

Ground-Water Resources of Liberty County Texas

PLANNING FILES
HYDROLOGY

With a section on Stream Runoff

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1079-A

*Prepared in cooperation with the Texas
State Board of Water Engineers*



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By W. H. ALEXANDER, JR.

With a section on Stream Runoff, by S. D. BREEDING

CONTRIBUTIONS TO HYDROLOGY OF THE UNITED STATES, 1945-47

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UNITED STATES DEPARTMENT OF THE INTERIOR

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GEOLOGICAL SURVEY

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CONTRIBUTIONS TO THE HYDROLOGY OF THE UNITED STATES, 1945-47

GROUND-WATER RESOURCES OF LIBERTY COUNTY, TEX.

BY W. H. ALEXANDER, JR.

ABSTRACT

Liberty County is in the Gulf Coastal Plain of southeastern Texas in the second tier of counties back from the Gulf.

The geologic formations discussed in this report in upward sequence consist of the Oakville sandstone of Miocene age and the Lagarto clay of Miocene (?) age, the Willis sand of Pliocene (?) age, and the Lissie formation and Beaumont clay of Pleistocene age. The rocks of these formations crop out in belts roughly parallel to the Gulf shore and dip southeastward. As one travels across San Jacinto and Liberty Counties from northwest to southeast the belts of outcrop are traversed in the above order, beginning with the Oakville sandstone and Lagarto clay.

The land surface slopes southeastward toward the Gulf at a rate less than the dip of the rocks; consequently artesian conditions exist in all parts of the county. The valley of the Trinity River is well known for its flowing wells, which range from 100 to 808 feet in depth.

Most of the ground water used in the county is obtained from wells ranging in depth from 350 to about 1,000 feet and is drawn from the Lissie formation. Wells yielding 1,000 to 3,500 gallons a minute and ranging from 740 to 1,030 feet in depth have been developed for rice irrigation in the North Dayton area, in the southwestern part of the county. These wells draw water mostly from sands in the Lissie formation, but most of them are also screened in overlying thinner sands in the Beaumont clay. The municipal water supplies of Liberty, Cleveland, Dayton, and Diasetta are obtained from wells ranging from 350 to 833 feet in depth with reported yields of 300 to 350 gallons a minute.

Most of the wells in the rural areas are less than 50 feet in depth and furnish small supplies of water for domestic use and for stock. Such supplies can be obtained almost anywhere in the county from shallow wells in the Lissie and Beaumont formations or in alluvial deposits.

The average daily withdrawal of ground water for irrigation, public supply, and industrial use is estimated to have been about 7,500,000 gallons in 1944, distributed as follows: irrigation, 6,780,000 gallons; public supply, 325,000 gallons; and industrial use, 395,000 gallons.

As shown by analyses of water from 145 wells and springs, the chemical character of the ground water varies materially in different localities and in different wells in the same locality. In general the water is relatively low in total dissolved solids but somewhat hard. Beds containing comparatively fresh water extend to depths exceeding 1,000 feet in the northern and central parts of the county and to a few hundred feet in the extreme southern part, according to estimates based on electrical logs of 8 oil tests. These logs are shown in cross sections *A-A'* in figure 2 and *B-B'* in figure 3 and extend across the county from northwest to southeast.

Abundant supplies of surface water are available in Liberty County from the Trinity River and other streams within the county, but storage will have to be provided if large continuous supplies of water are obtained.

According to daily tests of water from the Trinity River from October 1941 to September 1942 and from January to September 1944, the total dissolved solids exceeded 500 parts per million on only 11 days during the 21 months of study and was less than 250 parts per million more than a fourth of that time; the hardness exceeded 100 parts per million most of the time.

INTRODUCTION

LOCATION AND EXTENT OF THE AREA

Liberty County is a part of the Coastal Plain in southeastern Texas, and the south boundary of the county is 25 to 40 miles from the Gulf coast. It is bounded on the west by Harris and Montgomery Counties, on the north by San Jacinto and Polk Counties, on the east by Hardin and Jefferson Counties, and on the south by Chambers County. The land surface is level to gently rolling except in areas bordering the valleys of the Trinity River and the East Fork San Jacinto River, where it has been eroded into small hills. The minimum altitude is about 5 feet above sea level, on the flood plain of the Trinity River at the southern boundary of the county, and the maximum altitude is about 170 feet, near Cleveland in the northwestern part of the county. The Trinity River crosses the county from north to south in a broad valley 4 to 8 miles wide and 25 to 50 feet below the general level. The county has an area of 1,160 square miles and in 1940, according to the United States Bureau of the Census, had a population of 24,541, an average of 21 persons per square mile. The principal towns and their population in 1940 were: Liberty (county seat), 3,087; Daisetta, 2,000; Cleveland, 1,783; Dayton, 1,279; and Hull, 1,000.

ECONOMIC DEVELOPMENT

The economic development of Liberty County is diversified. The county ranks high as a producer of oil. During the year ending August 31, 1942, a total of 5,258,800 barrels was produced, according to the Texas Almanac for 1942-44, published by the Dallas News. The total production in the county from 1918 to 1940, inclusive, was 129,640,000 barrels.¹ Other mineral resources are natural gas, sulfur, sand, and gravel. Considerable timber is cut commercially, especially in the northern part of the county. Agriculture is diversified, the most important crops being rice and cotton. Beef cattle and hogs are the major livestock products, but some sheep and goats are raised. Dairying is also an important industry.

PRECIPITATION

According to records of the United States Weather Bureau the average annual precipitation at Liberty during the years 1904 to 1944 was 51.05 inches. Table 1 gives the precipitation for some of the wettest and driest years.

TABLE 1.—*Precipitation extremes, by years, 1904-44, at Liberty, Tex.*

Highest		Lowest	
Year	Inches	Year	Inches
1914.....	68. 64	1904.....	30. 15
1919.....	85. 08	1909.....	39. 36
1923.....	71. 56	1916.....	34. 88
1926.....	62. 13	1917.....	29. 82
1941.....	65. 27	1924.....	33. 99
1944.....	63. 74	1936.....	39. 61

Table 2 gives the United States Weather Bureau records of precipitation, by months, at Liberty, Tex., 1903-44.

¹ Leavenworth, P. B., Oil and gas production in the Texas Gulf Coast during 1940: Am. Inst. Min. Met. Eng., Petroleum Development and Technology, pp. 440-458, 1941.

TABLE 2.—*Precipitation, in inches, 1903 to 1944, at Liberty, Tex.*

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1903.....										1.96	0	1.60	-----
1904.....	0.08	2.20	0.07	5.70	4.00	4.50	2.50	2.85	2.00	1.70	1.65	2.90	30.15
1905.....	2.60	5.09	9.95	4.60	4.65	6.85	3.60	1.10	.40	2.65	4.70	5.10	51.29
1906.....	1.40	2.50	1.85	3.30	.80	.59	5.60	2.10	7.63	10.65	.75	4.30	41.47
1907.....	.61	2.11	2.70	2.65	18.10	2.20	1.45	3.03	5.75	6.85	6.75	4.80	57.00
1908.....	3.65	8.00	2.35	9.50	4.30	5.95	4.10	3.66	6.32	2.24	1.66	1.31	53.04
1909.....	Trace	1.88	.67	1.85	5.02	7.01	5.17	2.29	.60	8.25	2.51	4.11	39.96
1910.....	2.46	2.72	.94	2.19	6.28	4.66	7.42	1.95	2.77	4.27	.82	6.06	42.54
1911.....	.35	.04	3.98	6.52	5.08	3.83	8.93	2.54	1.68	2.82	2.24	14.10	52.11
1912.....	1.31	2.98	4.65	7.68	5.86	6.39	3.90	5.50	1.16	1.22	1.41	11.79	53.85
1913.....	5.67	4.42	2.28	5.44	3.43	2.39	.65	4.85	8.49	9.13	4.28	5.13	56.16
1914.....	1.34	3.47	6.30	3.93	14.88	2.14	1.23	9.28	3.19	1.84	10.91	10.13	68.64
1915.....	3.44	4.38	3.16	3.30	1.65	.37	4.80	22.70	1.48	2.60	3.45	6.30	57.63
1916.....	3.39	.18	Trace	2.27	7.69	1.08	4.09	4.12	5.73	.32	2.04	3.97	34.88
1917.....	2.12	2.08	2.72	4.28	2.66	.13	5.88	3.96	.81	2.31	.92	1.95	29.82
1918.....	1.41	2.47	3.79	5.55	.81	3.97	1.17	2.66	3.21	5.12	6.36	4.89	41.41
1919.....	7.60	4.62	5.02	1.63	10.31	15.66	6.36	6.60	4.39	16.76	3.29	2.84	85.08
1920.....	6.22	2.05	2.24	.33	6.25	6.19	3.24	9.64	1.18	9.87	4.08	3.99	55.28
1921.....	4.22	1.12	3.65	5.72	2.22	4.97	5.34	.56	5.71	1.12	1.04	7.19	42.86
1922.....	6.31	3.27	7.44	4.93	5.58	7.24	5.39	1.51	1.46	1.25	7.14	4.48	56.00
1923.....	2.59	5.71	5.74	9.06	7.33	5.77	3.66	5.13	4.42	4.41	3.71	14.03	77.56
1924.....	5.34	4.77	2.47	3.81	4.42	3.08	.93	2.24	1.16	Trace	1.58	4.19	33.99
1925.....	4.86	1.00	1.49	.66	.63	4.39	3.14	3.79	3.15	10.51	12.67	2.44	48.73
1926.....	6.25	1.68	11.27	4.88	4.19	9.32	4.23	3.25	5.47	5.60	2.01	3.98	62.13
1927.....	1.33	2.99	2.80	5.00	2.72	11.78	2.03	Trace	5.06	6.89	2.05	7.90	50.55
1928.....	1.24	4.43	1.87	2.95	7.03	9.29	2.66	3.67	3.53	3.15	6.66	3.52	50.00
1929.....	5.65	2.72	3.25	4.53	13.18	1.91	3.95	.57	2.60	1.92	10.21	2.78	53.27
1930.....	6.42	3.63	2.07	.64	6.50	2.50	1.72	2.58	3.35	8.72	3.28	5.36	46.77
1931.....	5.06	7.09	4.65	3.02	2.28	1.00	4.42	3.19	1.39	1.18	4.58	7.11	44.98
1932.....	7.78	4.24	1.24	1.91	3.38	4.38	1.23	6.88	1.81	1.42	2.51	6.09	42.87
1933.....	-----	4.10	2.88	1.93	2.98	2.41	15.04	2.42	3.63	1.57	.63	3.30	-----
1934.....	10.08	4.56	6.79	6.01	1.31	.97	2.24	3.36	7.41	.09	6.04	3.69	53.15
1935.....	3.34	3.34	4.66	4.71	4.18	6.76	5.62	1.84	7.28	2.74	4.06	10.85	59.38
1936.....	1.40	3.72	.99	2.29	8.81	.39	6.55	1.24	2.16	2.45	2.72	6.89	39.61
1937.....	5.79	2.42	9.18	.52	Trace	5.83	2.22	5.17	6.05	6.79	1.97	5.58	51.52
1938.....	6.11	3.92	2.63	2.30	7.93	6.90	4.95	1.89	4.22	1.23	4.03	2.63	48.74
1939.....	10.73	4.06	1.14	2.73	2.72	1.77	8.20	2.49	2.25	.71	3.38	3.21	43.39
1940.....	1.42	3.86	1.54	4.95	2.20	4.42	2.03	6.68	.83	4.84	10.33	10.37	53.47
1941.....	2.59	2.93	5.28	6.8c	7.06	8.94	4.81	.97	12.62	8.99	2.04	2.24	65.27
1942.....	3.59	3.05	3.00	8.50	3.29	6.82	7.33	7.45	5.11	3.22	2.18	2.55	56.09
1943.....	4.20	.55	3.64	1.14	7.00	2.82	16.40	1.24	4.89	.70	6.79	4.80	54.17
1944.....	8.73	2.19	7.71	.76	13.42	1.80	2.01	8.59	1.91	1.66	5.93	9.03	63.74

Average annual precipitation..... 51.05

ACKNOWLEDGMENTS

The writer is indebted to many persons who have contributed information for this report. The representatives of several oil companies, city officials of Liberty, Cleveland, and Dayton, and water-well drilling contractors furnished well logs and other important well data.

The work was done under the general direction of W. N. White, engineer in charge of ground-water investigations in Texas.

The water analyses were made under the supervision of W. W. Hastings, chemist of the quality of water branch of the Geological

Survey. The results of the analyses, which relate to the mineral constituents in the water and not to its sanitary character, are shown in parts per million in table 8.

GENERAL PRINCIPLES OF THE OCCURRENCE AND MOVEMENT OF GROUND WATER

For discussion of the fundamental principles of the occurrence and movement of ground water the reader is referred to papers by Meinzer and Wenzel.²

Ground water is derived chiefly from water that falls as rain and snow. A part of the precipitation runs off in streams, a part is returned to the atmosphere by evaporation and transpiration of trees and other plants, and a part sinks to the zone of saturation, in which all the interstitial openings of the rocks are filled with water.

In most places ground water is slowly but steadily moving under the influence of gravity from areas of intake to areas of discharge. In the more permeable rocks, such as coarse sand, gravel, and porous limestone, the water moves with comparative freedom, although the movement is very slow compared to the flow of a stream. Such rocks are capable of yielding abundant supplies of water to wells. In less permeable rocks, such as shale or clay, molecular attraction and surface tension retard the movement of the water, which may be almost infinitely slow. Such rocks yield little or no water to wells.

On the outcrop of water-bearing beds the water is usually unconfined and does not rise in wells above the water table, which is the upper surface of the zone of saturation and the level at which the water is first encountered.

The water table is not a level surface but usually slopes from areas of ground-water intake toward areas of ground-water discharge. In some places the land surface is lower than the water table in adjacent areas, and in such localities some of the ground water emerges as springs. In some localities perched water accumulates above the main zone of saturation, especially during the winter and spring, when the rates of evaporation and transpiration are low. Such supplies are usually small and are not dependable.

In areas down the dip of the water-bearing beds where the rocks are under cover and inclined between relatively impermeable strata the water usually is under artesian pressure and will rise in wells above the level at which it is first encountered. If the altitude to which the water will rise is greater than the altitude of the land surface, flowing wells may be obtained.

² Meinzer, O. E., The occurrence of ground water in the United States: U. S. Geol. Survey Water-Supply Paper 489, 1923; Outline of methods for estimating ground-water supplies: U. S. Geol. Survey Water-Supply Paper 638-C, pp. 99-145, 1931. Wenzel, L. K., Method for determining permeability of water-bearing materials: U. S. Geol. Survey Water-Supply Paper 887, 1942. Meinzer, O. E., and Wenzel, L. K., Physics of the earth, vol. 9, Hydrology, pp. 385-478, McGraw Hill, New York, 1942.

The rocks underlying Liberty County to depths of at least 2,000 feet consist chiefly of clays and shales interbedded with sands. The beds are inclined, the dip being toward the Gulf of Mexico. The general slope of the land surface is also toward the southeast. Hence artesian conditions occur in all parts of the county. The valley of the Trinity River is well known for its flowing water wells, which range from 100 to 808 feet in depth. On the upland only the deeper wells flow, the shallowest flowing well being about 1,200 feet.

Most wells are subject to water-level fluctuations of varying magnitude. These fluctuations are due to many different causes, but most of them are a manifestation of a change in the ratio between the rate of ground-water intake or recharge and the rate of loss or discharge. Most water-table wells are supplied in part from intake areas close at hand and respond with a moderate lag to changes in rainfall. In very shallow wells the water level may rise several feet after heavy rains and decline until the wells go dry during prolonged droughts. Artesian wells that draw from sand or sandstone and at considerable distances from the outcrops of the water-bearing beds seldom are affected by seasonal or yearly changes in rainfall, although they may respond to the effect of a series of wet or dry years. Fluctuations in pressure in such wells and accompanying rise and fall in water levels are usually due to withdrawals of ground-water from the well itself or from other wells.

When a well is pumped the water level in the well drops, and a hydraulic gradient is developed toward the well from all directions. It is this hydraulic gradient that causes water to flow toward the well. Within limits the amount of water that will enter a well varies directly with the amount the water level is lowered. For example, if a pumped well in fairly permeable material will yield 50 gallons a minute when the water level is lowered 10 feet, it will yield about 100 gallons a minute when the water level is lowered 20 feet. This ratio between the drawdown and the yield of the well is called the specific capacity and is expressed as yield in gallons a minute per foot of drawdown. The ratio is a very useful gauge of the productivity of a well.

Heavy withdrawals of ground water are sure to be accompanied by a general lowering of the water table or artesian pressure, a cone of depression gradually spreading out in all directions from the center of pumpage until large areas may be affected. However, this is usually considered not very serious unless the rate of decline persists without a corresponding increase in the rate of pumping or the trend is such as to indicate that the pumping lift may eventually exceed the economic limit. In some areas beds carrying fresh water are overlain by beds carrying salty water, and excessive pumping may lead to the invasion of salt water into the wells.

GEOLOGIC FORMATIONS AND THEIR WATER-BEARING PROPERTIES

With the exception of Recent alluvial deposits along the Trinity River and one small area of Willis sand in the northwestern corner of the county, the rocks that crop out in Liberty County are of Pleistocene age and belong to the Lissie formation and Beaumont clay. (See fig. 1.) These rocks are underlain in downward succession by the

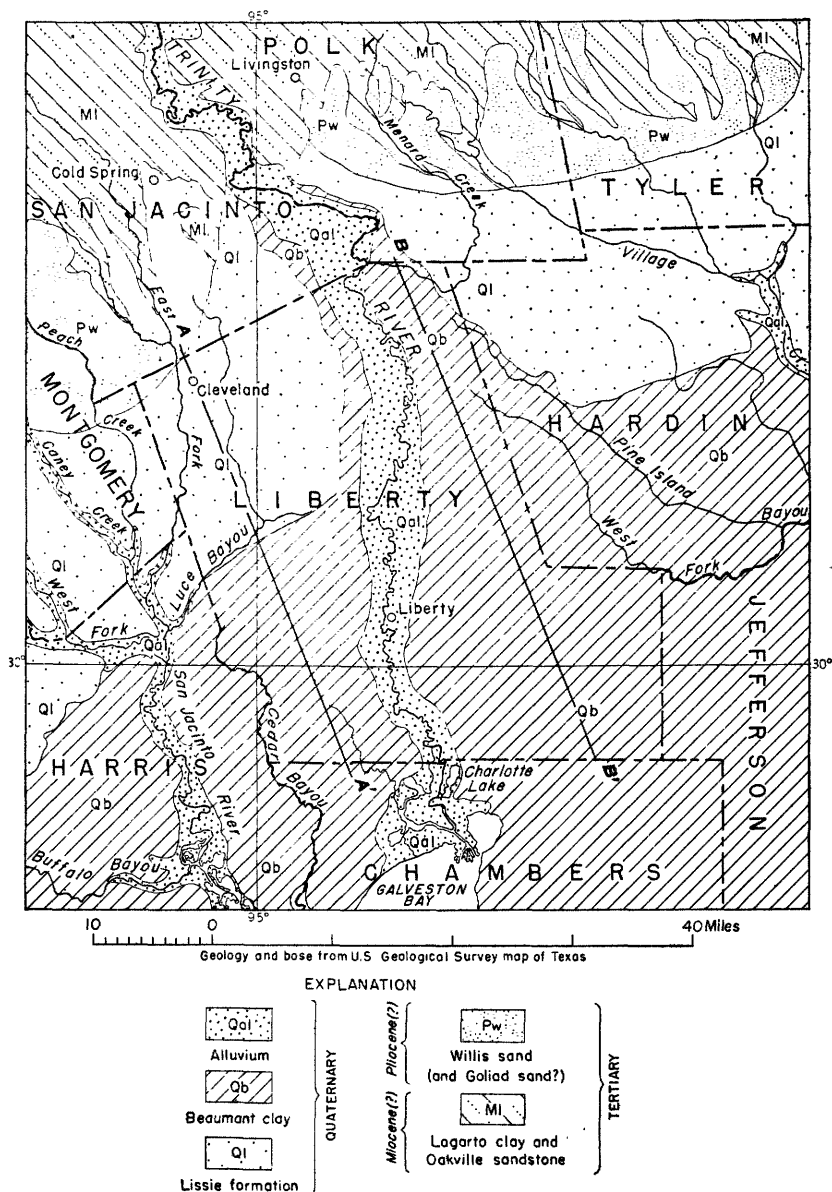


FIGURE 1.—Geologic map of Liberty County and adjacent territory, Texas.

Willis sand (and possibly by the Goliad sand), Lagarto clay, and Oakville sandstone, Catahoula sandstone, and older rocks. On the Geological Survey map of Texas the Oakville sandstone and Lagarto clay have not been differentiated east of the Brazos River and are considered in this report as though they were one unit. The rocks of these formations crop out in Montgomery, San Jacinto, and Polk Counties, and a part of the outcrop area is shown on the geologic map (fig. 1). The Goliad sand has not been identified in outcrop in this part of Texas but may be present and hidden by overlap of younger formation.

The information given below is based in part on a bulletin of the Texas Bureau of Economic Geology,³ in part on recent articles in the Bulletin of the American Association of Petroleum Geologists, and in part on well logs obtained by the writer.

