526-534). The results of the tests are shown in Table 4. The calculated values of permeability are based on the total amount of sand believed to be contributing to the well.

The coefficients of permeability ranged from 150 to 300 gpd per square foot, and averaged 240 gpd per square foot. The average permeability is within the range of 212 to 272 gpd per square foot observed in Austin and Waller Counties by Wilson (1967, p. 13), and very close to the 247 gpd per square foot observed in San Jacinto County by Sandeen (1968). Based on an average saturated thickness of 150 feet and an average permeability of 240 gpd per square foot, the average composite transmissibility of the upper part of the Jasper aquifer is about 36,000 gpd per foot. The coefficients of transmissibility determined from the tests averaged 33,500 gpd per foot. This value is greater than obtained by Wilson (1967, p. 13) and Sandeen (1968).

Little is known about the transmissibility or storage characteristics of the Evangeline and Chicot aquifers in Montgomery County. Although a few large-capacity wells are completed in the Evangeline, none are completed in the Chicot. However, the characteristics of these aquifers have been extensively tested in Harris and other counties where the aquifer has been developed by wells. Wood and Gabrysch (1965, figs. 34 and 35) indicate a range in transmissibility from 50,000 to 150,000 gpd per foot and a storage coefficient of 0.0025 in the "Heavily Pumped Layer," or Evangeline aquifer in the northern part of the Houston district. The average coefficient of permeability of the "Heavily Pumped Layer" in this area is about 300 gpd per square foot (Wood and Gabrysch, 1965, figs. 33 and 34). Wilson (1967) calculated an average permeability of 215 gpd per square foot from 26 tests in Austin and Waller Counties. The estimated average permeability in the Evangeline aquifer in Montgomery County is 250 gpd per square foot, and the estimated average composite transmissibility of the full thickness of the Evangeline is 50,000 gpd per foot.

The Chicot aquifer in Montgomery County was not tested. The average permeability of the "Alta Loma" in southern Harris and northern Galveston Counties is about 500 gpd per square foot (Wood and Gabrysch, 1965, figs. 36 and 37). This figure is probably near the average permeability of the aquifer in Montgomery County. Based on a permeability of 500 gpd per square foot, the average composite transmissibility is about 25,000 gpd per foot.

Recharge, Movement, and Discharge of Ground Water

The Chicot and Evangeline aquifers and the upper part of the Jasper aquifer crop out in Montgomery County and are recharged by precipitation on the outcrops. Part of the water infiltrates to the zone of saturation and then moves downdip through the aquifer. The Catahoula Sandstone and the lower part of the Jasper aquifer crop out north of Montgomery County; in Montgomery County these aquifers are recharged by downdip movement of water from the outcrop area.

The amount of precipitation on the outcrops exceeds the amount that can be transmitted through the aquifers, and a large part of the rainfall runs off into streams. A lesser part of the water that infiltrates to the zone of saturation emerges as spring flow that maintains the base flow of the streams. The base flow is regarded as rejected recharge. As development increases the transmission capacities of the aquifers, the present rejected recharge will move through the aquifers as recharge and the base flow of the streams will be reduced.

Ground water moves from areas of recharge to areas of discharge under the influence of gravity. The general direction of movement is downdip toward the areas of natural or artificial discharge. The rate of movement is dependent upon the hydraulic gradient, the permeability of the aquifer, and the temperature of the water. The rate of general movement is about 20, 40, and 60 feet per year in the upper part of the Jasper, in the Evangeline, and in the Chicot aquifers, respectively. In areas of ground-water withdrawal, ground water moves from all directions into the areas being pumped.

Ground water is discharged naturally and artificially. Natural discharge is by springs, seeps, and transpiration. Artificial discharge is by pumping from wells and by drainage from pits and channels.

CHEMICAL QUALITY OF GROUND WATER

The chemical constituents in the ground water in Montgomery County originate principally from the soil and rocks through which the water has moved and thus reflect the differences in the mineral content of the geologic formations with which the water has been in contact. The quantities of some constituents, especially sodium and chloride, indicate the extent of removal of connate water by flushing. Generally, the chemical content of the water increases with depth. The temperature of ground water near the land surface is generally about the same as the mean air temperature of the region but increases with depth. General discussions of the quality of ground water are included in *A Primer on Water Quality* by Swenson and Baldwin (1965) and in the *Study and Interpretation of the Chemical Characteristics of Natural Water* by Hem (1959). The chemical analyses of water from selected wells are given in Table 10.

Table 4.—Summary of Aquifer Tests in the Upper Part of the Jasper Aquifer in Montgomery and Adjacent Counties

WELL	DATE OF TEST		COEFFICIENT OF TRANSMISSIBILITY (GPD/FT)	FIELD COEFFICIENT OF PERMEABILITY (GPD/FT^2)	COEFFICIENT OF STORAGE	TYPE OF TEST	REMARKS
TS-60-45-402	July	24, 1966	41,600	210	—	R[a]	Measurements by driller. Well pumped at 1200 gpm for 24 hours.
do	July	25, 1966	39,400	200	—	R	Do.
TS-60-45-503	Apr.	24, 1954	40,600	300	—	R	Pumped well at 1000 gpm for 24 hours.
TS-60-45-505	June	24, 1942	44,000	300	4.7×10^{-5}	I[b]	Pumped TS-60-45-504 at 440 gpm for 9 hours. Observed drawdown and recovery in TS-60-45-505.
do	do		44,000	300	3.1×10^{-4}	I	Pumped TS-60-45-506 at 110 gpm for 10 hours. Observed recovery in TS-60-45-505.
TS-60-45-506	June	24, 1942	50,200	280	6.6×10^{-4}	I	Pumped TS-60-45-504 at 440 gpm for 3½ hours. Observed drawdown in TS-60-45-506.
TS-60-45-507	Nov.	2, 1953	20,500	150	—	R	Measurements by driller. Well pumped at 750 gpm for 3½ hours.
SB-60-48-202	Dec.	2, 1965	11,300	230	—	R	Measurements by driller. Well pumped at 600 gpm for 24 hours.
do	Jan.	14, 1966	10,000	200	—	R	Flowed 60 gpm.

a/ Recovery test.
b/ Interference test.

Relationship of Quality of Water to Use

The major factors that determine the suitability of a water supply are the limitations imposed by the contemplated use of the water. Among the various criteria established for water quality are: bacterial content; physical characteristics, such as temperature, odor, color, and turbidity; and chemical constituents. Usually, the bacterial content and the undesirable physical properties can be alleviated economically, but the removal of undesirable chemical constituents can be difficult and expensive.

The dissolved-solids content is an indication of the chemical quality of the water. A general classification of water based on dissolved-solids content, in mg/l (milligrams per liter), is as follows (modified from Winslow and Kister, 1956):

DESCRIPTION	DISSOLVED-SOLIDS CONTENT (MG/L)
Fresh	Less than 1,000
Slightly saline	1,000 to 3,000
Moderately saline	3,000 to 10,000
Very saline	10,000 to 35,000
Brine	More than 35,000

The U.S. Public Health Service (1962) has established and periodically revises standards of drinking water to be used on common carriers engaged in interstate commerce. The standards are widely accepted for evaluating domestic and public water supplies. According to the standards, chemical constituents should not be present in a public water supply in excess of the listed concentrations shown in the following table, except where other more suitable supplies are not available:

SUBSTANCE	CONCENTRATION (MG/L)
Chloride (Cl)	250
Fluoride (F)	1.0[1/]
Iron (Fe)	0.3
Nitrate (NO_3)	45
Sulfate (SO_4)	250
Dissolved solids	500

1/ Based on annual average of maximum daily air temperature records at Conroe, Texas.

Table 5 is a summary of the source and significance of dissolved-mineral constituents and the properties of water.

The quality of water requirements for industrial uses range widely, as almost every industrial requirement has different standards. In general, water used for industry may be placed in three categories—process water, cooling water, and boiler water. Process water is the term used for the water incorporated into or in contact with the manufactured products. Water for cooling and boiler uses should be noncorrosive and relatively free of scale-forming constituents. In boiler water the presence of silica is undesirable because it forms a hard scale or encrustation, the scale-forming tendency increasing with the pressure in the boiler (Moore, 1940, p. 263). Suggested water-quality tolerances for a number of industries have been summarized by Hem (1959, p. 250-254) and Moore (1940).

Several factors other than the chemical quality are involved in determining the suitability of water for irrigation. The type of soil, adequacy of drainage, crops grown, climatic conditions, and quantity of water used have an important bearing on the continued productivity of irrigated land.

A classification for judging the quality of a water for irrigation was proposed in 1954 by the U.S. Salinity Laboratory Staff (1954, p. 69-82). This classification, which is now commonly used, is based on the salinity hazard as measured by the electrical conductivity of the water and the sodium hazard as measured by the SAR (sodium-adsorption ratio). Sodium can be a significant factor in evaluating the quality of irrigation water because water with a high SAR will cause the soil structure to break down by deflocculating the colloidal soil particles. Consequently, the soil can become plastic, thereby causing poor aeration and low water availability. This possibility is especially true of fine-textured soils. Wilcox (1955, p. 15) stated that the system of classification of irrigation waters proposed by the Laboratory Staff "...is not directly applicable to supplemental waters used in areas of relatively high rainfall". Wilcox (1955, p. 16) indicated that generally water may be used safely for supplemental irrigation if its conductivity is less than 2,250 microhos per centimeter at 26°C and its SAR is less than 14.

Another factor in assessing the quality of water for irrigation is the RSC (residual sodium carbonate) in the water. Excessive RSC will cause the water to be alkaline, and the organic material in the soil will tend to dissolve. The soil may become a grayish-black and the land areas affected are referred to as "black alkali". Wilcox (1955, p. 11) states that laboratory and field studies have resulted in the conclusion that water containing more than 2.5 epm (equivalents per million) RSC is not suitable for irrigation. Water containing from 1.25 to 2.5 epm is marginal, and water containing less than 1.25 epm RSC probably is safe. However, the successful use of marginal water for irrigation might be made possible by proper irrigation practices and use of soil

Table 5.—Source and Significance of Dissolved-Mineral Constituents and Properties of Water

CONSTITUENT OR PROPERTY	SOURCE OR CAUSE	SIGNIFICANCE
Silica (SiO_2)	Dissolved from practically all rocks and soils, commonly less than 30 mg/l. High concentrations, as much as 100 mg/l, generally occur in highly alkaline waters.	Forms hard scale in pipes and boilers. Carried over in steam of high pressure boilers to form deposits on blades of turbines. Inhibits deterioration of zeolite-type water softeners.
Iron (Fe)	Dissolved from practically all rocks and soils. May also be derived from iron pipes, pumps, and other equipment. More than 1 or 2 mg/l of iron in surface waters generally indicates acid wastes from mine drainage or other sources.	On exposure to air, iron in ground water oxidizes to reddish-brown precipitate. More than about 0.3 mg/l stains laundry and utensils reddish-brown. Objectionable for food processing, textile processing, beverages, ice manufacture, brewing, and other processes. U.S. Public Health Service (1962) drinking-water standards state that iron should not exceed 0.3 mg/l. Larger quantities cause unpleasant taste and favor growth of iron bacteria.
Calcium (Ca) and magnesium (Mg)	Dissolved from practically all soils and rocks, but especially from limestone, dolomite, and gypsum. Calcium and magnesium are found in large quantities in some brines. Magnesium is present in large quantities in sea water.	Cause most of the hardness and scale-forming properties of water; soap consuming (see hardness). Waters low in calcium and magnesium desired in electroplating, tanning, dyeing, and in textile manufacturing.
Sodium (Na) and potassium (K)	Dissolved from practically all rocks and soils. Found also in ancient brines, sea water, industrial brines, and sewage.	Large amounts, in combination with chloride, give a salty taste. Moderate quantities have little effect on the usefulness of water for most purposes. Sodium salts may cause foaming in steam boilers and a high sodium content may limit the use of water for irrigation.
Bicarbonate (HCO_3) and carbonate (CO_3)	Action of carbon dioxide in water on carbonate rocks such as limestone and dolomite.	Bicarbonate and carbonate produce alkalinity. Bicarbonates of calcium and magnesium decompose in steam boilers and hot water facilities to form scale and release corrosive carbon dioxide gas. In combination with calcium and magnesium, cause carbonate hardness.
Sulfate (SO_4)	Dissolved from rocks and soils containing gypsum, iron sulfides, and other sulfur compounds. Commonly present in mine waters and in some industrial wastes.	Sulfate in water containing calcium forms hard scale in steam boilers. In large amounts, sulfate in combination with other ions gives bitter taste to water. Some calcium sulfate is considered beneficial in the brewing process. U.S. Public Health Service (1962) drinking-water standards recommend that the sulfate content should not exceed 250 mg/l.
Chloride (Cl)	Dissolved from rocks and soils. Present in sewage and found in large amounts in ancient brines, sea water, and industrial brines.	In large amounts in combination with sodium, gives salty taste to drinking water. In large quantities, increases the corrosiveness of water. U.S. Public Health Service (1962) drinking-water standards recommend that the chloride content should not exceed 250 mg/l.
Fluoride (F)	Dissolved in small to minute quantities from most rocks and soils. Added to many waters by fluoridation of municipal supplies.	Fluoride in drinking water reduces the incidence of tooth decay when the water is consumed during the period of enamel calcification. However, it may cause mottling of the teeth, depending on the concentration of fluoride, the age of the child, amount of drinking water consumed, and susceptbility of the individual. (Maier, 1950)
Nitrate (NO_3)	Decaying organic matter, sewage, fertilizers, and nitrates in soil.	Concentration much greater than the local average may suggest pollution. U.S. Public Health Service (1962) drinking-water standards suggest a limit of 45 mg/l. Waters of high nitrate content have been reported to be the cause of methemoglobinemia (an often fatal disease in infants) and therefore should not be used in infant feeding. Nitrate has been shown to be helpful in reducing inter-crystalline cracking of boiler steel. It encourages growth of algae and other organisms which produce undesirable tastes and odors.
Dissolved solids	Chiefly mineral constituents dissolved from rocks and soils. Includes some water of crystallization.	U.S. Public Health Service (1962) drinking-water standards recommend that waters containing more than 500 mg/l dissolved solids not be used if other less mineralized supplies are available. Waters containing more than 1000 mg/l dissolved solids are unsuitable for many purposes.
Hardness as $CaCO_3$	In most waters nearly all the hardness is due to calcium and magnesium. All the metallic cations other than the alkali metals also cause hardness.	Consumes soap before a lather will form. Deposits soap curd on bathtubs. Hard water forms scale in boilers, water heaters, and pipes. Hardness equivalent to the bicarbonate and carbonate is called carbonate hardness. Any hardness in excess of this is called non-carbonate hardness. Waters of hardness as much as 60 ppm are considered soft; 61 to 120 mg/l, moderately hard; 121 to 180 mg/l, hard; more than 180 mg/l, very hard.
Specific conductance (micromhos at 25°C)	Mineral content of the water.	Indicates degree of mineralization. Specific conductance is a measure of the capacity of the water to conduct an electric current. Varies with concentration and degree of ionization of the constituents.
Hydrogen ion concentration (pH)	Acids, acid-generating salts, and free carbon dioxide lower the pH. Carbonates, bicarbonates, hydroxides, and phosphates, silicates, and borates raise the pH.	A pH of 7.0 indicates neutrality of a solution. Values higher than 7.0 denote increasing alkalinity; values lower than 7.0 indicate increasing acidity. pH is a measure of the activity of the hydrogen ions. Corrosiveness of water generally increases with decreasing pH. However, excessively alkaline waters may also attack metals.

amendments. Furthermore, the degree of leaching will modify the permissible limit to some extent (Wilcox, Blair, and Bower, 1954, p. 265).

Boron is essential to proper plant nutrition, but an excessive boron content will make water unsuitable for irrigation. Wilcox (1955, p. 11) indicated that a boron concentration of as much as 1.0 mg/l is permissible for irrigating sensitive crops.

Water Quality in the Hydrologic Units

Fresh water in Montgomery County is generally free of excessive chemical constituents that are harmful to health, and is therefore suitable for public supply and domestic use. Though water-quality demands of various industries are different (Collins, 1926; Conklin, 1956; Hem, 1959; Mussey, 1955 and 1957), ground water in Montgomery County is generally suitable for industrial use. The water is also suitable for irrigation because it generally contains low concentrations of toxic constituents, and the soils are generally sandy and well drained. Records of laboratory analyses of water from wells in Montgomery and adjacent counties are given in Table 10. Records of field analyses are given in Table 11.

Catahoula Sandstone

Electrical-log interpretations indicate that fresh water-bearing sands are present in the Catahoula Sandstone in the northern and central part of Montgomery County (Figure 6). Where fresh water is present in the Catahoula, it is generally overlain by slightly or moderately saline water. The maximum thickness of sand containing fresh water is 160 feet, which occurs about 5 miles northwest of Willis. The average fresh-water sand thickness in the county is about 100 feet. The maximum thickness of sand containing slightly saline water is 200 feet, which occurs northwest of the town of Montgomery. Natural gas is present in the fresh and slightly saline water-bearing sand on the flanks of the Conroe Dome.

Lower Part of the Jasper Aquifer

Electrical-log interpretations indicate that as much as 270 feet of fresh water-bearing sand is present in the lower part of the Jasper aquifer in the northern and central parts of the county. Slightly saline water is also present in the aquifer as shown on Figure 8.

Upper Part of the Jasper Aquifer

The upper part of the Jasper aquifer contains water that is generally fresh, hard, and alkaline. Samples from wells 725 feet or less in depth were of the calcium bicarbonate type; those from wells 1,100 feet or more in depth were of the sodium bicarbonate type. Dissolved-solids content ranged from 49 to 665 mg/l, but in most of the samples ranged from 300 to 500 mg/l. Most of the samples had a pH ranging from 7.5 to 8.0. Hardness ranged from 10 to 258 mg/l, but generally ranged from 60 to 180 mg/l. Very hard water is found in wells in the outcrop area and south of the outcrop in a belt about 15 miles wide. Wells south of this belt yield soft water.

Electrical logs indicate that there are areas in the southern part of the county where slightly saline water is present in the upper part of the Jasper aquifer. The locations of these areas are shown on Figure 9.

Temperatures of water from 38 flowing or pumped wells screened in the Evangeline aquifer and in the upper part of the Jasper aquifer indicate a thermal increase of about 1°C per 125 feet increase in depth (1°F per 70 feet). However, a larger gradient exists near the Humble Dome. Based on the thermal gradient, fresh water as warm as 35°C (95°F) is probably present at the base of the upper part of the Jasper aquifer.

Burkeville Aquiclude

Only one water well, TS-60-34-502, completed in sands within the Burkeville aquiclude was sampled in Montgomery County. Electrical-log interpretations indicate that as much as 65 feet of fresh water-bearing sand is present in the aquiclude. However, this sand is discontinuous because the Burkeville is mostly clay.

