Ground-Water Resources of Gregg County, Texas

With a section on Stream Runoff

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1079–B

Prepared in cooperation with the Texas State Board of Water Engineers

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By W. L. BROADHURST

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

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GROUND-WATER RESOURCES OF GREGG COUNTY, TEX.

By W. L. Broadhurst

ABSTRACT

Gregg County is in the timber belt of northeastern Texas, and most of the western part of the county is occupied by the north-central part of the East Texas oil field.

The geologic formations or groups of formations discussed in the report include, from older to younger, the rocks of Upper Cretaceous age; the Midway group of Paleocene age; and the Wilcox group, the Carrizo sand, and the Reklaw and Queen City sand members of the Mount Selman formation of Eocene age.

In Gregg County the Upper Cretaceous rocks, consisting of clay, shale, marl, limestone, and sand, are believed to contain salty water. The Cretaceous rocks are overlain by those of the Midway group, which are essentially nonwater-bearing clays and shales.

All the formations in Gregg County that contain important water-bearing sands lie above the Midway group and crop out within the county. The formations, listed in the order in which they crop out successively from the southeastern part of the county to the northwestern part are the Wilcox group, the Carrizo sand, and the Queen City sand member of the Mount Selman formation.

The land surface slopes southeastward, but the beds in the outcropping formations dip northwestward into the East Texas syncline. Therefore, persistent beds that crop out in the eastern and central parts of the county are encountered by wells at considerable depths below the surface in the northern and western parts of the county.

Wells yielding about 500 gallons a minute and ranging from 700 to 1,000 feet in depth have been developed in most parts of the county. In general, somewhat highly mineralized water is encountered below depths of 200 to 300 feet in the east-central part of the county, below 300 to 400 feet in the northwestern part, and below about 500 feet in the southwestern part. Wells of shallower depth yield water of better quality at the rate of 50 to 200 gallons a minute. No important supplies of water are to be expected below the lowermost sands of the Wilcox group, which occur about 700 feet below the surface in the eastern part of the county and about 1,000 to 1,100 feet in the western part.

Supplies of surface water are available from the Sabine River and some of its larger tributaries, but in order to obtain a dependable supply of good water in considerable volume storage would have to be provided. In some areas, if the requirements are not too high, it might be possible to use a combination of ground water and surface water.

INTRODUCTION

LOCATION AND EXTENT OF THE AREA

Gregg County is in the timber and oil belt of northeast Texas. It is bounded on the north by Upshur County, on the east by Harrison County, on the south by Rusk County, and on the west by Smith County. The land surface is gently rolling to somewhat hilly and in general rises from east to west. The minimum altitude is about 250 feet above sea level; the maximum about 550 feet. The county has an area of 312 square miles and according to the 1940 census has a population of 58,027, an average of 186 persons per square mile. The principal cities and their population (1940) are: Longview (county seat), 13,758; Kilgore, 6,708; Gladewater, 4,454; and Greggton, 2,000.

ECONOMIC DEVELOPMENT

The economic development of Gregg County is diversified. The county is in the heart of the East Texas oil field and in 1940 produced 77,156,000 barrels of oil from approximately 14,000 wells. The timber, consisting of loblolly, short-leaf yellow pine, and hardwood, supports a thriving lumber industry. Farming is practiced throughout the county, the principal farm crops being cotton, corn, grain sorghums, peanuts, and sweet and Irish potatoes. Beef cattle and hogs constitute the principal livestock raised for market.

PRECIPITATION

According to records of the United States Weather Bureau the average annual precipitation at Longview during 53 years was 42.87 inches. In general the precipitation is highest in the winter and spring and lowest in the summer. Table 1 gives the precipitation for some of the wettest and driest years, 1890–1944.

TABLE 1.—*Precipitation extremes, by years, 1890 to 1944, at Longview, Tex.*

Highest		Lowest	
Year	Inches	Year	Inches
1890	60. 92	1909	32. 11
1905	63. 30	1910	32. 11
1919	56. 13	1917	29. 28
1941	55. 34	1923	33. 52
1944	71. 08	1924	33. 47
		1925	34. 24
		1936	29. 53

Table 2 gives the United States Weather Bureau records of precipitation, by months, at Longview, Tex., 1889 to 1944.