Beginning with the Oakville sandstone and Lagarto clay, the rocks are listed in the order in which they were deposited, or from oldest to youngest. This is the order in which the outcrops are successively crossed in traveling over the area from northwest to southeast.

MIOCENE AND PLIOCENE SERIES

OAKVILLE SANDSTONE AND LAGARTO CLAY

The beds of the Oakville sandstone (Miocene) and Lagarto clay (Miocene?) which crop out in Montgomery, San Jacinto, and Polk Counties dip southeastward toward the Gulf at the rate of about 60 feet to the mile. (See figs. 2 and 3.) In northern Liberty County they consist predominantly of clay, usually containing calcareous layers, but include important beds of water-bearing sands. They are believed to have a total thickness of at least 1,400 feet. At Cleveland, in the northwest corner of the county, wells in sands of these formations yield water of good quality. Down the dip in the central part of the county the water becomes brackish. The estimated position of the contact between fresh and brackish water in these formations, based on the writer's interpretation of electrical logs of a few oil tests, is shown by the dashed lines in figures 1 and 2.

WILLIS SAND (AND GOLIAD SAND?)

The Willis sand of Pliocene (?) age and possibly the Goliad sand of Pliocene age crop out in a belt 10 to 15 miles wide, paralleling and just south of the outcrop of the Oakville sandstone and Lagarto clay. The Willis sand has been described in general as a red sand, coarse and gravelly in part, slightly indurated, and having a total thickness of about 85 feet.⁴

³ Sellards, E. H., Adkins, W. S., and Plummer, F. B., The geology of Texas, vol. 1, Stratigraphy: Texas Univ. Bull. 3232, pp. 727-795, 1932.

⁴ Doering, John, Post-Fleming surface formations of Coastal southeast Texas and south Louisiana: Am. Assoc. Petroleum Geologists Bull., vol. 19, pp. 660-668, 1935.

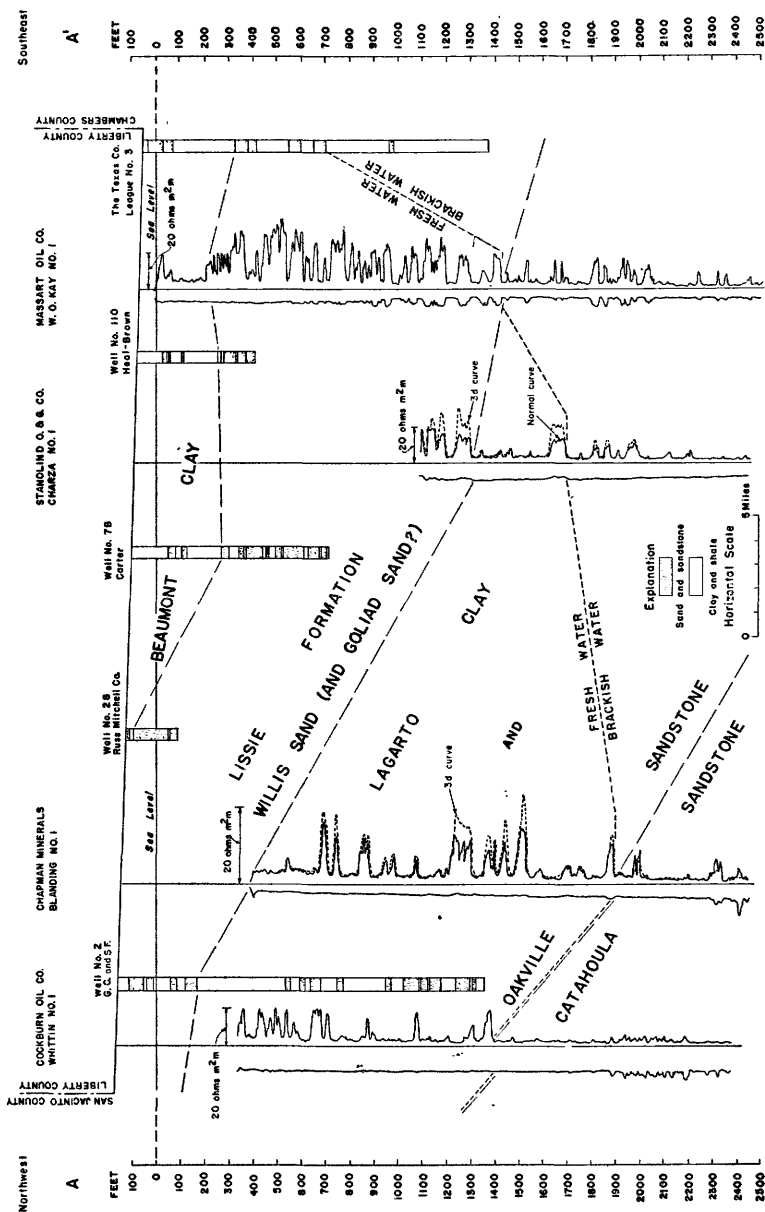


FIGURE 2.—Geologic cross section A-A', Liberty County, Tex.

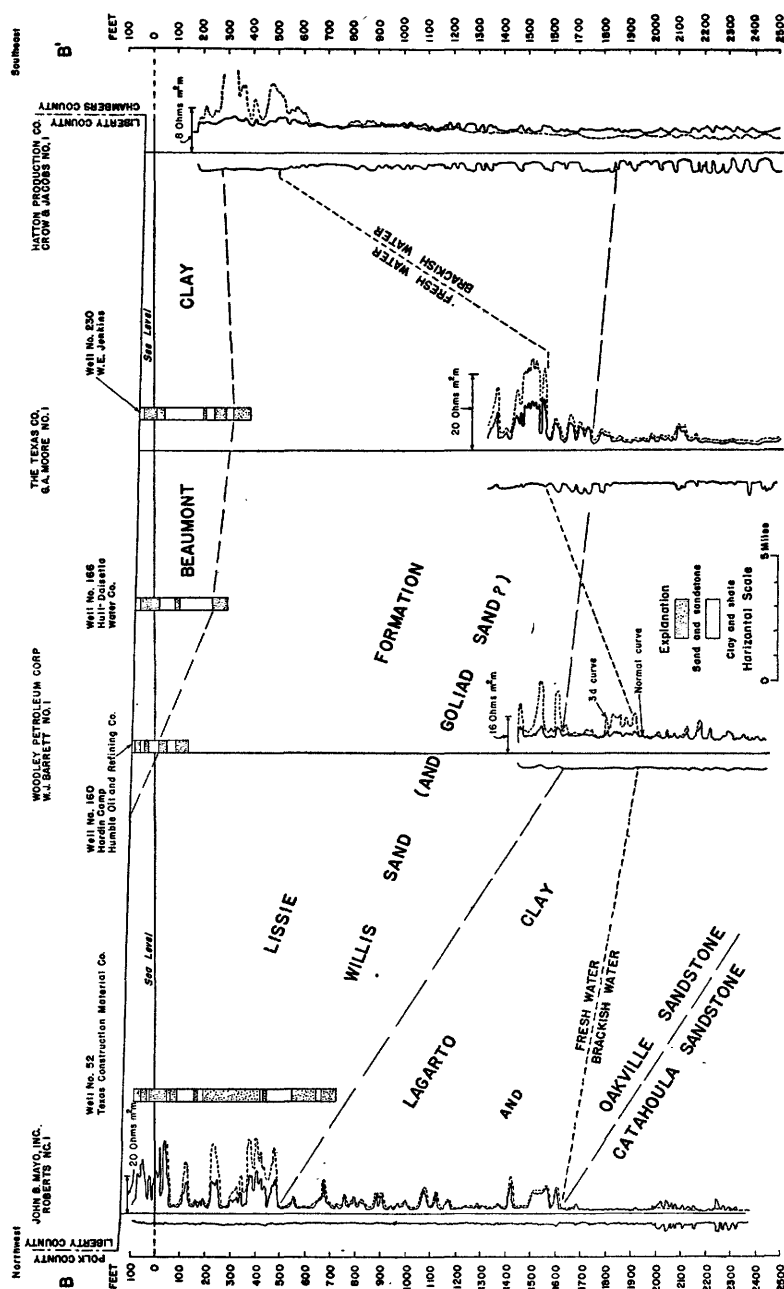


FIGURE 3.—Geologic cross section B-B', Liberty County, Tex.

PLEISTOCENE AND RECENT SERIES

LISSIE FORMATION

The Lissie formation of Pleistocene age overlies the Willis sand (and Goliad sand?) and appears in outcrop in a belt about 15 miles wide, paralleling and just south of the outcrop of the Willis sand. (See fig. 1.) The Lissie formation has been described by Meyer ⁵ as a sequence of gravels, sands, sandy clays, and clays, which are distinguished from the underlying Willis sand by a generally finer texture and from the overlying Beaumont clay by a generally coarser texture. However, in Liberty County it is not possible to differentiate between the beds of the Willis sand, Goliad sand (if present), and Lissie formation in drillers' and electrical logs, and for convenience in this report the combination will be called the Lissie formation. The total thickness of the Lissie formation as thus designated ranges from about 200 feet in the northwestern part of the county to about 1,400 feet in the southern part. The individual beds of sand range from a few feet to about 80 feet in thickness.

In the northern and central parts of the county the Lissie formation contains fresh water at all depths, but in the southern part the middle and lower beds contain brackish or salty water. The estimated position of the contact between the fresh and salty water in the formation in the southern part of the county is shown in figures 2 and 3.

BEAUMONT CLAY

The Beaumont clay of Pleistocene age overlies the Lissie formation, and its outcrop area covers all the county south of the outcrop of the Lissie. The Beaumont clay has been described ⁶ as being composed of calcareous mottled clays and sand, and silt, with clays locally comprising as much as 80 percent of the formation. Surface exposures of sand in the Beaumont clay are largely confined to narrow belts, which are believed to be old stream channels. The individual beds of sand range in thickness from a fraction of a foot to 30 feet, and locally slightly more. Drillers' logs of wells within a belt extending 5 or 6 miles south of the outcrop belt of the Lissie formation show a distinct contrast between the clays and thin sands of the Beaumont clay and the thicker sands of the underlying Lissie formation. Farther south the distinction is not so sharp, and the lower limit of the Beaumont clay is difficult to define. The Beaumont clay thickens from a feather edge at the Lissie outcrop to an estimated depth of about 400 feet in the southern part of the county. The sands in the Beaumont are fine-textured, and it is usually more difficult to develop a satisfactory well in them than in the sands of the Lissie formation.

⁵ Meyer, W. G., *Stratigraphy and historical geology of Gulf Coastal Plain in vicinity of Harris County, Texas*: Am. Assoc. Petroleum Geologists Bull., vol. 23, pp. 188-196, 1939.

⁶ Meyer, W. G., *op. cit.*, pp. 190-192, 1939. Plummer, F. B., *op. cit.*, p. 788, 1932.

ALLUVIAL DEPOSITS

Deposits of Recent alluvial sand, clay, and gravel ranging in thickness from a few feet to 80 feet are reported in drillers' logs of water wells in the flood plain and adjacent terraces of the Trinity River. The alluvium-covered area is 4 to 8 miles wide and extends all the way across the county. These deposits are an important source of ground water for domestic use and stock. The water varies in chemical quality but is usually potable.

**PRESENT DEVELOPMENT OF WATER SUPPLIES
FROM WELLS**

One railroad in Liberty County uses water from the Trinity River, but with this exception all the public and industrial water supplies in Liberty County are obtained from wells. In 1944 approximately 24,000 acres of rice was grown in the county, of which about 4,000 acres was irrigated from wells. Most of the ground water is obtained from the Lissie formation from wells 350 to 1,000 feet deep.

Most of the wells in the rural areas are less than 50 feet in depth and furnish small supplies of water for domestic use and stock. Such supplies can be obtained almost anywhere in the county from shallow wells. In the northern part of the county and in the Trinity River Valley shallow bored or dug wells are common, but in the southern part practically all the wells are drilled. The location of wells and springs is shown on plate 1.

The development of ground water in different parts of the county is briefly discussed below.

**NORTHWESTERN PART OF THE COUNTY,
CLEVELAND-HIGHTOWER AREA**

The railroad well at Cleveland (well 2), is 1,512 feet deep and draws water from the Oakville sandstone-Lagarto clay sequence. It is reported that when the well was completed in 1937 it had an artesian flow of 30 gallons a minute. At present it is equipped with a deep-well turbine pump and a 5-horsepower electric motor by means of which water is raised to an elevated storage tank. The pumpage from this well is estimated to have averaged about 220,000 gallons a day in 1944.

The water supply of the city of Cleveland is obtained from wells 7 and 8, respectively 845 and 929 feet deep, drawing water from the Oakville sandstone-Lagarto clay sequence. These wells were drilled in 1938, and each had an initial yield of 350 gallons a minute with a drawdown of 70 feet. The pumpage from the two wells is estimated to have averaged 97,000 gallons a day in 1944.

Well 21, about 1 mile west of Hightower, reported to have been 1,200 feet deep, also drew from the Oakville sandstone-Lagarto clay sequence. The well was destroyed in 1939.

Several wells in the Cleveland area are used to supply water to lumber mills and oil pipe-line pump stations. These wells range from 100 to about 300 feet in depth and draw water from the Lissie formation.

Wells 14 and 15, about 4 miles southwest of Cleveland in the valley of the East Fork San Jacinto River, have small flows, although they are comparatively shallow, the reported depth being 187 and 327 feet, respectively. The flow of each was estimated at about 10 gallons a minute in April 1945. The water is used for household supplies.

Well 20, about 6 miles northeast of Cleveland, supplied water for the irrigation of 250 acres of rice in 1944. The well is equipped with a deep-well turbine pump and a 125-horsepower Diesel engine. It is reported to yield 900 gallons a minute.

All the wells in this area for which analyses are available yield water of comparatively low mineral content. (See table 8.) In general the hardness of the water decreases with depth, the water from wells 2 and 22, the two deepest, being exceptionally soft. Some of the shallow wells, however, such as wells 11, 20, and 25, yield very soft water.

NORTHEASTERN PART OF THE COUNTY, ROMAYOR-RAYBURN AREA

The Romayor area is locally well known for its flowing water wells. Information was obtained on 13 such wells—44, 45, and 47 to 57. The flow from nine of the wells was measured with a current meter, or with a barrel or smaller container, and the flow from three of them was estimated. It was noted that with one or two exceptions the deeper wells, 580 to 808 feet in depth, have the largest flow, the flow ranging from 152 to 205 gallons a minute. The flow from the shallower wells, 100 to 480 feet in depth, is comparatively small, ranging from 4 to 60 gallons a minute. At the time of the investigation three of the flowing wells were used to supply sawmills, one to supply locomotive boilers, two for washing gravel and for domestic supplies; and six were unused.

Well 50, at the Santa Fe Railroad station at Romayor, used to supply locomotives, is 645 feet deep, and has a flow of 205 gallons a minute, the largest in the area. The artesian head in this well was 37 feet above the surface in January 1945. The well supplied an average of only about 55,000 gallons a day in 1944, the flow being cut off most of the time.

The nonflowing wells of the area are shallow and are used for domestic purposes and for stock.

The water from nearly all the wells recorded in the Romayor-Rayburn area is low in total dissolved solids. In four wells less than 200 feet in depth the hardness ranges from 11 to 135 parts per million and averages 80 parts per million; in 11 wells between 233 and 808 feet in depth the hardness ranges from 88 to 168 parts per million and averages 122 parts per million.

SOUTHWESTERN PART OF THE COUNTY, DAYTON AREA

The largest development of ground water in Liberty County is in the rice-growing district near Dayton, where a total of about 4,000 acres of rice was irrigated from wells in 1944. This development was started in 1943, and by the spring of 1945 12 irrigation wells had been drilled. The irrigation wells are numbered 76 to 79, inclusive, 81, 82, and 84 to 89, inclusive. Well 87 had a flow of about 30 gallons a minute when it was visited and is reported to be 2,500 feet in depth. The others range from 558 to 1,005 feet in depth and average about 800 feet. The water level in four of them ranged from about 38 to about 54 feet below the surface when the wells were measured by the writer in the spring of 1945, before the start of the irrigation season. The reported pumping yield of 10 of the wells (see table 6) ranges from 1,170 to 3,500 gallons a minute. Well 78 is reported to have a specific capacity of about 26 (yield in gallons a minute per foot of drawdown), and well 82 a specific capacity of about 20. The wells are equipped with deep-well turbine pumps and Diesel engines.

The casings in the rice wells are perforated opposite all the principal water-bearing sands, starting at depths as shallow as 118 to 150 feet in some wells and at greater depths in others, for example, at 389 feet in well 78.

The boundary between the base of the Beaumont clay and the top of the Lissie formation is easily recognized in drillers' logs of the rice wells and ranges in depth from 146 to 370 feet below the surface. Most of the wells are supplied with water from both formations. The individual sands in the Beaumont clay range from 10 to 30 feet in thickness and are not numerous, whereas in the underlying Lissie formation the drillers' logs of some of the wells show sands as much as 80 feet thick and comprising 60 to 75 percent of the sediments penetrated. (See table 7, logs of wells 78, 82, 84, 85, and 90.)

The public water supply of the city of Dayton is obtained from wells 119 and 120, respectively 395 and 399 feet in depth. Each well is equipped with a deep-well turbine pump operated by a 15-horsepower electric motor. The original yield of these wells is reported to have

been 300 gallons a minute each, with a specific capacity of about 27. The pumpage from the wells is estimated to have averaged 180,000 gallons a day in 1944, of which 65,000 gallons a day was used by the city and 115,000 gallons a day by the Texas and New Orleans (Southern Pacific) Railroad. The water is obtained from a sand 75 to 80 feet thick in the upper part of the Lissie formation and is of fairly good chemical quality.

As shown by the analyses of water from about 30 wells (see table 8), the ground water in the Dayton area shows a rather wide range in chemical content. There is a tendency for the total dissolved solids to increase and the hardness to decrease with depth, but several wells show exceptions to this general rule. In most of the wells of shallow or moderate depth the water is rather hard.

SOUTH-CENTRAL PART OF THE COUNTY, LIBERTY, MOSS BLUFF, RAYWOOD, AND DAISSETTA AREAS

Information was obtained regarding 10 flowing wells in the Liberty area, of which wells 178, 181 to 184 inclusive, 188 to 190 inclusive, and 199, were drilled between 1895 and 1911 and well 187 was drilled more recently. Six of these wells are in use today. Two furnish a part of the public supply for the city of Liberty, two are used for stock, one furnishes water for a swimming pool, and one is used for domestic supplies.

Most of the public supply of Liberty is pumped from well 179, which is 565 feet deep and is reported to have had a yield of 321 gallons a minute with a specific capacity of about 7 when completed in 1939. Well 180, 351 feet deep, serves as an additional source of supply. Both wells are equipped with deep-well turbine pumps and electric motors. Two flowing wells, 178 and 182, respectively 680 and 651 feet in depth, also contribute a small supplementary supply. The production from the four wells in 1944 is estimated to have averaged about 115,000 gallons a day.

The ice plant of the Trinity Valley Cold Storage Co. at Liberty is supplied from well 195, 350 feet deep, which is equipped with a deep-well turbine pump and electric motor and has an average production of 3,000 gallons a day.

According to the logs of the deeper wells at Liberty, the individual sands range from 15 to 40 feet in thickness and in the aggregate make up about 25 percent of the total thickness of the sediments penetrated by the wells. The city water supply is obtained from sands that are probably in the upper part of the Lissie formation. In well 168, below a depth of 320 feet, which is regarded as the base of the Beaumont clay, sands make up about 70 percent of the material logged.

Analyses of well waters in the Liberty area show a rather wide range in mineral content. In 7 wells, 260 to 651 feet in depth, the total dissolved solids ranged from 312 to 750 and averaged 454 parts per million, the hardness ranged from 63 to 234 and averaged 170 parts per million, and the chloride ranged from 46 to 303 and averaged 156 parts per million.

Twenty-two of the water wells recorded in this part of the county are in the vicinities of Moss Bluff and Raywood, respectively south and east of Liberty. Well 218 was drilled to a depth of 1,500 feet as an oil test then pulled to 800 feet. It has a flow of about 50 gallons a minute but is unused. Thirteen of the wells are less than 250 feet in depth, and 9 range from 275 to 538 feet in depth. Well 213, 628 feet in depth, was not completed when it was visited in May 1945. Wells 223 and 224, respectively 349 and 568 feet in depth, formerly supplied water for oil-drilling rigs. These two wells are in Chambers County, a short distance south of the Liberty County boundary. The remaining wells are used for domestic purposes and stock. Logs of nine water wells and two oil tests are given in table 7.

Analyses of samples from seven wells in the Moss Bluff-Raywood areas, ranging in depth from 137 to 528 feet, showed an average of 750 parts per million in total dissolved solids, 300 in chloride, and 144 in hardness. Five wells less than 100 feet in depth yield water having a rather wide range in mineral character.