Evangeline Aquifer

Analyses of water from wells in the Evangeline aquifer indicate that water in this unit is generally fresh and hard, with the hardest water occurring in or near the outcrop area. Electrical-log interpretations indicate that water in the aquifer is fresh throughout most of the county. Dissolved solids ranged from 66 to 3,420 mg/l. However, most of the samples had a dissolved-solids content that ranged from 250 to 400 mg/l.

Only three samples had dissolved-solids content greater than 700 mg/l. Two came from wells (TS-60-53-302 and TS-60-53-311) in areas of abandoned salt-water disposal pits, and the other came from a well (LJ-65-06-305) near the Humble Dome. Hardness ranged from 21 to 1,890 mg/l, but the range for most samples was from 60 to 180 mg/l. Hardness exceeded 500 mg/l in samples from two wells (TS-60-53-302 and TS-60-53-311) in areas of abandoned salt-water disposal pits. All of the soft water came from wells south of the outcrop area. The samples that had a dissolved-solids content greater than 400 mg/l, but less than 700 mg/l came from wells developed in or near the outcrop area.

The pH of the water samples ranged from 5.5 to 8.2, but most of the samples had a pH of 6.5 to 7.5. Samples with a pH of less than 6.5 came from shallow wells south of the outcrop area.

Chicot Aquifer

Water from the Chicot aquifer is generally soft and fresh. Hardness ranged from 8 to 140 mg/l, but was generally less than 60 mg/l. The pH ranged from 5.0 to 7.5, but most of the samples had a pH of 5.0 to 6.7. Dissolved solids ranged from 36 to 268 mg/l, but most of the samples had a dissolved-solids content of less than 150 mg/l.

Water-Quality Problems

Although most of the water contained in the upper part of the Jasper, the Evangeline, and the Chicot aquifers is fresh, some water-quality problems, involving waters that are hard, corrosive, or iron-bearing, exist in Montgomery County. All of these problems can be effectively eliminated by proper well-completion methods or water treatment.

The most popular treatment for hardness is the use of an ion exchange or zeolite softener. A cold lime-soda softening precipitator may be used to remove hardness, iron, and manganese. Treatment for water hardness is not commonly used in Montgomery County because the people have become adjusted to using hard water, and industrial water usage is still slight.

Corrosive (acidic) ground waters are found in the Evangeline and Chicot aquifers. Such water may corrode pump parts (Figure 14), plumbing fixtures, and iron casings in less than a year of contact. Table 11 shows field measurements of pH and other parameters.

There are two possible sources of iron in water in Montgomery County. One source is the solution of iron from ferruginous sands and gravels. The other source is corrosion of well casings and water distribution systems by water of low pH.

To alleviate the problem of iron caused by acidic water acting on ferrous metal, materials such as fiberglass, stainless steel, or plastics may be used in the construction of the well and distribution system. Iron may be removed by aeration, which precipitates the iron, and by filtration which removes the precipitate from the water. Various lime and oxidizing filters may also be used to treat water with high iron content.

Disposal of Oil-Field Brines

According to data obtained from the files of the Texas Railroad Commission (Texas Water Commission and Texas Water Pollution Control Board, 1963), about 26 million barrels of oil-field brine was produced in Montgomery County during 1961. Of this total, 9.2 percent was disposed of by miscellaneous means, 4.3 percent was diverted to surface pits, and 86.5 percent was disposed of by injection through wells that penetrated deep formations.

The disposal pits in Montgomery County have been located generally in sandy soils. Some of these pits were abandoned because overflow of the brine tended to destroy vegetation and to contaminate nearby streams. Seepage from the pits contaminates shallow ground water. A large number of these pits once existed in the Conroe Oil Field, and shallow sands in some areas of abandoned pits still contain brine. A water sample from well TS-60-53-311 completed in one such area contained 2,140 mg/l chloride. The Texas Railroad Commission issued orders, effective January 1, 1969, to close all salt-water disposal pits in the State.

The disposal of oil-field brines has not resulted in widespread damage to the chemical quality of the ground-water supplies in Montgomery County, but damage has occurred in local areas. Considerable care is currently exercised in the disposal of brines and other municipal and industrial wastes.

Protection of Water Quality in Oil-Field Drilling Operations

The Texas Railroad Commission requires that drilling contractors use casing and cement or by alternative protection devices to protect fresh-water strata from contamination. In recent years, the Texas Water Development Board has made recommendations to the oil operators and the Railroad Commission on the depths to which the water of usable quality should be protected. Where oil or gas fields are established, the recommended depths are incorporated in the field rules. Figure 15 shows the depth of protection required by the Texas Railroad Commission and the depth of fresh to slightly saline water in various oil fields in Montgomery County. The water-bearing strata in the older fields are, in general, not as well protected as in the more recently developed fields.

DEVELOPMENT OF GROUND WATER

Use of Ground Water

During the early days of settlement of Montgomery County, the only water used was for domestic and livestock purposes. This water was drawn from shallow dug wells, natural and developed springs and ponds, and streams. Deussen (1914, p. 306) reported that as early as 1901, deep wells had been drilled to supply the steam boilers of locomotives. The

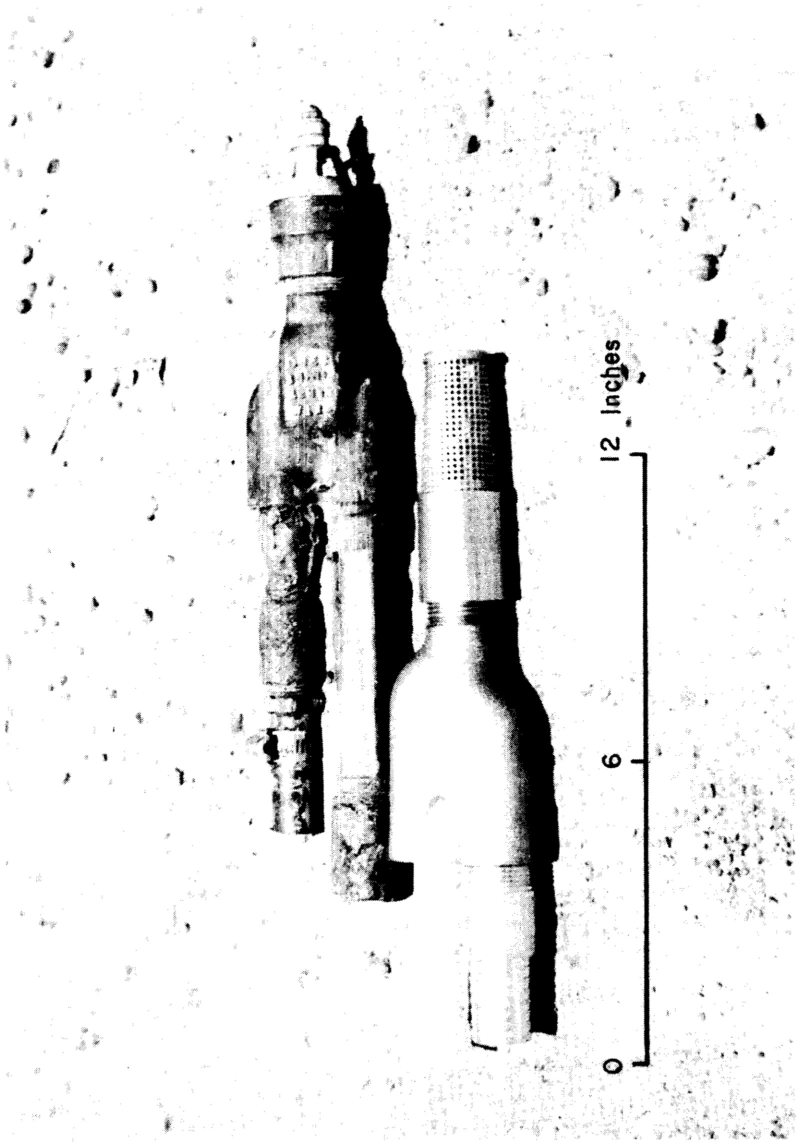

Figure 14
Comparison of New and Corroded Check Valves

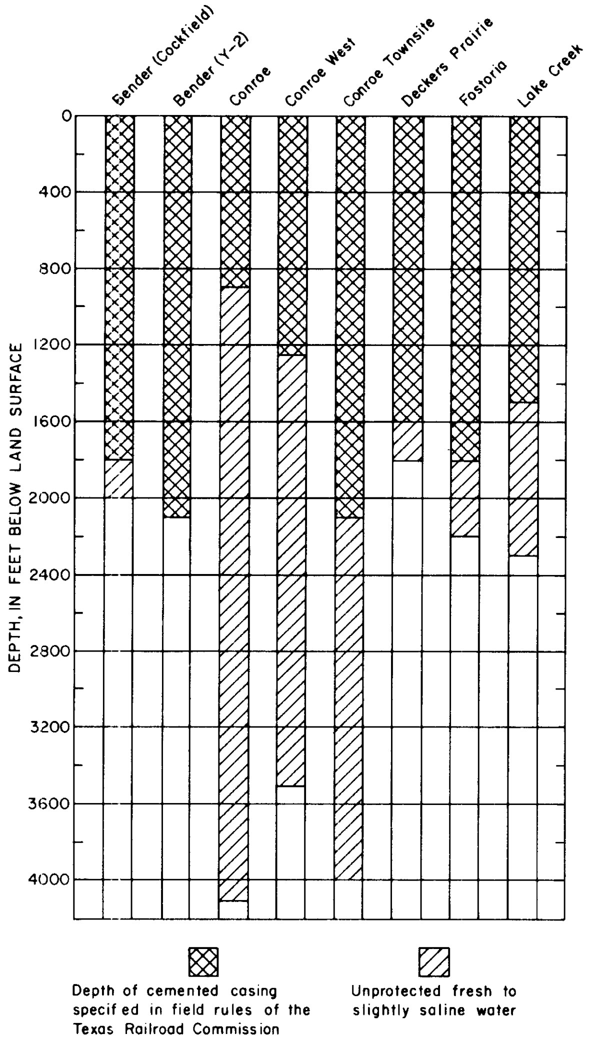

Figure 15.—Comparison Between Depth of Sands Containing Fresh to Slightly Saline Water and the Depth of Protection Required in Oil Fields in Montgomery County

earliest reported deep wells were drilled in towns that had railroad switches, such as Fostoria, Wilburton, Esperanza, Conroe, Tamina, and Splendora. The search for oil brought in many flowing water wells, some of which are still in use.

During the period 1910-43, ground water was developed for public supply, saw mills, railroads, oil and gas production, and pipeline stations. By the mid-1950's, the city of Conroe developed a well field, and recreational camps and clubs used drilled wells. By 1960, a few petroleum-related industries moved near Conroe and developed deep wells. The most recent ground-water developers are the small communities and real estate subdivisions.

The use of ground water has increased with the increase in population and industry. In 1850, probably less than 0.5 mgd (million gallons per day) of ground water was withdrawn. In 1900, about 3.5 mgd was produced; in 1940, about 4.7 mgd was withdrawn. About 6.2 mgd was pumped from ground-water aquifers in Montgomery County in 1966. Table 6 shows, by aquifers, the quantity of ground water that was pumped for public supply, rural domestic and livestock, industrial, and irrigation uses in the county in 1966. The figures are based on population data and industrial usage estimates. About 81 percent of the ground water withdrawal in 1966 was for public supply, domestic supply, and livestock uses; about 18 percent was for industrial use, and 1 percent for irrigation. The upper part of the Jasper supplied 3.50 mgd; the Evangeline, 2.64 mgd; and the Chicot, 0.05 mgd.

Water-Level Declines and Land-Surface Subsidence

Periodic measurements of water levels have been made in Montgomery County since 1931 (Tables 7 and 9). According to Deussen (1914, p. 304-306), Livingston (1939, p. 1-6), and Rose (1943, p. 2-17), wells completed in the upper part of the Jasper aquifer in the early 1900's flowed as much as 750 gpm. Static water levels in these wells at that time were as follows: about 45 feet above land surface at Tamina, 20 feet above land surface at Conroe and Dobbin, and 25 feet above land surface at Fostoria. By the mid-40's, many of the wells at Conroe stopped flowing, and in 1967, some water levels were 30 feet below land surface. However, some of the wells still flow. Static water levels in the flowing wells in 1966-67 are as follows: about 20 feet above land surface at Tamina, 10 feet above land surface at Dobbin, and 5 feet above land surface at Fostoria. Since development began, water levels have declined as much as 50 feet in wells tapping the upper part of the Jasper aquifer at Conroe, 10 feet at Dobbin, 20 feet at Fostoria, and 25 feet at Tamina. Figure 16 shows the fluctuations of water levels in two wells completed in the upper part of the Jasper aquifer at Conroe. The long-term decline of these water levels is probably related to pumpage, but variations in average rainfall may cause short-term fluctuations.

Figure 17 shows the approximate altitude of water levels in wells screened in the upper part of the Jasper aquifer, based on measurements made in the 1966-67 period. The average hydraulic gradient is 2.7 feet per mile.

Water levels have declined in wells completed in the Evangeline aquifer. According to Deussen (1914, p. 304-306), Livingston (1939, p. 1-6), and Rose (1943, p. 2-17), water levels in wells developed in this aquifer at Fostoria and Tamina were about 10 and 5 feet above land surface in the 1900's, but these wells no longer flow. Many wells completed in this aquifer in the Conroe Oil Field during the 1930's and 1940's flowed, but by the early 1950's, many of them stopped flowing. Since

Table 6.—Estimated Use of Ground Water in Montgomery County, 1966

USE	AQUIFER (MGD) UPPER PART OF JASPER	EVANGELINE	CHICOT	TOTAL (MGD)	PERCENTAGE
Public supply	2.28	0.07	—	2.35	37.9
Rural domestic and livestock	.53	2.07	0.05	2.65	42.9
Industrial	.69	.44	—	1.13	18.2
Irrigation	—	.06[1]	—	.06[1]	1.0
Totals	3.50	2.64	0.05	6.19	100.0

[1] 70 acre-feet, from 1964 records (Gillett and Janca, 1965, p. 20).

development began, water levels in wells tapping the Evangeline aquifer have declined as much as 50 feet at Fostoria and 35 feet at Tamina.

Figures 18 and 19 show the altitude of water levels in wells in the Evangeline aquifer measured in 1942-43 and 1966-67. The average hydraulic gradient increased from 4.3 to 5.4 feet per mile from 1943 to 1967. Water levels declined 10 to 25 feet in the Conroe area and 40 to 50 feet in the southeastern part of the county. The rate of water-level decline in the southeastern part of the county was as much as 2.1 feet per year. The areas of pumpage changed very little. Pumpage from the Evangeline increased about 0.5 mgd to 2.5 mgd between 1943 and 1967. Ground water taken from the "Heavily Pumped Layer" in Harris County, the equivalent of the Evangeline in Montgomery County, has lowered water levels in wells tapping the Evangeline aquifer in the southeastern part of Montgomery County.

Water levels in the Chicot aquifer, which are closely related to fluctuations of recharge, do not show a long-term trend. Figure 12 shows water levels in wells completed in the aquifer. The average hydraulic gradient is about 3.8 feet per mile. Figure 20 shows the fluctuation of selected water levels in a well tapping the Chicot at Conroe.

Water-level declines have caused some subsidence of the land surface in the southern part of Montgomery County. Withdrawal of water from the artesian aquifers results in an immediate decrease in the hydraulic pressure in the aquifers. The resulting pressure difference between the sands and clays causes water to move from the clays into the sands, and the clays are compressed. Some of the clay particles are permanently rearranged and the clay is permanently compacted. As compression and compaction of the beds occur, the land surface subsides (Winslow and Doyel, 1954; Winslow and Wood, 1959).

Slight decreases of altitude along the level lines established by the U.S. Coast and Geodetic Survey show that less than 0.5 foot of land surface subsidence has occurred between 1943 and 1964 in the southern half of Montgomery County (Gabrysch, 1967, fig. 19). This probably has been caused by the large ground-water withdrawals in the adjacent Houston district. However, greater amounts of subsidence may have occurred in Montgomery County in the vicinity of oil, gas, and salt-water withdrawals.

Well Construction

Most large capacity wells in Montgomery County are in the Conroe area. When a well is to be drilled for municipal or industrial use, a small diameter test hole is drilled by the hydraulic-rotary method to the depth desired, usually to the base of the upper part of the Jasper aquifer. During drilling, formation samples are collected, and upon completion of the test holes, an electrical log may be run.

If the data collected indicate favorable conditions, the test hole is reamed from 16 to 24 inches in diameter from the surface to or near the top of the first sand to be screened. A 12- to 20-inch diameter casing, called the pump pit, or surface casing, is installed and cemented into place. The section of sand to be screened is then reamed to a large diameter hole (about 30 inches) using the largest reamer that can pass the surface casing. The screen is then installed and the bottom of the screen is closed off with a back-pressure valve.

The wells are finished with a perforated section of pipe 6 to 14 inches in diameter that has been wrapped with stainless steel wire (fiberglass was used in a recently completed well, TS-60-45-605, for the casing below the pump pit and the well screen). In gravel-packed wells, the openings in the screen range from 0.040 to 0.050 inches in diameter. This opening is larger than the diameters of most of the sand grains but smaller than the diameters of most of the gravel particles in the gravel pack. Blank pipe of the same diameter as the screen extends above 100 feet from the top of the screen into the surface casing. Sized gravel is placed around the screen by means of a gravel tube, which is withdrawn as the annular space is filled with gravel. The gravel increases the effective diameter of the well and protects the screen from caving of the sand.

The well is developed by surging, swabbing, pumping, back-washing, by the use of chemicals, or by a combination of these processes until the specific capacity and sand-water ratio is satisfactory. Finally, the well is tested by pumping for 4 to 24 hours, during which time samples of water are collected for chemical analyses.

The size and type of pump installed depends principally upon the pumping lift and the quantity of water needed. In general, municipal and industrial wells in Montgomery County have high-capacity, deep-well turbine pumps powered by electricity. The wells produce from 200 to 1,200 gpm (gallons per minute). Pump settings range from about 50 to 200 feet below land surface. Specific capacities range from 3 to 12 gallons per minute per foot of drawdown.

Most of the small-capacity wells that furnish water for domestic use and small industry in the county are completed with a straight wall and a single screen. The size of the screen and pipe ranges from 1-1/4 to 4 inches. In some small-capacity wells more than one size of screen or pipe may be used.

In the construction of some small-capacity municipal, industrial, and domestic wells, 4- or 6-inch casing is cemented from the surface to the top of the sand to be developed. Then a slightly smaller size screen is lowered through the pipe and set in the sand. A short section (1 to 10 feet) of blank pipe and a lead nipple are placed on top of the screen. The lead nipple is battered down to form a seal between the surface pipe and the pipe to which the screen is attached. The screen is usually stainless steel or plastic because these materials are resistant to corrosion. The openings in the screen range from 0.08 to 0.018 inch in diameter, which is smaller than the diameter of most of the sand grains.