TABLE 2.—*Precipitation, in inches, 1889 to 1944, at Longview, Tex.*

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
1889	6.55	3.95	2.65	6.70	3.32	12.31	2.66	0.62	4.71	0.60	9.55	0.00	53.62
1890	5.59	12.85	4.67	8.00	5.43	3.04	2.42	.41	3.87	6.50	3.79	4.35	60.92
1891	9.74	2.52	3.56	5.14	2.82	4.43	3.89	.42	3.04	.15	4.49	4.60	44.80
1892	4.21	3.12	4.06	3.74	3.97	6.77	2.27	5.03	1.97	3.30	6.15	5.27	49.86
1893	.38	1.82	2.88	1.67	6.67	2.64	.90	3.81	4.20	1.46	6.42	2.62	35.47
1894	4.44	3.40	7.07	4.25	1.24	2.62	5.50	6.34	2.06	.21	1.60	3.66	42.39
1895	7.44	1.84	3.92	1.49	8.09	10.76	5.70	1.43	.01	3.59	2.66	3.26	50.19
1896	8.18	5.22	2.82	2.09	2.42	3.41	3.78	1.08	3.30	6.66	2.15	2.55	43.66
1897	5.19	.30	10.31	4.61	6.76	3.89	3.03	1.70	2.16	2.39	1.93	7.02	49.29
1898	9.42	2.86	3.30	1.24	1.69	5.21	1.17	3.01	3.77	1.94	3.60	2.55	39.76
1899	4.09	1.40	1.64	5.69	6.87	4.94	1.81	.83	.43	5.60	1.86	4.20	39.36
1900	3.39	3.05	7.37	6.60	5.98	3.27	3.13	1.28	5.01	3.78	1.48	2.01	46.35
1901	3.30	4.01	4.00	3.52	5.55	1.97	3.55	1.47	6.12	3.74	4.84	2.79	44.86
1902	2.52	2.63	3.59	3.44	2.03	4.50	7.83	.09	5.05	2.53	10.71	4.00	48.92
1903	1.12	9.34	3.62	.52	3.57	3.80	5.90	2.18	1.14	3.19	.65	2.73	37.76
1904	.47	2.92	2.04	6.23	4.82	6.55	4.67	2.28	2.37	.22	2.30	5.80	40.67
1905	4.04	2.33	6.00	8.00	7.59	8.51	8.03	.40	2.08	1.80	5.56	8.96	63.30
1906	2.52	2.28	7.91	1.51	3.44	3.60	5.88	5.17	3.47	4.23	1.34	7.03	48.38
1907	2.23	2.67	4.10	5.71	7.59	.68	2.68	1.15	.13	4.09	10.89	3.67	45.59
1908	2.57	5.79	2.62	4.96	10.30	2.05	2.46	3.52	3.86	.14	1.91	3.02	43.20
1909	.45	3.74	3.18	2.49	1.85	2.41	1.45	2.15	1.46	3.25	2.30	7.38	32.11
1910	1.76	3.99	1.67	4.89	5.93	1.89	2.41	.72	.71	1.09	1.88	5.17	32.11
1911	.45	6.13	2.22	7.96	1.77	.42	6.08	5.90	.55	1.60	2.92	6.35	42.35
1912	2.31	2.03	8.08	6.57	2.02	4.35	2.11	15.28	.26	.81	1.26	4.32	49.40
1913	2.83	4.16	4.93	4.56	2.75	2.89	3.32	.22	11.96	8.36	1.19	7.53	54.70
1914	1.79	3.88	4.67	5.29	6.10	.09	1.19	9.31	1.62	1.56	4.75	9.16	49.41
1915	4.09	3.56	3.60	3.99	1.44	4.70	1.75	11.41	.92	1.19	4.45	2.26	43.36
1916	5.64	.18	1.22	5.80	5.34	3.31	2.13	.92	2.66	3.35	3.69	1.67	35.91
1917	3.70	2.82	3.51	3.25	2.01	.82	7.51	.80	1.26	.30	2.02	1.28	29.28
1918	3.12	.67	2.00	7.64	1.28	2.43	.10	2.84	2.79	2.56	6.67	2.04	34.14
1919	3.80	3.33	3.83	3.45	3.25	6.34	5.68	4.58	2.19	12.97	5.68	1.03	56.13
1920	5.27	1.91	4.87	4.09	5.75	4.07	4.51	5.28	1.41	4.71	4.53	3.75	50.15
1921	3.11	2.03	2.73	6.92	2.33	9.37	3.80	1.07	2.28	1.71	2.77	4.10	42.22
1922	4.49	5.96	8.71	8.40	3.33	2.77	3.82	3.66	.45	.67	2.60	1.12	45.98
1923	3.19	5.71	2.06	4.14	1.63	2.34	.81	Trace	1.07	2.76	2.03	7.78	33.52
1924	5.12	3.50	3.40	3.37	7.64	.67	.00	.90	1.52	.50	2.53	4.32	33.47
1925	4.83	1.47	2.61	2.16	2.65	.30	4.76	.68	2.40	5.25	7.03	.10	34.24
1926	4.04	.74	9.42	2.70	3.43	3.56	4.69	1.11	1.48	1.38	1.59	8.30	42.44
1927	2.09	4.09	5.96	8.74	3.68	4.02	4.81	.93	2.06	3.55	1.00	.75	41.68
1928	1.10	2.50	3.30	7.05	1.25	3.90	2.24	.00	.75	4.90	1.95	7.20	36.14
1929	4.66	1.85	3.92	5.12	6.55	3.05	.72	.63	3.09	2.13	4.83	3.61	40.16
1930	3.93	5.28	2.25	1.40	9.23	.86	.08	1.46	1.51	7.18	5.73	3.58	42.49
1931	2.70	5.19	3.33	2.73	1.14	1.01	5.88	2.86	.02	2.96	6.28	10.38	44.48
1932	9.63	6.74	4.01	2.51	1.86	3.67	.94	.71	1.46	1.23	3.51	6.16	42.43
1933	4.65	2.54	4.92	4.77	5.21	.16	10.55	2.80	2.53	1.30	1.09	6.19	46.71
1934	3.55	2.74	7.30	5.50	1.67	.71	1.61	.72	2.06	.29	5.82	2.84	34.81
1935	2.83	3.88	4.35	3.77	7.06	5.22	.45	1.69	3.64	8.31	3.98	4.67	49.85
1936	.60	.40	1.05	1.27	7.29	.47	7.47	1.05	1.04	2.21	2.18	4.50	29.53
1937	9.72	2.00	4.92	4.44	.92	3.90	2.80	5.60	.00	3.37	3.53	7.19	48.39
1938	3.95	1.55	1.96	3.72	2.63	4.49	3.73	2.27	1.34	.70	6.15	2.99	35.48
1939	7.46	7.34	1.19	1.85	4.94	2.69	1.01	2.03	.07	1.19	4.23	2.92	36.92
1940	1.32	3.51	4.83	5.47	4.19	4.15	2.48	3.73	1.15	2.42	8.96	7.94	50.15
1941	3.04	3.30	4.62	6.48	5.68	7.66	4.07	2.81	4.15	5.27	3.67	4.59	55.34
1942	2.26	.81	3.50	8.62	4.02	------	4.05	8.71	3.10	1.35	1.03	------	------
1943	------	------	2.89	1.68	6.28	1.45	.65	1.16	4.51	3.63	.79	4.45	------
1944	5.75	7.44	5.33	12.82	16.43	2.62	.01	2.79	.60	.58	6.08	10.63	71.08

ACKNOWLEDGMENTS

This report is based on an investigation made between August 1941 and January 1942 in cooperation with the Texas State Board of Water Engineers.

The writer is indebted to many persons who have contributed information for the report. The representatives of oil companies and the city officials of Longview, Kilgore, and Gladewater furnished well logs and other important well data. Information was obtained from maps compiled by members of the East Texas Geological Society, showing the thickness of geologic formations in northeastern Texas.

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

OCCURRENCE AND MOVEMENT OF GROUND WATER

For discussions of the fundamental principles of the occurrence and movement of ground water, the reader is referred to papers by Meinzer and Wenzel.[1]

Ground water is derived chiefly from water that falls as rain and snow. Part of the precipitation runs off in streams, part is returned to the atmosphere by evaporation and transpiration through trees and other plants, and part sinks to the zone of saturation in which the interstitial openings in 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 toward areas of discharge. In the more permeable rocks, such as coarse-grained sand, gravel, and porous limestone, the water moves with comparative freedom, although the movement is very slow. 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.

At 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; it usually slopes in about the same direction as the slope of the land surface. It is generally high under areas of ground-water intake and low under 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 are confined between relatively impermeable strata the water is usually under artesian pressure and will rise in wells above the level at which it is first encountered. If the altitude to which the

[1] Meinzer, O. E., The occurrence of ground water in the United States: U. S. Geol. Survey Water-Supply Paper 489, 1923; Outline of ground-water hydrology: U. S. Geol. Survey Water-Supply Paper 494, 1923; Outline of methods for estimating ground-water supplies: U. S. Geol. Survey Water-Supply Paper 638–C, pp. 99–144, 1931. Meinzer, O. E., and Wenzel, L. K., Physics of the earth: vol. 9, Hydrology, pp. 385–478, McGraw-Hill, 1942. Wenzel, L. K., Method for determining permeability of water-bearing materials: U. S. Geol. Survey Water-Supply Paper 887, 1942.

water will rise is greater than the altitude of the land surface, flowing wells may be obtained.

The rocks underlying Gregg County to depths of about 1,000 feet consist chiefly of clays and shales interbedded with sands. The beds are inclined, the dip being westward and northwestward toward the center of the East Texas syncline. The general slope of the land surface, however, is in the opposite direction, or toward the east and southeast. Hence, although artesian conditions are believed to occur at moderate depths in most parts of the county, in general they are not favorable for producing flowing wells; the land surface in most places is higher than the outcrops of the underlying artesian beds.

All 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 sandstones at considerable distances from the outcrops of the water-bearing beds seldom are affected by seasonal or annual differences in rainfall, although they may respond somewhat to the effect of a series of wet or dry years. Fluctuation of artesian pressure in such a well and the accompanying rise and decline in water level are usually due to withdrawals of ground-water from that well or from neighboring wells.

When a well is pumped the water level in the well declines, and a hydraulic gradient is developed toward the well from all directions. This hydraulic gradient causes water to flow toward the well. Within limits the rate at which water will enter a well varies directly with the amount the water level is lowered. For example, if the water level in a well in fairly permeable material is lowered 10 feet when the well is pumped at 100 gallons a minute it will be lowered 20 feet if the well is pumped at 200 gallons a minute. This ratio between the drawdown and the yield of the well is called the specific capacity and may be expressed as yield in gallons a minute per foot of drawdown.