Well 166, 365 feet in depth, owned by the Hull-Daisetta Water Co., furnishes the public supply for Daisetta. This well is equipped with a centrifugal pump and a 5-horsepower electric motor, and the average pumpage is estimated to have been 50,000 gallons a day in 1944. Well 173, 255 feet in depth, supplies water for an oil lease. Well 168, 3 miles west of Daisetta, was drilled to a depth of 703 feet in 1917 and is reported to have furnished enough water by pumping to irrigate about 500 acres of rice in 1918. The well is no longer in use.

Wells 166 and 173 yield water of relatively low mineral content, 288 and 358 parts per million total dissolved solids, respectively. Well 175, 161 feet in depth, yields water containing 631 parts per million of total dissolved solids and 246 parts per million of chloride.

SOUTHEASTERN PART OF THE COUNTY, DEVERS AREA

Water for the irrigation of rice in the area is supplied from the Trinity River. Of the 22 wells recorded in this area, 12 are less than 250 feet in depth, and 10 range from 318 to 501 feet. Wells 227 and 237, respectively 406 and 492 feet in depth, formerly furnished water for the operation of oil pipe-line pump stations, but are now used for domestic supplies. Wells 232, 245, 246, 247, and 248, respectively 232, 224, 344, 335, and 318 feet in depth, formerly supplied water for

drilling oil tests but are now unused. The remaining wells are used for domestic purposes and stock.

Analyses of samples from 18 wells in the Devers area show a rather wide range in the chemical character of the water. The range in total solids, chloride, and hardness is indicated in table 3.

TABLE 3.—*Chemical content of ground water in Devers area*
[Parts per million]

Number of wells	Depth (feet)	Total dissolved solids		Chloride		Hardness	
		Range	Average	Range	Average	Range	Average
11	92-234	274-804	504	55-300	127	110-350	203
7	400-501	420-832	644	68-344	209	55-104	69

ESTIMATED WITHDRAWAL OF GROUND WATER

The withdrawal of ground water for irrigation and for municipal and industrial purposes in Liberty County is estimated to have averaged about 7,500,000 gallons a day in 1944. Distribution for these uses is shown in table 4.

TABLE 4.—*Estimated average daily withdrawal of ground water in Liberty County in 1944*

	Gallons per day
Irrigation.....	6,780,000
Industrial use:	
Railroads.....	390,000
Sawmills.....	5,000
Total.....	395,000
Municipal use:	
Liberty.....	115,000
Cleveland.....	95,000
Dayton.....	65,000
Daisette.....	50,000
Total.....	325,000
Grand total.....	7,500,000

In computing the amount pumped for the irrigation of rice, it was estimated that 4,000 acres was irrigated and that an average of 1.9 acre-feet of water was applied to each acre of land. In order to compare the volumes of water used for each purpose the rice pumpage is expressed as a daily average, although the water is used only during the summer.

TEMPERATURE OF GROUND WATER

The temperature of ground water has become increasingly important in the last few years because of the large quantities of water used for

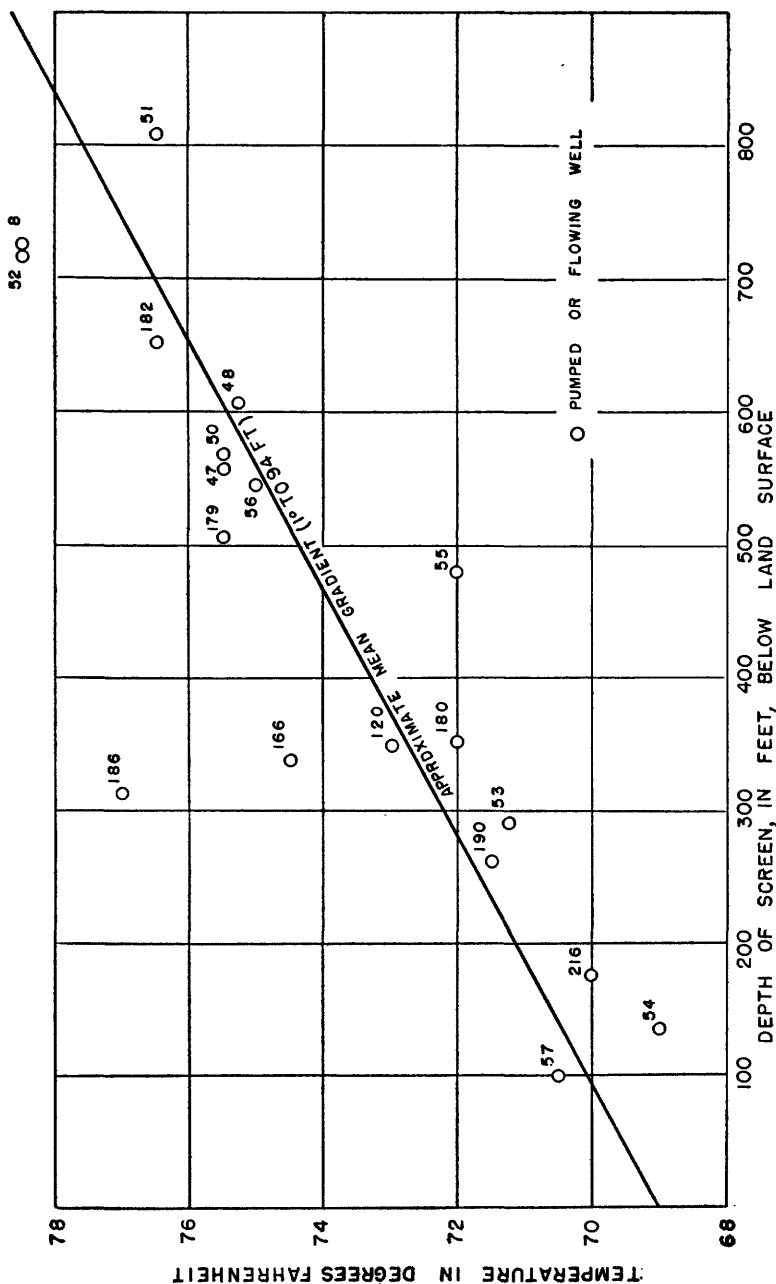


FIGURE 4.—Relation of temperature of water to depth of screen in 19 pumped or flowing wells in Liberty County, Tex.

cooling and air conditioning. The relation of the temperature of the water to the depth of the screens in 19 flowing or pumped wells in Liberty County is shown graphically in figure 4. Most of these wells have only one section of screen, and the middle of the screen section was considered to be the point of entry of the water into the well. Measurements were made with a mercury thermometer, and in pumped wells no measurements were made until the pump had been in operation for at least half an hour. The temperature for wells of about the same depth varies somewhat, and the heavy line in the graph represents the approximate average. Based on this median line, the average rate of increase in temperature is 1° F. to each 94 feet of increase in depth.

SURFACE WATER SUPPLY

STREAM RUNOFF

By S. D. BREEDING¹

The principal stream in Liberty County is the Trinity River, which traverses the county from north to south near the center and with its tributaries drains about half the county. The eastern part of the county is drained by the West Fork of Pine Island Bayou, a tributary of the Neches River, and the northwestern part is drained by East Fork San Jacinto River and its tributary, Luce Bayou. The extreme southwestern and southeastern parts of the county are drained by small coastal streams.

Records of daily flow have been obtained for the Trinity River at a gaging station at Romayor, near the northern boundary of the county, since May 1924, and for the East Fork San Jacinto River at a station near Cleveland since April 1939. In addition, records of the daily flow of the Trinity River at Liberty have been obtained since 1940, when the flow amounted to 4,000 cubic feet or more per second. When the flow at that point has been below 4,000 cubic feet per second the records have not been prepared because of tidal effect. These records were collected by the Geological Survey in co-operation with the Texas Board of Water Engineers and have been published in Geological Survey water-supply papers.

Records of rainfall collected at Liberty, in south-central Liberty County, by the United States Weather Bureau from October 1903 to 1944, with the exception of January 1933, are given in table 2. These records show the average annual rainfall for the 40 complete years of record through 1944 to be 51.05 inches. For the 41 years included, the annual rainfall varied from a minimum of 29.82 inches in 1917 to a maximum of 85.08 inches in 1919. However, the minimum rainfall for

¹ Surface water branch, U. S. Geological Survey.

12 consecutive months occurred June 1924 to May 1925 and amounted to 21.82 inches. Annual rainfall of less than 40 inches occurred in only 6 of the 40 complete years of record, namely, 1904, 1909, 1916, 1917, 1924, and 1936.

Table 5 gives runoff at gaging stations on the Trinity River and East Fork San Jacinto River.

TABLE 5. *Runoff, in acre-feet,¹ of streams in Liberty County, Tex.*

Trinity River at Romayor, Tex., 1925-44

[Drainage area, 17,190 square miles]

Calendar year	Daily runoff			Monthly runoff		Annual runoff
	Maximum	Minimum	Average	Maximum	Minimum	
1925.....	90,400	262	5,670	1,030,000	9,850	2,070,000
1926.....	92,400	823	17,700	1,380,000	107,000	6,440,000
1927.....	80,500	774	15,600	1,190,000	29,700	5,670,000
1928.....			8,830	582,000	16,000	3,230,000
1929.....	132,000	793	18,900	2,240,000	30,400	6,880,000
1930.....	114,000	486	15,500	1,420,000	20,800	5,650,000
1931.....	48,800		9,560	728,000	23,900	3,490,000
1932.....	101,000	1,040	21,800	2,090,000	35,200	7,980,000
1933.....	61,300	803	10,300	972,000	34,200	3,750,000
1934.....	87,470	357	10,350	1,290,000	15,200	3,779,000
1935.....	122,200	1,500	23,740	2,823,000	100,200	8,667,000
1936.....	49,590	585	8,315	677,200	21,240	3,044,000
1937.....	42,840	486	8,188	845,600	26,100	2,989,000
1938.....	81,920	700	17,470	1,750,000	28,720	6,376,000
1939.....	60,300	417	6,379	419,700	14,650	2,328,000
1940.....	120,600	793	17,760	2,658,000	25,990	6,500,000
1941.....	103,900	2,182	28,320	1,751,000	158,600	10,340,000
1942.....	218,200	1,468	25,210	3,732,000	177,200	9,206,000
1943.....	44,630	781	10,560	847,100	47,240	3,854,000
1944.....	136,900	900	22,230	3,009,000	44,640	8,141,000

East Fork San Jacinto River near Cleveland, Tex., 1940-44

[Drainage area, 336 square miles]

Calendar year	Maximum	Minimum	Average	Maximum	Minimum	Annual runoff
1940.....	85,690	15	954	184,500	669	349,100
1941.....	26,980	50	940	64,310	2,210	343,400
1942.....	12,460	54	555	52,040	2,460	202,900
1943.....	4,920	34	254	34,930	1,260	92,510
1944.....	13,190	24	444	33,980	998	162,600

¹ An acre-foot is the quantity of water required to cover 1 acre to a depth of 1 foot and amounts to about 325,000 gallons.

No continuous records of the flow of any of the small streams in Liberty County have been obtained; however, sufficient periodic measurements have been made on Luce Bayou at a point near its mouth to show that during periods of drought its flow is very small or may cease altogether.

The data indicate that abundant supplies of surface water are available from the Trinity River and other streams within the county, but storage will have to be provided if large continuous supplies of water are to be obtained.

QUALITY OF WATER OF TRINITY RIVER IN LIBERTY COUNTY

Analyses of water from the Trinity River near Romayor are available in a report issued by the Texas Board of Water Engineers.⁸ Specific conductance determinations and analyses for chloride content, with occasional partial analyses of composite samples, have been made on daily samples collected from the Trinity River near Romayor from October 1941 to September 1942 and from January to September 1944.

The water during these periods was generally of good chemical quality. The analyses show that the dissolved solids exceeded 500 parts per million only on 11 days during the 21 months of study. The dissolved solids were less than 250 parts per million more than a fourth of that time. The hardness of the Trinity water was greater than 100 parts per million at most times.

⁸ Hastings, W. W., and Rowley, J. H., Chemical composition of Texas surface waters, 1938-1944: Texas State Board of Water Engineers, p. 37, 1945. [Mimeographed.]

WELL RECORDS

TABLE 6.—Records of wells and springs in Liberty County, Tex.

[All wells are drilled unless otherwise indicated. Chemical analyses of water from most of these wells and springs are given in table 8.]

Well No.	Location	Owner	Driller	Date completed	Depth of well (feet)	Diameter of well (inches)	Hgt. of measuring point above ground (feet)	Water level		Method of lift	Use of water	Remarks
								Below measuring point (feet)	Date of measurement			
1	In Cleveland	Gulf Colorado & Santa Fe Ry. Co.	R. C. Davant	1916	1,360	8, 6, 4	0	+44	December 1936	Flows	N	Screeners: 690 to 710, 763 to 784, 912 to 932, 1,180 to 1,203, 1,258 to 1,298 feet. Reported flow December 1916, 300 gallons a minute. Replaced by No. 2 in October 1937.
2	do	do		1937	1,512	13, 8½, 6, 4	0	+30	October 1937	T, E, 5	RR	Screened in 5 sands between 1,181 and 1,478 feet. Reported flow October 1937, 30 gallons a minute. Supplies locomotive boilers. See log.
3	do	Gulf States Utilities Co.	A. J. Lesterjette	1905	336	4, 3	0	32	1930		N	Screen from 354 to 386 feet. Well sealed in 1938. Formerly used for municipal water supply. Oil test. See log.
4	7¼ miles S. of Cleveland	Jordan Campbell	Humble Oil & Refining Co.	1928	2,000							Do.
5	2 miles SW. of Cleveland	— Hornbeck	do	1931	5,633							Screen from 105 to 125 feet. Formerly supplied water for drilling oil test (Hornbeck No. 1).
6	do	Humble Oil & Refining Co.	F. Gay	1931	125	4						City No. 1. Screened in 3 sands between 618 and 883 feet. Reported yield 378 gallons a minute on June 17, 1938.
7	In Cleveland	City of Cleveland	Layne-Texas Co.	1938	845	13¾, 7	0	14.70	Jan. 26 1945	T, E, 15	P	City No. 2. Screened in 3 sands between 614 and 883 feet. Reported yield 353 gallons a minute on June 17, 1938. Temperature 78½° F. See log.
8	do	do	do	1938	929	13¾, 7	0	16.90	do	T, E, 15	P	

GROUND-WATER RESOURCES OF LIBERTY COUNTY, TEX.

9	5½ miles SE. of Cleveland.	Black Gold Petroleum Co.	dq.	1934	956					N	Supplied water for drilling rig. See log.
10	3¼ miles SE. of Cleveland.	Russ Mitchell Co.	Pitre Water Drilling Co.	1936	304	4	1.6	7.75	June 8, 1945.	N	Owner's No. 1. Supplied water for construction of concrete highway. See log.
11	In Cleveland.	Grimes Veneer & Panel Co.		1937	90	6	0	+24	Jan. 26, 1945.	Ind	Supplies boilers at lumber mill.
12	do.	Cleveland Veneer Co.		1938	300	4	0	+30	do.	Ind	Screen at 277 to 300 feet. Supplies boilers at lumber mill.
13	do.	Cleveland Mfg. Co.		1935	200	6	0	28.40	do.	Ind	Supplies boilers at lumber mill.
14	4 miles SW. of Cleveland.	Grogan Mfg. Co.		1910	187	4	0	+7	February 1945.	D	Estimated flow 10 gallons a minute on Apr. 6, 1945. Formerly supplied water for boilers at sawmill. Hydrant from pumps used to fan for domestic use of 6 families.
15	4½ miles SW. of Cleveland.	Clarkson and Meachim	Ford and Thompson	1920	327	8				D	Screen at 287 to 327 feet. Estimated flow 10 gal. per minute on Apr. 6, 1945. Formerly supplied gravel pit.
16	4½ miles SE. of Cleveland.	Gulf Oil Corp.		1940	100	4	0	+20	1940.	Ind	Screen at 94 to 100 feet. Supplies water for boilers at pump station.
17	In Cleveland.	Magnolia Pipe Line Co.		1915	175	6				Ind	Supplies water for pipeline pump station.
18	4 miles SW. of Cleveland.	W. E. Henry	E. L. Chambers	1944	18	1½	0	+10	Apr. 5, 1945.	D	Screen at 15 to 18 feet.
19	4 miles SE. of Cleveland.	Shell Oil Co.	L. Patterson	1944	179	4	0	+20	Oct. 5, 1944	N	Screen at 129 to 152 feet. Formerly supplied water for drilling oil test (Grogan No. 1).
20	5½ miles NE. of Cleveland.	M. A. Ellis	Layne-Texas Co.	1943	226	18, 12¾	0	+32	June 16, 1943.	Irr	Casing slotted opposite 3 and 225 feet. Reported yield 900 gallons a minute. Irrigated 250 acres of rice in 1944. See log.
21	6¼ miles NE. of Cleveland.	B. E. Quinn estate		Old	1,200	8	0	+5	Dec. 29, 1936.	N	Drilled to 1,800 feet as an oil test, casing then pulled to 1,200 feet and completed as a water well. Well was destroyed in 1939.
22	6 miles N.E. of Cleveland.	M. A. Ellis		1912	36	30	0	+28	Mar. 29, 1945.	D	Tile casing.

See footnotes at end of table.

TABLE 6.—Records of wells and springs in Liberty County, Tex.—Continued

Well No.	Location	Owner	Driller	Date completed	Depth of well (feet)	Diameter of well (inches)	Height of measuring point above ground (feet)	Water level		Method of lift	Use of water	Remarks
								Below measuring point (feet)	Date of measurement			
23	7¼ miles NE. of Cleveland.	W. P. Johnston.	Pitre Water Well Drilling Co.	1945	440	4	0.5	61.50	Apr. 17, 1945.	J, G, 1	D, S	Screen at 415 to 430 feet. See log.
24	7¼ miles NE. of Cleveland.	J. W. Whatley.	Jim Gibson.	1943	52	8	2.6	34.50	Apr. 5, 1945.	B, H	D	Concrete casing.
25	do	I. H. Ellington.	Otto Adams	1940	110	3	0	4.22	do.	C, G, 1	D, S	Screen at 98 to 110 feet.
26	7¼ miles E. of Cleveland.	Ida Smith.	Old	Old	45	12	0	32.25	Apr. 17, 1945.	B, H	D	Wooden casing 12 by 12 inches.
27	6¼ miles SE. of Cleveland.	Russ Mitchell Co.	Pitre Water Well Drilling Co.	1936	284	4		4.18				Owner's No. 2. Supplied water for construction of concrete highway. See log.
28	10¼ miles SE. of Cleveland.	do.	do.	1936	204	4	2.0	41.45	Jan. 25, 1945.	C, G	S	Owner's No. 3. Formerly supplied water for construction of concrete highway. See log.
29	9¼ miles SE. of Cleveland.	M. N. Cunningham	do.	1943	368	4	1.0	50.90	do.	J, E, ¼	D, S	Screen at 322 to 343 feet. See log.
30	7¼ miles SE. of Cleveland.	W. C. Crawley.		1939	35	8	1.0	24.95	do.	B, H	D	Supplies water for dairy. See log.
31	do	Tarkington school		1933	500	4, 2¼	0	4.50	do.	C, E, ¼	P	Concrete casing. Originally drilled to 325 feet and later deepened to 500 feet. Supplies Tarkington School.
32	9¼ miles SE. of Cleveland.	L. O. Ward.	A. E. Fawcett, Sr.	1944	247	3	1.0	45.95	do.	J, E, ¼	D, S	Screen at 210 to 222 feet.
33	13¼ miles SE. of Cleveland.	Charles Morris.	do.	1944	222	3				C, G	D, S	Screen at 57 to 60 feet.
34	13¼ miles SE. of Cleveland.	C. D. Jones.	C. D. Jones	1942	60	2				C, H	D, S	Screen at 96 to 103 feet. Supplies water for dairy.
35	10½ miles SE. of Cleveland.	J. E. Wigley.	A. E. Fawcett, Sr.	1944	103	4	0	4.14	March 1944	J, E, ¼	D, S	Screen at 90 to 100 feet.
36	5½ miles SE. of Cleveland.	R. E. Wortham.	— Adams	1936	100	2	0	4.15	Jan. 26, 1945.	A, G, 1	D	Concrete casing.
37	do	do.	Lee Angel	1936	39	8	2.6	12.54	do.	B, H	D	Screen at 85 to 95 feet.
38	8½ miles E. of Cleveland.	H. E. Kirk.	— Bland	1944	95	4	.8	42.30	Apr. 17, 1945.	J, E, ¼	D, S	Supplies water for dairy.