Most small-capacity wells are equipped with small jet pumps or air compressors. Larger jet pumps, small-capacity deep well turbines, and submersible pumps are also common.

AVAILABILITY OF GROUND WATER

The availability of water for future development from the aquifers in Montgomery County is dependent upon a number of factors. The most important are: the ability of the aquifers to transmit water; the amount of water in storage; the rate of recharge to the aquifers; the chemical quality of the water; and economic factors including the cost of wells.

The altitude of the base of fresh water ranges from 1,670 feet below sea level in the northwestern corner of the county to 3,870 feet below sea level in the central part (Figure 21).

The potential for development of the fresh-water resources of Montgomery County is greater in the areas where the total thickness of sands is greater. Figure 22 shows the thickness of sands containing fresh water below the Burkeville aquiclude (sands in the Catahoula Sandstone and in the lower and upper parts of the Jasper aquifer). The thickness of the sands ranges from 30 to 550 feet, and averages about 200 feet.

The sands of the Evangeline and Chicot aquifers (the sands above the Burkeville aquiclude) contain only fresh water. Figure 11 is a map of the base of the Evangeline aquifer showing the thickness of fresh water-bearing sands in the Evangeline and Chicot aquifers. These sands are as thick as 570 feet in the southeastern part of the county and average about 250 feet throughout the county.

The altitude of the base of slightly saline water ranges from less than 1,500 feet below sea level in the west central part of the county to 3,870 feet below sea level in the central part (Figure 23). The thickness of sand below the Burkeville aquiclude containing fresh to slightly saline water ranges from 80 to 780 feet (Figure 24).

Storage calculations were based on an estimated 250-foot thickness of fresh water-bearing sands above the Burkeville aquiclude and an estimated 200-foot thickness of fresh water-bearing sands below the Burkeville. A porosity of thirty percent is assumed. The volume of fresh water stored in the aquifers underlying Montgomery County is estimated to be about 80 million acre-feet, of which 40 million acre-feet is in the Evangeline and Chicot aquifers, 30 million acre-feet is in the upper part of the Jasper aquifer, and 10 million acre-feet is below the upper part of the Jasper. Theoretically, about half of this amount of water could be drained from the aquifers assuming no recharge. By orderly development and by utilizing recharge, the quantity of ground water economically recoverable may in time greatly exceed the quantity of water now in storage.

A large quantity of water is available from artesian storage and from compaction of clays. The water from clay compaction cannot be replaced by natural processes. On the basis of studies made in the Houston area, when compaction occurs, it is estimated that 0.5 to 1.0 foot of land-surface subsidence will occur per 100 feet of water-level decline (Winslow and Doyel, 1954, p. 143), thus releasing from storage an equivalent volume of water.

The calculations of the present quantity of water moving through an aquifer are based upon the transmissibility of the aquifer, the hydraulic gradient, and width of the aquifer. Coefficients of transmissibility of 36,000 gpd per foot and 50,000 gpd per foot were assumed for the upper part of the Jasper aquifer and the Evangeline aquifer, respectively. On the basis of these assumptions, about 3.4 mgd, or 3,800 acre-feet per year, is moving through the upper part of the Jasper aquifer across a line perpendicular to the hydraulic gradient at Conroe. Approximately 9.5 mgd, or 10,600 acre-feet per year, is moving through the Evangeline aquifer across this line. These figures are based on the present hydraulic gradients of 2.7 feet per mile in the upper part of the Jasper aquifer and 5.4 feet per mile in the Evangeline aquifer.

One of the principal factors in determining the quantity of water available is the ability of an aquifer to transmit water to wells. The transmission capacity of an aquifer, as defined by Wood and others (1963, p. 98), is the quantity of water that can be transmitted through a given width of an aquifer at a given hydraulic gradient. Calculations of the potential transmission capacity of the upper part of the Jasper aquifer and the Evangeline aquifer in Montgomery County were based on these assumptions:

1. Water levels will be lowered to 400 feet below land surface along a line that is perpendicular to the direction of water movement and approximately parallel to the outcrop of the aquifers. This line, which would pass through Conroe, about 19 miles southeast of the outcrop, would be 36 miles long.

2. Recharge to the aquifer occurs only along a line, parallel to the line of discharge, that is in the middle of the outcrop area.

3. Water levels in the area of the outcrop will not decline.

4. The hydraulic gradient is the slope of a straight line between the average altitude of the water levels at the outcrop and the altitude of the water levels at the line of discharge. After water levels are lowered to 400 feet along the line of discharge, the hydraulic gradient would be 24 feet per mile.

5. All sands between the line source of recharge and the line of wells will transmit water from the outcrop to the line of discharge. These sands have an average thickness of 300 feet and an average coefficient of permeability of 250 gpd per square foot. The coefficient of transmissibility is 75,000 gpd per foot.

Under these conditions, the transmission capacity of the upper part of the Jasper and the Evangeline aquifers would be 65 mgd, or 72,800 acre-feet per year. An even greater perennial supply of fresh water can be obtained if the fresh water-bearing sands in the lower Catahoula Sandstone, and lower part of the Jasper and the Chicot aquifers are developed.

The area of the outcrop of the Evangeline and upper part of the Jasper aquifers comprises about 790 square miles in Grimes, Montgomery, and Walker Counties. About 1.7 inches of recharge per year would be required in this area to maintain a transmission capacity of 65 mgd. This quantity of required recharge is rather small compared to the quantity available in other parts of southeastern Texas. If the rejected recharge (spring flow) in the outcrop areas were salvaged, an additional 140,000 acre-feet of water per year (125 mgd) would be available. Calculations of rejected recharge are based on streamflow records for Caney Creek near Splendora from 1944 to 1967, Peach Creek at Splendora from 1944 to 1967, Spring Creek near Spring from 1939 to 1967, and West Fork San Jacinto River near Conroe from 1924 to 1927 and 1939 to 1967.

Another way to estimate the quantity of fresh ground water available for development in Montgomery County is to compare this area to areas having similar hydrologic systems in which large developments have taken place, such as the Houston district and Liberty County. Observations of the performance of the aquifers in response to large withdrawals have been made in the 5,000 square miles of the Houston district since 1929. Pumping in the Houston district is from the Chicot and Evangeline aquifers exclusively. Pumpage of ground water in the Katy and Houston areas was about 186 mgd in 1960 and 278 mgd in 1965 (Gabrysch, 1967, p. 11). Since development began, water levels have declined as much as 50 feet in the Katy area and 250 feet in the Houston area (Wood and Gabrysch, 1965, fig. 10; Gabrysch, 1967, p. 21).

In 1965, about 51 mgd was pumped in Liberty County, and about 200 mgd was estimated to be perennially available from properly spaced wells developed in the Chicot and Evangeline aquifers, without excessive water-level declines (Anders and others, 1968, p. 30 and 46). The water-bearing beds in Liberty County are considered to be less prolific than those in the Houston district. The upper part of the Jasper aquifer, which contains fresh water along the northern boundary of Liberty County, was not included in this estimate.

It was conservatively estimated that about 56 mgd could be pumped from wells developed in the Chicot and Evangeline aquifers in the southern part of Austin and Waller Counties (Wilson, 1967, p. 68).

The aquifers in Montgomery County are very similar to those in Austin, Waller, and Liberty Counties, and in the Houston and Katy areas. Montgomery County, in fact, is the recharge area for much of the ground water withdrawn in the Houston district. With the proper spacing and development of wells, about 150 mgd of ground water could be pumped perennially from the upper part of the Jasper, Evangeline, and Chicot aquifers in Montgomery County, with only moderate water-level declines and land-surface subsidence. Additional supplies of fresh water could be obtained from sands below the upper part of the Jasper. Currently, about 6.2 mgd, or 4 percent of the available supply is being used.

A ground-water development of 150 mgd in Montgomery County probably would affect large scale ground-water development in adjoining areas, especially in the Houston district. The effect in the Houston district would be an accelerated decline in water levels and probably a reduction in the yields of wells.

Wells yielding 1,000 gpm could be developed anywhere in Montgomery County, and in many areas, wells yielding 3,000 gpm could be developed. This is confirmed in Waller and Harris Counties (Wilson, 1967, Table 5; Lang and Winslow, 1950, p. 6) by yields of wells developed in sands similar to those present in Montgomery County.

The upper part of the Jasper aquifer will probably be developed first in Montgomery County because it contains softer water which is under the highest pressure head. With increased pumping, the head in the upper part of the Jasper will be lowered, and as a result, more wells will be completed in the Evangeline aquifer. Except in areas of large withdrawals, wells completed in the Evangeline aquifer will have higher water levels than those completed in the Chicot aquifer. Eventually, the Chicot aquifer will be developed.

NEED FOR FUTURE STUDIES

The present investigation described the basic hydraulic framework of the aquifers. A continuing program of hydrologic data collection is prerequisite to efficient development of the ground-water resources. This work should include the following:

1. A continuing inventory should be conducted of all new large-capacity wells, including the collection of drillers' and electrical logs and well completion data. Annual inventories of the quantities of ground water used should be made.

2. Periodic measurements of water levels in representative wells should be made to observe changes in the hydraulic gradients and to observe the effect of pumping. An adequate number of wells in the recharge areas should be included.

3. Pumping tests should be made on new large-capacity wells to more accurately determine the aquifer characteristics.

4. Measurements of base flow of streams should be made to determine more accurately the quantities of rejected recharge available for future use.

5. U.S. Coast and Geodetic Survey benchmarks should be relevelled to determine land-surface subsidence.

6. A study should be conducted of the relationships between acid ground water, rainfall, and forest cover; and between hard ground water and limy and clayey soils as a method of delineating areas of corrosive ground water.

The continuing program of basic-data collection must extend into adjoining counties because the effects of the development in nearby areas will affect the ground-water supplies in Montgomery County. The area of observation should include, in addition to Montgomery County, at least half of Walker County and parts of the other adjoining counties.

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Table 8.—Drillers' Logs of Wells in Montgomery and Adjacent Counties

	THICKNESS (FEET)	DEPTH (FEET)

Montgomery County

Well TS-60-29-802

Owner: Mrs. Merrill
Driller: Con-Tex Water Well Co.

	THICKNESS (FEET)	DEPTH (FEET)
Sand and red clay	12	12
Sand, brown	12	24
Clay with gravel	129	153
Sand, white	30	183

Well TS-60-34-502

Owner: Texas Forest Product Co.
Driller: Layne-Texas Co.

	THICKNESS (FEET)	DEPTH (FEET)
Clay	5	5
Sand, soft	39	44
Clay, brown	24	68
Clay, sandy	8	76
Sand, fine and clay, broken	8	84
Shale, tough, brown and blue	27	111
Sand, fine, white	23	134
Shale, sandy	6	140
Shale, soft, sandy	22	162
Shale, tough, brown, and blue	25	187
Sand, hard, fine, and shale with lime streaks	31	218
Shale	3	221
Shale, sandy, and lime	4	225
Shale, sandy	4	229
Shale, tough	7	236
Shale, sandy	15	251
Shale, tough	12	263
Shale, sand with hard lime streaks	28	291
Rock	1	292
Sand and shale, broken	12	304
Sand and shale, streaks	14	318
Sand and shale, broken	6	324
Sand, fine, white and black	11	335
Shale	2	337
Sand, medium, white and black	9	346
Rock	1	347
Shale, sandy	17	364
Sand, medium, white and black	37	401
Shale	1	402

Well TS-60-34-604

Owner: Robert E. Webb
Driller: Tomball Drilling Co.

	THICKNESS (FEET)	DEPTH (FEET)
Soil	8	8
Shale, red	7	15
Sand	6	21
Shale, blue	5	26
Sand	12	38
Shale	29	67
Sand, salt and pepper	22	89

Well TS-60-34-903

Owner: Gray
Driller: Con-Tex Water Well Co.

	THICKNESS (FEET)	DEPTH (FEET)
Clay	31	31
Sand	19	50
Sand and clay	4	54
Sand	19	73

Well TS-60-35-302

Owner: J. A. Bond
Driller: Con-Tex Water Well Co.

	THICKNESS (FEET)	DEPTH (FEET)
Clay, red and sand	20	20
Clay and iron ore	32	52
Sand and sandy shale	4	56
Sand, white	20	76
Shale and lime streaks	28	104
Sand, gray and black	22	126
Sand, shale, and lime	6	132

Well TS-60-35-802

Owner: City of Montgomery
Driller: Falkenbury

	THICKNESS (FEET)	DEPTH (FEET)
Clay and rock	70	70
Sand	10	80
No record	5	85
Sand	20	105
Clay	90	195
Sand, fine	25	220

Table 8.—Drillers' Logs of Wells in Montgomery and Adjacent Counties—Continued

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-35-802—Continued		
Clay and rock	235	455
Clay	65	520
Sand	70	590
Well TS-60-36-201		
Owner: Bonanza Corp. Driller: Con-Tex Water Well Co.		
Clay	18	18
Sand with clay	12	30
Sand	44	74
Clay with sand	11	85
Sand	20	105
Sand, hard	1	106
Clay and gravel	13	119
Sand	34	153
Clay and lime	85	238
Sand	17	255
Shale and lime	29	284
Sand, hard with clay streaks	90	374
Sand with shale streaks	25	399
Shale	33	432
Sand	38	470
Sand and shale	3	473
Well TS-60-36-401, partial log		
Owner: Luther E. Hall Driller: Sprague Oil Co.		
Soil	8	8
Sand	40	48
Shale	12	60
Shale, sandy	25	85
Shale, sticky	100	185
Shale and boulders	65	250
Shale, sticky	60	310
Sand, artesian flow	20	330
Shale, sticky	30	360
Sand, hard	24	384
Shale, sticky	64	448
Sand, artesian flow	22	470
Shale and boulders	42	512
Shale, sticky	108	620
Shale, sandy	130	750
Sand, artesian flow	24	774
Shale	46	820
Shale, sticky	130	950
Sand, water	22	972
Shale and boulders	52	1,024
Shale, sticky	76	1,100
Sand	12	1,112
Shale, sticky	18	1,130
Shale	44	1,174
Sand and boulders	47	1,221
Shale	89	1,310
Shale, sticky	90	1,400
Sand, artesian flow	24	1,424
Shale	36	1,460
Total depth		4,316
Well TS-60-36-601		
Owner: Hulan Lakes Subdivision Driller: Con-Tex Water Well Co.		
Clay, red	67	67
Shale, sandy and sand, hard streaks	29	96
Sand, hard	2	98
Sandstone	1	99
Sand, hard streaks	6	105
Shale and lime	39	144
Shale, sand and lime	14	158
Lime, hard sandy	2	160
Shale and lime	34	194
Shale, sandy	18	212
Sand	23	235
Shale	3	238
Shale, sandy	11	249
Sand	29	278
Shale and sand streaks	9	287
Shale and lime	6	293
Sand	37	330

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-36-601-Continued		
Sand and shale	16	346
Sand	38	384
Sand, hard streaks, and shale	45	429
Sand	32	461

Well TS-60-37-103

Owner: Ray F. Weston
Driller: Con-Tex Water Well Co.

	THICKNESS (FEET)	DEPTH (FEET)
Clay and ore	12	12
Sand and red clay	27	39
Clay and gravel streaks	24	63
Sand, hard and red clay	11	74
Sand, hard streaks	10	84
Clay and sand	4	88
Sand, gray and black	9	97
Clay and sand streaks	8	105
Sand, brown	6	111
Clay	23	134
Shale and hard sandy lime	16	150
Shale and lime	27	177
Sand, firm	32	209
Shale and lime	8	217
Sand	36	253

Well TS-60-37-105

Owner: Robert Hardy, Jr.
Driller: Con-Tex Water Well Co.

	THICKNESS (FEET)	DEPTH (FEET)
Clay	16	16
Sand, hard	6	22
Clay with sand streaks	41	63
Sand, hard and sandy lime	33	96
Clay with lime	16	112
Clay	5	117
Sand and shale	29	146
Sand	37	183

Well TS-60-37-202

Owner: S. Noviski
Driller: Con-Tex Water Well Co.

	THICKNESS (FEET)	DEPTH (FEET)
Clay and gravel	8	8
Sand	17	25
Clay and gravel	44	69
Sand, hard and clay	11	80
Shale	24	104
Shale with lime	67	171
Sand	36	207

Well TS-60-37-304

Owner: Afton Park Subdivision
Driller: Kerns Water Wells

	THICKNESS (FEET)	DEPTH (FEET)
Clay	14	14
Sand	17	31
Clay	7	38
Sand	1	39
Clay	12	51
Sand, red	17	68
Clay	38	106
Sand with hard streaks	11	117
Clay, sand	9	126
Sand	8	134
Clay and rock	93	227
Sand and rock	11	238
Sand	18	256
Clay and rock	38	294
Rock and sand	8	302
Sand	60	362

Well TS-60-37-401

Owner: City of Willis, Well 1
Driller: Layne-Texas Co.

	THICKNESS (FEET)	DEPTH (FEET)
Clay, sandy	25	25
Gravel	15	40
Clay	10	50
Sand	30	80
Clay	50	130
Clay, sandy	11	141
Clay	27	168
Clay with hard streaks	76	244
Sand, hard	10	254
Shale	22	276
Sand, hard fine	21	297
Shale	23	320

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-37-401—Continued		
Sand, hard	13	333
Sand, fine	28	361
Shale	4	365

Well TS-60-37-403

Owner: City of Willis, Well 3
Driller: Layne-Texas Co.

	THICKNESS (FEET)	DEPTH (FEET)
Clay	10	10
Sand	50	60
Clay, sandy	205	265
Clay, sandy and sand streaks	19	284
Clay	28	312
Sand	39	351
Clay, sandy	53	404
Sand and clay streaks	46	450
Clay	20	470
Sandrock	3	473
Sand	8	481
Clay	10	491
Sand and shale streaks	38	529
Shale	71	600
Sand	10	610
Shale, sandy	63	673
Sand streaks and shale	17	690
Sand	20	710
Shale	37	747
Sand	19	766
Shale, sandy	34	800
Sand	57	857
Shale, sandy	10	867
Sand	13	880
Shale, sandy	33	913

Well TS-60-37-405

Owner: H. E. Harrison
Driller: Con-Tex Water Well Co.

	THICKNESS (FEET)	DEPTH (FEET)
Sand and gravel	30	30
Clay with sand streaks	40	70
Clay	70	140
Sand and lime streaks	38	178
Clay and lime streaks	104	282
Lime, sandy	8	290
Clay and sand	28	318
Sand with clay streaks	22	340
Lime, hard	1	341
Sand, hard and soft	14	355

Well TS-60-37-406

Owner: R. B. Howard
Driller: Con-Tex Water Well Co.