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 in all directions from the center of pumping 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 unless the trend indicates that the sands may become unwatered or the pumping lift

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may eventually exceed the economic limit. In some areas beds carrying fresh water are overlain or underlain by beds carrying salty water, and excessive pumping may lead to the invasion of salt water into the formation that supplies the wells.

GEOLOGIC FORMATIONS AND THEIR WATER-BEARING PROPERTIES

Most of the information given in this section of the report is based on field investigations by the writer, maps compiled by the Federal Geological Survey and the East Texas Geological Society, and Bulletin 3232 of the University of Texas,[2] to which the reader is referred for more detailed descriptions of the rock formations.

Gregg County lies in the Gulf Coastal Plain of northeastern Texas. It is on the west flank of the Sabine uplift and extends westward into the East Texas syncline. Except for thin deposits of alluvium and terrace silts and sands of Quaternary age, all the rocks that crop out in the county belong to the Eocene series of Tertiary age. The outcropping formations or groups of formations, from older to younger, are as follows: Wilcox group (undifferentiated) and the Carrizo sand and Mount Selman formation (including the Reklaw and Queen City sand members) of the Claiborne group. The Wilcox group is underlain by the Midway group of the Paleocene series and by rocks of Cretaceous age. These older rocks do not appear at the surface in Gregg County but crop out on the opposite side of the East Texas syncline in Hopkins, Hunt, Kaufman, and other counties.

The principal ground-water reservoirs in Gregg County occur in sands of the Wilcox group, in the Carrizo sand, and in the Queen City sand member of the Mount Selman formation.

The rocks underlying the county are briefly described below in the order of age from older to younger.

CRETACEOUS SYSTEM

UPPER CRETACEOUS (GULF SERIES)

The Upper Cretaceous rocks in northeast Texas consist of shale, marl, chalk, limestone, and sand and have been divided into the following formations or groups of formations, which from oldest to youngest are the Woodbine sand, Eagle Ford shale, Austin chalk, Taylor marl, and Navarro group.

The Woodbine sand, the source of most of the oil that is being produced in the East Texas field, is 3,000 feet or more below sea level in Gregg County and yields salty water. The Eagle Ford shale, Austin chalk, and Taylor marl are also very deep and probably

[2] Sellards, E. H., Adkins, W. S., and Plummer, F. B., The geology of Texas, vol. 1, Stratigraphy: Texas Univ. Bull. 3232, pp. 480–665, 1932.

contain salty water. The Navarro group, comprising the uppermost rocks of the Gulf series, has been divided into four formations, which in ascending order are the Neylandville marl, Nacatoch sand, Corsicana marl, and Kemp clay.

According to interpretation of electrical logs of oil tests, the Nacatoch sand is encountered about 1,800 to 2,000 feet below the land surface in Gregg County and averages about 100 feet in thickness. No analyses of water from the Nacatoch sand in the county are available, but the electrical logs indicate that the water is salty. Moreover, the sand is known to yield brackish and salty water at shallower depths near the outcrop in Bowie, Titus, Franklin, Hopkins, and other counties.

TERTIARY SYSTEM

PALEOCENE SERIES

MIDWAY GROUP (UNDIFFERENTIATED)

The term Midway has been generally adopted by geologists for the Paleocene series in the Gulf Coastal Plain. The Midway is of marine origin, and in northeast Texas, according to Plummer,[3] consists chiefly of clay, silt, glauconitic sand, and lentils of limestone. Deposition appears to have been continuous from Midway into Wilcox time, the sediments indicating a gradual transition from one group to the other. However, the contact is most frequently drawn where the marine silty clays of the Midway are overlain by fine-grained deltaic sands and nonmarine deposits of the Wilcox. The Midway is a poor water bearer practically everywhere in Texas, and it is not likely to yield appreciable quantities of good water in Gregg County.

EOCENE SERIES

WILCOX GROUP (UNDIFFERENTIATED)

The rocks of the Wilcox group in this area consist mostly of interbedded clay, sandy clay, sand, and lentils of lignite. The sands are medium-grained to fine-grained and consist mostly of quartz, but they contain some organic matter or dark-colored minerals and are often referred to as "salt and pepper" sands. The individual beds of sand, which in places are 50 feet or more thick, are lenticular, and it is difficult to correlate them between wells, even wells that are only a fraction of a mile apart.

The rocks of the Wilcox group crop out along the Sabine River in the southeastern part of the county. A good exposure can be seen south of the Sabine River bridge on the old Kilgore-Longview highway. The top of the formation is encountered at depths ranging

[3] Sellards, E. H., Adkins, W. S., and Plummer, F. B., op. cit., p. 527.

from a few feet to more than 100 feet below the land surface in the vicinity of Longview, and from 200 to 250 feet near Gladewater, and, according to maps of the East Texas Geological Society, the rocks should be encountered between 300 and 400 feet in the southwestern part of the country, where they reach a thickness of about 1,000 feet. According to the writer's interpretation of electrical logs and drillers' logs, the average thickness of the Wilcox group in Gregg County is about 900 feet.

Approximately 100 wells equipped with pumps of 3 horsepower or greater are listed in the Gregg County report of the Texas State Board of Water Engineers for 1937. Most of these wells draw from sands in the Wilcox group. The yields of the wells range from a few gallons to 600 gallons a minute, depending largely on the methods of well construction and the size and type of pumping equipment. Many of the wells in the oil field are pumped by air-lift method and yield only a few gallons a minute.

The dissolved minerals in water from wells in the Wilcox group, mostly sodium, bicarbonate, and chloride, range from about 500 to 2,500 parts per million. In general the lower sands yield more highly mineralized water than the upper sands.

CLAIBORNE GROUP

CARRIZO SAND [4]

The Carrizo sand lies unconformably on rocks of the Wilcox group and crops out in narrow belts on both sides of the Sabine River in the central and southeastern parts of the county. It varies considerably in thickness within short distances, owing in part to the uneven surface of the Wilcox group on which it was deposited, and in some places seems to be absent. A good exposure of the formation can be seen south of the river bridge on the old Kilgore-Longview highway.

The Carrizo sand is for the most part a continental deposit, which consists of fine-grained to medium-grained quartz sand with some yellowish clay and ferruginous cementing material. Although the sand grains of the Carrizo are coarser than those of the Wilcox group below and the Mount Selman formation above, in well logs it is difficult to distinguish the Carrizo sand from the sands above and below. According to the interpretation of drillers' logs and electrical logs the average thickness of the Carrizo sand in Gregg County probably does not exceed 30 feet.

In parts of south and east Texas large quantities of water of good quality for municipal and industrial purposes and for irrigation are obtained from wells in the Carrizo sand. In Gregg County, however,

[4] The Carrizo sand of northeastern Texas, according to L. W. Stephenson of the Geological Survey, may not be the same age as the Carrizo sand of the type area in Dimmit County, southern Texas.

only a few wells draw water from this sand, which is less important as an aquifer than the sands of the underlying Wilcox group. However, water from the Carrizo sand, as a rule, contains considerably less dissolved minerals than water from sands of the Wilcox group.

MOUNT SELMAN FORMATION

In central and northeastern Texas the Mount Selman formation has been divided into three members, which in ascending order are the Reklaw, Queen City sand, and Weches greensand. Only the Reklaw member and Queen City sand member are shown in Gregg County on the geologic map. (See fig. 5.)