TABLE 6.—Records of wells and springs in Liberty County, Tex.—Continued

Well No.	Location	Owner	Driller	Date completed	Depth of well (feet)	Diameter of well (inches)	Height of measuring point above ground (feet)	Water level		Method of lift	Use of water	Remarks
								Below measuring point (feet) ¹	Date of measurement			
50	In Romayor	Gulf, Colorado & Santa Fe Ry. Co.	Homer Wright	1943	645	8, 6	0	+37	Jan. 5, 1945	Flows	RR	Screen from 536 to 600 feet. Measured flow 20 gallons a minute on Jan. 4, 1945. Supplies water for boiler in power house. Water flows from well and is lifted to elevated tank by a centrifugal pump driven by a 2-horsepower electric motor. Temperature 75½° F. See log.
51	¾ mile SE. of Romayor.	Texas Construction Material Co.	—Jackson	1917	808	8	0	+15	Nov. 23, 1944	Flows	Ind	Measured flow 170 gallons a minute on Nov. 23, 1944. Supplies water for gravel pit. Temperature 76¼° F.
52	4¼ miles SE. of Romayor.	do	do	1937	808	6, 4				Flows	N	Measured flow 173 gallons a minute on Jan. 4, 1945. Screens in 2 sands between 706 and 808 feet. Formerly supplied water for gravel pit. Temperature 78½° F. See log.
53	do	do	do	1937	310	6	0	+20	Jan. 5, 1945	Flows	N	Measured flow 25 gallons a minute on Jan. 5, 1945. Screen from 270 to 310 feet. Formerly supplied water for gravel pit. Temperature 71¼° F.
54	4 miles SW. of Romayor.	do		1937	135	4	0	+18	Jan. 9, 1945	Flows	Ind	Measured flow 60 gallons a minute on Jan. 9, 1945. Supplies water for gravel pit. Temperature 69° F.
55	6¾ miles S. of Romayor.	South Texas Hardwood Co.	A. E. Fawcett	1933	490	6	0	+12	do	Flows	Ind	Measured flow 28 gallons a minute on Jan. 9, 1945. Supplies water for boilers at sawmill. Temperature 72° F.

56	2 miles W. of Romayor.	Liberty Lumber Co.	W. J. Giles.	1907	608	8, 6.	0	+55	1908	Flows	N	Measured flow 165 gallons a minute on Jan. 10, 1946. Formerly supplied water for boilers at sawmill. Deussen No. 762. ³ Temperature 75° F. Estimated flow 3 gallons a minute, Nov. 23, 1944. Supplies Dolen School. Drilled for seismograph test hole. Temperature 70½° F.
57	4¼ miles SW. of Romayor.	Dolen school		1940	100+	4				Flows	P	
58	1 mile W. of Romayor.	W. D. Dunn		1939	233	4	1.7	4.30	Jan. 10, 1945	C, G, ¼	D, S	
59	2¾ miles W. of Romayor.	A. M. Smith		1924	23	1½	0	4.14	Apr. 4, 1945	C, H	D	Screen at 20 to 23 feet.
60	4 miles W. of Romayor.	C. Die	Jim Gibson	1911	56	8	1.0	48.85	do	B, H	D	Concrete casing.
61	3¾ miles W. of Romayor.	do	J. W. Smith	1911	140	4	1.0	50.50	do	C, E, ¾	D, S	Screen at 130 to 140 feet.
62	4½ miles W. of Romayor.	S. J. Keith		1940	86	2	2.3	9.35	do	C, H	D, S	
63	3¼ miles SW. of Romayor.	Pearl Kirkham	Reuter	1943	22	2	0	4.9	do	C, E, 2.	D	Screen at 18 to 22 feet.
64	4¾ miles SW. of Romayor.				Spring					Flows	N	Estimated flow 5 gallons a minute, Apr. 4, 1945. Temperature 69° F. Screen at 80 to 85 feet.
65	6 miles SW. of Romayor.	J. W. Phillips		1940	85	3	0	4.37	June 1940	C, G, 1.	D	Concrete casing.
66	do	J. C. Carter	Jim Gibson	1943	45	8	1.0	33.67	Apr. 5, 1940	B, H	D	
67	5½ miles SW. of Romayor.	Henderson Landers		1940	30	2	0	4.20	Apr. 6, 1945	C, H	D	
68	4¾ miles SW. of Romayor.	J. H. Halton	Jim Gibson	1940	62	2	0	4.52	do	C, E, ¾	D, S	Screen at 58 to 62 feet.
69	4½ miles E. of Romayor.	Concord school	Pitre Water Well Drilling Co.	1943	104	4	0	4.21	Jan. 25, 1943	C, E, ¾	P	Screen at 87 to 97 feet. Supplies Concord School. See log.
70	4¾ miles E. of Romayor.	Boyd Sewell	do	1940	135	2	0	4.70	December 1940		N	Screen at 116 to 126 feet. Abandoned. Algae in well. See log.
71	4½ miles E. of Romayor.	John Griffin	Chas. Carlson		165	4	.6	42.10	Jan. 11, 1945	C, H	D	Screen at 81 to 87 feet.
72	do	Hollis Griffin			90	2	0	4.40	1940	J, E, ½	D	Estimated flow 10 gallons a minute, Jan. 24, 1946.
73	4 miles E. of Romayor.	Mrs. W. M. Emanuel	Chas. Carlson	1929	87	4, 2	0	4.47	Jan. 23, 1945	C, E, 1.	D	Deussen No. 758. ³ Known as Concord Spring. Temperature 69° F.
74	4½ miles SE. of Romayor.				Spring					Flows	N	

See footnotes at end of table.

TABLE 6.—Records of wells and springs in Liberty County, Tex.—Continued

Well No.	Location	Owner	Driller	Date completed	Depth of well (feet)	Diameter of well (inches)	Height of measuring point above ground (feet)	Water level		Method of lift	Use of water	Remarks
								Below measuring point (feet)	Date of measurement			
75	4 miles NW. of Dayton.	Chas. B. Peterson		Old	3,407							Owner's No. 2. Oil test. See log.
76	7 $\frac{1}{4}$ miles NW. of Dayton.	J. W. Anslan	A. E. Fawcett, Sr.	1943	750	20, 12		4 50	1943	T, D, 165.	Irr	Irrigated 350 acres of rice in 1944. Temperature 73° F. slotted opposite
77	6 $\frac{1}{2}$ miles NW. of Dayton.	W. A. Conner	Layne-Texas Co.	1944	742	20, 12	2.0	50.30	Apr. 19, 1945.	T, D, 150.	Irr	Casing slotted opposite sands below 150 feet. Reported yield 2,500 gallons a minute. Irrigated 400 acres of rice in 1944.
78	6 miles NW. of Dayton.	A. J. and S. O. Carter	do	1943	569	18 $\frac{3}{4}$, 14	0	4 60	September 1943	T, D, 150.	Irr	Casing slotted opposite sands below 380 feet. Reported yield 1,700 gallons a minute. See log.
79	do	D. A. Reidland	do	1943	740	16, 10	1.0	38.40	Apr. 19, 1945.	T, D, 120.	Irr	Owner's No. 1 Casing slotted opposite sands below 113 feet. Reported yield 2,000 gallons a minute. Irrigated 400 acres of rice in 1944.
80	6 $\frac{1}{2}$ miles NW. of Dayton.	do	do	1943	550							Test well.
81	7 miles NW. of Dayton.	do	do	1944	1,000	20, 8	2.0	40.55	Apr. 19, 1945	T, D, 160.	Irr	Casing slotted opposite sands below 120 feet. Reported yield 2,500 gallons a minute. Irrigated 500 acres of rice in 1944. Temperature 76 $\frac{1}{2}$ ° F.
82	5 $\frac{1}{2}$ miles NW. of Dayton.	Ralph Graves	do	1943	558	18, 10 $\frac{1}{2}$	0	4 41	May 24, 1943.	T, D, 120.	Irr	Casing slotted opposite sands below 140 feet. Reported yield 1,170 gallons a minute. Irrigated 350 acres of rice in 1944. See log.
83	do	do	do	1943	139	21 $\frac{1}{2}$						Screen 169 to 189 feet. Drilled to 558 feet as a test well.

84	5 miles NW. of Dayton.	Arnold Wolfe	do.	1943	834	20.16	0	45	August 1943	T, D, 120	Irr	Reported yield 2,000 gallons a minute. Irrigated 500 acres of rice in 1944. Temperature 78° F. See log.
85	7¾ miles W. of Dayton.	E. J. Stoesser	do.	1944	806	24.12	0	57	March 1944	T, D, 125	Irr	Casing slotted opposite sands below 133 feet. Reported yield 3,000 gallons a minute. Irrigated 300 acres of rice in 1944. Temperature 75° F. See log.
86	4¾ miles W. of Dayton.	W. F. Graves	A. E. Fawcett, Sr.	1944	1,005	20.12	40	60	do.	T, D, 100	Irr	Casing slotted opposite sands below 240 feet. Reported yield 3,000 gallons a minute. Irrigated 300 acres of rice in 1944 and 400 acres in 1945. Temperature 77° F.
87	4½ miles W. of Dayton.	do.		Old	2,800	6				Flows	Irr	Estimated flow 30 gallons a minute on April 18, 1945. Used with well 86 to irrigate rice. Temperature 102° F.
88	4 miles W. of Dayton.	Leo Moreau	A. E. Fawcett, Sr.	1944	870	20.12	1.5	54.32	Apr. 18, 1945	T, D, 100	Irr	Casing perforated opposite sands below 240 feet. Reported yield 3,500 gallons a minute. Irrigated 425 acres of rice in 1944. Temperature 76° F.
89	5 miles W. of Dayton.	A. C. Holbrook	do.	1944	780	20.12	0	60	February 1944	T, D, 100	Irr	Casing perforated opposite sands below 240 feet. Reported yield 3,000 gallons a minute. Irrigated 400 acres of rice in 1944. Temperature 74° F.
90	4½ miles W. of Dayton.	Peterson and Sterling	Layne-Texas Co.	1920	592						N	Screens opposite 3 sands between 340 and 592 feet. Formerly used for rice irrigation. See log.
91	do	Chas. B. Peterson	Petre Water Well Drilling Co.	1941	1,916			46	June 1941		N	Oil test. See log.
92	7 miles W. of Dayton.	Patrick-Tyrell Drilling Co.			255	4	0				N	Screen at 243 to 253 feet. Formerly supplied water for drilling rig. See log.
93	do	Henry Bode	Rudolph Okracha	1942	276	3.2	1.0	47.00	Apr. 18, 1945	C, W	D, S	Screen at 376 to 384 feet. Supplies water for pipeline pump station.
94	3½ miles W. of Dayton.	Sun Pipe Line Co.		1923	384	6	4	55	Jan. 27, 1945	C, E, 2	Ind	No screen.
95	do	B. T. Sturrock	B. T. Sturrock	1936	19	2½	0	40	do	C, H	S	Screen at 155 to 165 feet. Formerly supplied water for Myrtle Ridge school.
96	8 miles NW. of Dayton.	Myrtle Ridge school	F. Gay	1928	165	4.2	.8	37.90	Apr. 18, 1945		N	School house abandoned.

See footnotes at end of table.

TABLE 6.—Records of wells and springs in Liberty County, Tex.—Continued

Well No.	Location	Owner	Driller	Date completed	Depth of well (feet)	Diameter of well (inches)	Height of measuring point above ground (feet)	Water level		Method of lift	Use of water	Remarks
								Below measuring point (feet)	Date of measurement			
97	7½ miles W. of Dayton.	Joe Sobotik.	J. N. Nadmtil.	1927	20	4	0	4 12	Apr. 18, 1945.	C, G, 1½	D	No screen.
98	7½ miles W. of Dayton.	Magnolia Pipe Line Co.		1927	540	4	0	4 30	do.	A, G	Ind	Supplies water for pipe-line pump station.
99	6¼ miles W. of Dayton.	Wolf Island school.	F. Gay	1928	360	4					N	Screen at 350 to 380 feet. Formerly supplied water for Wolf Island school. School house abandoned.
100	8¼ miles NW. of Dayton.	R. F. Janik	R. F. Janik	1913	32	8	0	4 15	Apr. 19, 1945.	C, H	D, S	No screen.
101	5¼ miles NW. of Dayton.	Roy Seaburgh	Layne-Texas C. o.	1945	1,030	16, 12	0	4 47	March 1945.	T, D, 180	Irr	Reported yield 3,000 gallons a minute. Temperature 80° F.
102	7¼ miles NW. of Dayton.	do.	F. Gay	1945	209	4	0	47.00	June 9, 1945.	C, H	D	Screen at 199 to 209 feet.
103	7 miles W. of Dayton.	C. Newman	C. A. Brown	Old	400	10, 7	0	4 17	1908		N	Formerly used for rice irrigation. Deussen No. 740.
104	6½ miles NW. of Dayton.	Sun Oil Co.	Sun Oil Co.	1905	775							Reported in 1908 as producing oil at 775 feet. Deussen No. 752.
105	6¼ miles NW. of Dayton.	do.	do.	1905	1,763							Owner's No. 1. Oil test. Deussen No. 753. See log.
106	7¼ miles NW. of Dayton.	Taylor-Dayton Co.		Old	1,200					C, H	D, S	Oil test. Deussen No. 755. See log.
107	6¼ miles SW. of Dayton.	R. Freeman			175	2						Formerly used for rice irrigation.
108	5¼ miles SW. of Dayton.	C. M. Rogers		Old	650	4	0	13.02	Oct. 10, 1931	None	N	Screens set in 2 sands between 248 and 395 feet. Formerly used for rice irrigation. See log.
109	5 miles SW. of Dayton.	Heal and Brown	Layne Bowler Co.	Old	407	9¼, 8					N	Formerly used for rice irrigation. Deussen No. 743.
110	do.	do.		Old	487	8	0	4 10	1903			Screen at 380 to 400 feet.
111	6½ miles SW. of Dayton.	J. M. Hlavaty	F. Gay	1940	400	4½	0	4 33	August 1944.	Ng	D	

TABLE 6.—Records of wells and springs in Liberty County, Tex.—Continued

Well No.	Location	Owner	Driller	Date completed	Depth of well (feet)	Diameter of well (inches)	Hght. of measuring point above ground (feet)	Water level		Method of lift	Use of water	Remarks
								Below measuring point (feet)	Date of measurement			
128	2 miles E. of Dayton.	Ed Pruitt	J. A. Conklin	1904	1,014	8	0	4 50	1904	Flows	S	Drilled as oil test, developed as water well. Deussen No. 757.
129	7¼ miles S. of Dayton.	Moores Bluff Canal Co.	F. Gay	1935	110	4				C, W		
130	3¼ miles S. of Dayton.	J. B. Sterling	do.	1941	108	4, 2	0	4 10	1941	C, W	S	Screen at 98 to 108 feet.
131	2¾ miles S. of Dayton.	F. Gay	do.	1941	376	4½	0	4 40	1941	C, W	S	Screen at 356 to 376 feet.
132	2½ miles N. of Dayton.	E. R. Gordon			180	4					D	
133	3 miles E. of Dayton.	Texas Pipe Line Co.		1918	350	6	0	7 95	June 15, 1945	C, H	D	Formerly supplied water for pipe-line pump station. Flow reported 50 gallons a minute in 1919; ceased flowing in 1940.
134	3¼ miles SE. of Dayton.	Noble and Baker	F. Gay	1941	404	4	0	4 50	1941		N	Screen at 384 to 404 feet. Formerly supplied water for drilling rig.
135	4¾ miles SE. of Dayton.	Gulf Pipe Line Co.	Blair	1918	428	6				C, W	D, S	Formerly supplied water for pipe-line pump station.
136	5¼ miles SE. of Dayton.	Loftis Bros.	F. Gay	1942	190	4½			1942	Flows	N	Screen at 170 to 190 feet. Formerly supplied water for drilling rig. Flowed when drilled. Now abandoned and plugged.
137	6¼ miles SE. of Dayton.	Joe Dureo	do.	1934	120	4	0	4 20	1934	C, W	D, S	Screen at 330 to 350 feet. Supplies water for pump station.
138	6½ miles SE. of Dayton.	Dayton Canal Co.	do.		350	4, 2	0	4 35			Ind	Do.
139	do.	do.	do.		350	4, 2	3	4 35			Ind	Screen at 204 to 225 feet.
140	6¼ miles N. of Dayton.	Suderman-Dolsen Co.	Layne-Bowler Co.	1906	225	4						See log. No. 4. Well sealed. Supplied water for construction of concrete highway. See log.
141	3¼ miles N. of Dayton.	Russ Mitchell Co.	Pitre Water Well Drilling Co.	1936	413	3	0	4 50	1936		N	

142	4½ miles N. of Dayton.	A. H. Cass.	Ed Paul.	1933	45	4	0	4 15	April 1933.	C, W	D, S	No screen.
143	5½ miles NE. of Dayton.	V. L. Moore.	F. Gay.	1934	116	4	0	4 30	1934.	C, H	D, S	No screen. Formerly supplied Moore School.
144	5 miles NE. of Dayton.	L. L. Batchelor.		1940	26	36	0	4 20	June 15, 1934.	J, E, ¼	D	Dug well.
145	7½ miles N. of Dayton.	Mrs. S. B. Branton.	F. Gay.	1937	301	4	0	4 28	1937.	C, H	D, S	No screen.
146	13 miles N. of Liberty.	L. E. Wiggins.	Pitre Water Well Drilling Co.	1942	116	2		4 40	Oct. 25, 1942.	J, E, ½	D	Screen at 90 to 95 feet. See log.
147	16½ miles N. of Liberty.	Sun Oil Co.	A. E. Fawcett, Sr.	1938	236	6, 4					N	Screen at 263 to 286 feet. Formerly supplied water for drilling log.
148	13¼ miles N. of Liberty.	J. E. Dillon.	Pitre Water Well Drilling Co.	1945	213	2	0	4 40	May 1945.	J, E, ¼	D	Screen at 200 to 206 feet.
149	12¾ miles N. of Liberty.	John Morgan.	do.	1945	192	4	0	4 40	do.	J, E, ¼	D	Screen at 163 to 173 feet.
150	do.	Luther McDaniel.	do.	1945	183	2	0	4 40	April 1945.	J, E, ¼	D	Screen at 177 to 182 feet.
151	10¾ miles N. of Liberty.	L. Daifern.	do.	1945	125	4	0	4 40	do.	J, E, ¼	D	Screen at 108 to 120 feet.
152	7¾ miles N. of Liberty.	Morgan & Morgan Lumber Co.	do.	1937	228	4	2.6	37.50	June 7, 1945.		N	Formerly supplied boiler at sawmill. See log.
153	do.	Hardin Baptist Church.	do.	1943	99	4, 2	0	4 28	June 1943.	C, E, ¾	P	Supplies water to Hardin Baptist Church. Screen at 61 to 66 feet. See log.
154	7 miles N. of Liberty.	John Rosnick.	do.	1944	110	4	0	4 25.5	Mar. 21, 1944.	Cf. G, ½	D	Screen at 71 to 82 feet. See log.
155	8½ miles N. of Liberty.	Humble Oil & Refining Co.	do.	1938	230	4	0	4 12	Dec. 14, 1938.		N	Screen at 183 to 211 feet. Formerly supplied water for drilling oil test (Part. low No. 10). Casing pulled and well abandoned in 1939. See log.
156	do.	do.	do.	1940	227	4	0	4 15	July 1940.		N	Formerly supplied water for drilling oil test (Part. low No. 17). Casing pulled and well abandoned in 1940. See log.
157	9 miles N. of Liberty.	do.	do.	1938	200	4	0	4 15	July 1938.		N	Formerly supplied water for drilling oil test (John-son No. 1). Casing pulled and well abandoned in 1938. See log.
158	7¼ miles N. of Liberty.	James R. Nowery Drilling Co.	do.	1941	254	4	0	4 15	June 1941.		N	Formerly supplied water for drilling oil test. Casing pulled and well abandoned in 1941. See log.

See footnotes at end of table.

TABLE 6.—Records of wells and springs in Liberty County, Tex.—Continued

Well No.	Location	Owner	Driller	Date completed	Depth of well (feet)	Diameter of well (inches)	Height of measuring point above ground (feet)	Water level		Method of lift	Use of water	Remarks
								Below measuring point (feet)	Date of measurement			
159	8 $\frac{1}{4}$ miles N. of Liberty.	Humble Oil & Refining Co.	Pitre Water Well Drilling Co.	1938	218	6, 4	0	4.15	November 1938	-----	N	Screen at 185 to 212 feet. Formerly supplied water for drilling oil test (Part-low A No. 8). Casing pulled and well abandoned in 1939. See log.
160	8 $\frac{1}{4}$ miles N. of Liberty.	do	do	1938	226	6	0	4.15	August 1938	T, E, 3	D	Screen at 191 to 213 feet. Supplies drinking water for oil camp. See log.
161	7 $\frac{3}{4}$ miles N. of Liberty.	do	do	1940	230	4	0	4.16	May 26, 1940	-----	N	Screen at 181 to 214 feet. Formerly supplied water for drilling oil test (Bye No. 1). Casing pulled and well abandoned in 1940.
162	8 miles N. of Liberty.	do	do	1940	244	4	0	4.15	May 1940	-----	N	Screen at 199 to 228 feet. Formerly supplied water for drilling oil test (Cessna No. 1). Casing pulled and well abandoned in 1940.
163	8 $\frac{3}{4}$ miles N. of Liberty.	do	do	1938	223	4 $\frac{1}{2}$, 4	0	4.14	Oct. 21, 1938	-----	N	Screen at 185 to 211 feet. Formerly supplied water for drilling oil test (Part-low A No. 5). Casing pulled and well abandoned in 1939.
164	8 $\frac{1}{2}$ miles N. of Liberty.	Mrs. A. Cessna	do	1945	192	4, 2 $\frac{1}{2}$	0	40.06	June 16, 1945	J, E, $\frac{1}{4}$	D	Screen at 179 to 191 feet. See log.
165	7 $\frac{1}{2}$ miles N. of Liberty.	A. J. Huddleson	do	1945	107	4	0	4.25	May 1945	J, E, $\frac{1}{2}$	D	Screen at 83 to 94 feet.
166	11 miles NE. of Liberty.	Hull-Dalsetta Water Co.	do	1940	365	6	0	4.27	May 1940	C, E, 5	P	Screen at 327 to 350 feet. Supplies water for city of Dalsetta. Temperature 74 $\frac{1}{2}$ ° F. See log.
167	10 $\frac{1}{4}$ miles NE. of Liberty.	Joe Haines	do	1938	106	6	0	31.5	May 30, 1938	-----	N	Screen at 85 to 106 feet. Water reported highly mineralized. Well destroyed in 1940. See log.