	THICKNESS (FEET)	DEPTH (FEET)
Clay	54	54
Sand	28	82
Clay	12	94
Sand	11	105
Clay	5	110
Sand	10	120
Hard streaks	1	121
Sand	9	130
Clay	2	132

Well TS-60-37-701

Owner: W. L. Massey
Driller: Kerns Water Wells

	THICKNESS (FEET)	DEPTH (FEET)
Clay and rock	116	116
Rock	2	118
Broken formation of shale, sand, rock	24	142
Sand, hard, brown, fine	8	150
Shale	70	220
Formation, hard	20	240
Shale	13	253
Sand, soft, brown	27	280

Well TS-60-37-703

Owner: Camp Agnes Arnold (Girl Scouts of America)
Driller: Layne-Texas Co.

	THICKNESS (FEET)	DEPTH (FEET)
Soil	3	3
Clay, red sandy	3	6
Sand and gravel	26	32
Gravel and clay	10	42
Clay	236	278

Table 8.—Drillers' Logs of Wells in Montgomery and Adjacent Counties—Continued

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-37-703—Continued		
Sand and boulders	11	289
Clay	111	400
Clay, sandy	3	403
Sand, fine	20	423
Clay	39	462
Clay, sandy	11	473
Clay	25	498
Sand, fine	17	515
Clay	5	520
Sand	2	522
Clay	20	542
Clay, sticky	44	586
Clay, sandy	24	610
Clay, sticky	109	719
Clay	16	735
Sand	8	743
Clay, sticky	20	763
Clay, sandy	25	788
Clay, sticky	37	825
Clay and hard sandy layers	9	834
Sand and clay layers	49	883
Sand	30	913
Sand and boulders	5	918
Clay	13	931
Well TS-60-37-902		
Owner: Carl Currie Driller: Con-Tex Water Well Co.		
Clay	21	21
Sand and gravel	24	45
Clay with sand and gravel streaks	12	57
Clay	27	84
Sand, hard and clay streaks	10	94
Sand, trashy	7	101
Clay	2	103
Sand, hard streaks	1	104
Sand	4	108
Clay	7	115
Sand	4	119
Clay	44	163
Sand, hard streaks	5	168
Sand	13	181
Hard streaks	1	182
Sand	39	221
Clay	1	222
Well TS-60-37-904		
Owner: S. C. Boone Driller: Con-Tex Water Well Co.		
Sand and red clay	24	24
Sand and red gravel	12	36
Clay	3	39
Sand and clay	3	42
Sand	33	75
Well TS-60-42-202		
Owner: Robert and James Herzog Driller: Tomball Drilling Co.		
Soil	2	2
Shale	26	28
Sand	13	41
Shale	17	58
Sand	46	104
Shale	6	110
Sand	9	119
Shale	19	138
Sand	28	166
Well TS-60-42-307		
Owner: Gulf, Colorado and S.F. R.R. Driller: W. J. Giles		
Clay, yellow	12	12
Sand, shale and gravel	10	22
Rock, white lime	2	24
Clay, brown	4	28
Rock, white lime	2	30
Clay, brown	2	32
Rock, white lime	3	35
Clay, brown and white	20	55

Table 8.—Drillers' Logs of Wells in Montgomery and Adjacent Counties—Continued

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-42-307—Continued		
Rock, white lime	3	58
Clay, gray	40	98
Sand, brown	16	114
Gumbo, gray	51	165
Rock, white lime	3	168
Clay, gray	20	188
Gumbo, gray	12	200
Shale, red	12	212
Gumbo, brown	34	246
Sand, blue	31	277
Shale, hard blue	13	290
Rock, white lime	21	311
Sand, blue	23	334
Rock, white lime	6	340
Sand, blue and shale	34	374
Gumbo, blue	23	397
Shale, blue and sand	14	411
Rock, white lime	8	419
Sand, blue and shale	25	444
Shale, hard blue	33	477
Gumbo, blue	28	505
Rock, white lime	2	507
Gumbo, blue	13	520
Water sand	40	560
Gumbo, brown	26	586
Rock, white lime	2	588
Sand, fine-grained, blue	4	592
Rock, white lime	1	593
Shale, gray	19	612
Sand, white	4	616
Rock, sand	3	619
Sand, hard	14	633
Sand and shale	22	655
Rock, sand	2	657
Sand	35	692
Rock, sand	3	695
Sand	51	746

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-42-501		
Owner: A. C. Coumes Driller: Con-Tex Water Well Co.		
Sand and clay, red	40	40
Clay, red	4	44
Sand, brown	14	58
Clay, brown	13	71
Clay and lime	26	97
Lime, hard	3	100
Sand with clay	8	108
Clay with hard lime streaks	82	190
Clay, white sandy	24	214
Sand	33	247
Well TS-60-42-901		
Owner: Toby Smith Driller: Carl Rudel		
Clay, yellowish	40	40
Clay, white	40	80
Sand	18	98
Well TS-60-43-102		
Owner: J. R. Little Driller: Con-Tex Water Well Co.		
Clay, lime streaks	113	113
Sand	7	120
Clay, lime streaks	3	123
Sand	8	131
Clay	2	133
Sand, hard streaks	9	142
Sand	20	162
Well TS-60-43-201		
Owner: Keith Dickson Driller: Layne-Texas Co.		
Sand, gravel and clay	35	35
Clay	30	65
Clay and boulders	94	159
Sand, hard	29	188
Clay with sandy clay layers	63	251
Clay	22	273
Clay, sandy	14	287

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-43-201—Continued		
Sand	8	295
Clay	15	310
Shale, sandy	15	325
Rock	1	326
Shale	55	381
Shale, sandy	22	403
Shale	77	480
Clay and boulders	18	498
Shale, sandy	13	511
Shale	29	540
Shale, sandy	10	550
Shale	105	655
Sand	22	677
Shale, sandy	5	682
Well TS-60-43-203		
Owner: A. B. Hamil Driller: Kerns Water Wells		
Clay and sand	45	45
Sand	15	60
Clay	30	90
Hard formation	2	92
Shale and hard lime	128	220
Sand	3	223
Shale and lime	4	227
Sand	5	232
Lime, hard and shale	48	280
Shale, hard and lime	6	286
Sand	7	293
Shale	21	314
Sand and lime	9	323
Shale	5	328
Sand, soft	9	337
Shale and lime	67	404
Well TS-60-43-301		
Owner: W. S. Taliver Driller: Con-Tex Water Well Co.		
Sand and clay	78	78
Clay	21	99
Sand, hard streaks	14	113
Clay and lime	57	170
Sand	26	196
Clay and lime	51	247
Sand	22	269
Well TS-60-43-302		
Owner: Paul Hoffart Driller: Con-Tex Water Well Co.		
Clay, gravel and ore	65	65
Lime and shale	13	78
Sand streaks and shale	29	107
Shale	38	145
Sand	3	148
Shale, sand streaks	97	245
Sand	12	257
Shale	17	274
Sand	5	279
Shale	2	281
Sand	7	288
Shale	4	292
Sand	46	338
Well TS-60-43-502		
Owner: J. H. Kurth, Jr. Driller: Falkenburg		
Clay	32	32
Sand	5	37
Clay and rock	284	321
Sand	43	364
Well TS-60-43-601		
Owner: James L. Slowey Driller: Con-Tex Water Well Co.		
Clay with lime	110	110
Sand	17	127
Well TS-60-43-702		
Owner: John Waters Driller: Con-Tex Water Well Co.		
Sand	7	7
Sand and gravel, red	40	47
Sand, red	25	72

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-43-702—Continued		
Clay and gravel streaks	9	81
Clay and sand streaks	25	106
Clay	14	120
Clay and gravel	14	134
Sand	14	148
Clay	18	166
Sand	19	185
Shale	3	188
Well TS-60-43-703		
Owner: J. Neeves Driller: Con-Tex Water Well Co.		
Clay, red	14	14
Sand, red	10	24
Clay	2	26
Sand, white	17	43
Sand and gravel, white	9	52
Clay	2	54
Sand, white	25	79
Well TS-60-43-901		
Owner: E. B. Hethcoth Driller: Con-Tex Water Well Co.		
Sand and clay	36	36
Clay, brown	9	45
Sand with clay, red	12	57
Clay with gravel streaks	76	133
Clay with sand streaks	47	180
Clay and lime	100	280
Clay with sandy lime	88	368
Sand	22	390
Well TS-60-44-104		
Owner: B. J. Higgins Driller: Con-Tex Water Well Co.		
Clay, red	13	13
Sand and clay, sand and gravel, red	81	94
Sandstone, broken and shale	8	102
Sand with hard streaks	10	112
Shale and lime	98	210
Sand, dark gray	17	227

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-44-204		
Owner: Mrs. Libie Vick Driller: Kerns Water Wells		
Clay	58	58
Sand, fine brown	40	98
Hard formation	11	109
Well TS-60-44-302		
Owner: G. A. Wilkson Driller: Con-Tex Water Well Co.		
Sand and clay, red	14	14
Clay, brown and gray	59	73
Clay and gravel streaks, gray	8	81
Clay and lime	28	109
Lime, hard sand and clay streaks	11	120
Clay and lime	35	155
Clay, sand and lime	6	161
Sand	22	183
Shale and lime, blue	56	239
Lime, hard	2	241
Shale, sandy and lime	16	257
Sand	12	269
Shale	15	284
Sand, gray	52	336
Clay	11	347
Sand	26	373
Clay	19	392
Sand, blue	30	422
Well TS-60-44-401		
Owner: Charles Glass Driller: Kerns Water Wells		
Clay, sand and gravel	18	18
Clay	18	36
Sand, brown	20	56
Clay	42	98
Sand, hard brown	26	124
Clay	29	153
Sand, soft	17	170
Clay	3	173
Sand, soft	30	203
Clay and rock	4	207

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-44-402		
Owner: Wayne Broyles Driller: J. A. Walling		
Clay and sand	168	168
Clay, yellow	22	190
Clay, blue	40	230
Clay and sand	22	252
Clay, blue	40	292
Rock	1	293
Clay	19	312
Sand	23	335
Clay	40	375
Clay and sand	20	395
Clay	83	478
Sand	21	499
Sand and gravel	89	588
Clay and boulders	244	832
Sand	59	891
Well TS-60-44-503		
Owner: John E. Sykora Driller: Con-Tex Water Well Co.		
Clay, red	23	23
Sand and gravel	37	60
Clay, white	41	101
Clay with sand streaks	44	145
Sand with hard streaks	17	162
Sand, brown	22	184
Well TS-60-44-506		
Owner: Charles S. Scott Driller: Con-Tex Water Well Co.		
Surface sand and clay	45	45
Clay	41	86
Sand	46	132
Sand with hard streaks	13	145
Sand with clay	34	179
Sand, clay and hard lime	16	195
Clay	12	207
Clay with lime	11	218
Shale, hard and lime	56	274
Shale, hard	16	290
Lime, hard sandy, and shale	16	306
Lime, hard	13	319
Shale and lime	11	330
Sand and shale	68	398
Sand	24	422
Well TS-60-44-702		
Owner: H. E. Norman Driller: Con-Tex Water Well Co.		
Sand and gravel, red	22	22
Clay with gravel, brown	86	108
Sand, hard streaks	4	112
Sand	7	119
Clay	16	135
Sand	25	160
Well TS-60-44-801		
Owner: Superior Oil Co. Driller: Luther Patterson		
Soil	24	24
Sand	21	45
Shale	44	89
Sand	49	138
Shale	2	140
Shale, sandy	23	163
Well TS-60-45-105		
Owner: Panorama Development Co. Driller: Layne-Texas Co.		
Clay, sandy and clay	5	5
Clay, sandy	7	12
Sand, brown	13	25
Sand and gravel	25	50
Clay	57	107
Sand, fine brown	31	138
Shale and sandy shale	353	491
Shale, sandy and streaks of sand	58	549
Shale and sandy shale	75	624
Sand, broken and streaks of shale	31	655
Shale, sandy and streaks of sand	115	770

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-45-105—Continued		
Sand, fine	15	785
Shale	23	808
Sand, broken	21	829
Shale	3	832
Sand	24	856
Shale	19	875
Sand	15	890
Shale, sandy and streaks of sand	10	900
Sand	21	921
Shale, sandy and streaks of sand	29	950
Sand and gravel	76	1,026
Sand	67	1,093
Shale	10	1,103

Well TS-60-45-201

Owner: Montgomery County Airport
Driller: Layne-Texas Co.

	THICKNESS (FEET)	DEPTH (FEET)
Sand	4	4
Clay	17	21
Clay, sandy	22	43
Clay	8	51
Sand	19	70
Clay	3	73
Sand	14	87
Sand and gravel	17	104
Clay, sandy	16	120
Clay and boulders	21	141
Shale, hard	8	149
Rock	1	150
Shale, hard	54	204
Shale, sandy	20	224
Shale, hard	61	285
Rock	3	288
Shale, hard streaks	248	536
Shale, sandy	35	571
Sand	21	592
Shale, sandy	5	597
Sand and gravel	10	607
Shale	2	609

Well TS-60-45-402

Owner: City of Conroe
Driller: Katy Drilling Co.

	THICKNESS (FEET)	DEPTH (FEET)
Sand and soil	12	12
Clay	47	59
Sand	60	119
Clay	14	133
Sand	37	170
Clay	59	229
Sand with rock strips	27	256
Clay, hard	132	388
Sand	20	408
Clay with sand strips	67	475
Sand	55	530
Clay	41	571
Sand	50	621
Clay	3	624
Sand	31	655
Clay	30	685
Sand	35	720
Clay	77	797
Sand	14	811
Clay	16	827
Sand	21	848
Clay	35	883
Sand	21	904
Rock	1	905
Sand	1	906
Clay	19	925
Rock and sand	77	1,002
Clay	25	1,027
Sand and limerock	122	1,149
Shale, hard	156	1,305
Sand, hard and rocky	18	1,323
Shale, hard	78	1,401

Well TS-60-45-407

Owner: Wayne H. Edwards
Driller: Con-Tex Water Well Co.

	THICKNESS (FEET)	DEPTH (FEET)
Clay and red ore	12	12
Clay and red sand	12	24

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-45-407—Continued		
Clay, red	41	65
Sand, red and white	51	116
Clay and lime	62	178
Sand	38	216
Clay and lime	86	302
Shale, sandy with sand streaks	32	334
Lime, hard and shale	4	338
Sand and lime	9	347
Lime, hard	2	349
Shale and lime	70	419
Shale with sand streaks	52	471
Shale, hard and lime	8	479
Sand	32	511

Well TS-60-45-408

Owner: J. S. Hunt and R. E. Floyd
Driller: Layne-Texas Co.

	THICKNESS (FEET)	DEPTH (FEET)
Sand and clay	22	22
Sand, white	38	60
Clay, yellow	55	115
Sand	14	129
Clay	15	144
Sand	19	163
Sand and gravel	12	175
Clay, yellow	58	233
Sand	10	243
Clay	81	324
Shale	14	338
Clay	7	345
Rock	1	346
Clay	20	366
Shale, blue and brown	20	386
Clay, tough	40	426
Shale	21	447
Gumbo	10	457
Shale, blue	18	475
Rock	2	477
Gumbo	11	488
Shale, blue	30	518
Gumbo	10	528
Shale, blue	20	548
Shale, chocolate	18	566
Rock	3	569
Sand, blue shale and boulders	59	628
Sand and blue shale mixed	41	669
Shale, chocolate	20	689
Gumbo, soft	20	709
Shale, blue	41	750
Shale, hard	20	770
Rock, soft and chocolate shale	20	790
Shale	17	807
Rock, soft	3	810
Gumbo, soft	40	850
Gumbo, tough	40	890
Shale	19	909
Rock, soft	20	929
Gumbo and boulders	61	990
Gumbo, tough	20	1,010
Gumbo	20	1,030
Sand and shale mixed	20	1,050
Water sand	41	1,091
Rock, soft and sand	20	1,111
Water sand	41	1,152
Sand and gravel	20	1,172

Well TS-60-45-505

Owner: City of Conroe, Well 1
Driller: D. G. Hamil

	THICKNESS (FEET)	DEPTH (FEET)
Clay, red	60	60
Sand	30	90
Clay	15	105
Sand	35	140
Clay	45	185
Sand	45	230
Clay	75	305
Sand	12	317
Clay	63	380

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-45-505—Continued		
Sand	10	390
Rock, sand	4	394
Sand	18	412
Shale	186	598
Rock, hard	14	612
Sand, fine and blue	28	640
Shale, chocolate	80	720
Shale, chocolate and scattering rock	170	890
Rock, hard	6	896
Shale	64	960
Shale, scattering rock	120	1,080
Rock and sand-bearing water	150	1,230
Rock, hard	6	1,236
Shale, blue	24	1,260
Rock	7	1,267
Shale, chocolate	33	1,300
Shale	20	1,320
Shale, blue	20	1,340
Gumbo, blue	15	1,355
Rock	25	1,380
Shale, chocolate	32	1,412
Rock, soft	8	1,420
Sand, blue	16	1,436
Rock	28	1,464

Well TS-60-45-506

Owner: Gulf, Colorado and S.F. R.R.
Driller: R. C. Davant

	THICKNESS (FEET)	DEPTH (FEET)
Sand and clay	14	14
Clay, yellow	44	58
Sand, coarse	24	82
Clay, yellow	99	181
Sand, yellow	21	202
Clay, tough red	33	235
Rock, sand	6	241
Gumbo, gray	55	296
Rock, sand	7	303
Gumbo	15	318
Rock, sand	16	334
Gumbo	42	376
Rock	2	378
Gumbo	85	463
Rock	2	465
Gumbo and shale	102	567
Rock, lime	22	589
Sand	9	598
Shale	33	631
Gumbo	51	682
Sand, hard	13	695
Shale and gumbo	41	736
Sand, red	29	765
Gumbo and shale	180	945
Rock	23	968
Shale, tough blue and gumbo	18	986
Gumbo and shale	61	1,047
Rock and sand	9	1,056
Shale, tough	5	1,061
Rock	3	1,064
Gumbo	23	1,087
Sand, coarse	24	1,111
Sand and rock	7	1,118
Shale and gravel	21	1,139
Sand	7	1,146
Shale, tough and soft rock	46	1,192
Sand, coarse	22	1,214
Rock, sand	29	1,243
Sand, coarse	33	1,276
Shale, tough	6	1,282

Well TS-60-45-605

Owner: Jefferson Chemical Co., Well 6
Driller: Layne-Texas Co.