Reklaw member.—The Reklaw member of the Mount Selman formation lies conformably on the Carrizo sand and crops out in the central and southeastern parts of the county. It consists mostly of clay but contains some glauconitic sand, sandstone, and impure lignite. The outcrop is characterized by red clay soils. Locally in the outcrop areas the Reklaw yields water of good quality to shallow domestic wells, but down the dip where the member is under cover it yields rather highly mineralized water.

Queen City sand member.—The outcrop areas of the Queen City sand member of the Mount Selman formation occupy most of the western and northern parts of the county. The sediments are chiefly of continental origin and consist mostly of light-gray cross-bedded medium-grained to fine-grained quartz sand interbedded with silt, clay, bentonite, greensand, and impure lignite. The member weathers into a lightcolored sandy loam on the outcrop. It ranges in thickness from a few feet to possibly 300 feet, being thickest in the western part of the county. Many shallow dug wells in the outcrop yield fresh water in sufficient quantities for domestic use and for stock, but no deep wells are known to draw from the Queen City sand in Gregg County.

PRESENT DEVELOPMENT OF WATER SUPPLIES FROM WELLS

Ground water has had an important part in the economic development of Gregg County. Practically all the water used in the rural areas is obtained from dug wells less than 50 feet deep. Such supplies can be obtained almost anywhere in the county. Until 1914 the city of Longview obtained its water supply from wells. The public and industrial supplies for the cities of Kilgore and Gladewater and water used for drilling oil wells, for the operation of oil refineries, and for domestic purposes in the oil fields are obtained from drilled wells that range from about 200 to 1,000 feet in depth. Records of about 100 wells were published in a mimeographed report which was released

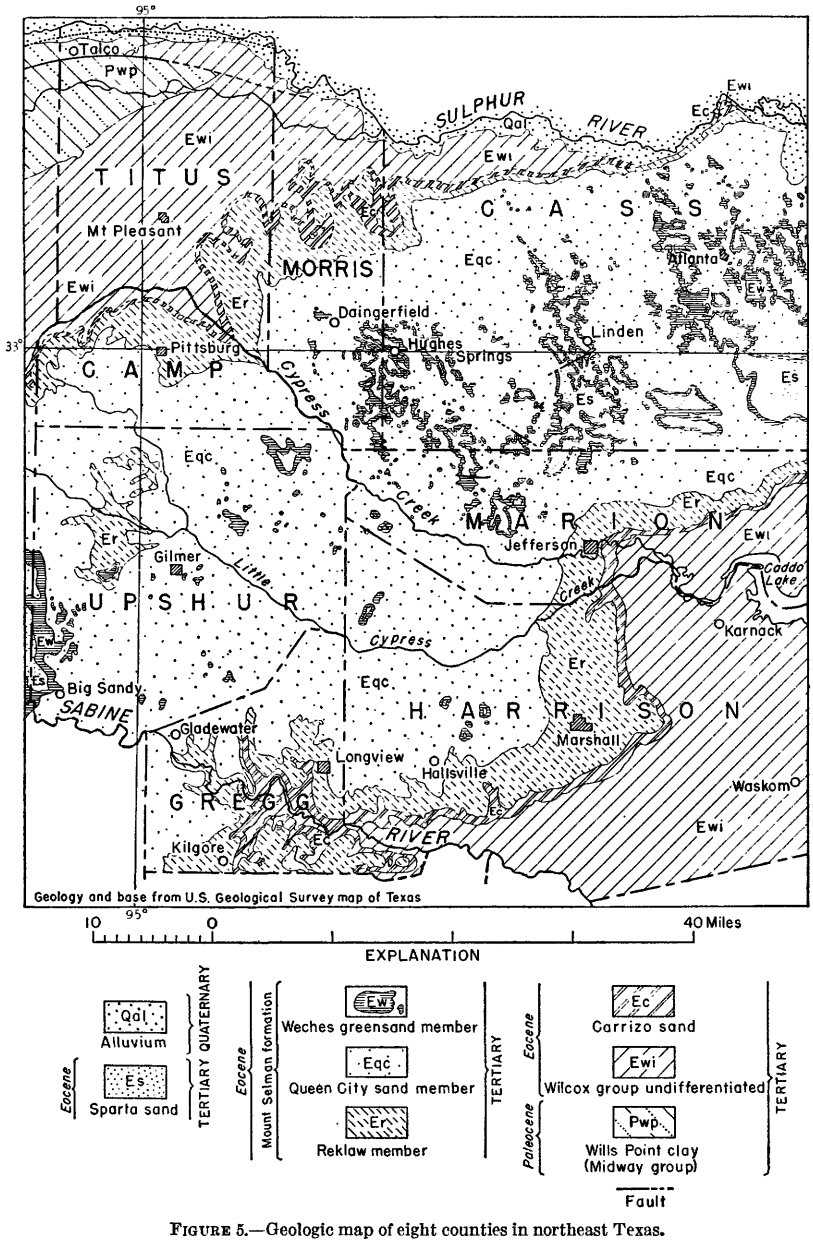

FIGURE 5.—Geologic map of eight counties in northeast Texas.

by the Texas State Board of Water Engineers on February 15, 1937. Records of 90 wells, most of which have been drilled since 1936, are included in table 4 of the present report; the distribution of these wells is shown in figure 6.

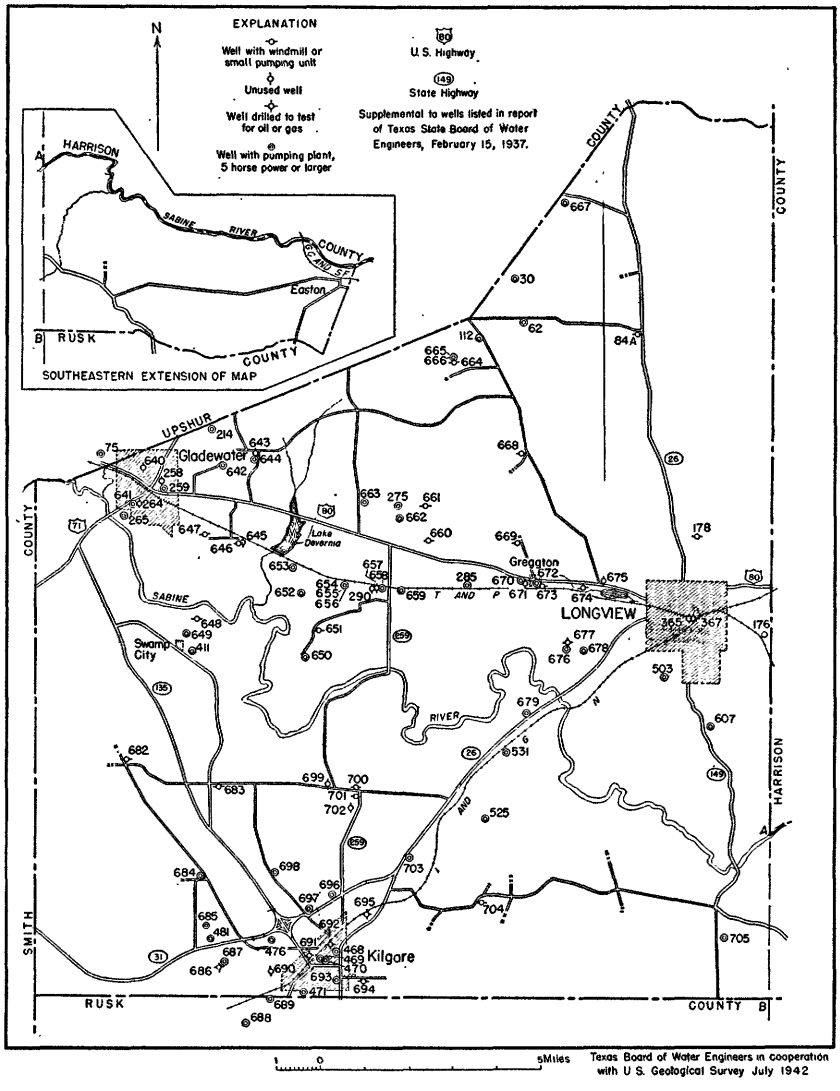

FIGURE 6.—Map of Gregg County, Tex., showing water wells listed in this report.