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166	7½ miles NE. of Liberty.	Liberty Ranch Co.		1917	703	24, 13, 10.	0	4 5	1917.			Formerly supplied water for irrigation of 500 acres of rice. See log.
169	11 miles NE. of Liberty.	Hancomer Lumber Co.	Pitre Water Well Drilling Co.	1943	222	4.	0	6.75	Nov. 5, 1943.		N	Screen at 161 to 181 feet. Formerly supplied boiler at sawmill. Well abandoned when water became mineralized. See log.
170	9¾ miles NE. of Liberty.	Gulf Oil Corp.	do.	1944	321	4.	0	4 21	Sept. 22, 1944.		N	Screen at 288 to 310 feet. Supplied water for drilling oil test (Hannah No. 20). See log.
171	10 miles NE. of Liberty.	John Mecon.	do.	1937	236	4½.	0	4 20	Nov. 1937.		N	Screen at 226 to 236 feet. Water reported mineralized. See log.
172	9½ miles NE. of Liberty.	Hanill and Smith.	do.	1938	305	4.	0	4 20	1938.		N	Screen at 285 to 305 feet. Reported sulfur water. See log.
173	do.	do.	do.	1938	255	5½, 5.	0	4 17	1938.	A, E, 15.	Ind. D	Screen at 228 to 255 feet. Supplies water for oil lease. See log.
174	do.	Houston Production Co.	do.	1939	255	7, 5.	0	4 30	1939.		N	Screen at 233 to 255 feet. Supplied water for drilling oil test (Baltwin No. 3).
175	do.	do.	do.	1941	161	7, 5.	0	4 30	July 1941.	A, E, 5.	Ind	Screen at 120 to 140 feet. Supplies lease.
176	do.	do.	do.	1941	374	5.	0	4 30	do.		N	Screen at 353 to 373 feet. Supplies water for drilling oil test (Heimle No. 1). See log.
177	9¾ miles NE. of Liberty.	The Texas Co.	L. Patterson	1941	383	5.	0	4 30	October 1941.		N	Screen at 355 to 379 feet. Supplied water for drilling oil test (Armedin No. 2). See log.
178	In Liberty.	City of Liberty.	J. A. Walling.	Old	680	8.	0	+7	Dec. 7, 1944.	Flows.	P	Estimated now 4 gallons a minute on Dec. 7, 1944. (Screened from 2 sands from 445 to 562 feet. Reported yield 321 gallons a minute on Jan. 24, 1939. Temperature 75½° F. See log.)
179	do.	do.	Texas Water Supply Co.	1939	565	13, 7.	1.6 {	1.02 {	Nov. 26, 1943 {	T, E, 30.	P	
180	do.	do.	do.	1939	351	8.	0	4 6	July 1943.	T, E, 20.	P	This well and wells 178, 179, and 182 supply the city of Liberty. Temperature 72° F.
181	do.	do.	— Tucker	Old	695	8.	0	4+18	Oct. 30, 1931.			Well destroyed in 1939.

See footnotes at end of table.

TABLE 6.—Records of wells and springs in Liberty County, Tex.—Continued

Well No.	Location	Owner	Driller	Date completed	Depth of well (feet)	Diameter of well (inches)	Height of measuring point above ground (feet)	Water level		Method of lift ²	Use of water ³	Remarks
								Below measuring point (feet) ¹	Date of measurement			
182	In Liberty	City of Liberty	— Tucker	Old	651	4	0	+8	Nov. 17, 1944	Flows	P	Reported flow 40 gallons a minute on Nov. 7, 1944. Temperature 76½° F. Formerly supplied water for locomotive boilers. Screen at 559 to 591 feet. Deussen No. 736. ⁴ See log.
183	do	{Southern Pacific R. Co.	Layne-Bowler Co.	1911	601	10	0	+7	February 1911.	}	N	{Formerly supplied water for locomotive boilers. Screen at 559 to 591 feet. Deussen No. 736. ⁴ See log.
184	do	do	do	Old	576	6			Nov. 1, 1927		N	
185	do	Layl Sandwich Shop	Pitre Water Well Drilling Co.	1940	119	4	1	18.60	Dec. 7, 1944	J, E, ¼	P	Formerly supplied water for locomotive boilers. Reported flowing in 1907. Deussen No. 735. ⁴
186	3 miles S. of Liberty.	Texas Pipe Line Co.	do	1941	333	4½, 4	.2	5.30	do	Cf, E, 3	Ind	Screen at 98 to 108 feet. Supplies water for restaurant. See log. Screen at 301 to 321 feet. Supplies water for pipeline pump station. Temperature 77° F. See log.
187	1 mile S. of Liberty.	John Mecom	do		540	4				Flows	D	Estimated flow 5 gallons a minute on Jan. 16, 1945.
188	½ mile S. of Liberty.	Mecom and Harrison	Serles Yount	1909	260	3	0	+5	Dec. 9, 1944	Flows	S	Estimated flow 1 gallon a minute on Dec. 9, 1944.
189	do	do	do	1903	260	4½				Flows	D	Estimated flow 50 gallons a minute on Dec. 9, 1944. Supplies water for swimming pool.
190	¾ mile S. of Liberty.	do	do	1903	260	4½				Flows	S	Measured flow 50 gallons a minute on Dec. 9, 1944.
191	1¼ miles SE. of Liberty.	Liberty County Fairgrounds.	Pitre Water Well Drilling Co.	1943	65	4	0	+19	October 1943	J, E, ½	P	Screen at 45 to 57 feet. With No. 192 supplies fairgrounds. See log.
192	1¼ miles SE. of Liberty.	do	do	1943	65	4	0	+19	October 1943	J, E, ½	P	Screen at 47 to 57 feet.
193	In Liberty.	Mrs. Maggie L. Moorefield.	do	1941	200	2	0	+13	August 1941	J, E, ½	D	Screen at 134 to 144 feet. See log.
194	5 miles N. of Liberty.	Martin Leissner	do	1941	103	3	0	+25	June 1941	J, E, ½	D, S	Screen at 87 to 97 feet. See log.
195	In Liberty	Trinity Valley Cold Storage Co.	do	1924	350	10				T, E, 15	Ind	Supplies water for ice plant.

197	do.	South Fork Sun Pipe Line Co.	1932	28 4	0	4 10	4 10	Jan. 27, 1935	U	Screen at 44 to 45 feet.
198	do.	A. C. Neyland Sun Pipe Line Co.	1932	40 6	0	4 10	4 10	Mar. 31, 1945	D	Screen at 24 to 28 feet.
199	do.	C. W. Fisher	1935	232 2	0	4 +34	1908	Apr. 20, 1945	Ind	Screen at 30 to 40 feet. Supplies water for pipe-line pump station.
200	7 1/4 miles E. of Liberty.	Howard Le Cour	1942	191 2 1/2	0	4 24	February 1942		N	Reported flow 17 gallons a minute in 1908; no flow in 1945. Deussen No. 731. ³ See log.
201	9 1/2 miles E. of Liberty.	Carl Johnson	1942	528 4	0	4 22	Nov. 20, 1942		D, S	Screen at 179 to 189 feet. See log.
202	9 1/4 miles SE. of Liberty.	Chas. Welch	1938	96 2 1/2	0	4 8	July 1938		D, S	Screen at 415 to 437 feet. See log.
203	7 1/2 miles E. of Liberty.	Silva and Welch	1940	151 4 2	0	4 26	September 1940		D	Screen at 96 to 93 feet. See log.
204	do.	Mrs. — Robinett	1944	161 4	0	4 26	April 1944		D	Screen at 138 to 148 feet. See log.
205	6 miles SE. of Liberty.	C. C. Thornton	1944	287 4	0	4 32	Sept. 1, 1944		S	Screen at 147 to 157 feet. See log.
206	7 miles E. of Liberty.	Leo B. Pitre	1944	370 4	0	4 27	July 1944		D	Screen at 273 to 283 feet. See log.
207	do.	J. W. Swinney	1942	137 2	0	4 17	October 1942		D, S	Screen at 860 to 370 feet. See log.
208	4 miles SE. of Liberty.	Edward Mallet	1938	35 1 1/2	0	4 15	October 1938		D, S	Screen at 132 to 137 feet. See log.
209	5 1/2 miles SE. of Liberty.	Cleveland Domain	1944	20 5	2 0	4 27	Jan. 16, 1945		S	Screen at 70 to 80 feet.
210	2 1/4 miles E. of Liberty.	Pitre Water Well Drilling Co.	1940	80 2	0	4 30	1940		D	
211	7 1/4 miles SE. of Liberty.	C. M. Mitchell	1930	400 2	0	4 25	1930		D, S	
212	7 1/4 miles E. of Liberty.	Chas. Welch	1945	145 2	0	4 24.50	May 22, 1945		D	
213	do.	Leo B. Pitre	1945	628						Screen at 134 to 145 feet. Well not completed. See log.
214	7 miles S. of Liberty.	S. S. Hill	1924	22 1 1/2	0	4 16	Dec. 8, 1944		D, S	Screen from 20 to 22 feet. Temperature 75° F.
215	6 1/2 miles S. of Liberty.	Jack Moss	1942	28 1 1/2	0	4 15	do		D, S	Screen from 26 to 28 feet. Temperature 71° F.
216	7 1/2 miles S. of Liberty.	Devers Canal Co.	1940	176 3	.5	4 10	do		D	Screen from 170 to 176 feet. Temperature 70° F.
217	7 1/4 miles SE. of Liberty.	do.	1943	238 2	0	4 17	August 1943		D	Screen from 226 to 238 feet. Supplies water for 4 families.
218	5 miles SE. of Liberty.	Bab Le Cour	1910	800 8	0.0	+3	Dec. 22, 1944		N	Drilled to 1,500 feet as an oil test; casing then pulled to 800 feet and completed as flowing water well. Water is mineralized and contains marsh gas. Estimated flow 50 gallons a minute on Dec. 22, 1944. Temperature 72° F.

See footnotes at end of table.

TABLE 6.—Records of wells and springs in Liberty County, Tex.—Continued

Well No.	Location	Owner	Driller	Date completed	Depth of well (feet)	Diameter of well (inches)	Height of measuring point above ground (feet)	Water level		Method of lift	Use of water	Remarks
								Below measuring point (feet)	Date of measurement			
219	8½ miles S. of Liberty.	J. M. Heiskell Estate.	Rycade Oil Corp.	1930	5,927							Oil test. See log.
220	10 miles S. of Liberty.	Liberty Investment Co.	The Pure Oil Co.	1929	5,766							Do.
221	9 miles S.E. of Liberty.	Shilo school.	Pitre Water Well Drilling Co.	1940	333	2½	0	4 4.5	June 1940	J, E, ½	P	Screen at 306 to 317 feet. See log. Supplies Shilo School.
222	6¼ miles SE. of Liberty.	A. R. Milintz.	do.	1944	275	4	1.5	12.23	June 16, 1945	C, W	D, S	Screen at 261 to 273 feet. See log.
223	12¼ miles SE. of Liberty.	Franklin and Tideman, Ltd.	do.	1943	349	4	0	4 3	August 1943		N	Screen at 326 to 347 feet. Water reported highly mineralized. Supplied water for drilling rig (Sherman No. 1). See log.
224	13¼ miles SE. of Liberty.	Shell Oil Co.	Layne-Texas Co.	1930	568	4	0	4 6	Feb. 19, 1930		N	Screen at 546 to 566 feet. Supplied water for drilling rig. Sulfur water reported between 681 and 707 feet. See log.
225	9¾ miles SE. of Liberty.	R. P. Whittington.	F. Gay	1930	346					C, W	S	Oil test. See log.
226	2¼ miles NE. of Devers.	Sabine Tram Co.	Humble Oil & Refining Co.	1930	5,800						D, S	Screen at 384 to 404 feet. Formerly supplied water to pipe-line pump station. See log.
227	3 miles S. of Devers.	Texas Pipe Line Co.	Pitre Water Well Drilling Co.	1938	406	4	0	4 14	Mar. 17, 1938	C, G, ¼	D, S	Screen at 211 to 221 feet. See log.
228	3¾ miles S. of Devers.	Bert Hays	do.	1942	234	2	0	4 13.5	June 11, 1942	Cf, G, ¼	D, S	Screen at 74 to 79 feet. See log.
229	1 mile E. of Devers.	V. D. Myers	do.	1943	99	2½	.2	9.00	Jan. 23, 1945	C, E, 1½	D	Screen at 407 to 417 feet. See log.
230	In Devers.	W. E. Jenkins	do.	1943	443	2	0	4 21	Nov. 10, 1943	J, E, ¼	D	Screen at 476 to 488 feet. See log.
231	6¼ miles S. of Devers.	Dan Hart.	do.	1944	488	4	0	4 15	February 1944	C, W	D, S	Screen at 209 to 231 feet. Supplied water for drilling oil test (C. A. Moore No. 1). See log.
232	3¾ miles NE. of Devers.	The Texas Co.	do.	1944	232	4	0	4 11	August 1944		N	

223	1 mile S. of Devers.	E. V. Boyt.	Jess Hollingshead.	1937	210	4	0	114 118	1937 1945	C, E, 1/2 C, W	D	Screen at 201 to 210 feet. "Pearson place."
224	5 1/2 miles E. of Devers.	B. H. Willis estate.	do	1941	180	6	1.8	14.90	Jan. 17, 1945	C, W	D, S	"Headquarters well."
225	7 1/2 miles E. of Devers.	do	do	1941	200	6	2.0	11.40	do	C, W	D, S	"Gilmore place."
226	9 1/2 miles E. of Devers.	do	do	1941	180	3	.8	11.18	do	C, H	D	Formerly supplied water to pipe-line pump station; domestic supply at present. Screen at 429 to 492 feet. See log.
227	5 1/2 miles E. of Devers.	Sinclair Pipe Line Co.	do	1923	492	8, 6	1.8	13.72	June 20, 1945	A	D	Screen at 92 to 112 feet. Supplies drinking water for employees. Screen at 77 to 92 feet.
228	In Devers.	American Rice Growers Association.	Pitre Water Well Drilling Co.	1941	107	3	0	4.12	June 1941	J, E, 1 1/2	P	Screen at 483 to 499 feet. Supplies 8 customers. See log.
229	4 1/2 miles SE. of Devers.	J. E. Clark, Jr.	Hollingshead.	1940	92	1 1/2	0	4.4	Jan. 3, 1945	C, W	D, S	Screen at 391 to 403 feet.
230	6 1/2 miles S. of Devers.	J. M. Rich.	Abshier.	1940	200	2	0	4.10	1940	C, E, 3/4	D, S	Screen at 390 to 400 feet.
231	In Devers.	H. A. Gripon.	Pitre Water Well Drilling Co.	1945	501	2	0	21.30	Mar. 12, 1945	J, E, 1/2	D	Screen at 182 to 205 feet. Supplied water for drilling oil test (Boyt No. 19). See log.
232	9 1/2 miles SE. of Devers.	E. W. Boyt.	Paul Acheson.	1941	403	2	0	4.15	July 1941	C, W	D, S	Screen at 314 to 336 feet. Supplied water for drilling oil test (Boyt No. 20). See log.
233	7 1/2 miles SE. of Devers.	do	Jack White.	1928	400	2	0	4.15	November 1928	C, W	D, S	Screen at 315 to 335 feet. Supplied water for drilling oil test (Boyt No. 3).
234	8 1/2 miles S. of Devers.	E. F. Abshier.	J. F. Abshier.	1920	150	2	0	4.16	1920	C, W	D, S	Screen at 274 to 318 feet. Supplied water for drilling oil test (Boyt No. 5).
235	9 miles S. of Devers.	E. W. Boyt.	Gulf Oil Corp.	1935	225	7	0				N	
236	9 1/2 miles S. of Devers.	do	do	1935	344	6					N	
237	9 miles S. of Devers.	do	do	1935	335	6					N	
238	do	do	do	1935	318	6					N	

¹ Plus (+) indicates water level above measuring point.

² Pump or lift: T, turbine; Cf, centrifugal; A, air lift; C, cylinder; B, rope and bucket, Power: E, electric; G, gas or gasoline engine; S, steam; W, windmill; H, hand. Number indicates horsepower.

³ P, public supply; Ind, industrial; RR, railroad; D, domestic; S, stock; N, not used; Irr., irrigation.

⁴ Water level reported by driller or owner.

⁵ Number under which well is listed by Deussen in U. S. Geological Survey Water-Supply Paper 335, 1914.

⁶ In Chambers County.

WELL LOGS

TABLE 7.—*Drillers' logs, Liberty County, Tex.*

Well 2, Gulf, Colorado & Santa Fe Ry. Co., in Cleveland

	Thick- ness (feet)	Depth (feet)		Thick- ness (feet)	Depth (feet)
Surface.....	44	44	Loose sand.....	13	918
Sand.....	62	106	Gumbo.....	3	921
Clay.....	13	119	Sand.....	9	930
Sand and gravel.....	27	146	Shale.....	15	945
Rock.....	3	149	Rock.....	12	957
Clay.....	66	215	Gumbo.....	8	965
Fine-grained sand.....	24	239	Shale.....	6	971
Shale.....	34	273	Gumbo.....	9	980
Sand and gravel.....	55	328	Shale.....	127	1,107
Gumbo.....	137	465	Fine packsand.....	21	1,128
Shale.....	35	500	Gumbo.....	42	1,170
Rock.....	1	501	Shale streaks.....	10	1,180
Gumbo.....	26	527	Sand.....	25	1,205
Gumbo and boulders.....	40	567	Boulders.....	2	1,207
Soft shale.....	23	590	Sand and gravel.....	32	1,239
Boulders.....	5	595	Gravel.....	6	1,245
Shale.....	7	602	Gumbo.....	5	1,250
Boulders.....	9	611	Sand.....	30	1,280
Ledges of rock.....	13	624	Gumbo.....	5	1,285
Gumbo.....	68	692	Sand.....	52	1,337
Fine-grained sand.....	18	710	Shale and boulders.....	58	1,395
Gumbo.....	7	717	Tight sand.....	21	1,416
Shale.....	33	750	Sand.....	35	1,451
Sand.....	20	770	Shale streaks.....	13	1,464
Gumbo.....	24	794	Sand.....	14	1,478
Sand.....	45	839	Shale.....	34	1,512
Shale.....	66	905			

Well 4, Humble Oil & Refining Co. (Campbell No. 1), 7¼ miles south of Cleveland

Surface sand.....	12	12	Sand and boulders.....	28	759
Sandy clay.....	13	25	Gumbo and lime.....	41	800
Sand.....	13	38	Shale and lime.....	18	818
Clay.....	22	60	Tough sticky shale.....	18	836
Sand.....	26	86	Rock.....	1	837
Clay.....	5	91	Sticky shale.....	16	853
Gumbo.....	13	104	Gumbo.....	54	907
Shale.....	27	131	Rock.....	1	908
Sand.....	42	173	Gumbo.....	27	935
Gravel.....	64	237	Sand.....	9	944
Shale.....	11	248	Gumbo.....	43	987
Sand and gravel.....	13	261	Sand.....	3	990
Sticky shale.....	22	283	Sandy shale.....	26	1,016
Shale.....	24	307	Gumbo.....	44	1,060
Gumbo.....	5	312	Rock.....	1	1,061
Sticky shale.....	17	329	Gumbo.....	9	1,070
Sand and gravel.....	44	373	Sand.....	40	1,110
Rock.....	3	376	Gumbo.....	34	1,144
Gumbo.....	40	416	Sand and boulders.....	16	1,160
Gumbo, lime, and sand.....	17	433	Gumbo.....	32	1,192
Gumbo and lime.....	32	465	Hard sandy shale.....	3	1,195
Sand and boulders.....	21	486	Gumbo and boulders.....	9	1,204
Hard sand.....	5	491	Gumbo.....	9	1,213
Gumbo and lime.....	20	511	Boulders.....	3	1,216
Hard lime.....	4	515	Sand.....	24	1,240
Sand and boulders.....	15	530	Hard sandy shale.....	5	1,245
Hard lime.....	4	534	Gumbo.....	121	1,366
Gumbo and lime.....	47	581	Sand.....	2	1,368
Sand and boulders.....	19	600	Sandy shale.....	17	1,385
Hard brown sand.....	12	612	Gumbo.....	15	1,400
Sand.....	8	620	Sand.....	3	1,403
Gumbo and lime.....	108	728	Soft sandy shale.....	16	1,419
Sand.....	3	731	Gumbo.....	62	1,481

TABLE 7.—*Drillers' logs, Liberty County, Tex.—Continued*

Well 4, Humble Oil & Refining Co. (Campbell No. 1), 7¼ miles south of Cleveland—Continued