	THICKNESS (FEET)	DEPTH (FEET)
Clay, red	18	18
Clay, white	72	90
Sand	16	106
Clay, red	22	128
Sand	35	163
Shale	5	168

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-45-606		
Owner: Jefferson Chemical Co., Well 4 Driller: Layne-Texas Co.		
Clay	85	85
Sand, yellow and gravel	25	110
Shale	5	115
Sand, white	52	167
Sand, fine	30	197
Shale	9	206
Shale and sandy shale	15	221
Shale	81	302
Shale, sandy	21	323
Shale	37	360
Sand, fine and hard streaks	18	378
Shale	118	496
Sand, fine	10	506
Shale, sandy and streaks of shale	24	530
Shale	48	578
Sand, fine	37	615
Shale	42	657
Sand, fine	24	681
Rock	2	683
Sand and lignite	10	693
Shale	38	731
Shale and sandy shale	24	755
Sand	5	760
Shale, sandy	14	774
Sand, fine and shale streaks	9	783
Sand and layers of rock	14	797
Shale and sandy shale	12	809
Shale and sticky shale	76	885
Rock and hard sand streaks	7	892
Sand	12	904
Rock	2	906
Shale	34	940
Shale, sandy	7	947
Sand	26	973
Shale	13	986
Sand, fine and layers of sandy shale	44	1,030
Shale, sandy	12	1,042
Sand	42	1,084
Shale and sandy shale	18	1,102
Shale, sandy	10	1,112
Sand, fine	8	1,120
Shale and sandy shale	46	1,166
Sand, broken	12	1,178
Shale, sandy and sand streaks	36	1,214
Shale, sandy	21	1,235
Shale	26	1,261
Shale, sandy and sand streaks	40	1,301
Sand	24	1,325
Shale, sandy	12	1,337
Shale	16	1,353
Well TS-60-45-607		
Owner: Jefferson Chemical Co., Well 5 Driller: Layne-Texas Co.		
Soil	3	3
Clay	62	65
Clay, sandy and streaks of sand	13	78
Sand	27	105
Clay	20	125
Sand and streaks of clay	42	167
Clay, sandy	5	172
Well TS-60-45-608		
Owner: Columbia Carbon Co., Well 9 Driller: Layne-Texas Co.		
Fill	2	2
Clay, soft	12	14
Clay, white	18	32
Clay and breaks of sandy clay	30	62
Sand, coarse and gravel	43	105
Clay and streaks of coarse sand	29	134
Clay, hard	17	151
Clay and streaks of sand	90	241
Clay and few boulders	103	344
Clay and boulders	77	421
Shale, streaks of sand, and boulders	121	542

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-45-608—Continued		
Rock, sand	2	544
Shale	14	558
Shale and sandy shale	18	576
Shale, sandy shale, and sand breaks	38	614
Shale, hard	165	779
Sand	3	782
Sand and shale	8	790
Shale and sandy shale	76	866
Shale and rock layers	5	871
Rock	3	874
Sand, fine	24	898
Shale and sandy shale	24	922
Sand and shale streaks	15	937
Shale	31	968
Sand	7	975
Boulders	4	979
Shale, sand and breaks of fine sand	11	990
Shale, hard	21	1,011
Sand, fine green	61	1,072
Sand, fine and breaks of shale	19	1,091
Shale and breaks of sandy shale	19	1,110
Shale and sand breaks	5	1,115

Well TS-60-45-703

Owner: Camp Martha F. Madeley (Girl Scouts of America)
Driller: Lowry Water Wells, Inc.

	THICKNESS (FEET)	DEPTH (FEET)
Clay, gray	10	10
Sand	45	55
Shale	19	74
Sand with broken shale	100	174
Shale, white, soft	90	264
Clay, tough, white	82	346
Sand and sandrock	14	360
Clay, tough, white	139	499
Sand with white clay	16	515
Gumbo, sandy and tough	42	557
Sand, tough, broken	32	589
Shale, sandy	18	607
Sand, good	23	630
Shale, sandy	5	635
Sand, broken and shaley	8	643

Well TS-60-45-805

Owner: Walter M. Mischer
Driller: Layne-Texas Co.

	THICKNESS (FEET)	DEPTH (FEET)
Clay, sandy	3	3
Sand and gravel	20	23
Clay	21	44
Sand	21	65
Clay	23	88
Clay, sandy	6	94
Sand	50	144
Clay	5	149
Sand	4	153
Clay	11	164
Sand and clay layers	31	195
Clay	16	211
Sand	4	215
Clay	29	244
Hard streaks	2	246
Sand	4	250
Clay	71	321
Clay and hard layers	5	326
Sand	14	340
Clay and sand	4	344
Clay, sand and hard layers	18	362
Clay	36	398
Sand and clay layers	10	408
Clay and sand streaks	9	417
Clay, sticky	8	425
Clay, sand streaks and hard layers	70	495
Clay, sandy	35	530
Clay	10	540
Clay, sandy	50	590
Sand and hard streaks	26	616
Shale	2	618
Sand and shale layers	66	684

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-45-805—Continued		
Shale, sandy and sand	25	709
Shale and sandy shale	28	737
Sand and shale layers	11	748
Shale and sandy shale	42	790
Shale, sand and hard streaks	10	800
Well TS-60-46-102		
Owner: Thelbert Sheffield Driller: Keens Water Wells		
Clay	17	17
Sand	13	30
Clay	13	43
Sand	58	101
Clay	16	117
Sand	18	135
Clay	5	140
Sand and gravel	29	169
Clay	6	175
Sand	5	180
Clay	2	182
Well TS-60-46-204		
Owner: Rigley Owens (KNRO Radio) Driller: Con-Tex Water Well Co.		
Clay and sand	8	8
Clay and iron ore	10	18
Sand and clay, red	7	25
Sand	35	60
Well TS-60-46-303		
Owner: William G. Vaughn Driller: Con-Tex Water Well Co.		
Clay and iron ore	44	44
Sand with clay, red	4	48
Sand	35	83
Clay	2	85
Sand	36	121
Well TS-60-46-707		
Owner: Charles B. Wrightsman Driller: Con-Tex Water Well Co.		
Clay and sand, red	34	34
Clay with sand streaks	5	39
Sand, white	20	59
Sand and white gravel	43	102
Sand and red gravel	33	135
Sand, hard	12	147
Sand, gray and black	11	158
Shale, blue	30	188
Sand streaks and shale	6	194
Sand streaks, hard and shale	18	212
Sand	6	218
Shale, sandy blue	9	227
Well TS-60-46-708		
Owner: Pladger Phenix Driller: Con-Tex Water Well Co.		
Clay	17	17
Sand	13	30
Sand and gravel	13	43
Clay and sand	6	49
Sand	16	65
Shale, blue	15	80
Shale and hard sand streaks	7	87
Sand, hard	2	89
Sand	27	116
Shale	18	134
Sand	30	164
Sand, shale and lime	32	196
Well TS-60-46-801		
Owner: Humble Oil Co. Driller: Luther Patterson		
Clay	24	24
Shale, sandy	21	45
Shale	66	111
Sand and rock	74	185
Shale	250	435

Table 8.—Drillers' Logs of Wells in Montgomery and Adjacent Counties—Continued

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-46-801—Continued		
Shale, sandy	41	476
Shale	43	519
Shale, sandy	69	588
Shale	14	602
Rock	30	632
Shale	8	640
Sand	30	670
Well TS-60-47-606		
Owner: Foster Lumber Co., Well 1 Driller: W. J. Giles		
Sand and gravel	60	60
Clay, red	40	100
Gravel and gumbo	50	150
Sand, packed	25	175
Rock, gray	20	195
Gumbo	25	220
Sand, packed	27	247
Gumbo	135	382
Sand	10	392
Gumbo	27	419
Gravel	21	440
Gravel and gumbo	18	458
Gumbo	76	534
Gravel	30	564
Gumbo	22	586
Rock	2	588
Boulders	8	596
Gumbo	10	606
Shale and gumbo	160	766
Water-bearing sand and gravel	40	806
Well TS-60-47-609		
Owner: Foster Lumber Co., Well 5 Driller: Layne-Texas Co.		
No record	4	4
Soil and clay	20	24
Sand, broken	71	95
Shale, sandy	28	123
Sand, broken	45	168
Rock	2	170
Shale	34	204
Sand, broken	51	255
Shale	98	353
Sand	7	360
Shale	7	367
Sand	30	397
Shale	5	402
Sand	28	430
Shale	106	536
Rock	2	538
Shale	113	651
Sand	19	670
Shale	22	692
Sand	28	720
Shale	18	738
Sand	52	790
Shale	14	804
Sand	62	866
Sand, broken	41	907
Shale	4	911
Sand	26	937
Shale	177	1,114
Sand	23	1,137
Shale	7	1,144
Sand	60	1,204
Shale	5	1,209
Sand	5	1,214
Shale	5	1,219
Well TS-60-50-302		
Owner: City of Magnolia Driller: McMasters-Pomeroy		
Clay, yellow	75	75
Sand	20	95
Clay	26	121
Sand	25	146
Pack sand	42	188

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-50-302—Continued		
Hard rock	16	204
Sand and boulders	74	278
Gumbo	125	403
Rock	2	405
Gumbo and boulders	110	515
Sand, hard pack	89	604
Sand, fine-grained	36	640
Shale, brown	67	707
Rock, hard lime	1	708
Shale, brown	10	718
Sand	23	741
Pack sand	32	773
Gumbo	10	783
Hard sand	25	808
Shale, brown	20	828
Sand	7	835
Shale and gumbo	148	983
Sand and shale	45	1,028
Gumbo	38	1,066
Sand and gravel	19	1,085
Gumbo	97	1,182
Shale and boulders	10	1,192
Gumbo, tough	108	1,300
Sand and gumbo	7	1,307
Rock	2	1,309
Sand	12	1,321
Lime rock	4	1,325
Sand	22	1,347
Gumbo	4	1,351
Rock	4	1,355
Sand	28	1,383
Gumbo, sand and lime	6	1,389
Pack sand	41	1,430
Shale, blue	16	1,446
Gumbo, tough	6	1,452

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-51-103		
Owner: T. A. Satterwhite Driller: Leo R. Doyle		
Clay, red	45	45
Sand	10	55
Clay, brown	5	60
Sand	7	67
Clay, white, brown	23	90
Sand	20	110
Clay, white	10	120
Sand	20	140
Clay	5	145
Sand	25	170
Well TS-60-51-204		
Owner: Frank McWhorter Driller: C. A. Rudel		
Clay, red	50	50
Sand, fine	10	60
Sand, mixed and clay	20	80
Clay, red	30	110
Clay, bluish	40	150
Sand	20	170
Well TS-60-51-301		
Owner: Superior Oil Co., Well 3 Driller: Layne-Texas Co.		
Soil	3	3
Clay and gravel	9	12
Sand	5	17
Clay, yellow	61	78
Sand and clay layers	78	156
Clay	6	162
Sand and fine gravel	45	207
Clay	3	210
Well TS-60-51-302		
Owner: Superior Oil Co., Well 2 Driller: Layne-Texas Co.		
Sandy soil	3	3
Sand, red and clay and gravel	18	21

Table 8.—Drillers' Logs of Wells in Montgomery and Adjacent Counties—Continued

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-51-302—Continued		
Sand, yellow and fine gravel	17	38
Clay, red and yellow	61	99
Sand	32	131
Clay, soft yellow	15	146
Sand	61	207
Clay, yellow	3	210

Well TS-60-51-506

Owner: Lester Goodson
Driller: Lowry Water Wells, Inc.

	THICKNESS (FEET)	DEPTH (FEET)
Clay, red, iron ore	30	30
Sand, red	52	82
Clay, white	44	126
Sand, good	37	163
Shale, broken	10	173
Sand, broken	10	183
Sand, good	28	211

Well TS-60-51-902

Owner: Dr. M. D. Meredith
Driller: C. A. Rudel

	THICKNESS (FEET)	DEPTH (FEET)
Clay, red	60	60
Sand, fine	10	70
Sand and clay mixed	20	90
Clay, yellow	30	120
Clay, bluish, soft	30	150
Clay streaks and rock	10	160
Water sand	20	180

Well TS-60-52-101

Owner: Superior Oil Co., Well 1
Driller: Layne-Texas Co.

	THICKNESS (FEET)	DEPTH (FEET)
Soil	14	14
Clay	51	65
Clay, sandy	20	85
Sand, fine-grained and clay	49	134
Clay, sandy	19	153
Sand	9	162
Clay, sandy	20	182
Sand, coarse-grained	40	222
Clay	60	282
Sand	44	326
Clay	33	359
Sand, coarse-grained	7	366
Clay and sandy clay	42	408
Sand	6	414
Clay	18	432
Sand	4	436
Sand and clay	28	464
Rock	1	465
Clay	14	479
Sand	6	485
Shale	16	501
Sand, fine-grained, and hard layers	26	527
Shale	66	593
Sand	32	625
Sand with thin clay layers	8	633
Clay	26	659
Sand	17	676
Clay	18	694
Sand	72	766
Clay	10	776

Well TS-60-52-104

Owner: Superior Oil Co.
Driller: Layne-Texas Co.

	THICKNESS (FEET)	DEPTH (FEET)
Soil	4	4
Clay	75	79
Sand	53	132
Clay	3	135
Sand	124	259
Clay	51	310
Sand	9	319
Sand, broken and clay	49	368
Clay	3	371
Shale	78	449
Sand, fine-grained	18	467
Shale and layers of sand	40	507
Shale	23	530

Table 8.—Drillers' Logs of Wells in Montgomery and Adjacent Counties—Continued

Well TS-60-52-104—Continued

	THICKNESS (FEET)	DEPTH (FEET)
Sand	10	540
Gumbo	5	545
Clay	49	594
Sand	56	650
Rock	1	651
Clay	40	691
Sand, broken	7	698
Sand	54	752
Clay, sandy	8	760
Sand	24	784
Clay	5	789

Well TS-60-52-706

Owner: J. M. Williams
Driller: Norman R. Corgey

	THICKNESS (FEET)	DEPTH (FEET)
Soil	9	9
Clay	9	18
Sand	22	40
Clay	5	45
Sand	30	75
Clay	15	90
Gravel	10	100
Clay	4	104
Sand	6	110
Clay	8	118
Sand	23	141

Well TS-60-52-806

Owner: Frank Martin
Driller: Leo Doyle

	THICKNESS (FEET)	DEPTH (FEET)
Clay	17	17
Sand	33	50
Clay	25	75
Sand	20	95
Clay	15	110
Sand	24	134

Well TS-60-53-102

Owner: John F. Adams
Driller: Con-Tex Water Well Co.

	THICKNESS (FEET)	DEPTH (FEET)
Clay with red sand	24	24
Sand with gravel	16	40
Clay with red gravel	23	63
Sand and gravel	15	78

Well TS-60-53-103

Owner: W. G. Jones State Forest
Driller: Frye Drilling Co.

	THICKNESS (FEET)	DEPTH (FEET)
Soil	12	12
Sand, red and clay	10	22
Sand and gravel	20	42
Clay, sandy	30	72
Shale and gravel	10	82
Gumbo, yellow	30	112
Sand	20	132
Sand and thin shale	10	142
Shale	40	182
Shale and sand	10	192
Shale with thin shale layers	20	212

Well TS-60-53-104

Owner: W. G. Jones State Forest
Driller: Layne-Texas Co.

	THICKNESS (FEET)	DEPTH (FEET)
Clay	30	30
Sand and gravel	50	80
Clay	41	121
Sand	88	209

Well TS-60-53-202

Owner: Ted Brannon
Driller: Con-Tex Water Well Co.

	THICKNESS (FEET)	DEPTH (FEET)
Sand, white	23	23
Clay, red	8	31
Sand, red and white	21	52
Clay with gravel	35	87
Sand	12	99

Table 8.—Drillers' Logs of Wells in Montgomery and Adjacent Counties—Continued

Well TS-60-53-302

Owner: C. Layton
Driller: Con-Tex Water Well Co.

	THICKNESS (FEET)	DEPTH (FEET)
Sand	5	5
Clay	15	20
Sand	20	40
Clay	20	60
Sand	12	72
Clay	9	81
Sand	11	92
Clay	13	105
Sand, coarse, white	43	148
Clay	12	160
Sand, fine white	35	195

Well TS-60-53-805

Owner: Lake Chateau Woods
Driller: Con-Tex Water Well Co.

	THICKNESS (FEET)	DEPTH (FEET)
Sand and clay, red	25	25
Sand and gravel, red	46	71
Clay	8	79
Sand	14	93
Clay with lime	76	169
Sand	28	197
Clay with lime	11	208
Sand and gravel	28	236

Well TS-60-54-101

Owner: Humble Club
Driller: Con-Tex Water Well Co.

	THICKNESS (FEET)	DEPTH (FEET)
Sand and clay	14	14
Sand and gravel, red	19	33
Clay	15	48
Sand, red	10	58
Clay, white	17	75
Sand	27	102
Clay, blue	28	130
Sand	16	146
Shale, sandy	29	175
Sand	20	195

Well TS-60-54-402

Owner: G. A. Nelson
Driller: Con-Tex Water Well Co.

	THICKNESS (FEET)	DEPTH (FEET)
Clay and gravel	28	28
Sand, white and gravel	23	51
Clay	29	80
Sand and clay streaks	15	95
Clay, blue and gravel	22	117
Sand	13	130

Well TS-60-54-604

Owner: John F. Freeman
Driller: Con-Tex Water Well Co.

	THICKNESS (FEET)	DEPTH (FEET)
Clay	18	18
Sand and gravel	11	29
Clay and sand	11	40
Sand	10	50
Clay and sand	6	56
Sand and gravel	22	78
Shale	4	82
Sand	38	120

Well TS-60-55-202

Owner: L. E. Jernigen
Driller: Noak Drilling Co.