The position of the principal water-bearing sands and the development of ground water in different parts of the county are briefly discussed below.

NORTHWESTERN PART OF COUNTY IN VICINITY OF GLADEWATER

The Queen City sand member of the Mount Selman formation, the Carrizo sand, and the Wilcox group underlie this part of the county. Most of the rural water supplies are obtained from shallow dug

wells in the outcrop of the Queen City sand member of the Mount Selman formation. The water supplies in the oil field, which covers most of the western half of the county, are obtained from wells that draw mostly from sands in the Wilcox group.

The city of Gladewater is supplied with about 300,000 gallons of water a day from well 75 in Upshur County, well 641 in Gregg County, and a new well—city well 6—completed after the map and tables in this report were prepared. Well 75 was drilled to a depth of 294 feet and is screened in a sand (probably Carrizo) from 205 to 268 feet. In a test made in April 1943 the well yielded 154 gallons a minute with a drawdown of 143 feet. Its specific capacity (yield in gallons a minute per foot of drawdown), therefore, was about 1.1.

Well 641 was drilled to a depth of 279 feet and is screened in sands from 202 to 265 feet. It is reported to have yielded 124 gallons a minute with a drawdown of 130 feet when drilled, but in April 1943 the yield had declined to about 50 gallons a minute. The well is believed to be drawing from both the Carrizo sand and from sands in the Wilcox group.

City well 6, located near the elevated tank, was drilled in 1943 to a depth of 405 feet and is screened between 200 and 400 feet. The driller's log shows sand between 100 and 180 feet, 22 feet of sand (probably Carrizo) from 198 to 220 feet, and thin sands between 220 and 400 feet. In a test the yield was 140 gallons a minute, and the pumping level was 310 feet below the land surface after 24 hours of continuous operation. The drawdown was approximately 150 feet, and the specific capacity therefore was about 1.0.

Analyses of water from city well 75 in Upshur County showed 766 parts per million of dissolved solids with 238 parts per million of chloride in 1940 and 871 parts per million of dissolved solids with 282 parts per million of chloride in 1942. Well 641 in Gregg County showed 687 parts per million of dissolved solids with 150 parts per million of chloride in 1942. (See table 6.) The analysis of water from city well 6 (not given in the table) shows 286 parts per million of dissolved solids with 63 parts per million of chloride.

Within a radius of 6 miles east and southeast of Gladewater, 13 wells (Nos. 644, 645, 646, 647, 649, 650, 651, 654, 655, 656, 658, 659, and 661), ranging in depth from 214 to 485 feet, yield a few gallons to 230 gallons a minute; the water contains less than 100 parts per million of chloride and less than 700 parts per million of dissolved solids. Four wells in the same area (Nos. 265, 275, 290, and 411), ranging in depth from 807 to 1,008 feet, yield a few gallons to 560 gallons a minute; the water contains 650 to 1,170 parts per million of chloride and 1,725 to 2,575 parts per million of dissolved solids. (See table 6.)

The records show that in the Gladewater area in general water relatively low in dissolved solids can be obtained at the rate of 100 to 200 gallons a minute from wells in the Carrizo sand and upper sands of the Wilcox group. Water can be obtained at the rate of 500 gallons a minute from wells in the lower sands of the Wilcox group, but this water is more highly mineralized. The base of the lowermost sands in the Wilcox group is about 1,000 to 1,100 feet below the land surface. No important supplies of ground water of good quality are to be expected in the underlying formations.

NORTHEASTERN PART OF COUNTY

This area is underlain by the Queen City sand member of the Mount Selman formation, the Carrizo sand, and the Wilcox group. The quality of water from sands at various depths differs materially. Five wells (62, 84A, 664, 667, and 668), ranging in depth from 148 to 394 feet, yield a few gallons to 108 gallons a minute; the water contains less than 100 parts per million of chloride and less than 400 parts per million of dissolved solids. Wells 665 and 666, respectively, 410 and 420 feet deep, yield 20 to 40 gallons a minute; the water contains about 550 parts per million of chloride and 1,150 parts per million of dissolved solids. Wells 30 and 112, respectively, 812 and 811 feet deep, yield about 150 gallons a minute; the water contains about 1,000 parts per million of chloride and 2,000 parts per million of dissolved solids. (See table 6.)

CENTRAL PART OF COUNTY IN VICINITY OF GREGGTON

Until about 1938 the town of Greggton was supplied with water from a well 290 feet deep. The water from this well contained 750 parts per million of chloride; consequently the use of well water was discontinued, and the town obtains its present supply from the Longview pipe line. (See p. 76.)

Wells 285, 670, 672, and 674, ranging in depth from 250 to 964 feet and drawing from sands in the Wilcox group, yield a few gallons to 200 gallons of water a minute containing 660 to 785 parts per million of chloride and 1,335 to 1,738 parts per million of dissolved solids.

EASTERN PART OF COUNTY IN VICINITY OF LONGVIEW

In 1908, according to Deussen,[5] the city of Longview obtained its water supply (52 gallons a minute) from three shallow dug wells. About 1910 two deep wells were drilled by the city to meet the increased demand for water. The wells were between 400 and 600 feet

[5] Deussen, Alexander, Geology and underground waters of the southeastern part of the Texas Coastal Plain: U. S. Geol. Survey Water-Supply Paper 335, pp. 176-180, 1914.

deep, and drew from sands in the Wilcox group. The water is reported to have contained 1,000 parts per million of sodium chloride (common salt). The wells were abandoned in 1914 when Longview turned to the Sabine River for its water supply.

According to reports, the water of the Sabine River became so polluted with oil-field waste during periods of low flow in 1934 and 1935 that it was deemed advisable for the city to seek a source of water supply elsewhere. A study of the old Longview water wells and existing wells in the territory surrounding Longview convinced the city officials that it was not advisable to attempt to develop a water supply from wells. In 1936 a pipe line was constructed from the city to a diversion point on Big Sandy Creek, near Big Sandy in Upshur County, and since that time the stream water has been used.

The logs of wells 680 and 681 (Deussen's Nos. 365 and 367) in Longview are given in table 5. The water, drawn from sands in the Wilcox group, is reported to have been used for the manufacture of ice but was unsuitable for locomotive boilers.

Well 503, 2 miles south of Longview, is 467 feet deep. It draws from sands in the Wilcox group and is reported to yield about 100 gallons a minute. The water contains 940 parts per million of chloride and 2,028 parts per million of dissolved solids.