	Thick- ness (feet)	Depth (feet)		Thick- ness (feet)	Depth (feet)
Sand.....	21	1,502	Hard sand and shale.....	10	1,686
Gumbo.....	39	1,541	Shale and lime.....	18	1,704
Sandy shale.....	40	1,581	Gumbo.....	4	1,708
Rock.....	2	1,583	Gumbo and lime.....	47	1,755
Gumbo.....	11	1,594	Gumbo and lime, sand and boulders.....	62	1,817
Sticky shale and lime.....	11	1,605	Sand.....	52	1,869
Packsand.....	5	1,610	Sand and boulders.....	16	1,885
Sand.....	10	1,620	Gumbo.....	7	1,892
Sticky shale.....	6	1,626	Tough gumbo.....	55	1,947
Gumbo and lime.....	2	1,628	Gumbo.....	2	1,949
Shale and lime.....	1	1,629	Sandy shale and lime.....	32	1,981
Sticky shale and lime.....	28	1,657	Gumbo.....	19	2,000
Shale and lime.....	15	1,672			
Sand and shale.....	4	1,676			

Well 5 (partial log), Humble Oil & Refining Co. (Hornbeck No. 1), 2 miles southwest of Cleveland

Surface clay.....	55	55	Gumbo and sticky shale.....	35	1,715
Quicksand.....	50	105	Sandy shale.....	35	1,750
Clay and gravel.....	207	312	Gumbo.....	18	1,768
Rock.....	1	313	Sand and sandy shale with streaks of lime.....	30	1,798
Sand and boulders.....	59	372	Sticky shale.....	13	1,811
No record.....	248	620	Sticky shale and gumbo.....	19	1,830
Gumbo.....	15	635	Rock.....	1	1,831
Sandy shale.....	60	695	Water sand.....	19	1,850
Gumbo.....	20	715	Sticky shale and gumbo.....	30	1,880
Sandy shale and boulders.....	170	885	Water sand.....	11	1,891
Gumbo.....	15	900	Sand.....	14	1,905
Sandy shale and boulders.....	45	945	Sticky shale and gumbo.....	15	1,920
Sticky shale and gumbo.....	172	1,117	Hard rock.....	1	1,921
Rock.....	1	1,118	Water sand and red shale.....	4	1,925
Gumbo with streaks of shale.....	91	1,209	Sand and broken lime.....	10	1,935
Gumbo with streaks of sticky shale.....	76	1,285	Gumbo and hard shale.....	30	1,965
Sand and shale.....	6	1,291	Broken lime, shale, and gumbo.....	120	2,085
Fresh water sand.....	3	1,294	Shale and gumbo.....	215	2,300
Sand and shale.....	6	1,300	Gumbo.....	10	2,310
Broken lime and gumbo, sticky shale.....	96	1,396	Rock.....	3	2,313
Sandy shale.....	5	1,401	Sand.....	2	2,315
Sticky shale with streaks of lime.....	24	1,425	Sand and shale.....	15	2,330
Broken lime and sand.....	2	1,427	Gumbo.....	15	2,345
Coarse-grained sand.....	4	1,431	Sand and sandy shale.....	10	2,355
Broken lime and sand.....	44	1,475	Broken sand and shale.....	75	2,430
Gumbo.....	85	1,560	Sticky shale and gumbo.....	15	2,445
Sticky shale with streaks of lime and gumbo.....	88	1,648	Sand and shale.....	15	2,460
Sand.....	3	1,651	Broken sand and shale.....	35	2,495
Water sand.....	29	1,680	Gumbo.....	11	2,506
			Total depth.....		5,633

Well 8, City of Cleveland No. 2, in Cleveland

Surface soil.....	6	6	Hard layers.....	1	434
Soft yellow clay.....	14	20	Clay.....	61	495
Sand.....	6	26	Hard layers.....	2	497
Soft clay.....	24	50	Clay.....	29	526
Sand.....	29	79	Hard layers.....	1	527
Clay.....	2	81	Clay.....	83	610
Sand.....	29	110	Sand.....	26	636
Clay.....	5	115	Clay.....	10	646
Sand.....	30	145	Gumbo.....	105	751
Clay.....	61	206	Sand.....	19	770
Coarse sand and gravel.....	11	217	Sticky shale.....	21	791
Clay.....	17	234	Hard sandy shale.....	22	813
Gravel.....	51	285	Sand breaks and shale.....	17	830
Soft yellow clay and sand.....	4	289	Sticky shale.....	16	910
Sand and gravel.....	25	314	Sand.....	80	926
Clay with sand breaks.....	21	335	Sticky shale.....	3	929
Clay.....	98	433			

TABLE 7.—*Drillers' logs, Liberty County, Tex.—Continued*

Well 9, Black Gold Petroleum Co., 5¼ miles southeast of Cleveland

	Thick- ness (feet)	Depth (feet)		Thick- ness (feet)	Depth (feet)
Sand.....	10	10	Sand and gravel.....	21	88
Clay.....	33	43	Clay.....	7	95
Sand rock.....	24	67			

Well 10, Russ Mitchell Co. No. 1, 3¼ miles southeast of Cleveland

Sand and gravel.....	112	112	Sand and gravel.....	104	304
Sandy shale.....	88	200			

Well 20, M. A. Ellis, 5½ miles northeast of Cleveland

Sandy soil.....	2	2	Gray sand (good).....	29	125
Red clay.....	10	12	Clay.....	30	155
Fine red sand and streaks of clay..	30	42	Broken, fine, brown sand and		
White sand (good).....	18	60	clay.....	21	176
White sand and streaks of clay.....	10	70	Sand and fine gravel.....	48	224
Clay.....	26	96	Clay.....	2	226

Well 23, W. P. Johnston, 7¾ miles northeast of Cleveland

Hard red to pink sand.....	38	38	Sand and lenses of lime.....	18	255
Sandy red clay.....	21	59	Lime rock.....	2	257
Brown sand.....	21	80	Sand.....	1	258
Gravel and streaks of sandy clay..	18	98	Lime rock.....	2	260
Sand.....	19	117	Sand.....	8	268
Sandy clay.....	7	124	Lime rock.....	6	274
Gravel.....	2	126	Hard and soft sand.....	32	306
Sandy clay.....	3	129	Brown, red and white clay.....	48	354
Gravel.....	11	140	Sand.....	2	356
White sandy clay.....	9	149	Clay.....	44	400
Tough cream-colored clay.....	24	173	Brown sand rock.....	4	404
Rock.....	1	174	Gray sand.....	26	430
Sand and gravel.....	16	190	Clay.....	4	434
Hard brown, red, and white clay..	47	237	Sandy clay.....	6	440

Well 27, Russ Mitchell Co. No. 2, 6½ miles southeast of Cleveland,

Clay.....	69	69	Sand and gravel.....	9	140
Sand.....	10	79	Clay.....	11	151
Clay.....	5	84	Sandy clay.....	6	157
Shale.....	13	97	Sand.....	3	160
Sand.....	33	130	Clay.....	47	207
Sticky clay.....	1	131	Sand.....	77	284

Well 28, Russ Mitchell Co. No. 3, 10¾ miles southeast of Cleveland

Sand.....	8	8	Fine gray sand.....	51	170
Clay.....	16	24	Shale.....	6	176
Sand.....	61	85	Sand and gravel.....	26	202
Sand and gravel.....	34	119	Fine-grained sand.....	2	204

Well 29, M. N. Cunningham, 9½ miles southeast of Cleveland

Sand.....	3	3	Hard clay.....	2	206
Clay.....	9	12	Coarse red sand and gravel.....	15	221
Sand.....	6	18	Hard clay.....	72	283
Hard clay.....	49	67	Sand and gravel.....	12	305
Red sand.....	29	96	Hard clay.....	2	307
Hard clay.....	21	117	Sand and gravel.....	4	311
Red sand.....	6	123	Hard clay.....	10	321
Hard clay.....	40	163	Sand and gravel.....	15	336
Sand.....	23	186	Hard clay.....	10	346
Hard clay.....	12	198	Medium gravel.....	5	351
Sand.....	6	204	Clay.....	17	368

TABLE 7.—*Drillers' logs, Liberty County, Tex.*—Continued

Well 40, Mrs. Corine Brown, 11 miles south of Romayor

	Thick- ness (feet)	Depth (feet)		Thick- ness (feet)	Depth (feet)
Sand.....	31	31	Medium-grained sand.....	16	130
Clay.....	6	37	Shale.....	3	133
Sand.....	45	82	Sand.....	9	142
Shale.....	6	88	Clay.....	32	174
Fine-grained sand.....	26	114			

Well 44, A. G. Lesterjette No. 1, 9 miles south of Romayor

Top soil.....	12	12	Sand and shale.....	150	570
Shale and sand, showing of dead oil.....	173	185	Gumbo.....	5	575
Blue gumbo.....	100	285	Oil sand (blow-out).....	18	593
Shale and packsand.....	95	380	Gumbo.....	47	640
Gumbo, showing oil.....	40	420	Sand with salt water.....	22	662

Well 48, T. B. Allen & Co., 2 miles east of Romayor

Clay.....	10	10	Gravel.....	19	210
Sand.....	70	80	Rock and sand.....	30	240
Clay and gravel.....	20	100	Clay and gravel.....	160	400
Sand.....	40	140	Sand.....	20	420
Clay and gravel.....	20	160	Clay and gravel.....	50	470
Sand.....	20	180	Thin layers of "rocksand".....	12	482
Rock.....	2	182	Shale.....	38	520
Clay and gravel.....	6	188	Clay and gravel.....	30	550
Rock.....	3	191	Water sand.....	109	659

Well 50, Gulf, Colorado & Santa Fe Ry. Co., in Romayor

Surface soil.....	7	7	Gumbo.....	17	302
Sandy clay and gravel.....	39	46	Sand.....	40	342
Red clay.....	12	58	Shale.....	43	385
Sand and clay.....	32	90	Very hard sand.....	20	405
Very fine sand.....	34	124	Gumbo.....	67	472
Shale.....	17	141	Hard sand.....	12	484
Hard sand.....	7	148	Hard gumbo.....	8	492
Shale.....	21	169	Hard sand.....	40	532
Sand and boulders.....	63	232	Salt and pepper sand.....	64	596
Shale.....	29	261	Very rough sand.....	14	610
Sand.....	24	285	Shale.....	35	645

Well 52, Texas Construction Material Co., 4½ miles southeast of Romayor

Clay and sand.....	24	24	Rock.....	1	380
Sand and gravel.....	26	50	Clean sand.....	11	391
Clay.....	8	58	Clay and gravel.....	5	396
Sand and gravel.....	72	130	Sand and gravel.....	20	416
Clay and gravel.....	16	146	Sand.....	26	442
Sand and gravel.....	26	172	Sand and gravel.....	62	504
Hard clay.....	68	240	Shale.....	11	515
Sand and gravel.....	12	252	Sand, clay and boulders.....	15	530
Clay.....	26	278	Shale.....	102	632
Sand and gravel.....	17	295	Sand and gravel.....	96	728
Gravel.....	52	347	Shale and gumbo.....	21	749
Shale.....	3	350	Sand and gravel.....	59	808
Gravel.....	29	379			

Well 69, Concord school, 4½ miles east of Romayor

Soft clay.....	24	24	Soft sand.....	53	95
Sand and gravel.....	13	37	Medium clay.....	9	104
Medium clay.....	5	42			

TABLE 7.—*Drillers' logs, Liberty County, Tex.—Continued*

Well 70, Boyd Sewell, 4¼ miles east of Romayor

	Thick- ness (feet)	Depth (feet)		Thick- ness (feet)	Depth (feet)
Sand.....	7	7	Sand.....	8	109
Clay.....	11	18	Clay.....	1	110
Fine sand.....	21	39	Sand.....	18	128
Clay.....	28	67	Clay.....	1	129
Sand and gravel.....	11	78	Sand.....	4	133
Clay.....	23	101	Clay.....	2	135

Well 75, Chas. B. Peterson No. 2, 4 miles northwest of Dayton

Shale and clay.....	60	60	Hard pack sand.....	19	1,535
Clay.....	283	343	Shale and gumbo.....	75	1,610
Blue gumbo.....	64	407	Sand and boulders.....	17	1,627
Sand and gravel.....	22	429	Gumbo and boulders.....	46	1,673
Shale and sand.....	91	520	Hard sand.....	21	1,694
Hard sand and gravel.....	35	555	Rock.....	2	1,696
Shale and sand.....	40	595	Sand and boulders.....	6	1,702
Gumbo and sand.....	115	710	Gumbo.....	16	1,718
Shale and sand.....	25	735	Hard sand and boulders.....	14	1,732
Shale and gumbo.....	17	752	Gumbo.....	14	1,746
Rock.....	4	756	Lime rock.....	6	1,752
Hard sand and boulders.....	24	780	Gumbo and sand.....	195	1,947
Gyp and gumbo.....	14	794	Sand and boulder.....	4	1,951
Sand and shale.....	46	840	Gumbo.....	34	1,985
Sand and rock.....	17	857	Hard sand and shale.....	39	2,024
Gumbo.....	15	872	Gumbo and shale.....	121	2,145
Hard sand and boulders.....	68	940	Gypsum.....	2	2,147
Rock.....	5	945	Shale and gumbo.....	41	2,188
Gumbo.....	58	1,003	Hard sticky shale.....	24	2,212
Rock.....	2	1,005	Shelly clay.....	53	2,265
Sand and boulders.....	25	1,030	Gyp, rock and blue shale.....	15	2,280
Shale and shell.....	20	1,050	Shale.....	50	2,330
Sand and boulders.....	12	1,062	Gypsum.....	1	2,331
Gumbo and sand.....	119	1,181	Gumbo and shale.....	311	2,642
Gumbo and gypsum.....	4	1,185	Hard shell.....	38	2,680
Hard sand and boulders.....	29	1,214	Gumbo and shale.....	70	2,750
Shale and shell.....	10	1,224	Lime rock.....	18	2,768
Gumbo.....	11	1,235	Gypsum and sand rock.....	23	2,791
Sand and boulders.....	28	1,263	Gumbo and sand.....	35	2,826
Gumbo and gypsum.....	15	1,278	Hard sand rock.....	21	2,847
Rock.....	2	1,280	Hard rock.....	5	2,852
Pyrites and sand.....	32	1,312	Hard sand.....	9	2,861
Rock.....	3	1,315	Hard sand and boulders.....	27	2,886
Shale.....	5	1,320	Gypsum rock.....	3	2,891
Gumbo and gypsum.....	42	1,362	Hard sand.....	8	2,899
Rock.....	3	1,365	Hard rock.....	3	2,902
Gumbo.....	23	1,388	Rock and hard sand.....	50	2,952
Rock.....	3	1,391	Gumbo.....	23	2,975
Hard sand and boulders.....	8	1,399	Shale and sand.....	8	2,983
Rock.....	16	1,415	Gumbo and shale.....	424	3,407
Gumbo and shale.....	101	1,516			

Well 78, A. J. and S. O. Carter, 6 miles northwest of Dayton

Soil, sand, and clay.....	56	56	Sand.....	22	462
Clay.....	42	98	Clay.....	10	472
Clay.....	22	120	Sand.....	68	540
Sandy clay.....	20	140	Clay.....	12	552
Clay.....	10	150	Sand.....	14	566
Sand.....	30	180	Sandy clay.....	16	582
Sandy clay.....	10	190	Clay.....	12	594
sandy clay.....	15	205	Sand.....	24	618
Sand.....	23	228	Clay.....	7	625
Sandy clay.....	40	268	Sand.....	85	710
Clay.....	36	304	Clay.....	15	725
Sandy clay.....	14	318	Sandy clay.....	5	730
Clay.....	42	360	Sand.....	42	772
Sandy clay.....	10	370	Clay.....	5	777
Sand.....	30	400	Sand.....	30	807
Clay.....	40	440	Clay.....	5	812

TABLE 7.—*Drillers' logs, Liberty County, Tex.—Continued*

Well 82, Ralph Graves, 5½ miles northwest of Dayton

	Thick- ness (feet)	Depth (feet)		Thick- ness (feet)	Depth (feet)
Surface.....	9	9	Hard shale.....	5	330
Sandy clay.....	35	44	Sand and streaks of hard shale.....	28	358
Sand and clay streaks.....	12	56	Shaley sand.....	6	364
Joint clay.....	34	90	Sand (good).....	58	422
Sandy clay.....	20	110	Shale and sand.....	17	439
Hard shale.....	7	117	Sand (good).....	13	452
Shale.....	29	146	Sand and boulders.....	4	456
Sand (good).....	57	203	Sand, shale, and boulders.....	16	472
Sandy shale.....	10	213	Shale and lime.....	8	480
Sand and streaks of shale.....	11	224	Sandy shale.....	3	483
Sandy shale.....	6	230	Sand (good).....	14	497
Sand and streaks of shale.....	21	251	Hard pack sand and boulders.....	5	502
Sandy shale.....	6	257	Sand.....	12	514
Sand (good).....	18	275	Hard sand.....	2	516
Hard shale.....	8	283	Sand.....	19	535
Sand.....	32	315	Shale.....	4	539
Hard shale.....	3	318	Sand and boulders.....	14	553
Sand and boulders.....	7	325	Shale and sand boulders.....	5	558

Well 84, Arnold Wolfe, 5 miles northwest of Dayton

Surface clay.....	4	4	Sand and clay.....	18	412
Yellow clay.....	14	18	Sand.....	12	424
Sand.....	27	45	Clay.....	6	430
Clay.....	75	120	Sand.....	54	484
Sand.....	12	132	Clay.....	29	513
Clay.....	28	160	Sand.....	40	553
Sand.....	10	170	Clay.....	32	585
Clay.....	46	216	Sand.....	20	605
Sand.....	30	245	Clay and sand.....	79	684
Clay.....	19	265	Sand.....	40	724
Sandy clay.....	15	280	Clay.....	15	739
Clay.....	82	362	Sand.....	93	832
Sand.....	25	387	Clay.....	2	834
Clay.....	7	394			

Well 85, E. J. Stoesser, 7¼ miles west of Dayton

Sandy soil.....	3	3	Sand (good).....	87	509
Clay.....	17	20	Hard shale.....	6	515
Sandy clay.....	21	41	Sand (good).....	17	532
Clay and sandy clay.....	92	133	Shale.....	3	535
Sand (good).....	31	164	Sand (good).....	45	580
Clay.....	22	186	Sandy shale.....	5	585
Sandy shale.....	16	202	Shale.....	12	598
Shale.....	10	212	Sand (good).....	12	610
Sandy shale.....	10	222	Sticky shale.....	14	624
Shale.....	22	244	Sandy shale.....	8	630
Sand (good).....	19	263	Sticky shale.....	15	645
Sandy shale.....	13	276	Sandy shale.....	5	650
Sand (good).....	58	334	Sand (good).....	37	687
Shale.....	7	341	Shale.....	13	700
Shale and layers of sand.....	22	363	Sand.....	55	755
Sand (good).....	31	394	Sand and gravel.....	27	782
Hard sandy shale.....	20	414	Fine sand and boulders.....	20	802
Shale.....	8	422	Hard shale.....	6	808

Well 90, Peterson and Sterling, 4¼ miles west of Dayton

Soil.....	3	3	Gumbo.....	11	404
Clay.....	63	66	Coarse-grained sand.....	74	478
Buckshot clay.....	85	151	Gumbo.....	35	513
Soft clay and gumbo.....	176	327	Coarse-grained sand.....	77	590
Fine-grained sand.....	16	343	Gumbo.....	2	592
Coarse-grained sand.....	50	393			

TABLE 7.—*Drillers' logs, Liberty County, Tex.*—Continued

Well 91, Chas. B. Peterson, 4¼ miles west of Dayton

	Thick- ness (feet)	Depth (feet)		Thick- ness (feet)	Depth (feet)
Shale and clay.....	21	21	Rock.....	55	1, 040
Gumbo.....	138	165	Gumbo.....	1	1, 041
Sand.....	171	336	Sand and shale.....	36	1, 127
Gumbo.....	5	341	Gumbo.....	36	1, 163
Water sand.....	10	351	Sand and boulders.....	2	1, 165
Gumbo.....	48	399	Gumbo.....	38	1, 203
Shale.....	6	405	Rock.....	14	1, 217
Sand.....	15	420	Sand, shell, and boulders.....	3	1, 220
Shale.....	55	475	Gumbo.....	23	1, 243
Gumbo.....	15	490	Sand and boulders.....	15	1, 258
Shale.....	6	496	Gumbo.....	36	1, 294
Sand.....	27	523	Hard sand and boulders.....	8	1, 302
Gumbo.....	70	593	Soft rock.....	26	1, 328
Sand.....	49	642	Hard sand.....	2	1, 330
Gumbo.....	5	647	Rock.....	10	1, 340
Sand.....	13	660	Sand, boulders, and gravel.....	3	1, 343
Gumbo.....	66	726	Gumbo and boulders.....	40	1, 383
Sand.....	12	738	Sand.....	30	1, 413
Shale.....	10	748	Gypsum and hard gumbo.....	6	1, 419
Sand rock.....	12	760	Sand.....	179	1, 598
Gypsum.....	12	772	Gumbo.....	6	1, 604
Gumbo.....	15	787	Sand.....	46	1, 650
Shale.....	25	812	Gumbo.....	15	1, 665
Gravel and shale.....	15	827	Sand and boulders.....	17	1, 682
Gumbo.....	11	838	Gumbo and boulders.....	20	1, 702
Sand.....	19	857	Lime rock.....	14	1, 716
Rock.....	2	869	Gumbo and boulders.....	14	1, 730
Gumbo.....	2	871	Gumbo.....	24	1, 754
Sand.....	9	880	Sand.....	36	1, 790
Gypsum.....	35	915	Gumbo.....	18	1, 808
Gumbo.....	21	936	Hard shale.....	2	1, 810
Gypsum.....	40	976	Gypsum and gumbo.....	7	1, 817
Sand.....	3	979	Sand.....	29	1, 846
Shell and shale.....	6	985	Rock.....	64	1, 910