	THICKNESS (FEET)	DEPTH (FEET)
Clay, red and iron ore	22	22
Clay, white	8	30
Sand and fine gravel	34	64
Clay, red and white	8	72
Sand	48	120
Sand and clay streaks	10	130
Clay, red and white	35	165
Sand	11	176
Clay	3	179
Sand	9	188
Sand and lime with rock streaks	6	194
Clay	39	233
Sand	25	258

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-55-504		
Owner: Philip Dearing Driller: C & C Contractors		
Soil, sandy	2	2
Iron ore, sandy	8	10
Shale, off white	8	18
Sand, reddish and shale	8	26
Clay, gray	14	40
Shale, red and blue	8	48
Water sand and gravel	32	80
Well TS-60-55-801		
Owner: John Calhoun Driller: Con-Tex Water Well Co.		
Clay	12	12
Sand, red	38	50
Clay	12	62
Sand, red	38	100
Clay	16	116
Sand, white, coarse	53	169
Well TS-60-55-901		
Owner: D. V. Robinson Driller: Noak Drilling Co.		
Soil	7	7
Clay, red	3	10
Water sand	4	14
Clay, blue	6	20
Sand and gravel	17	37
Clay, blue with streaks	5	42
Sand, fine-grained	16	58
Sand, coarse and fine gravel	12	70
Clay, blue with streaks	2	72
Sand, fine	10	82
Well TS-60-55-904		
Owner: San Jacinto Girl Scouts Driller: Lowry Water Wells, Inc.		
Clay, red	37	37
Sand	94	131
Clay, white and shale	37	168
Sand	24	192
Shale, loose and broken	116	308
Sand, top loose and broken	28	336
Sand, good	17	353
Well TS-60-55-905		
Owner: San Jacinto Girl Scouts Driller: Lowry Water Wells, Inc.		
Clay, red	35	35
Sand	66	101
Well TS-60-58-205		
Owner: A. D. McMillian Driller: Tomball Drilling Co.		
Soil	5	5
Shale	3	8
Sand and broken rock	12	20
Shale, sandy	6	26
Sand	29	55
Shale	3	58
Sand, gravel and iron ore	28	86
Shale, blue	64	150
Sand	10	160
Well TS-60-61-206, partial log		
Owner: C. L. Fitch Driller: Brains		
Clay	20	20
Sand, white	79	99
Clay	3	102
Sand, white	36	138
Clay	11	149
Sand	4	153
Gumbo	37	190
Sand, hard	26	216
Shale and boulders	40	256
Rock and gumbo	10	266
Rock and sand	13	279
Shale and boulders	21	300
Shale, red and brown	68	368
Gumbo, red	11	379

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-61-206, partial log—Continued		
Sand, hard	15	394
Gumbo, pink	102	496
Rock	2	498
Shale, brown	32	530
Gumbo, pink	10	540
Shale, brown	12	552
Gumbo, pink	10	562
Rock	2	564
Gumbo	5	569
Rock	1	570
Gumbo, pink	10	580
Sand and boulders	8	588
Gumbo, pink and boulders	47	635
Shale, blue	15	650
Gumbo, pink	13	663
Shale, sandy	14	677
Gumbo, pink	51	728
Sand, blue	22	750
Sand, blue water	15	765
Shale, blue	23	788
Shale, white sandy	4	792
Rock, hard	17	809
Shale, blue	17	826
Water sand	92	918
Gumbo	32	950
Shale, sandy and boulders	45	995
Gumbo	15	1,010
Lime, sandy	25	1,035
Shale and gumbo	49	1,084
Shale, sandy and boulders	16	1,100
Gumbo and lime	95	1,195
Shale, blue and boulders	15	1,210
Gumbo	8	1,218
Water sand	7	1,225
Gumbo, pink, blue and brown	90	1,315
Sand, blue gumbo	3	1,318
Shale, pink and blue	10	1,328
Sand and boulders	43	1,371
Shale, blue	16	1,387
Pack sand and boulders	15	1,402
Shale, blue	32	1,434
Sand, hard white	6	1,440
Sand, blue and white	15	1,455
Gumbo	75	1,530
Total depth		2,285

Well TS-60-62-301

Owner: Floyd Oil Co.
Driller: —

	THICKNESS (FEET)	DEPTH (FEET)
Shale, yellow	45	45
Water sand with streaks of shale	291	336
Sand and shale	84	420
Shale	45	465
Sand and shale	731	1,196
Shale and shells	130	1,326
Sand with streaks of shale	61	1,387
Shale	217	1,604
Sand	25	1,629
Shale	53	1,682
Shale, sticky	78	1,760
Shale, sandy	280	2,040
Shale	920	2,960
Shale, sandy	35	2,995
Shale	45	3,040
Sand	40	3,080
Shale	126	3,206
Sand, hard	8	3,214
Sand, hard, lime and shell	58	3,272
Shale	118	3,390
Shale and shells	322	3,712
Shale with streaks of sand	90	3,802
Sand	70	3,872
Shale and shells	359	4,231
Shale and lime	225	4,456
Shale and shells	310	4,766
Shale with sand streaks	16	4,782

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-62-301—Continued		
Shale	188	4,970
Sand, hard	4	4,974
Shale, sandy	41	5,015
Shale and lime shells	130	5,145
Shale and shells	140	5,285
Shale, sandy	40	5,325
Shale with streaks of sand	84	5,409
Shale and shells	252	5,661
Shale with breaks of lime and shell	706	6,367
Shale	250	6,617

Well TS-60-62-601

Owner: Baker Brothers
Driller: H. R. Adams

	THICKNESS (FEET)	DEPTH (FEET)
Sand	150	150
Clay, red	15	165
Sand and boulders	25	190
Clay	15	205
Sand	45	250
Clay and gravel	30	280
Sand	45	325
Gumbo, blue	15	340
Sand	55	395
Clay, sandy	20	415
Clay	35	450
Sand	90	540
Clay	25	565
Sand	65	630
Clay	20	650
Sand	80	730
Gumbo	10	740
Clay, sandy	26	766
Gumbo	20	786
Artesian water sand	94	880
Gumbo, tough	6	886
Gumbo	24	910
Shale, sandy	22	932
Sand	3	935
Shale, sandy	5	940
Sand	8	948
Shale	4	952
Sand	6	958
Gumbo	9	967
Sand	13	980
Gumbo	12	992

Well TS-60-63-101

Owner: H. L. McConnell
Driller: C & C Contractors

	THICKNESS (FEET)	DEPTH (FEET)
Soil	3	3
Clay, yellowish-brown	37	40
Sand, fine	10	50
Clay, bluish	6	56
Water sand	18	74

Well TS-60-63-105

Owner: New Laney Independent School Dist.
Driller: Noack

	THICKNESS (FEET)	DEPTH (FEET)
Clay	60	60
Sand	37	97
Clay	44	141
Sand	4	145
Rock and sand	7	152
Clay	29	181
Sand	14	195
Clay	7	202
Sand	41	243
Clay	41	284
Sand	11	295
Clay	11	306
Sand	3	309
Clay	5	314
Sand	38	352
Rock and clay	14	366
Sand	27	393

Well TS-60-63-403

Owner: V. H. Edwards
Driller: C & C Contractors

	THICKNESS (FEET)	DEPTH (FEET)
Soil	3	3
Sand	35	38

	THICKNESS (FEET)	DEPTH (FEET)
Well TS-60-63-403—Continued		
Clay, streaks of red and blue	9	47
Shale, hard blue	14	61
Water sand, gray with black specks	20	81

Grimes County

Well KW-60-42-802

Owner: —
Driller: Seismograph Crew

	THICKNESS (FEET)	DEPTH (FEET)
Sand, fine-grained	18	18
Clay, sandy	39	57
Sand, fine-grained	13	70
Clay, calcareous	265	335
Silt, fine-grained sand, some lime	32	367
Clay, calcareous	40	407
Sand, some lime	21	428
Clay, calcareous	10	438
Sand, some lime and clay breaks	34	472
Clay, calcareous	21	493
Sand, silty and some lime	12	505
Clay, calcareous	100	605
Sand, silty and some lime	20	625

Liberty County

Well SB-60-48-101

Owner: City of Cleveland, Well 3
Driller: Layne-Texas Co.

	THICKNESS (FEET)	DEPTH (FEET)
Sand	10	10
Clay	90	100
Sand and gravel	14	114
Shale, sandy	160	274
Sand	61	335
Shale	44	379
Clay	10	389
Sand	7	396
Shale	32	428
Shale, sandy	69	497
Shale	51	548
Shale and sand	69	617
Sand, hard	19	636
Shale	76	712
Sand and shale streaks	36	748
Sand	23	771
Shale	16	787
Sand and shale streaks	5	792
Sand	43	835
Shale	17	852
Shale, sandy	15	867
Sand	12	879
Shale	4	883
Shale, sandy	8	891
Shale	8	899
Sand and shale streaks	15	914
Sand	15	929
Shale, blue and gray	56	985
Shale, sandy	21	1,006
Shale	26	1,032
Shale, sandy	75	1,107
Sand	43	1,150
Shale	13	1,163
Sand	26	1,189
Shale, sandy	5	1,194
Sand	26	1,220
Sand and shale streaks	25	1,245
Shale	10	1,255
Shale, sandy	8	1,263
Sand	39	1,302
Sand and thin shale breaks	33	1,335
Shale	2	1,337

Well SB-60-48-102

Owner: City of Cleveland, Well 1
Driller: Layne-Texas Co.

	THICKNESS (FEET)	DEPTH (FEET)
Soil	8	8
Clay	44	52
Sand	24	76
Clay	14	90
Sand	12	102
Clay	24	126

	THICKNESS (FEET)	DEPTH (FEET)
Well SB-60-48-102—Continued		
Clay, soft, sandy	18	144
Sand	9	153
Clay	54	207
Sand	12	219
Clay	16	235
Clay breaks, sand and gravel	16	251
Clay	30	281
Sand	9	290
Sand and gravel	53	343
Clay	87	430
Sand	24	454
Clay	70	524
Hard layers	1	525
Clay, sandy, and breaks of sand	9	534
Clay	84	618
Sand	18	636
Clay, sandy	4	640
Clay	8	648
Shale, hard, sticky	19	667
Clay	87	754
Sand	20	774
Clay	20	794
Sand breaks and shale	21	815
Sand	17	832
Shale	13	845
Well SB-60-48-103		
Owner: City of Cleveland, Well 2 Driller: Layne-Texas Co.		
Soil	6	6
Clay, soft, yellow	14	20
Sand	6	26
Clay	24	50
Sand	29	79
Clay	2	81
Sand	29	110
Clay	5	115
Sand	30	145
Clay	61	206
Sand, coarse and gravel	11	217
Clay	17	234
Gravel	51	285
Clay, soft, yellow, and sand	4	289
Sand and gravel	25	314
Clay with sand breaks	21	335
Clay	98	433
Hard layers	1	434
Clay	61	495
Hard layers	2	497
Clay	29	526
Hard layers	1	527
Clay	83	610
Sand	26	636
Clay	10	646
Gumbo	105	751
Sand	19	770
Shale, sticky	21	791
Shale, hard, sandy	22	813
Sand breaks and shale	17	830
Shale, sticky	80	910
Sand	16	926
Shale, sticky	3	929

Table 9.—Water Levels in Wells in Montgomery and Adjacent Counties
(Depth to water in feet below land surface)

Montgomery County

Well TS-60-35-201

Owner: Flower Follett

DATE		WATER LEVEL
Nov.	28, 1952	56.03
Dec.	22	55.87
Feb.	2, 1953	55.99
June	22	55.98
Oct.	2	56.18
Dec.	9	56.34
Feb.	16, 1954	56.27
June	14	56.19
Sept.	28	56.54
Dec.	14	56.59
Feb.	4, 1955	56.83
June	16	57.03
Sept.	20	57.26
Dec.	21	57.94
Feb.	12, 1956	57.37
June	13	57.54
Sept.	21	59.91
Dec.	11	Dry
Feb.	19, 1957	Dry
June	13	Dry
Dec.	12	Dry

Well TS-60-35-202

Owner: Flower Follett

DATE		WATER LEVEL
Nov.	28, 1952	58.32
Dec.	22	48.17
Feb.	2, 1953	49.30
June	22	49.35
Oct.	2	49.53
Dec.	9	49.48
Feb.	16, 1954	49.45
June	14	49.37
Sept.	28	49.83
Dec.	12	49.92
Feb.	4, 1955	49.47
June	16, 1955	50.18
Sept.	20	50.41
Dec.	21	50.60
Feb.	14, 1956	50.63
June	13	50.83
Sept.	21	51.04
Dec.	11	51.27
Feb.	19, 1957	51.36
June	13	51.42
Sept.	13	51.62
Dec.	12	51.70
Feb.	20, 1958	51.51
June	10	51.12
Sept.	17	51.37
Dec.	16	51.48
Feb.	12, 1959	51.33
June	16	51.37
Sept.	23	51.50
Dec.	17	51.38
Mar.	1, 1960	51.34
June	10	51.05
Sept.	19	50.99
Feb.	23, 1961	50.28
June	15	49.95
Dec.	13	50.07
Feb.	20, 1962	49.92
June	19	49.87
Sept.	25	50.10
Dec.	14	50.36
Mar.	1, 1963	50.12
Feb.	17, 1964	50.55
June	17	50.27
Sept.	18	50.72
Dec.	2	50.60
Feb.	2, 1965	50.48
June	1	50.49
Sept.	16	50.68
Dec.	3	50.93
Feb.	9, 1966	50.86
June	22	50.67
Dec.	2	50.85
Feb.	15, 1967	51.13

Well TS-60-37-401

Owner: City of Willis, Well 1

DATE		WATER LEVEL
June	10, 1942	180.70
Dec.	9, 1955	185.11
Feb.	14, 1956	185.00
Sept.	21	197.26
Dec.	11	187.07
Feb.	19, 1957	186.71
June	13	186.33
Sept.	13	187.18
Dec.	12	186.71
Feb.	20, 1958	186.26
June	10	186.25
Sept.	17	187.33
Dec.	16	187.08
Feb.	12, 1959	186.53
June	16	186.70
Sept.	23	187.05
Mar.	1, 1960	186.27
Sept.	19	186.21
Feb.	23, 1961	185.19
Dec.	13	185.54
Feb.	20, 1962	185.88
Sept.	25	186.23
Dec.	14, 1962	186.48
Nov.	1, 1963	186.06
Feb.	17, 1964	186.61
Feb.	10, 1965	188.04
Feb.	9, 1966	190.59
Feb.	15, 1967	190.69

Well TS-60-38-801

Owner: Finch-Jacobsen

DATE		WATER LEVEL
Dec.	9, 1965	21.96
Sept.	13, 1966	21.49

Table 9.—Water Levels in Wells in Montgomery and Adjacent Counties—Continued
(Depth to water in feet below land surface)

Well TS-60-38-801—Continued

DATE		WATER LEVEL
Sept.	16, 1966	21.31
Sept.	18	21.54
Oct.	10	21.70
Oct.	24	21.68
Oct.	25	21.74
Nov.	6	21.75
Nov.	21	21.88
Nov.	23	21.90
Dec.	2	21.87
Dec.	13	21.87
Dec.	28	21.73
Jan.	12, 1967	21.71
Feb.	13	21.69
Feb.	15	21.50
Feb.	28	21.56
Mar.	26	21.31
Apr.	18	21.48

Well TS-60-38-805

Owner: Finch-Jacobsen

DATE		WATER LEVEL
Dec.	9, 1965	12.04
Sept.	9, 1966	13.71
Sept.	16	13.00
Sept.	18	13.11
Oct.	24	13.92
Nov.	6	13.41
Nov.	21	13.45
Nov.	23	13.51
Dec.	2	13.88
Dec.	13	13.30
Dec.	28	13.17
Jan.	12, 1967	13.16
Feb.	13	14.06
Feb.	15	13.18
Feb.	28	13.20
Apr.	18	12.96

Well TS-60-45-104

Owner: R. E. Hix and J. W. Bolinghouse

DATE		WATER LEVEL
Oct.	3, 1940	44.40
Dec.	5	44.20
Jan.	27, 1941	43.57
Feb.	26	43.35
Apr.	8	42.53
June	3	42.16
July	3	41.82
Aug.	15	41.93
Sept.	19	42.02
Nov.	4	40.67
Dec.	16	40.45
Jan.	22, 1942	40.43
May	7	39.10
July	29	39.05
Sept.	18	38.72
Jan.	20, 1943	38.81
Mar.	28	39.53
July	21	39.53
Aug.	26	39.66
Jan.	28, 1944	40.52
May	29	40.07
July	21	40.48
Sept.	18	40.63
Dec.	13	40.94
Jan.	24, 1945	40.33
Mar.	26	39.56
June	15	39.16
Jan.	11, 1946	39.76
May	27	39.07
July	10	39.02
Sept.	20	39.78
Dec.	6	39.30
Jan.	31, 1947	37.79
Mar.	17	38.09
June	4	37.94
Sept.	18, 1947	39.11
Dec.	18	39.92
Feb.	18, 1948	39.94
June	16	40.88
Sept.	28	41.27
Dec.	16	41.80
Feb.	14, 1949	41.92
June	15	41.61
Sept.	28	42.02
Dec.	19	41.61
Feb.	14, 1950	40.86
June	20	39.78
Sept.	26	40.64
Dec.	7	41.38
Mar.	5, 1951	41.51
June	19	42.32
Sept.	20	42.98
Dec.	11	43.34
Feb.	11, 1952	43.32
June	23	43.97
Sept.	9	44.14
Oct.	22	44.33
Feb.	2, 1953	44.53
June	22	44.69
Oct.	2	44.92
Dec.	9	44.93
Feb.	16, 1954	44.98
June	14	45.30
Sept.	28	45.49
Dec.	14	45.54
Feb.	7, 1955	45.34
June	16	45.74
Sept.	20	Well destroyed

Well TS-60-45-106

Owner: R. E. Hix

DATE		WATER LEVEL
Nov.	13, 1931	16.00
Nov.	25	15.98

Table 9.—Water Levels in Wells in Montgomery and Adjacent Counties—Continued
(Depth to water in feet below land surface)

DATE		WATER LEVEL
Well TS-60-45-106—Continued		
Dec.	2, 1931	15.46
Dec.	9	12.90
Dec.	15	11.38
Dec.	22	9.79
Dec.	29	10.70
Jan.	5, 1932	5.42
Jan.	12	2.18
Jan.	19	6.41
Jan.	28	4.78
Feb.	2	7.50
Feb.	9	8.78
Feb.	15	9.27
Feb.	22	2.26
Mar.	7	5.59
Mar.	14	7.19
Mar.	21	8.66
Mar.	28	9.90
Apr.	4	9.84
Apr.	11	11.06
Apr.	18	11.10
Apr.	25	11.25
May	2	11.62
May	9	11.95
May	16	11.75
July	25	14.60
Aug.	31	15.50
Sept.	27	12.78
Oct.	21	16.43
Feb.	7, 1938	31.71
May	13	30.80
Oct.	26	43.84
Dec.	17	43.39
Jan.	26, 1939	43.96
May	24	43.84
Aug.	3	44.70
Well TS-60-45-107		
Owner: J. M. Liles		
June	10, 1940	10.86
June	11	10.42
June	12	10.20
June	13	9.99
June	15	9.88
June	21	10.22
June	26	10.54
July	1	10.20
July	16	9.05
Aug.	21	11.12
Oct.	4	12.13
Dec.	5	9.29
Jan.	9, 1941	8.64
Jan.	18	8.48
Jan.	24	8.32
Jan.	31	8.54
Feb.	14	8.50
Feb.	22	8.45
Feb.	27	8.19
Mar.	25	7.07
May	13	6.45
May	27	7.70
June	10	6.70
June	20	5.62
July	8	6.85
July	30	7.20
Aug.	15	7.98
Sept.	3	8.77
Sept.	19	9.26
Nov.	4	5.48
Dec.	16	7.24
Jan.	22, 1942	7.78
July	29	6.28
Sept.	18	1.85
Jan.	20, 1943	5.70
Mar.	28	7.23
June	21, 1943	8.39
Aug.	26	4.84
Jan.	28, 1944	.63
June	3	5.92
July	21	8.60
Sept.	18	9.54
Dec.	13	7.61
Jan.	24, 1945	6.05
Mar.	26	6.08
June	15	6.88
Jan.	11, 1946	7.07
May	27	4.89
July	10	6.21
Sept.	20	9.00
Dec.	6	5.43
Jan.	31, 1947	4.71
Mar.	17	6.57
June	4	6.49
Sept.	18	9.91
Dec.	18	8.93
Feb.	18, 1948	7.75
June	16	9.84
Sept.	28	11.36
Dec.	16	12.06
Feb.	14, 1949	10.48
June	15	9.59
Sept.	28	11.19
Dec.	19	7.19
Feb.	14, 1950	6.46
June	20	6.69
Sept.	26	10.33
Dec.	7	11.45
Mar.	5, 1951	11.57
June	19	11.75
Sept.	20	12.59
Dec.	11	13.09
Feb.	11, 1952	12.36
June	23	11.02