Well 678, 2 miles southwest of Longview, was drilled to a depth of 558 feet. Screens were set between 313 and 418 feet opposite several sands in the Wilcox group. The well is reported to yield 200 gallons a minute with a drawdown of 45 feet, indicating a specific capacity of about 4.4. The water contains 790 parts per million of chloride and 1,673 parts per million of dissolved solids.

Wells 178 and 607, near Longview, 348 and 378 feet deep, respectively, yield small quantities of water that is not excessively mineralized.

A partial electrical log of well 677, an oil test about 3 miles southwest of Longview, shows that the base of the lowermost sands of the Wilcox group is about 875 feet below the surface.

A study of all available data indicates that no large supplies of ground water of good quality are to be expected in the vicinity of Longview.

SOUTHWESTERN PART OF COUNTY IN VICINITY OF KILGORE

Three municipally owned wells, 468, 469, and 470, respectively, 780, 875, and 906 feet deep, supply the city of Kilgore with an average of about 500,000 gallons of water a day. The wells are equipped with deep-well turbine pumps driven by electric motors and yield 285, 350, and 600 gallons a minute, respectively.

According to the geologic map (fig. 5) the Carrizo sand crops out in the creek valley just east of Kilgore. In general the formation dips westward and should be encountered about 100 feet below the land surface in the vicinity of the city wells. Well 468 is screened between 607 and 755 feet, well 469 from 773 to 873 feet, and well 470 from 802 to 906 feet; therefore all three wells are believed to draw water exclusively from lower sands in the Wilcox group.

Water from the Kilgore city wells is rather highly mineralized; the chloride ranges from about 600 to 900 parts per million, and the total dissolved solids range from 1,600 to 2,000 parts per million.

Well 471, about half a mile south of Kilgore, was drilled to a depth of 908 feet, and screens were set at 380 to 436, 747 to 769, and 821 to 856 feet. It is equipped with a deep-well turbine pump driven by a 50-horsepower electric motor and is reported to yield 560 gallons a minute. The water is believed to be drawn chiefly from the sand between 380 and 436 feet, because it contains only 155 parts per million of chloride and 951 parts per million of dissolved solids, unlike the water from the deeper sands in the nearby city wells.

Well 476, located 1¼ miles west of Kilgore, was drilled to a depth of 500 feet, and cased to 450 feet. It is equipped with a deep-well turbine pump driven by a 10-horsepower electric motor and is reported to yield 200 gallons a minute. The water from this well is believed to come from both the Carrizo sand and the upper sands of the Wilcox group. It contains only 14 parts per million of chloride and 448 parts per million of dissolved solids.

Ten wells within a radius of 6 miles from Kilgore (682, 683, 688, 689, 693, 694, 698, 700, 701, and 703) are screened at various depths between 200 and 450 feet. The yields range from a few gallons to 300 gallons a minute per well, and the water contains less than 25 parts per million of chloride and less than 600 parts per million of dissolved solids.

It is concluded from available data that moderate supplies of water relatively low in total dissolved solids can be obtained in the vicinity of Kilgore from the Carrizo sand and the upper sands of the Wilcox group through properly constructed wells at depths of about 500 feet. Larger supplies of more highly mineralized water can be obtained from the lower sands in the Wilcox group. The base of the lowermost sands of the Wilcox group is about 1,000 feet below the surface, and no important supplies of ground water of good quality are to be expected at greater depths.

SOUTHEASTERN PART OF COUNTY

Only one deep well was recorded in this part of the county. Well 705 is 603 feet deep and supplies water for the Gregg County airport. The well is cased to 454 feet and screened at 246 to 249, 311 to 331, 357 to 368, and 413 to 444 feet. It is equipped with a deep-well turbine pump driven by a 10-horsepower electric motor, and when completed it yielded 168 gallons a minute with a drawdown of 109 feet after 24 hours of pumping, representing a specific capacity of about 1.5. According to the geologic map, the well is on the outcrop of the Reklaw member of the Mount Selman formation. It is believed that all the screens in well 705 are opposite sands in the Wilcox group. The analysis shows that the water contains 86 parts per million of chloride and 673 parts per million of dissolved solids.

STREAM RUNOFF

By S. D. Breeding

Gregg County is drained by numerous small tributaries of the Sabine River, which flows in a southeasterly direction through the center of the county. Records of the daily flow of the river have been obtained at gaging stations near Longview during 1904–6 and 1924–32 and near Gladewater since October 1932. These records were collected by the Geological Survey in cooperation with the Texas State Board of Water Engineers and have been published annually by the Geological Survey in its series of water-supply papers.

Records of rainfall have been obtained at Longview since 1889, except for the years 1942 and 1943, for which the records were incomplete. These records show a range in annual rainfall from 71.08 inches in 1944 to 29.28 inches in 1917. The average annual rainfall for the 53 complete years of record is 42.87 inches. (See also pp. 64–65.)

The following table summarizes the runoff of the Sabine River at the stations near Gladewater and Longview.

TABLE 3.—*Runoff of Sabine River, in acre-feet [1] per day*

Station	Period of record (calendar years)	Average during period	Average during 12 consecutive months of lowest flow	Minimum
Gladewater	1933–41	3, 180	622	11
Longview	1904–06, 1924–32	3, 700	619	28

[1] An acre-foot is the amount of water required to cover 1 acre to the depth of 1 foot and is equivalent to about 325,000 gallons.

Based on the records given in part in the above table, the annual runoff of the Sabine River from an area of 3,013 square miles, at the station near Longview, averaged 1,351,000 acre-feet during the 12 calendar years 1904–6 and 1924–32. The smallest runoff during 12 consecutive months occurred from October 1924 to September 1925 and amounted to 226,000 acre-feet.

The annual runoff near Gladewater during the 9 calendar years 1933–41 averaged 1,161,000 acre-feet from an area of 2,846 square miles. The runoff during the 12 consecutive months of lowest flow occurred from April 1939 to March 1940 and amounted to 227,500 acre-feet. In the six driest calendar years of record the daily runoff was less than 30 acre-feet (9,775,000 gallons) during the following number of days: 1925, 6 days; 1934, 18 days; 1936, 34 days; 1938, 30 days; 1939, 90 days; and 1940, 7 days. During periods of low flow the water is somewhat highly mineralized because of salt-water contamination from oil fields upstream.

No records of the runoff from small streams in Gregg County are available.

WELL

TABLE 4.—*Records of*

[Supplemental to wells listed in mimeographed report of Texas State Board of Water Engineers, Feb. 15, are shown in

Well No.	Location	Owner (lessor)	Driller	Date completed	Depth of well (feet)	Diameter of well (inches)
30	7¾ miles NW of Longview.	Tidewater Associated Oil Co. (J. J. Flewellen).	Layne-Texas Co.	1931	812	6⅝
62	7 miles NW of Longview.	Humble Oil & Refining Co. (G. W. Willingham).	do	1931	390	10
84A	5¼ miles N of Longview	Judson Grove school		1925	394	
112	7 miles NW of Longview.	Magnolia Petroleum Co. (W. E. Jones).	Layne-Texas Co.	1931	811	8
178	¾ mile NE of Longview.	Dr. —— Hurst		1932	348	
214	2 miles NE of Gladewater.	Humble Oil & Refining Co. (W. W. Holland).	Layne-Texas Co.	1931	1,084	9⅞
258	In Gladewater	City of Gladewater No. 1	do	1931	826	12½, 6⅝
259	do	City of Gladewater No. 2	do	1931	388	12½
264	do	City of Gladewater No. 3	do	1933	213	10, 8¼
265	½ mile SW of Gladewater.	Sinclair-Prairie Oil Co. (W. H. York).	Conway Bros.	1932	807	8¼
275	5¼ miles E of Gladewater.	Stanolind Oil & Gas Co. (L. E. Pearsons).	L. W. Little	1931	872	10, 6⅝
285	7 miles E of Gladewater.	Gulf Oil Corp. (M. Smith)		1931	964	6⅝
290	5½ miles E of Gladewater.	Tide Water Associated Oil Co. (E. M. Nettleton "A").	Mid-Kansas Oil Co.	1931	843	8¼, 6
411	6¼ miles NW of Kilgore.	Sinclair-Prairie Oil Co. (M. T. Cole).	Layne-Texas Co.	1931	1,008	12½, 8¼
468	In Kilgore (city park).	City of Kilgore No. 4	do	1934	780	16, 10
469	In Kilgore	City of Kilgore No. 1	do	1931	875	15½, 8¼

See footnotes at end of table.