Well 92, Patrick & Tyrrell Drilling Co., 7 miles west of Dayton

Clay.....	94	94	Fine-grained sand.....	7	143
Fine-grained sand.....	15	109	Clay.....	58	201
Clay.....	2	111	Fine-grained sand.....	25	226
Streaks of sand and clay.....	13	129	Rock.....	1	227
Fine-grained sand.....	5	134	Fine-grained sand.....	11	238
Clay.....	2	136	Medium-grained sand.....	18	256

Well 105, Sun Oil Co. (Quintette No. 1), 6¼ miles northwest of Dayton

Yellow surface clay.....	20	20	Gumbo.....	6	679
Blue shale.....	13	33	Sand.....	26	705
White sand.....	20	53	Shale.....	25	730
Sand and clay.....	105	158	Gumbo.....	65	795
White quicksand.....	13	171	Rock.....	4	799
Blue shale.....	9	180	Gumbo.....	7	806
White sand.....	6	186	Shale.....	12	818
Blue shale.....	7	193	Gumbo.....	27	945
Gumbo.....	47	240	Yellow clay.....	10	855
Sand and gravel.....	85	325	Gumbo.....	20	875
Gumbo.....	22	347	Clay.....	9	884
Sand, putty sand.....	11	358	Gumbo.....	6	890
Sand and gravel.....	79	437	Sand, putty sand.....	5	895
Shale.....	6	443	Limestone.....	1	896
Sand.....	22	465	Sand, putty sand.....	3	904
Gumbo.....	16	481	Coarse-grained sand.....	6	910
Sand.....	15	496	Gumbo.....	23	933
Gumbo.....	17	513	Sand, putty sand.....	9	942
Sand, putty sand.....	14	527	Shale.....	16	958
Gumbo.....	38	565	Rock.....	3	961
Sand, putty sand.....	32	597	Gumbo and shale.....	64	1, 025
Shale.....	4	601	Shale, rock, and shale.....	11	1, 036
Sand.....	12	613	Rock.....	2	1, 038
Gumbo.....	8	621	Shale.....	22	1, 060
Shale, rock, and clay.....	39	660	Rock.....	5	1, 065
Shale.....	12	672	Gumbo and shale.....	47	1, 112
Hard rock.....	1	673	Shale and rock.....	12	1, 124

TABLE 7.—*Drillers' logs, Liberty County, Tex.—Continued*

Well 105, Sun Oil Co. (Quintette No. 1), 6¼ miles northwest of Dayton—Continued

	Thick- ness (feet)	Depth (feet)		Thick- ness (feet)	Depth (feet)
Limestone.....	2	1, 126	Hard shale.....	27	1, 552
Sand, putty sand.....	7	1, 133	Shale and gumbo.....	39	1, 591
Limestone.....	1	1, 134	White shell and rock.....	7	1, 598
Brown and blue shale.....	33	1, 167	Blue shale.....	32	1, 630
No record.....	78	1, 245	Soft rock.....	2	1, 632
Boulders (concretions) and rock.....	4	1, 249	Gumbo.....	8	1, 640
Gumbo.....	41	1, 290	Hard blue sand with strata of rock.....	10	1, 650
Shale.....	5	1, 295	Blue gumbo.....	30	1, 680
Rock and clay.....	4	1, 299	Rock.....	3	1, 683
Gumbo.....	7	1, 306	Shale.....	8	1, 691
Shale.....	86	1, 392	Hard sandstone.....	2	1, 693
Hard sand.....	6	1, 398	Blue shale and blue sand, very slight show of oil.....	12	1, 705
Shale.....	8	1, 406	Blue shale and thin strata of rock.....	13	1, 718
Gumbo.....	14	1, 420	Blue shale.....	45	1, 763
Shale.....	34	1, 454			
Very tough gumbo.....	71	1, 525			

Well 106, Taylor-Dayton Co., 7¼ miles northwest of Dayton

Black dirt.....	6	6	Blue marl and boulders.....	3	232
Blue clay.....	22	28	Blue marl.....	6	238
Water sand.....	8	36	Boulders.....	3	241
Blue marl.....	37	73	Blue marl, gas at 244 feet.....	32	273
Quicksand.....	12	85	Quicksand.....	47	320
Blue clay.....	15	100	Water sand.....	6	326
Boulders (sandstone).....	2	102	Quicksand.....	3	329
Quicksand.....	39	141	No record except blue marl at top.....	271	600
Blue marl.....	66	207	Limestone.....	200	800
Boulders.....	2	209	Rock salt.....	400	1, 200
Coarse quicksand.....	20	229			

Well 109, Heal & Brown, 5 miles southwest of Dayton

Soil and clay.....	26	26	Sand, layers of rock.....	42	287
Fine-grained sand.....	5	31	Soft clay.....	16	303
Shale and clay.....	57	88	Sand.....	2	305
Sand.....	11	99	Clay.....	5	310
Clay.....	71	170	Sand, layers of rock.....	87	397
Sand.....	5	175	Clay.....	6	403
Clay.....	70	245	Sand.....	4	407

Well 120, city of Dayton No. 2, in Dayton

Clay.....	52	52	Sandy shale.....	11	170
Sand.....	11	63	Shale.....	43	213
Clay.....	7	70	Gumbo.....	97	310
Boulder.....	2	72	Sand.....	75	385
Red clay.....	41	113	Shale.....	14	399
Sticky clay.....	46	159			

Well 121, The Texas Co. (League No. 3), 9½ miles south of Dayton

Soil.....	1	1	Blue shale and shell.....	36	863
Clay.....	21	22	Blue sandy gumbo.....	94	957
Yellow clay and gravel.....	62	84	Blue shale and shell.....	61	1, 018
Sand and clay.....	37	121	Gray sand and shell.....	16	1, 034
Blue gumbo.....	260	381	Gumbo and lime, sandy.....	65	1, 099
Shale, sand, shell, and gravel.....	56	437	Blue shale and shell.....	24	1, 123
Gray sand and shell.....	33	470	Blue sandy gumbo.....	28	1, 151
Blue gumbo.....	34	504	Shale and boulders.....	68	1, 219
Gumbo and shell, sandy.....	57	561	Blue gumbo.....	17	1, 236
Blue gumbo.....	44	605	Blue gumbo and lime.....	28	1, 264
Gray sand and shell.....	46	651	Gumbo.....	52	1, 316
Blue sandy gumbo.....	58	709	Shale and lime.....	19	1, 335
Shale, sand, shell, and gravel.....	48	757	Brown gumbo.....	39	1, 374
Blue sandy gumbo.....	32	789	Blue shale and lime.....	37	1, 411
Blue gumbo.....	38	827	Blue gumbo.....	17	1, 428

TABLE 7.—*Drillers' logs, Liberty County, Tex.—Continued*

Well 122, C. A. Grebey, 1¼ miles northwest of Dayton

	Thick- ness (feet)	Depth (feet)		Thick- ness (feet)	Depth (feet)
Clay.....	140	140	Clay.....	14	164
Fine-grained sand.....	10	150	Coarse-grained sand.....	29	193

Well 140, Sudermann-Dolsen Co., 6¼ miles north of Dayton

Clay.....	60	60	Joint clay.....	35	145
Sand.....	13	73	Gumbo.....	64	185
Joint clay.....	17	90	Sand.....	40	225
Gumbo.....	20	110			

Well 141, Russ Mitchell Co. No. 4, 3¾ miles north of Dayton

Clay.....	23	23	Hard shale.....	122	300
Sand.....	8	31	Sticky clay.....	64	364
Clay.....	89	120	Fine-grained sand.....	41	405
Very fine red and gray sand.....	58	178	Sand.....	8	413

Well 146, L. E. Wiggins, 13 miles north of Liberty

Yellow clay.....	65	65	Clay.....	4	83
Sand.....	14	79	Sand and gravel.....	33	116

Well 148, J. E. Dillon, 13¼ miles north of Liberty

Clay.....	22	22	Coarse-grained sand.....	20	109
Sand.....	22	44	Fine-grained sand.....	17	126
Clay.....	22	66	Clay.....	69	195
Fine-grained sand.....	23	89	Sand and gravel.....	18	213

Well 149, John Morgan, 12¼ miles north of Liberty

Yellow clay.....	15	15	Clay.....	3	87
Tight fine-grained sand.....	6	21	Hard packsand.....	13	100
Yellow clay.....	31	52	Clay.....	29	129
Fine-grained sand.....	32	84	Sand and gravel.....	63	192

Well 151, L. Daffern, 10¾ miles north of Liberty

Yellow clay.....	60	60	Coarse-grained sand.....	41	122
Blue clay.....	21	81	Shale.....	3	125

Well 152, Morgan and Morgan Lumber Co., 7¾ miles north of Liberty

Clay.....	60	60	Clay with lenses of sand.....	28	145
Fine-grained sand.....	26	86	Clay.....	15	160
Clay.....	29	115	Blue sandy clay.....	22	182
Sand.....	2	117	Good sand and gravel.....	46	228

Well 153, Hardin Baptist church, 7¾ miles north of Liberty

Soft sand.....	4	4	Coarse-grained sand.....	18	88
Soft clay.....	66	70	Medium clay.....	11	99

Well 154, John Rosnick, 7 miles north of Liberty

Clay.....	50	50	Clay.....	28	110
Sand and gravel.....	32	82			

TABLE 7.—*Drillers' logs, Liberty County, Tex.*—Continued

Well 155, Humble Oil & Refining Co. (Partlow No. 10), 8½ miles north of Liberty

	Thick- ness (feet)	Depth (feet)		Thick- ness (feet)	Depth (feet)
Sand.....	2	2	Lenses of sand and clay.....	35	151
Clay.....	10	12	Sand.....	25	176
Sand and gravel.....	26	38	Clay.....	13	189
Clay.....	4	42	Sand and gravel.....	30	219
Sandy clay.....	56	98	Clay.....	11	230
Sand.....	18	116			

Well 156, Humble Oil & Refining Co. (Partlow No. 17), 8½ miles north of Liberty

Clay.....	26	26	Sand.....	14	191
Fine-grained sand.....	51	77	Clay.....	14	205
Clay.....	20	97	Coarse-grained sand.....	23	228
Rock.....	2	99	Clay.....	14	242
Clay.....	31	130	Coarse-grained sand.....	11	253
Fine-grained sand.....	29	159	Clay.....	4	257
Clay.....	18	177			

Well 157, Humble Oil & Refining Co. (Johnson No. 1), 9 miles north of Liberty

Red sand.....	42	42	Very fine gray sand.....	30	126
Red clay.....	20	62	Sand with lenses of shale.....	26	152
Sand.....	4	66	Sand and gravel.....	15	167
Sandy clay.....	4	70	Blue clay.....	10	177
Fine sand, "salt and pepper".....	20	90	Sand and gravel.....	23	200
Tough red clay.....	6	96			

Well 158, James R. Nowery Drilling Co., 7¼ miles north of Liberty

Sand and gravel.....	36	36	Gravel.....	5	207
Clay.....	60	96	Clay.....	13	220
Fine-grained sand.....	22	118	Streaks of clay and gravel.....	13	233
Clay.....	43	161	Clay.....	8	241
Fine-grained sand.....	35	196	Fine-grained sand.....	13	254
Streaks of sand and clay.....	6	202			

Well 159, Humble Oil & Refining Co. (Partlow "A" No. 8), 8¾ miles north of Liberty

Sand.....	2	2	Lenses of sand and clay.....	35	151
Clay.....	10	12	Sand.....	24	175
Sand and gravel.....	26	38	Clay.....	6	181
Clay.....	4	42	Sand and gravel.....	35	216
Lenses of sand and clay.....	56	98	Tough clay.....	2	218
Sand.....	18	116			

Well 160, Humble Oil & Refining Co. (Hardin Camp well), 8¼ miles north of Liberty

Clay.....	12	12	Clay.....	41	109
Loose fine red sand.....	23	35	Sand and gravel.....	29	138
Clay.....	15	50	Blue clay.....	37	175
Sand and gravel.....	18	68	Sand and gravel.....	51	226

Well 164, Mrs. A. Cessna, 8½ miles north of Liberty

Surface sand.....	3	3	Gray sand.....	21	86
Yellow clay.....	38	41	Yellow clay.....	69	155
Clay streaks and sand.....	24	65	Gray sand.....	37	192

TABLE 7.—*Drillers' logs, Liberty County, Tex.—Continued*

Well 166, Hull-Daisetta Water Co., 11 miles northeast of Liberty

	Thick- ness (feet)	Depth (feet)		Thick- ness (feet)	Depth (feet)
Clay.....	20	20	Sand.....	5	96
Fine-grained sand.....	10	30	Clay.....	60	156
Coarse-grained sand.....	33	63	Fine-grained sand.....	19	175
Clay.....	1	64	Clay.....	23	198
Coarse-grained sand.....	11	75	Rock.....	6	204
Clay.....	3	78	Clay.....	30	234
Coarse-grained sand.....	4	82	Gravel.....	3	237
Yellow clay.....	3	85	Clay.....	71	308
Coarse-grained sand.....	5	90	Coarse-grained sand.....	57	365
Clay.....	1	91			

Well 167, Joe Haines, 10¼ miles northeast of Liberty

Tough clay.....	53	53	Tough clay.....	5	84
Sand.....	26	79	Sand and gravel.....	22	106

Well 168, Liberty Ranch Co., 7½ miles northeast of Liberty

Yellow clay.....	120	120	Gumbo.....	21	529
Soft shale.....	10	130	Fine-grained sand.....	35	564
Light-blue gumbo.....	110	240	Gumbo.....	20	584
Sand.....	20	260	Sand.....	13	597
Gumbo.....	60	320	Gumbo.....	46	643
Sand.....	120	440	Fine-grained sand.....	19	662
Gumbo.....	32	472	Gumbo.....	5	667
Sand.....	36	508	Good sand.....	36	703

Well 169, Hancomer Lumber Co., 11 miles northeast of Liberty

Sand.....	2	2	Shale.....	24	98
Clay.....	15	17	Sand.....	24	122
Fine-grained sand.....	41	58	Clay.....	24	146
Clay.....	4	62	Medium-grained sand.....	32	178
Sand.....	12	74	Clay.....	44	222

Well 170, Gulf Oil Corp. (Hannah No. 20), 9¼ miles northeast of Liberty

Clay.....	60	60	Fine-grained sand.....	21	235
Fine-grained sand.....	27	87	Clay.....	27	262
Yellow clay.....	127	214	Fine-grained sand.....	59	321

Well 171, John Mecon, 10 miles northeast of Liberty

Clay.....	12	12	Shale.....	20	100
Sand.....	43	55	Sand.....	7	107
Shale.....	2	57	Shale.....	113	220
Sand.....	23	80	Sand.....	16	236

Well 172, Hamill and Smith, 9½ miles northeast of Liberty

Clay.....	35	35	Tough clay.....	78	223
Sandy clay.....	5	40	Fine sand and clay.....	52	275
Sand.....	35	75	Clean sand and gravel.....	30	305
Clay.....	70	145			

Well 173, Hamill and Smith (Barngrover lease), 9½ miles northeast of Liberty

Clay.....	6	6	Clay.....	3	170
Red sand.....	34	40	Coarse-grained sand.....	10	180
Sandy clay.....	10	50	Tough blue clay.....	10	190
Tough blue clay.....	69	119	Hard packsand.....	10	200
Coarse sand and gravel.....	6	125	Tough blue clay.....	23	223
Tough blue clay.....	33	158	Coarse sand and gravel.....	32	255
Fine gray sand.....	9	167			

TABLE 7.—*Drillers' logs, Liberty County, Tex.—Continued*

Well 176, Houston Production Co., 9½ miles northeast of Liberty

	Thick- ness (feet)	Depth (feet)		Thick- ness (feet)	Depth (feet)
Clay.....	42	42	Sand.....	23	258
Fine-grained sand.....	25	67	Sand and gravel.....	21	279
Clay.....	37	104	Sand.....	21	300
Fine sand and streaks of clay.....	20	124	Fine-grained sand.....	20	320
Clay.....	41	165	Hard sand.....	13	333
Sandy clay.....	25	190	Clay.....	10	343
Clay.....	22	212	Sand and gravel.....	27	370
Sand.....	20	232	Fine sand.....	4	374
Sand and gravel.....	3	235			

Well 177, The Texas Co., 9¼ miles northeast of Liberty

Soil.....	24	24	Sand.....	10	132
Shale.....	21	45	Shale.....	117	249
Sand.....	63	108	Sand.....	134	383
Shale.....	14	122			

Well 179, city of Liberty, in Liberty

Surface clay.....	12	12	Sand and gravel.....	14	320
Sand.....	48	60	Sticky shale.....	40	360
Clay.....	20	80	Sand.....	16	376
Sand.....	14	94	Sticky shale.....	69	445
Clay.....	25	119	Sand.....	10	455
Sand and clay.....	27	146	Sand and shale.....	10	465
Sticky shale.....	110	256	Sticky shale.....	58	523
Sand.....	42	298	Sand.....	39	562
Sticky shale.....	8	306	Sticky shale.....	3	565

Well 183, Southern Pacific R. R. Co., in Liberty

Soil and clay.....	8	8	Sandy clay.....	20	201
Sand.....	33	41	Clay.....	75	276
Clay.....	2	43	Sandy clay.....	27	303
Sand.....	30	73	Sand with streaks of clay.....	28	331
Sandy clay.....	21	94	Clay.....	45	376
Sand.....	23	117	Sand.....	10	386
Clay.....	53	150	Clay.....	174	560
Sand.....	14	164	Sand.....	28	588
Clay.....	9	173	Clay.....	13	601
Sand.....	8	181			

Well 185, Layl Sandwich Shop, in Liberty

Sand.....	32	32	Clay.....	2	108
Coarse red sand.....	17	49	Coarse grained sand.....	4	112
Clay.....	43	92	Clay.....	7	119
Coarse-grained sand.....	14	106			

Well 186, Texas Pipe Line Co., 3 miles south of Liberty

Sand.....	60	60	Rock.....	2	278
Clay.....	45	105	Coarse-grained sand.....	37	315
Streaks of sand and shale.....	46	151	Shale.....	3	318
Sand and gravel.....	9	160	Fine-grained sand.....	10	328
Fine-grained sand.....	70	230	Tight sand.....	4	332
Coarse-grained sand.....	46	276	Rock.....	1	333

Well 191, Liberty County Fair Grounds, 1¼ miles southeast of Liberty

Soft clay.....	15	15	Clay.....	5	36
Sand.....	16	31	Sand.....	29	65

TABLE 7.—Drillers' logs, Liberty County, Tex.—Continued

Well 193, Mrs. Maggie L. Moorefield, in Liberty

	Thick- ness (feet)	Depth (feet)		Thick- ness (feet)	Depth (feet)
Sand.....	60	60	Fine-grained sand.....	11	144
Clay.....	73	133	Clay.....	56	200

Well 194, Martin Leissner, 5 miles north of Liberty

Clay.....	37	37	Clay.....	9	81
Fine-grained sand.....	17	54	Medium-grained sand.....	16	97
Shale.....	14	68	Clay.....	6	103
Gravel.....	4	72			

Well 199, C. W. Fisher, in Liberty

Clay with layers of sand.....	40	40	Blue clay.....	30	230
Sand and gravel.....	160	200	Water-bearing sand.....	8	238

Well 200, Howard LeCour, 7¼ miles east of Liberty

Clay.....	106	106	Fine-grained sand.....	5	160
Fine-grained sand.....	9	115	Clay.....	21	181
Clay.....	25	140	Fine-grained sand.....	7	188
Fine-grained sand.....	7	147	Clay.....	3	191
Clay.....	8	155			

Well 201, Carl Johnson, 9½ miles east of Liberty

Clay.....	41	41	Fine-grained sand.....	44	256
Fine-grained sand.....	19	60	Sand.....	85	341
Coarse-grained sand.....	45	105	Fine-grained sand.....	94	435
Sandy clay.....	10	115	Clay.....	24	459
Clay.....	63	178	Sand.....	3	462
Sand and gravel.....	3	181	Fine-grained sand.....	7	469
Shale.....	31	212	Clay.....	59	528

Well 202, Chas. Welch, 9¼ miles southeast of Liberty

Sand.....	4	4	Sand.....	22	82
Clay.....	31	35	Sand and gravel.....	14	96
Fine-grained sand.....	25	60			