Table 9.—Water Levels in Wells in Montgomery and Adjacent Counties—Continued
(Depth to water in feet below land surface)

DATE		WATER LEVEL
Well TS-60-45-107—Continued		
Sept.	12, 1952	12.56
Dec.	22	12.52
Feb.	2, 1953	13.17
June	22	10.53
Oct.	2	12.17
Dec.	9	12.59
Feb.	16, 1954	10.80
June	14	11.99
Oct.	28	13.16
Dec.	14	11.91
Feb.	7, 1955	9.69
June	16	11.33
Sept.	20	12.61
Dec.	21	13.18
Feb.	14, 1956	10.85
June	13	11.86
Sept.	21	13.47
Dec.	11	13.75
Feb.	19, 1957	13.67
June	13	11.30
Sept.	13	13.29
Dec.	12	10.90
June	1958	9.59
Well TS-60-45-108		
Owner: J. M. Liles		
June	8, 1940	11.65
June	10	11.47
June	11	11.08
June	12	10.72
June	13	10.79
June	15	10.75
June	21	10.94
June	26	11.21
July	1	10.94
July	16	10.73
Aug.	21	11.66
Oct.	4, 1940	12.59
Dec.	5	10.16
Jan.	9, 1941	9.44
Jan.	18	9.25
Jan.	24	9.08
Jan.	31	9.28
Feb.	14	9.21
Feb.	22	9.19
Feb.	27	8.95
May	25	7.88
May	13	8.26
May	27	8.34
June	10	7.45
June	20	6.52
July	8	7.66
July	30	7.91
Aug.	15	8.61
Sept.	3	9.31
Sept.	19	9.82
Nov.	4	6.40
Dec.	16	7.93
Jan.	29, 1942	8.16
Sept.	18	8.30
Jan.	20, 1943	7.69
Mar.	28	9.02
June	21	10.04
Aug.	26	10.28
Jan.	28, 1944	8.92
June	3	7.77
July	21	10.22
Sept.	18	11.15
Dec.	13	8.95
Jan.	24, 1945	8.04
May	26	7.93
June	15	8.64
Jan.	11, 1946	9.00
May	27	6.88
July	10	8.03
Sept.	20, 1946	9.14
Dec.	6	5.87
Jan.	31, 1947	5.13
Mar.	17	6.88
June	4	6.82
Sept.	18	9.96
Dec.	18	9.24
Feb.	18, 1948	8.09
June	16	10.01
Sept.	28	11.42
Dec.	16	12.07
Feb.	14, 1949	10.78
June	15	9.84
Sept.	28	11.34
Dec.	19	7.73
Feb.	14, 1950	6.97
June	20	7.04
Sept.	26	10.42
Dec.	7	11.98
Mar.	5, 1951	12.17
June	19	12.33
Sept.	20	13.12
Dec.	11	13.64
Feb.	11, 1952	13.06
June	23	11.67
Sept.	12, 1953	13.14
Dec.	22, 1952	13.31
Feb.	2	12.86
June	22	11.22
Oct.	2	12.79
Dec.	9, 1953	13.22
Feb.	16, 1954	11.58
June	14	12.54
Sept.	28	13.23
Dec.	14	12.76
Feb.	7, 1955	10.76
June	16	12.02
Sept.	20	13.22

Table 9.—Water Levels in Wells in Montgomery and Adjacent Counties—Continued
(Depth to water in feet below land surface)

Well TS-60-45-108—Continued

DATE		WATER LEVEL
Dec.	21, 1955	13.79
Feb.	14, 1956	11.88
June	13	12.56
Sept.	21	14.03
Dec.	11	14.31
Feb.	19, 1957	14.29
Apr.	25	12.08
June	13	12.03
Sept.	13	13.83
Dec.	12	11.79
Feb.	20, 1958	10.38
June	10	10.82
Sept.	17	13.24
Dec.	16	11.99
Feb.	12, 1959	10.91
June	16	10.04

Well TS-60-45-409

Owner: Texas Highway Department

DATE		WATER LEVEL
Nov.	18, 1938	32.36
Dec.	17	32.54
Jan.	26, 1939	32.43
Mar.	4	31.74
May	24	31.61
Aug.	3	32.15
Sept.	25	32.40
Dec.	19	33.00
Feb.	15, 1940	32.80
May	1	33.10
June	28	32.20
Aug.	21	31.90
Oct.	4	32.20
Dec.	5	31.50
Jan.	27, 1941	30.20
Feb.	26	28.70
Apr.	8	27.99
June	3	27.42
July	3	25.80

Well TS-60-45-504

Owner: City of Conroe, Well 2

DATE		WATER LEVEL
June	16, 1956	26.16
Sept.	21	34.68
Dec.	11	21.85
Feb.	19, 1957	21.17
June	13	23.10
Sept.	13	28.20
Dec.	12	21.49
Feb.	20, 1958	22.86
June	10	30.90
Sept.	17	25.48
Dec.	16	25.48
Feb.	12, 1959	24.92
June	16	27.12
Sept.	23	32.01
Dec.	17	25.13
Mar.	1, 1960	26.11
June	10	28.95
Sept.	19	30.77
Feb.	23, 1961	35.70
June	15	29.16
Sept.	19	28.43
Dec.	13	33.84
Feb.	20, 1962	28.83
June	19	21.58
Sept.	25	26.86
Dec.	14	29.22
Mar.	1, 1963	22.88
June	20	21.16
Oct.	4	27.71
Dec.	2	22.90
Feb.	17, 1964	24.16
June	17	24.37
Sept.	18	33.80
Dec.	2	25.53
Feb.	10, 1965	23.46
June	1	24.53
Sept.	16, 1965	35.98
Dec.	3	30.77
Feb.	9, 1966	27.76
June	22	25.77
Dec.	2	24.14
Feb.	15, 1967	25.95

Well TS-60-45-505

Owner: City of Conroe, Well 1

DATE		WATER LEVEL
June	3, 1931	+ .62
Aug.	12	3.73
Nov.	18	.05
June	15, 1939	2.67
Aug.	3	1.78
Sept.	25	7.69
Dec.	19	1.65
Feb.	15, 1940	1.32
May	1	.94
June	28	2.30
Aug.	21	11.83
Dec.	5	.40
Feb.	26, 1941	.09
May	4	+ .65
June	3	+ .99
July	3	+ .50
Sept.	3	1.35
Nov.	4	+ .44
Dec.	16	+ .77
Jan.	22, 1942	+ .25
May	7	+ .79
June	24	+ .90
Jan.	20, 1943	+ 1.07
June	21	.80
Aug.	26	.75
Jan.	28, 1944	+ .66
May	29	+ 1.08
Sept.	18	4.65

Table 9.—Water Levels in Wells in Montgomery and Adjacent Counties—Continued
(Depth to water in feet below land surface)

Well TS-60-45-505—Continued

DATE		WATER LEVEL
Dec.	13, 1944	.26
Jan.	24, 1945	.05
Mar.	26	1.62
June	15	6.50
Jan.	11, 1946	3.95
May	27	1.33
July	10	10.57
Sept.	20	4.30
Dec.	6	6.88
Jan.	31, 1947	5.87
Mar.	17	+ .51
June	4	.64
Sept.	18	2.63
Sept.	28, 1948	11.11
Dec.	16	3.40
Feb.	14, 1949	2.44
June	15	2.30
Sept.	28	1.79
Dec.	19	2.06
Feb.	14, 1950	1.16
June	20	1.23
Sept.	26	3.22
Dec.	7	6.55
Mar.	5, 1951	4.73
June	19	11.53
Sept.	20	10.24
Dec.	11	8.42
Feb.	11, 1952	3.89
June	23	10.79
Sept.	12	11.81
Dec.	22	13.27
Feb.	2, 1953	11.78
June	22	19.74
Oct.	10	19.07
Dec.	9	11.72
Feb.	16, 1954	12.29
June	14	14.86
Sept.	28	21.26
Dec.	14, 1954	16.40
Feb.	4, 1955	23.82
June	16	Well destroyed

Well TS-60-45-507

Owner: City of Conroe

DATE		WATER LEVEL
Dec.	16, 1948	+ 12.00
Oct.	1954	2.00
Dec.	8, 1955	11.42
Jan.	13, 1967	20.21

Well TS-60-45-706

Owner: Elizabeth Moody

DATE		WATER LEVEL
May	1941	Flows
Nov.	9, 1966	4.22
Feb.	28, 1967	4.23

Well TS-60-45-801

Owner: L. Johnson

DATE		WATER LEVEL
June	3, 1931	26.20
Aug.	12	24.30
Nov.	25	25.77
Dec.	15	23.68
Jan.	19, 1932	20.70
Jan.	29	17.93
Mar.	21	18.50
Apr.	25	19.64
May	21	21.88
July	25	24.34
Sept.	27	25.68
Oct.	21	27.12
Nov.	26	27.48
Dec.	30	26.91
Jan.	25, 1933	29.80
Mar.	15	25.84
Aug.	21, 1935	26.45
Feb.	27, 1936	25.84
Feb.	7, 1938	27.22
May	13, 1938	27.45
Oct.	26	29.98
Nov.	18	29.21
Dec.	17	29.50
Jan.	26, 1939	28.36
Mar.	4	26.72
May	24	28.56
Aug.	3	28.96
Sept.	25	29.56
Dec.	19	30.40
Feb.	15, 1940	30.39
May	1	29.90
June	28	29.52
Aug.	25	29.94
Oct.	4	30.25
Dec.	5	Well destroyed

Well TS-60-45-803

Owner: Brown Estate

DATE		WATER LEVEL
Nov.	18, 1931	24.45
Nov.	25	24.83
Dec.	2	24.48
Dec.	9	23.15
Dec.	15	22.42
Dec.	22	20.94
Dec.	29	20.78
Jan.	5, 1932	20.34
Jan.	12	18.54
Jan.	19	18.70
Jan.	28	16.78
Feb.	2	16.82
Feb.	9	17.53
Feb.	15	17.82
Feb.	29	15.98
Mar.	7	15.45
Mar.	14	16.29
Mar.	21	16.37

Table 9.—Water Levels in Wells in Montgomery and Adjacent Counties—Continued
(Depth to water in feet below land surface)

DATE		WATER LEVEL
Well TS-60-45-803—Continued		
Mar.	28, 1932	16.76
Apr.	4	18.27
Apr.	11	18.70
Apr.	18	18.84
Apr.	25	19.31
May	2	20.46
May	9	20.78
May	16	20.86
July	1	22.15
Sept.	27	23.90
Oct.	21	24.65
Nov.	26	24.82
Dec.	30	24.64
Jan.	25, 1933	24.79
Mar.	15	21.00
May	8	22.87
Nov.	24, 1934	25.86
May	29, 1935	16.00
Aug.	21	21.60
Feb.	27, 1936	20.75
Feb.	7, 1938	22.31
May	13	22.64
Oct.	26	24.25
Nov.	18	24.48
Dec.	17	24.80
Jan.	26, 1939	22.48
Mar.	4	21.61
May	24	23.35
Aug.	3	23.65
Sept.	25	24.46
Dec.	19	25.30
Feb.	15, 1940	25.04
May	1	24.76
June	28	24.26
Aug.	25	24.52
Oct.	4	25.10
Dec.	5	24.00
Jan.	27, 1941	21.25
Feb.	26	20.60
Apr.	8	19.05
June	3	17.93
July	3	17.00
Sept.	3	19.88
Sept.	19	20.53
Nov.	4	13.96
Dec.	16	15.71
Jan.	22, 1942	17.06
May	7	14.26
July	29	15.37
Sept.	18	15.90
Jan.	20, 1943	15.23
Mar.	28	16.81
June	21	18.85
Aug.	26	19.63
Jan.	28, 1944	19.84
May	29	15.38
July	21	18.55
Sept.	18	21.21
Dec.	13	20.00
Jan.	24, 1945	16.48
Mar.	26	16.38
June	15	15.46
Jan.	11, 1946	20.90
May	27	15.51
July	10	14.71
Sept.	20	19.48
Dec.	6	15.63
Jan.	31, 1947	13.48
Mar.	17	15.71
June	4	16.24
Sept.	18	21.67
Dec.	18	22.25
Feb.	18, 1948	21.65
June	16	22.52
Sept.	28	24.01
Dec.	16, 1948	24.87
Feb.	14, 1949	24.92
June	15	22.12
Sept.	28	23.63
Dec.	19	18.79
Feb.	14, 1950	15.83
June	20	14.52
Sept.	26	21.28
Dec.	7	23.16
Mar.	5, 1951	24.18
June	19	24.54
Sept.	20	25.25
Dec.	11	25.72
Jan.	13, 1952	26.00
Feb.	11	26.30
June	23	24.40
June	30	24.39
July	31	24.83
Aug.	2	24.81
Sept.	2	25.20
Sept.	9	25.30
Dec.	22	25.95
Dec.	23	25.97
Jan.	7, 1953	25.75
Feb.	2	25.60
Mar.	5	25.26
Mar.	12	25.03
Mar.	23	24.83
Mar.	30	24.70
Apr.	6	24.61
Apr.	14	24.67
Apr.	20	24.74
Mar.	21	21.82
June	1	21.82
June	22	22.91
July	7	23.32
Aug.	1	23.86
Sept.	3	24.32

Table 9.—Water Levels in Montgomery and Adjacent Counties—Continued
(Depth to water in feet below land surface)

DATE		WATER LEVEL
Well TS-60-45-803—Continued		
Oct.	1, 1953	24.65
Nov.	1	25.07
Dec.	27	25.16
Jan.	29, 1954	24.75
Feb.	10	24.58
Mar.	1	24.66
Apr.	3	25.04
May	1	25.19
June	14	25.52
July	30	25.63
Aug.	1	25.75
Sept.	1	25.99
Oct.	24	25.90
Nov.	14	26.13
Dec.	26	26.18
Jan.	31, 1955	25.66
Feb.	18	25.03
Mar.	31	24.66
Apr.	3	24.56
May	1	24.83
June	1	25.06
June	16	25.20
July	26	25.56
Aug.	18	25.76
Sept.	20	25.94
Oct.	27	26.21
June	13, 1957	25.95
June	16	25.99
July	1	25.91
Aug.	1	26.08
Sept.	25	26.00
Oct.	15	25.96
Nov.	23	25.06
Dec.	31	24.48
Feb.	28, 1958	21.68
Mar.	13	21.60
Apr.	5	21.88
May	17, 1958	21.78
June	1	22.15
July	1	23.13
Aug.	1	23.75
Sept.	1	24.36
Oct.	22	24.56
Nov.	27	24.29
Dec.	16	24.41
Jan.	23, 1959	24.69
Feb.	12	23.15
Mar.	13	22.83
Apr.	14	21.24
June	16	20.73
Aug.	20	22.31
Sept.	23	22.79
Dec.	17	23.07
Mar.	1, 1960	18.81
May	31	20.44
June	10	20.92
Aug.	4	18.58
Sept.	19	18.52
Oct.	7	19.46
Nov.	18	16.50
Dec.	29	13.58
Jan.	18, 1961	12.04
Feb.	20	11.98
Feb.	23	11.05
Apr.	3	13.62
May	9	15.61
June	15	17.69
July	28	13.96
Sept.	19	15.02
Dec.	13	19.58
Feb.	20, 1962	19.02
June	19	20.03
Dec.	14	22.94
Mar.	1, 1963	19.72
June	20	22.43
Oct.	4, 1963	23.86
Dec.	2	24.43
Feb.	17, 1964	24.14
Dec.	2	24.01
Jan.	4, 1965	24.00
Feb.	4	23.82
Mar.	20	22.70
Apr.	29	22.80
May	17	22.81
June	30	22.30
July	31	22.99
Aug.	29	23.64
Sept.	24	24.08
Oct.	30	24.44
Nov.	30	24.48
Dec.	1	24.50
Jan.	17, 1966	23.38
Feb.	4	22.53
Mar.	25	21.18
Apr.	15	21.19
May	2	20.50
June	27	20.42
July	31	21.81
Aug.	31	22.34
Sept.	30	23.18
Oct.	29	23.32
Nov.	28	23.87
Dec.	24	24.17
Jan.	5, 1967	24.25
Feb.	15	24.27
Mar.	9	24.49
Apr.	18	22.44
Well TS-60-45-806		
Owner: M. H. Crighton		
Nov.	18, 1938	3.65
Dec.	17	3.53
Jan.	26, 1939	2.33
Mar.	4	1.56

Table 9.—Water Levels in Montgomery and Adjacent Counties—Continued
(Depth to water in feet below land surface)

DATE		WATER LEVEL
Well TS-60-45-806—Continued		
May	24, 1939	3.44
Aug.	3	3.84
Sept.	25	3.78
Dec.	19	4.50
Well TS-60-47-607		
Owner: Foster Lumber Co., Well 2		
	1914	+ 10.00
June	5, 1942	14.95
Jan.	26, 1966	6.98
Well TS-60-51-302		
Owner: Superior Oil Co., Well 2		
	1942	84.00
June	23	84.04
Dec.	6, 1966	88.40
Well TS-60-53-503		
Owner: Blair and Sons		
Nov.	18, 1931	16.20
Dec.	15	15.98
Jan.	19, 1932	16.21
Mar.	21	16.28
May	21	15.60
July	1	15.82
Aug.	31	16.04
Sept.	27	21.18
Nov.	26	21.60
Dec.	30	21.20
Jan.	25, 1933	21.74
Nov.	29, 1934	23.71
May	29, 1935	24.08
Aug.	21	26.78
Feb.	27, 1936	22.34
Feb.	6, 1938	21.56
May	13	21.70
Oct.	26	24.13
Nov.	18	24.17

DATE		WATER LEVEL
Dec.	17, 1938	23.53
Jan.	26, 1939	22.27
Mar.	4	22.91
May	24	22.56
Aug.	3	23.55
Sept.	23	24.15
Dec.	19	23.80
Feb.	15, 1940	23.40
May	1	24.02
June	28	24.10
Aug.	25	24.40
Oct.	4	24.40
Dec.	5	22.15
Jan.	27, 1941	23.30
Feb.	26	21.86
Apr.	8	23.32
June	3	23.81
July	3	24.38
Sept.	3	23.20
Nov.	4	20.59
Dec.	16	21.10
Jan.	22, 1942	20.78
May	7	21.60
July	29	19.02
Sept.	18	19.23
Jan.	20, 1943	17.16
Mar.	28	18.43
June	21	21.46
July	26	20.63
Jan.	28, 1944	20.87
May	29	19.29
July	21	20.98
Sept.	18	20.69
Dec.	13	17.61
Jan.	23, 1945	16.75
Mar.	26	16.93
June	15	17.96
Jan.	11, 1946	15.11