RECORDS

wells in Gregg County, Tex.

1937. All wells are drilled unless otherwise stated. Chemical analyses of water from some of these wells tables 6 and 7]

Well No.	Height of measuring point above ground (feet)	Water level		Method of lift [1]	Use of water [2]	Remarks
		Below measuring point (feet)	Date of measurement			
30				A, 90	Ind	Cased to bottom. Screens at 452–497, 581–604, 702–746, and 768–789 feet. See log.
62	0.5	54.15	June 15, 1936	T, E, 30	D, Ind	Cased to bottom. Screens at 50–72, 153–175, 183–195, and 337–381 feet. Reported yield 108 gallons a minute with drawdown of 120 feet in 1936. See log.
84A				C, E	P	See log.
112				A, 90	Ind	Cased to bottom. Screens at 497–518, 544–565, 602–620, and 747–789 feet. Estimated yield 150 gallons a minute in 1936. See log.
178				C, E, 1½	Irr	Sand reported from 320 to 348 feet.
214				T, E, 60	D, Ind	See log.
258	.5	178.02	June 10, 1938	None	N	Casing: 12½-inch to 294 feet and 6⅝-inch to 629 feet. Screens at 316–333, 339–349, 355–375, 489–499, and 589–629 feet. Gravel-walled. See log.
259	1.7	143.50	Apr. 4, 1940	T, E, 25	P	Cased to bottom. Screens at 173–195, 206–216, and 312–354 feet. Gravel-walled. Reported yield 140 gallons a minute with drawdown of 90 feet when drilled. See log.
264	2.0	71.99	July 12, 1940	None	N	Casing: 10-inch to 139 feet and 8-inch to 213 feet, perforated at 41–98, 140–162, and 191–211 feet. See log.
265				C, A, 5	Ind	Cased to bottom. See log.
275	2.0	105.0	Apr. 6, 1936	A, G, 25	Ind	Casing: 10-inch to 82 feet and 6⅝-inch from 0 to 872 feet. See log.
285				C, E, 10	D, Ind	Cased to bottom, perforated from 784 to 844 feet. Reported yield 200 gallons a minute. See log.
290				None	N	Casing: 8¼ inch to 780 feet, cemented; 6-inch perforated liner from 757 to 843 feet. See log.
411		[3] 60	Aug. 5, 1931	T, E, 60	Ind	Casing: 12½-inch to 844 feet and 8-inch screen from 846 to 1,003 feet. Reported yield 560 gallons a minute. See log.
468		111.0	Sept. 14, 1934	T, E, 40	P	Casing: 16-inch to 607 feet, cemented; 10-inch from 0 to 777 feet. Screens at 607–625 and 665–755 feet. See log.
469	1.0	156.04 158.33 162.81	Dec. 11, 1939 Nov. 26, 1940 Sept. 3, 1941	T, E, 30	P	Casing: 15½-inch to 373 feet and 8¼-inch to 873 feet. Screen from 773 to 873 feet. Water level reported to have been 87 feet below ground when drilled. See log.

TABLE 4.—*Records of wells in*

Well No.	Location	Owner (lessor)	Driller	Date completed	Depth of well (feet)	Diameter of well (inches)
470	In Kilgore	City of Kilgore No. 3	Layne-Texas Co	1934	906	10, 6⅝
471	½ mile S of Kilgore	Humble Oil & Refining Co. (S. S. Laird "B").	do	1931	908	16, 8¼
476	1¼ miles W of Kilgore.	Shell Oil Co., Inc. (W. W. Elder).	do	1931	500	10
503	2 miles S of Longview.	D. H. Jones	Walter Meller	1934	467	6
525	6 miles SW of Longview.	Magnolia Pipe Line Co		1931	218	
531	4¾ miles SW of Longview.	Atlantic Pipe Line Co	Walter Meller	1935	365	6
607	3 miles S of Longview.	United Gas Public Service Co.	Layne-Texas Co	1931	378	6
640	In Gladewater (city park).	City of Gladewater	do	1937	765	
475	1½ miles NW of Gladewater (in Upshur County).	City of Gladewater No. 4	do	1937	294	10¾
641	½ mile SW of Gladewater.	City of Gladewater No. 5	do	1940	279	10¾, 8
642	1¾ miles NE of Gladewater.	Tide Water Associated Oil Co. (W. H. Richey).	Johnson and Sitton	1931	600	7, 5¾6
643	2¾ miles NE of Gladewater.	Gulf Oil Corp. (J. H. Bozeman).	R. L. Miles	1931	1,023	4
644	do	J. H. Bozeman	Bill Boling	1938	400	6
645	2½ miles SE of Gladewater.	Gulf Oil Corp. (M. O. Sheppard).	H. L. Taylor	1937	304	4
646	do	do	Bill Boling	1941	305	4½
647	1¾ miles SE of Gladewater.	Gulf Oil Corp. (F. M. Fonville).	do	1941	258	4½
648	3¼ miles SE of Gladewater.	Gulf Oil Corp. (E. L. Walker).	do	1942	104	4½
649	3½ miles SE of Gladewater.	E. P. Halliburton, Inc. (W. D. Lacy "B").	Dan Kerr	1937	485	6

See footnotes at end of table.