Well 203, Silva and Welch, 7½ miles east of Liberty

Clay.....	72	72	Fine-grained sand.....	10	147
Fine-grained sand.....	6	78	Clay.....	4	151
Clay.....	59	137			

Well 204, Mrs. Robinett, 7½ miles east of Liberty

Hard yellow clay.....	147	147	Hard clay.....	9	161
Fine-grained sand.....	5	152			

Well 205, C. C. Thornton, 6 miles southeast of Liberty

Yellow sticky clay.....	149	149	Fine-grained sand.....	20	257
Clay.....	72	221	Medium-grained sand.....	30	287
Shale.....	16	237			

TABLE 7.—*Drillers' logs, Liberty County, Tex.—Continued*

Well 206, Leo B. Pitre, 7 miles east of Liberty

	Thick- ness (feet)	Depth (feet)		Thick- ness (feet)	Depth (feet)
Clay.....	310	310	Sand.....	60	370

Well 213, Leo B. Pitre, 7 miles east of Liberty

Clay.....	41	41	Fine hard sand.....	25	359
Clay and sand streaks.....	43	84	Clay.....	3	362
Fine-grained sand.....	24	108	Fine hard sand.....	67	429
Clay.....	109	217	Tough clay.....	57	486
Fine-grained sand.....	15	232	Fine gray sand.....	71	557
Clay.....	55	287	Clay.....	15	572
Fine hard sand.....	41	328	Fine hard gray to white sand with lenses of clay.....	56	628
Clay.....	6	334			

Well 219 (partial log), Rycade Oil Corp. (Heiskell No. 1), 8½ miles south of Liberty

Sandy clay.....	45	45	Gumbo.....	57	1,055
Sand.....	35	80	Sandy shale.....	57	1,112
Clay.....	100	180	Gumbo.....	28	1,140
Sand.....	32	212	Sand.....	71	1,211
Sand and shale.....	184	396	Gumbo.....	21	1,232
Sand and gravel.....	102	498	Sand and boulders.....	4	1,236
Gumbo.....	122	620	Sand and lime.....	64	1,300
Sandy shale.....	60	680	Gumbo.....	30	1,330
Gumbo.....	40	720	Sand and lime.....	60	1,390
Hard sandy lime.....	60	780	Gumbo.....	95	1,485
Gumbo.....	40	820	Sand.....	29	1,514
Sand and boulders.....	40	860			
Gumbo.....	80	940	Total depth.....		5,927
Sand and boulders.....	58	998			

Well 220 (partial log), Pure Oil Co. (Liberty Investment Co. No. 1), 10 miles south of Liberty

Clay.....	31	31	Sand, gravel.....	42	996
Sand, clay.....	129	160	Sandy gumbo.....	33	1,029
Sand.....	46	206	Sand.....	22	1,051
Clay.....	30	236	Gumbo.....	63	1,114
Sand.....	46	282	Sand.....	18	1,132
Clay.....	47	329	Gumbo.....	4	1,136
Sand, gravel.....	42	371	Sand, gravel.....	9	1,145
Gumbo.....	37	408	Gumbo.....	10	1,155
Sand, gravel.....	122	530	Sand, gravel.....	45	1,200
Clay.....	32	562	Gumbo.....	32	1,232
Sand.....	21	583	Sand, gravel.....	15	1,247
Clay.....	25	608	Gumbo.....	40	1,287
Sand.....	15	623	Sand.....	37	1,324
Clay.....	78	701	Gumbo.....	79	1,403
Sand, gravel.....	69	770	Sand.....	90	1,493
Clay.....	10	780	Gumbo.....	17	1,510
Sand, gravel.....	16	796			
Clay.....	26	822	Total depth.....		5,766
Sand, gravel.....	103	925			
Gumbo, lime.....	29	954			

Well 221, Shilo School, 9 miles southeast of Liberty

Clay.....	17	17	Fine-grained sand.....	34	250
Fine-grained sand.....	22	39	Clay.....	52	302
Clay.....	12	51	Sand.....	10	312
Sandy clay.....	13	64	Fine-grained sand.....	8	320
Clay.....	152	216	Clay.....	13	333

TABLE 7.—*Drillers' logs, Liberty County, Tex.*—Continued

Well 222, A. R. Milintz, 6½ miles southeast of Liberty

	Thick- ness (feet)	Depth (feet)		Thick- ness (feet)	Depth (feet)
Clay	5	5	Sand	5	232
Sand	15	20	Blue shale	2	234
Clay	180	200	Fine-grained sand	16	250
Sand	23	223	Coarse-grained sand	23	273
Blue shale	4	227	Shale	2	275

Well 223, Franklin & Tideman, Ltd., 12¼ miles southeast of Liberty

Clay	18	18	Tight fine sand	69	330
Coarse-grained sand	7	25	Soft, coarse sand, salt water	13	343
Hard clay	92	117	Hard shale	6	349
Hard shale	144	261			

Well 224, Shell Oil Co., 13½ miles southeast of Liberty

Clay	44	44	Sandy shale	21	414
Sand	117	161	Sticky shale	12	426
Clay	36	198	Sand	10	436
Sandy shale	84	282	Gumbo	102	538
Sandy shale	15	297	Sand	30	568
Sticky shale	21	319	Gumbo	81	650
Sandy shale	22	341	Tough shale	31	681
Sticky shale	28	369	Sand	26	707
Gumbo	23	392			

Well 226 (partial log), Humble Oil & Refining Co. (Sabine Tract No. 1), 2¼ miles northeast of Devers

Surface clay	45	45	Shale, lime, sand	32	1,281
Sand	49	94	Shale, lime	17	1,298
Shale, sand	78	172	Lime	45	1,343
Sand	42	214	Sand, boulders	35	1,378
Shale	53	267	Gumbo, lime	40	1,418
Gumbo	37	304	Sand, lime	34	1,452
Sand	30	334	Gumbo	4	1,456
Shale	27	361	Sand	44	1,500
Sand	29	390	Lime, shale, sand	2	1,502
Gumbo	160	550	Sandy shale	12	1,514
Sand	98	648	Gumbo, lime	38	1,552
Gumbo	38	686	Sand	2	1,554
Shale	23	709	Sand, shale	15	1,569
Sand, gravel	73	782	Sandy shale	16	1,585
Gumbo	16	798	Gumbo	169	1,754
Sand	20	818	Sand	3	1,757
Gumbo	12	830	Sandy lime	40	1,797
Sand	10	840	Gumbo	32	1,829
Gumbo	16	856	Sand	5	1,834
Sand	46	902	Sticky shale	88	1,922
Sand, boulders	40	942	Sandy lime	10	1,932
Shale, lime	30	972	Sticky shale	33	1,965
Sand, boulders	58	1,030	Sand	31	1,996
Gumbo	19	1,049	Shale	27	2,023
Sand, boulders	159	1,208			
Shale, lime	15	1,223			
Sand	26	1,249			
			Total depth		5,800

Well 227, Texas Pipe Line Co., 3 miles south of Devers

Clay	38	38	Sandy shale and shell	21	276
Shell	3	41	Fine sand with lenses of shale	21	297
Sandy shale	59	100	No record	36	333
Fine red sand	22	122	Sand and boulders	5	338
Sandy shale with beds of shell	79	201	Lime rock	3	341
Fine-grained sand	5	206	Very fine gray sand	45	386
Sandy shale	49	255	Fine gray sand	20	406

TABLE 7.—*Drillers' logs, Liberty County, Tex.*—Continued

Well 228, Bert Hays, 3¼ miles south of Devers

	Thick- ness (feet)	Depth (feet)		Thick- ness (feet)	Depth (feet)
Clay	209	209	Clay	14	234
Fine white sand	11	220			

Well 229, V. D. Meyers, 1 mile east of Devers

Clay	74	74	Coarse loose sand	25	99
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Well 230, W. E. Jenkins, in Devers

Clay	19	19	Shale	34	299
Soft sand	49	68	Fine-grained sand	45	344
Sand and shale	32	100	Shale	15	359
Sandy shale	154	254	Sandy shale	14	373
Soft fine sand	11	265	Water sand	70	443

Well 231, Dan Hart, 6¼ miles south of Devers

Clay	95	95	Fine-grained sand	11	296
Fine-grained sand	45	140	Shale	18	314
Hard clay	10	150	Shale and sand	141	455
Fine-grained sand	10	160	Shale	18	473
Shale	22	182	Fine-grained sand	13	486
Fine-grained sand	48	230	Shale	2	488
Shale	55	285			

Well 232, The Texas Co. (Moore No. 1), 3½ miles northeast of Devers

Clay	40	40	Sand and shale	142	203
Sand	21	61	Fine-grained sand	29	232

Well 237, Sinclair Pipe Line Co., 5¼ miles east of Devers

Clay	22	22	Blue clay	319	427
Sand	86	108	Sand	65	492

Well 241, H. A. Gripon, in Devers

Red and white sand	66	66	Gray sand	10	338
Blue clay	24	90	Gray sandy clay	51	379
Streaks of sandy clay and sticky blue clay	80	170	Fine gray sand	6	385
Fine gray sand	44	214	Gray sandy shale	10	395
Sandy clay	36	250	Streaks of sand and blue shale	38	433
Tough clay	70	320	Hard fine sand	25	458
Fine gray sand	6	326	Blue sandy clay	8	466
Blue shale	2	328	Gray hard fine sand	32	498
			Tough clay	3	501

Well 245, Gulf Oil Corp., 9 miles south of Devers

Clay	39	39	Sand	76	225
Clay and sand	110	149			

Well 246, Gulf Oil Corp., 9½ miles south of Devers

Surface clay and sand	150	150	Gumbo	50	290
Sand	90	240	Sand and boulders	54	344

WATER ANALYSES

TABLE 8.—*Partial analyses of water from wells and springs in Liberty County, Tex.*

[Analyzed at the University of Texas under the direction of W. W. Hastings, chemist, U. S. Geological Survey, and Dr. E. P. Schoch, Director of the Bureau of Industrial Chemistry of the University of Texas. Results are in parts per million. Well numbers correspond to numbers in table 6]

Well No.	Owner	Depth (feet)	Date of collection	Total dissolved solids	Silica (SiO ₂)	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na+K) (calculated)	Bicarbonate (HCO ₃)	Sulfate (SO ₄)	Chloride (Cl)	Fluoride (F)	Nitrate (NO ₃)	Total hardness as CaCO ₃ (calculated)
1	Gulf, Colorado & Santa Fe Ry.	1,350	Oct. —, 1931	323			16		129		34	49		0	16
2	do.	1,512	Jan. 8, 1937	378	19	0.02	65	0.9	133	270	16	47		0.8	20
3	Gulf States Utilities Co.	386	Jan. 8, 1945	180					140	269	15	17	0.8	0	171
8	City of Cleveland	929	Apr. 11, 1944	377	17	.12	34	7.2	97	186	12	14		0.5	114
11	Grimes Veneer & Panel Co.	90	Jan. 26, 1945	171			12	3.2	33	321	15	27	.6	10	43
12	Cleveland Veneer Co.	300	do.	190	26	.05	47	3.4	11	29	2	18		0	131
13	Cleveland Veneer Co.	200	Jan. 27, 1945	187			21	2.7	22	154	3	47	.2	.5	64
14	Grogan Mfg. Co.	187	Apr. 6, 1945	265			71	3.7	17	52	3	21		0	182
15	Clarkson and Mechum	327	do.	238			68	3.1	12	239	7	118		0	101
16	Gulf Oil Corp.	100	Mar. 30, 1945	298	20	.10	31	5.7	43	24	3	16		.2	182
17	Magnolia Pipe Line Co.	175	do.	207			40	6.7	20	191	10	47		0	101
18	W. A. Ellis	226	Apr. 6, 1945	268			17	1.7	18	104	2	22		.5	131
20	W. A. Ellis	236	June 8, 1945	143			2		208	165	2	38		0	16
21	E. E. Quinn Estate	36	Jan. 8, 1937	493			0.2	3.3	21	402	1	21		20	31
22	W. P. Vonnegut	440	Mar. 24, 1945	119		.29	33	7.9	31	172	4	21		5.6	127
23	I. W. Vonnegut	132	Apr. 17, 1945	201			87	1.3	104	160	19	215		7.9	222
24	I. W. Vonnegut	145	do.	90			7.7	2.8	64	64	3	15		3.7	35
25	Mac Smith	45	Apr. 17, 1945	92		.71	5.7	2.1	14	34	5	20		3.2	36
26	M. N. Cunningham	368	Jan. 25, 1945	212			49	10.1	18	178	26	18		94	139
30	W. C. Crawley	35	do.	1,040	30	.05	62	4	266	188	2	18	0	0	160
31	Tackniet school	506	do.	252			57	4.4	15	231	4	18		0	160
32	I. O. Ward	247	do.	238			36	2.7	17	205	5	24		0	101
33	Charles Morris	229	do.	188		17	13	2.6	28	139	3	18		11	28
34	C. D. Jones	60	do.	99			9.9	1.9	38	60	2	32		2.5	40
35	I. E. Wight	103	do.	161		.06	17	2.2	26	87	4	26		4.5	53
36	E. E. Wortham	100	Jan. 26, 1945	145			19	1.4	18	61	2	18		1.2	22
37	do.	39	do.	120		.09	19	1.7	27	63	2	19		16	23
38	H. E. Kirk	95	Apr. 17, 1945	106		.41	5.9	2.4	16	19	2	18		0	288
39	Joe Simmonds	24	June 8, 1945	85		.26	5.2	4.4	22	350	14	18		11	85
40	John Kite	18	Jan. 9, 1945	380		.07	108	1.9	11	117	9	6		28	102
41	Wirt Davis	40	do.	164		.10	31	1.9	11	117	9	6		0	85
42	do.	40	do.	164		.10	31	1.9	11	117	9	6		0	85
43	N. Gibson	46	Apr. 27, 1945	218		.23	34	4.1	11	63	4	34		28	102

45	Reckitt Lumber Co.	580	Apr. 13, 1942	211	6.4	5.4	75	207	4	18	0	38
47	Miller & Vidor Lumber Co.	585	do	197	60	4.6	12	207	4	14	0	168
48	T. B. Allen Co.	589	Jan. 11, 1945	268	41	7.1	30	210	4	16	0	132
49	Gulf, Colorado & Santa Fe Ry.	650	Apr. 13, 1942	210	53	2.2	20	214	5	16	0	141
50	do	645	Nov. 23, 1944	237	49	7.2	32	216	7	18	0	140
51	Texas Construction Materials Co.	808	Apr. 13, 1942	211	46	4.5	33	220	5	14	0	133
52	do	808	do	209	27	1	58	207	6	16	0	71
53	do	310	Jan. 4, 1945	158	51	2.2	9.2	196	2	17	0	88
54	do	135	Apr. 13, 1942	232	55	3.8	15	171	3	12	0	136
55	South Texas Hardwood Co.	480	Nov. 23, 1944	217	06	3.9	22	188	2	21	0	153
56	Liberty Hardwood Lumber Co.	608	Jan. 10, 1945	244	04	6.6	44	163	2	29	0	128
57	Dolen School	100	Nov. 23, 1944	247	06	4.7	5.8	150	2	18	0	117
58	W. D. Duman	233	Jan. 10, 1945	207	04	3.5	25	170	3	19	0	139
59	A. M. Smith	23	Apr. 4, 1945	1,060	18	16	61	219	17	74	138	111
60	C. Die	56	do	249	217	14	94	219	7	426	20	599
61	do	140	do	157	65	4.8	13	207	3	26	5	182
62	S. J. Keith	86	do	159	31	2.7	11	94	3	23	0	88
63	Pearl Kirkham	22	do	65	3	9	12	26	3	6	5.5	11
64	Spring	85	do	148	17	2.1	20	32	3	45	1.8	51
65	J. W. Phillips	66	Apr. 5, 1945	172	23	1.9	22	89	2	27	0	65
66	J. C. Carter	45	do	170	27	2.2	27	101	8	31	0	76
67	H. Landers	30	Apr. 6, 1945	147	23	2.4	17	71	11	24	0	67
68	J. H. Halton	62	do	229	28	6.4	17	21	7	17	104	96
69	Concord School	104	Jan. 10, 1945	168	10	1.8	20	92	2	34	2	82
70	John Griffin	165	Jan. 11, 1945	121	30	1.5	16	62	14	18	2	56
71	Hollis Griffin	90	do	72	6.6	1.6	15	26	2	22	5.5	23
72	Mrs. W. M. Emanuel	87	Jan. 24, 1945	123	19	2.3	15	65	2	24	0	57
73	Spring	75	June 9, 1945	264	06	3.2	24	201	10	45	5	86
74	J. W. Anson	740	do	470	48	4.9	28	201	4	32	2	132
75	D. A. Redland	1,000	do	590	51	8.3	46	264	12	104	2	276
76	do	840	Apr. 19, 1945	1,440	40	8.5	104	354	12	133	2	264
77	Arnold Wolfe	808	June 9, 1945	388	26	8.1	61	206	18	560	0	78
78	E. J. Stoesser	1,005	June 19, 1945	708	21	2.1	250	221	18	113	0	203
79	W. F. Graves	2,500	Apr. 18, 1945	856	1.7	5.2	329	455	19	270	0	14
80	do	870	June 9, 1945	542	08	1.8	212	268	19	172	0	18
81	Leo Moreau	780	June 15, 1945	382	65	1.6	132	204	12	69	0	14
82	A. C. Holbrook	276	Apr. 18, 1945	264	26	5.9	40	204	7	43	0	149
83	Henry Bode	384	Jan. 27, 1945	401	2.3	51	91	228	2	112	0	161
84	Sun Pipe Line Co.	19	do	400	4.3	5.2	32	408	2	21	0	296
85	B. T. Sturrock	19	do	523	38	110	40	423	6	68	6.9	367
86	Joe Sobotik	540	Apr. 18, 1945	502	89	7.5	108	434	7	178	0	302
87	R. F. Janik	32	Apr. 19, 1945	623	1.7	103	11	235	8	119	0	38
88	Magnolia Pipe Line Co.	1,030	do	638	54	12	2.0	250	12	234	0	120
89	Roy Seaburg	101	do	235	06	4.8	41	178	2	43	0.2	120
90	do	209	June 9, 1945	389	68	1.5	149	333	2	45	0.2	19
91	R. Freeman	175	Oct. 30, 1931	1,080	64	21	271	450	11	436	0	405
92	J. M. Hlavaty	400	Jan. 27, 1945	590	11	4.4	174	239	2	208	0	118
93	N. B. Sapp	395	Oct. 30, 1931	592	4.2	13	60	400	9	115	0	368
94	City of Dayton	399	Apr. 17, 1944	592	21	4.4	174	239	2	208	0	118
95	do	120	do	592	4.2	13	60	400	9	115	0	368
96	C. A. Grebey	193	Jan. 27, 1945	592	21	4.4	174	239	2	208	0	118

216	Devers Canal Co.	176	.....do.....	760	.....	.04	39	7.4	244	294	3	294	294	0	128
217	do	238	Jan. 6, 1945	752	.....	.10	30	2.9	268	368	2	368	260	.2	87
218	Bab Le Cour	1,500	Dec. 22, 1944	1,080	.....	.06	50	4.8	336	186	2	186	510	.2	144
221	Shilo School	333	Jan. 6, 1945	836	.....	.07	26	4.1	300	318	2	318	334	0	82
227	Texas Pipe Line Co.	406	Jan. 24, 1945	615	.....	1.1	23	3.1	213	279	2	279	212	.2	70
228	Bert Hays	234	do	673	.....	25	45	9.8	206	358	3	358	216	0	153
229	V. D. Meyers	99	Jan. 23, 1945	274	.....	.11	56	6.6	29	171	21	171	49	0	167
230	W. F. Jenkins	443	Jan. 24, 1945	822	.....	.26	20	3.8	131	292	2	292	68	.5	55
231	Don Hart	488	do	822	.....	.26	36	2.4	204	335	2	335	86	.8	66
233	E. V. Boyt	210	Jan. 17, 1945	449	.....	.....	35	5.6	142	360	3	360	86	1.0	110
234	B. H. Willis Estate	180	do	338	.....	.....	35	5.6	94	269	4	269	63	.8	110
235	do	200	do	311	.....	.....	61	3.2	47	229	3	229	85	1.0	165
236	do	180	do	804	.....	.08	76	9.3	213	303	18	303	300	.2	228
237	Sinclair Pipe Line Co.	585	June 30, 1945	854	.....	.20	21	3.9	308	281	2	281	344	.2	68
238	American Rice Growers Assn.	107	Jan. 23, 1945	395	.....	1.1	88	6.3	47	358	4	358	36	2.5	246
240	J. E. Clark, Jr.	92	do	372	.....	7.8	75	4.6	60	308	5	308	56	0	206
241	J. M. Rich	200	Jan. 24, 1945	692	.....	.....	117	14	114	344	48	344	188	0	350
241	H. W. Gibson	501	June 30, 1945	441	.....	.37	16	2.2	154	290	2	290	90	0	49
242	E. W. Boyt	403	Jan. 16, 1945	673	.....	.18	21	5.9	242	330	2	330	223	0	673
243	E. V. Boyt	400	do	67316	32	5.9	236	353	2	353	211	0	104
244	E. F. Absner	150	Jan. 24, 1945	737	95	15	163	356	37	356	228	0	298

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