DATE		WATER LEVEL
May	27, 1946	14.63
July	10	13.75
Sept.	20	14.18
Dec.	6	12.26
Jan.	31, 1947	10.73
Mar.	17	10.50
June	4	11.24
Sept.	18	13.16
Dec.	18	13.45
Feb.	18, 1948	13.05
June	16	20.71
Sept.	28	14.10
Dec.	16	15.36
Feb.	14, 1949	14.82
June	15	14.98
Sept.	28	14.91
Dec.	19	13.93
Feb.	14, 1950	12.88
June	20	16.28
Sept.	26	17.39
Dec.	7	19.30
Mar.	5, 1951	16.09
June	19	14.83
Sept.	20	15.03
Dec.	11	15.40
Feb.	11, 1952	15.33
June	23	14.20
June	30	14.24
July	31	14.44
Sept.	12	14.97
Dec.	22	15.50
Feb.	2, 1953	15.72
June	22	14.33
Well TS-60-53-504		
Owner: E. W. Castleschouldt		
June	2, 1931	29.80
Aug.	12	29.43
Dec.	15	29.38

Table 9.—Water Levels in Montgomery and Adjacent Counties—Continued
(Depth to water in feet below land surface)

DATE		WATER LEVEL	DATE		WATER LEVEL	DATE		WATER LEVEL
Well TS-60-53-504—Continued			Jan.	27, 1941	30.68	Sept.	28, 1948	28.06
Jan.	19, 1932	29.50	Feb.	26	28.90	Dec.	16	27.98
Feb.	29	29.28	Apr.	8	31.30	Feb.	14, 1949	27.88
Mar.	21	28.91	June	3	30.96	June	15	28.23
Apr.	25	29.67	July	3	31.45	Sept.	28	23.23
May	21	29.46	Aug.	15	31.75	Dec.	19	27.26
July	1	30.57	Sept.	19	31.05	Feb.	14, 1950	27.46
Aug.	31	30.08	Nov.	4	29.52	Sept.	26	27.86
Sept.	27	29.60	Dec.	16	30.97	Dec.	7	28.15
Oct.	21	31.60	Jan.	22, 1942	31.37	Mar.	5, 1951	28.05
Nov.	26	29.97	May	7	30.82	June	19	28.40
Dec.	30	29.77	July	29	31.04	Sept.	20	28.48
Jan.	25, 1933	29.84	Sept.	18	30.25	Dec.	11	28.66
Mar.	15	30.24	Jan.	20, 1943	30.39	Feb.	11, 1952	28.52
May	8	29.98	Mar.	28	29.96	June	23	28.94
June	24	31.44	June	21	30.12	June	30	28.88
Nov.	29, 1934	20.24	Aug.	26	30.35	July	31	28.83
May	29, 1935	30.52	Jan.	28, 1944	29.53	Sept.	12	29.03
July	21	30.87	May	29	29.30	Dec.	22	28.90
Feb.	27, 1936	30.15	July	21	29.73	Feb.	2, 1953	29.15
Aug.	13	38.91	Sept.	18	29.56	June	22	29.33
Feb.	6, 1938	30.35	Dec.	13	29.41	Oct.	2	29.65
May	13	30.19	Jan.	24, 1945	28.98	Dec.	9	29.43
Oct.	26	32.30	Mar.	26	29.16	Feb.	16, 1954	29.48
Nov.	18	30.79	June	15	29.27	June	14	30.38
Dec.	17	30.73	Jan.	11, 1946	28.52	Sept.	28	30.65
Jan.	26, 1939	39.90	May	27	28.56	Dec.	4	27.87
Mar.	4	39.73	July	10	28.65	Feb.	4, 1955	29.93
May	24	31.01	Sept.	20	28.96	June	16	30.38
Aug.	3	30.92	Dec.	6	28.45	Sept.	20	30.50
Sept.	25	31.55	Jan.	31, 1947	28.04	Dec.	21	30.29
Dec.	19	31.38	Mar.	17	27.96	Feb.	14, 1956	30.15
Feb.	15, 1940	30.44	June	4	27.92	June	13	30.85
May	1	29.52	Sept.	18	28.08	Sept.	21	30.72
June	28	31.64	Dec.	18	27.76	Dec.	11	30.77
Aug.	25	31.96	Feb.	18, 1948	27.66	Feb.	19, 1957	30.89
Oct.	4	31.78	June	16	28.14	June	13	39.92
Dec.	5	30.62				Sept.	13	31.05

Table 9.—Water Levels in Montgomery and Adjacent Counties—Continued
(Depth to water in feet below land surface)

DATE		WATER LEVEL
Well TS-60-53-504—Continued		
Dec.	12, 1957	30.75
Feb.	20, 1958	30.49
June	10	30.85
Sept.	17	Well destroyed
Harris County		
Well LJ-60-60-103		
Owner: City of Tomball, Well 3		
	1958	64.00
Feb.	23, 1961	56.43
Feb.	20, 1962	56.90
Mar.	1, 1963	58.94
Mar.	4, 1964	60.75
Feb.	10, 1965	62.64
Feb.	9, 1966	63.85
Feb.	15, 1967	65.82
Well LJ-60-61-504		
Owner: I. and G. N. R. R.		
	1931	Flows
Oct.	29, 1963	80.41
Aug.	29, 1966	96.28
Feb.	14, 1967	95.44
Waller County		
Well YW-60-58-201		
Owner: Cameron Iron Works		
Dec.	11, 1959	88.00
June	30, 1965	93.24
Feb.	3, 1966	89.18

Table 11.--Field Analyses of Water From Wells in Montgomery and Adjacent Counties

WELL	DATE OF ANALYSIS	pH	SPECIFIC CONDUCTANCE (MICROMHOS AT 25° C)	CASING MATERIAL	SCREEN MATERIAL	REMARKS
			Montgomery County			
a/ TS-60-28-901	June 27, 1966	6.4	725	Steel	Steel	Reported iron problem. Iron conductor pipe pulled and found corroded. Clear water sample turned red in about 5 hours after sampling.
29-701	do	6.9	450	Concrete	--	Reported hardness problem. Uses special soap to lather. Water not used for cooking. Water has offensive taste.
801	June 28, 1966	--	740	Steel	Steel	Reported no iron problem.
903	June 27, 1966	7.4	650	do	do	Reported hardness problem.
a/ 36-302	do	7.8	425	do	do	Reported no iron problem.
303	July 27, 1966	7.1	--	do	do	Do.
405	Nov. 3, 1966	6.3	350	Concrete	--	Reported iron problem. Observed corrosion on plumbing fixtures and iron discoloration on ceramics.
a/ 37-102	June 27, 1966	5.9	130	Rock	--	Reported iron problem when plumbing fixtures were iron. Installation of plastic and copper fixtures ended problem. Conductor pipe is plastic.
201	June 28, 1966	--	700	Concrete	--	Reported no iron problem.
308	June 27, 1966	5.2	75	Plastic	Plastic	Reported occasional iron problem. Observed corroded plumbing fixtures.
406	June 28, 1966	7.2	550	Steel	Steel	Reported hardness problem. Uses special soap to lather.

See footnote at end of table.

Table 11.--Field Analyses of Water From Wells in Montgomery and Adjacent Counties--Continued

WELL	DATE OF ANALYSIS	pH	SPECIFIC CONDUCTANCE (MICROMHOS AT 25° C)	CASING MATERIAL	SCREEN MATERIAL	REMARKS
TS-60-37-501	June 28, 1966	5.7	42	Steel	Steel	Reported soft water. Reported no iron problem. Observed no corrosion in well or in distribution system.
504	Aug. 28, 1966	5.3	145	Plastic	--	Reported iron problem when casing was iron. Formerly replaced iron casing yearly because of corrosion. Substitution of plastic casing ended iron problem.
a/ 602	June 30, 1966	5.6	--	Concrete	--	Reported iron problem. "Water gets rusty during heavy rain."
901	June 28, 1966	--	310	Steel	Steel	Reported no iron problem.
902	June 21, 1966	--	390	do	do	Do.
903	June 28, 1966	--	130	Concrete	--	Do.
38-401	July 8, 1966	5.7	52	do	--	Reported no iron problem. Water distribution system is plastic.
506	do	6.7	75	do	--	Reported iron problem when well is first turned on.
701	do	5.6	68	Plastic	--	Reported no iron problem.
a/ 44-602	July 1, 1966	--	590	Steel	Steel	Do.
803	Nov. 28, 1966	--	210	do	do	Observed corrosion on casing.
45-202	July 5, 1966	5.6	135	do	do	Reported iron problem only when well is first turned on. Reported soft water.

See footnote at end of table.

Table 11.--Field Analyses of Water From Wells in Montgomery and Adjacent Counties--Continued

WELL	DATE OF ANALYSIS	pH	SPECIFIC CONDUCTANCE (MICROMHOS AT 25° C)	CASING MATERIAL	SCREEN MATERIAL	REMARKS
a/ TS-60-45-203	July 5, 1966	5.3	120	Plastic	Plastic	Reported iron problem developed a few months after well was completed. Iron problem diminishes with increased water usage. Observed rust stains on enamel of sinks and tubs. Water distribution system is iron.
602	Oct. 24, 1966	--	80	Steel	Steel	Reported iron problem developed 15 to 18 months after well was completed. Air compressor "knocks out the iron."
802	June 17, 1966	6.5	200	Concrete	--	Reported no iron problem. "Water occasionally blue." Water distribution system is copper.
a/ 46-101	July 6, 1966	7.3	625	Steel	Steel	Reported no iron problem. Water distribution system is plastic.
201	do	--	65	do	do	Reported iron problem when well pumps only occasionally.
203	July 12, 1966	5.7	180	Concrete	--	Reported iron problem. Reported iron deposition in water heater. Water distribution system is iron.
301	July 6, 1966	5.9	145	Wood	--	Reported no iron problem. Conductor pipe is plastic.
404	do	--	195	Steel	Steel	Reported iron problem.
405	July 13, 1966	6.6	290	Concrete	--	Reported no iron problem.
601	July 6, 1966	--	115	do	--	Reported iron problem. Water distribution system is iron. Conductor pipe is plastic.

See footnote at end of table.

Table 11.--Field Analyses of Water From Wells in Montgomery and Adjacent Counties--Continued

WELL	DATE OF ANALYSIS	pH	SPECIFIC CONDUCTANCE (MICROMHOS AT 25° C)	CASING MATERIAL	SCREEN MATERIAL	REMARKS
TS-60-46-602	July 6, 1966	--	110	Plastic	Plastic	Reported iron and hardness problems. Water distribution system is iron and is reportedly corroded.
603	July 12, 1966	6.5	175	Concrete	--	Reported iron problem. Conductor pipe is plastic.
703	July 13, 1966	--	290	Steel	Steel	Reported iron problem. Water distribution system is iron.
803	July 12, 1966	--	150	do	do	Reported no iron problem. Well pumped with air compressor. Water treated with filter.
a/ 47-102	May 26, 1966	5.7	--	Concrete	--	Reported occasional iron problem. Reported soft water.
407	do	6.2	--	do	--	Reported no iron problem. Conductor pipe is plastic.
a/ 501	May 25, 1966	6.9	--	Steel	Steel	Reported iron problem.
503	do	6.3	--	do	do	Reported iron problem decreases as well is pumped.
610	May 27, 1966	7.1	--	do	do	Reported iron problem. Observed corrosion on casing and storage tank.
801	do	7.8	--	do	do	Reported no iron problem. Reported soft water.
53-203	Nov. 21, 1966	--	700	do	do	Reported no iron problem.
54-301	June 15, 1966	5.9	410	Concrete	--	Reported iron problem. Conductor pipe is iron.
303	do	8.2	370	Steel	Steel	Reported no iron problem.

See footnote at end of table.

Table 11.--Field Analyses of Water From Wells in Montgomery and Adjacent Counties--Continued

WELL	DATE OF ANALYSIS	pH	SPECIFIC CONDUCTANCE (MICROMHOS AT 25° C)	CASING MATERIAL	SCREEN MATERIAL	REMARKS
TS-60-54-304	June 15, 1966	6.4	180	Concrete	--	Reported no iron problem. Conductor pipe is plastic.
401	June 10, 1966	5.4	280	Steel	--	Reported iron problem. Conductor pipe is plastic.
502	do	6.9	--	do	Steel	Reported no iron problem.
503	June 16, 1966	7.7	540	do	do	Do.
601	do	7.5	440	do	do	Reported no iron problem. Conductor pipe is plastic.
602	do	7.4	510	Concrete	--	Reported no iron problem.
604	June 15, 1966	7.5	380	Steel	Steel	Reported no iron problem. Reported hardness problem.
605	do	7.6	480	do	do	Reported iron problem in original 72-foot-deep well. Well deepened to 154 feet, and no iron problem encountered. Occasional hardness problem.
606	June 16, 1966	6.9	--	Wood	--	Reported no iron problem.
801	June 10, 1966	6.3	--	Steel	Steel	Reported iron problem, especially when water is allowed to settle. Water distribution system is plastic.
802	do	6.7	--	do	do	Reported iron problem.
902	do	7.5	--	do	do	Reported no iron problem.
903	do	7.1	--	do	do	Reported occasional iron problem.

See footnote at end of table.

Table 11.--Field Analyses of Water From Wells in Montgomery and Adjacent Counties--Continued

WELL	DATE OF ANALYSIS	pH	SPECIFIC CONDUCTANCE (MICROMHOS AT 25° C)	CASING MATERIAL	SCREEN MATERIAL	REMARKS
TS-60-54-904	June 10, 1966	7.2	--	Concrete	--	Reported no iron problem. Water distribution system and conductor pipe are plastic.
a/ 55-204	May 27, 1966	7.1	--	Steel	Steel	Reported no iron or hardness problems.
305	do	7.6	--	do	do	Reported no iron problem.
702	June 6, 1966	7.5	--	do	do	Do.
704	do	7.5	--	do	do	Do.
902	do	7.6	--	Plastic	Plastic	Reported no iron or hardness problems.
903	do	7.6	--	Steel	Steel	Reported no iron problem.
904	do	8.2	--	do	do	Do.
a/ 62-302	June 16, 1966	7.3	--	do	do	Reported no iron problem. Reported hardness problem.
303	June 9, 1966	7.1	--	Plastic	Plastic	Reported no iron problem.
63-102	June 20, 1966	6.5	240	Steel	Steel	Reported iron problem. Observed corroded pump. Water used only to wash trucks.
103	June 7, 1966	7.9	--	do	do	Reported no iron problem.
401	June 9, 1966	6.1	--	do	do	Reported iron problem.

See footnote at end of table.

Table 11.--Field Analyses of Water From Wells in Montgomery and Adjacent Counties--Continued

WELL	DATE OF ANALYSIS	pH	SPECIFIC CONDUCTANCE (MICROMHOS AT 25° C)	CASING MATERIAL	SCREEN MATERIAL	REMARKS
			San Jacinto County			
a/ WU-60-47-302	Oct. 5, 1965	6.2	--	Steel	Steel	Reported iron problem. Original iron casing corroded by water and replaced. "Water makes bad coffee." Water is filtered before use.
			Walker County			
YU-60-29-702	June 27, 1966	7.1	1,150	do	do	Reported "slightly hard and alkaline" water.

a/ See Table 10 for a more complete laboratory chemical analysis.

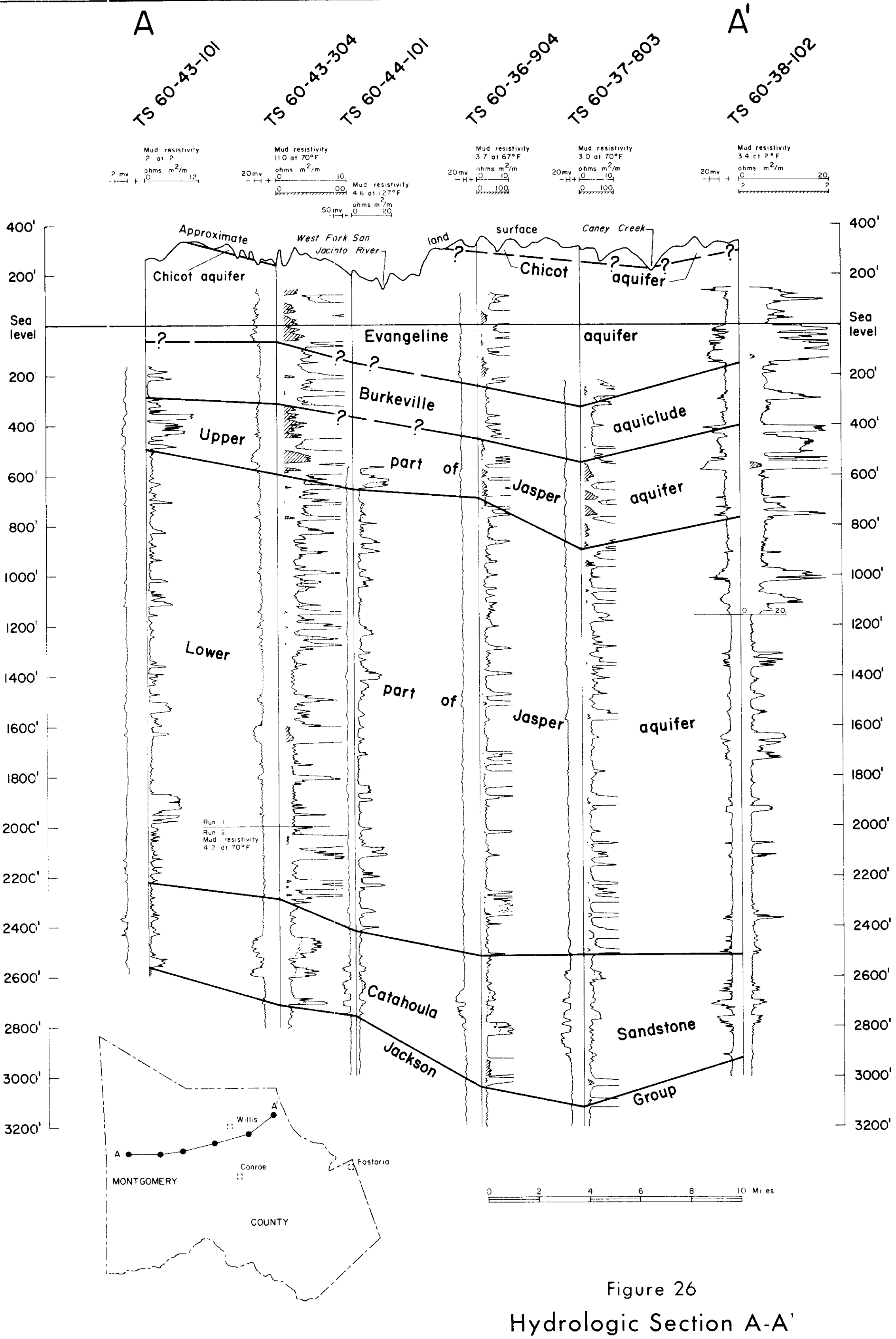

Figure 26

Hydrologic Section A-A'