Gregg County, Tex—Continued

Well No.	Height of measuring point above ground (feet)	Water level		Method of lift [1]	Use of water [2]	Remarks
		Below measuring point (feet)	Date of measurement			
470	0.7	150.76 153.88 157.78	Dec. 11, 1939 Nov. 26, 1940 Sept. 3, 1941	T, E, 25	P	Casing: 10-inch to 763 feet and 6⅝-inch to 906 feet. Screen from 802 to 906 feet. Water level reported to have been 134 feet below ground in 1934. Temperature 80° F. See log.
471		[3] 76	Apr. 29, 1931	T, E, 50	D, S, Ind	Casing: 16-inch to 350 feet and 8¼-inch to 908 feet. Screens at 380–436, 747–769, and 821–865 feet. See log.
476		[3] 70	Apr. 13, 1936	T, E, 10	D, Ind	Cased to 450 feet. Reported yield 200 gallons a minute in 1933.
503		32	June 30, 1936	A	D	
525				A	D, Ind	Estimated yield 500 gallons a minute in 1936.
531	0	[3] 45	1935	C, E, 5	D	Fine-grained sand reported from 355 to 365 feet. Yield, 15 gallons a minute.
607				A	Ind	See log.
640				None	N	City test well. Supply reported inadequate. See log.
[4] 75	1.5	80.44	Nov. 26, 1940	T, E, 25	P	Casing: 20-inch to 203 feet, cemented; 10¾-inch from 0 to 294 feet. Screen from 205 to 268 feet. Gravel-walled. Yield, 185 gallons a minute with drawdown of 160 feet when drilled. Temperature 74° F. See log.
641	2.0	85.21	July 12, 1940	T, E, 15	P	Casing: 18⅝-inch to 50 feet, cemented; 10¾-inch from 0 to 275 feet. Screen from 202 to 265 feet. Gravel-walled. Liner: 8-inch from 186 to 268 feet, perforated. Yield, 124 gallons a minute with drawdown of 130 feet when drilled. See log.
642						Casing: 8¼-inch to 353 feet; 7-inch from 0 to 531 feet; 5⅜-inch perforated from 513 to 600 feet. See log.
643				None	N	Cased to bottom, 180 feet perforated between 497 and 835 feet. Reported yield 230 gallons a minute of highly mineralized water. See log.
644	0	[3] 25	1938	C, A, 5	D	Reported sand from 360 to 400 feet and yield 10 gallons a minute.
645	0	[3] 75	1937	C, E, ½	D	Cased to bottom, perforated from 284 to 304 feet. Estimated yield 3 gallons a minute. See log.
646				C, E, ½	D	Casing: 8⅝-inch to 51 feet; 4½-inch from 0 to 295 feet, perforated from 278 to 295 feet. See log.
247				C, E, ½	D	Casing: 8⅝-inch to 63 feet; 4½-inch from 0 to 251 feet. Screen from 231 to 251 feet. See log.
648	.8	19.50	Jan. 22, 1942	C, E, ½	D	Casing: 8⅝-inch to 66 feet; 4½-inch from 0 to 104 feet, perforated from 82 to 104 feet. See log.
649	0	[3] 25	1937	C, A, 11	Ind	Cased to bottom, 2 perforations 2 feet long at 450 feet. See log.

TABLE 4.—*Records of wells in*

Well No.	Location	Owner (lessor)	Driller	Date completed	Depth of well (feet)	Diameter of well (inches)
650	5¼ miles SE of Gladewater.	Gulf Oil Corp. (J. C. Judge).	H. L. Taylor	1940	302	4
651	5 miles SE of Gladewater.	Atlantic Refining Co. (Martin Hays).	J. C. Boling	1938	340	4½
652	4½ miles SE of Gladewater.	Atlantic Refining Co. (S. C. Fishburn).	Pilot Oil Co	1933	214+	6
653	3¾ miles SE of Gladewater.	Superior Oil Co. (W. E. Pasture).		1932	512	8
654	5 miles SE of Gladewater.	Sinclair-Prairie Oil Co. No. 2 (D. Moore).	W. A. Meller	1934	476	8, 6
655	do	Sinclair-Prairie Oil Co. No. 3 (D. Moore).	do	1934	241	6
656	do	Sinclair-Prairie Oil Co. No. 4 (D. Moore).	do	1935	456	8¼
657	3½ miles W of Greggton.	Tide Water Associated Oil Co. (E. M. Nettleton "A").	do	1936	457	10¾, 7
658	do	Tide Water Associated Oil Co. No. 2 (E. M. Nettleton "A").	Layne-Texas Co	1938	458	7
659	3 miles W of Greggton.	Texas-Empire Pipe Line Co. (E. M. Nettleton "A").	do		375	6
660	2½ miles W of Greggton.	Atlantic Refining Co. (T. B. Harris).	Boling and Boling	1938	362	5½, 4
661	3 miles NW of Greggton.	Gulf Oil Corp. (Lacy-Snider).	Bill Boling	1941	228	4½
662	3¼ miles W of Greggton.	W. C. Turnbow	—— Adams	1934	390	10, 7
663	4 miles NW of Greggton.	White Oak School No. 2	Layne-Texas Co	1940	470	13⅜, 7
664	4¾ miles N of Greggton.	Greggtex Gasoline Corp	Bill Boling	1941	161	6¼
665	do	do	W. A. Meller	1934	410	6
666	do	do	do	1934	420	6
667	8 miles N of Greggton.	Mabee Oil & Gas Co. (H. F. Whitehurst).		1932	320	8
668	2½ miles N of Greggton.	Leroy Ziegler		1937	148	6

See footnotes at end of table.

Gregg County, Tex.—Continued

Well No.	Height of measuring point above ground (feet)	Water level: Below measuring point (feet)	Water level: Date of measurement	Method of lift [1]	Use of water [2]	Remarks
650				C, E, 5	D	Cased to bottom. Reported yield 50 gallons a minute when drilled. See log.
651	0	[2] 125	1938	C, E, 3	D, S	Casing: 6-inch to 150 feet, cemented; 4½-inch from 0 to 340 feet, perforated from 310 to 340 feet. See log.
652	0	[3] 70	1940	C, A, 5	D	Reported yield, 4-inch pipe full 24 hours a day when drilled.
653	0	[3] 60	1932	A	D	Reported yield 85 gallons a minute when drilled.
654				A	Ind	Casing: 8-inch to 340 feet, cemented. Screen 6-inch below 340 feet. Estimated yield 15 gallons a minute. See log.
655				A	Ind	Casing: 8-inch to 178 feet and 6-inch from 0 to 241 feet. Screen from 177 to 241 feet. Estimated yield 15 gallons a minute. See log.
656				A	Ind	Casing: 8¼-inch to 330 feet, cemented. Estimated yield 15 gallons a minute. See log.
657				None	N	Casing: 10¾-inch to 405 feet, cemented. Screen 7-inch from 405 to 457 feet. Abandoned. See log.
658	0	[3] 146	June 1938	T, E, 15	D, Ind	Casing: 13-inch to 356 feet, cemented; 7-inch from 0 to 458 feet. Screen from 370 to 434 feet. Gravel-walled. Reported yield 100 gallons a minute when drilled. See log.
659	0	[3] 60		T, E, 5	Ind	Casing: 6-inch to 314 feet. Reported sand from 310 to 350 feet and yield 47 gallons a minute.
660				C, E, 3	D	Casing: 5½-inch to 250 feet and 4-inch to 350 feet. Reported yield 3 gallons a minute.
661				C, E, ½	D	Casing: 8-inch to 34 feet; 4½-inch from 0 to 221 feet, perforated from 199 to 221 feet. See log.
662	1.2	137.85	Sept. 29, 1941	T, E, 15	Irr	Casing: 10-inch to 300 feet and 7-inch perforated from 300 to 390 feet. Reported sand from 320 to 390 feet and yield 40 gallons a minute.
663	1.5	172.08	Aug. 29, 1941	T, E, 7½	P	Casing: 13⅜-inch to 360 feet, cemented; 7-inch from 315 to to 470 feet. Gravel-walled. Yield 52 gallons a minute with drawdown of 103 feet when drilled. See log. Electrical log in files of the Texas State Board of Water Engineers shows thick sand from 100 to 220 feet and thin sands between 360 and 480 feet.
664	0	[3] 100	1941	T, E, 3	D	Cased to bottom. Reported yield 15 to 20 gallons a minute. See log.
665	0	[3] 100	1934	A	Ind	Casing: 6-inch to 390 feet. Reported yield 20 gallons a minute.
666				A	Ind	Cased to bottom. Reported yield 40 gallons a minute.
667				C, A	D	Cased to bottom. Reported yield 8 gallons a minute.
668				C, E, 1	D	Cased to bottom, perforated from 128 to 148 feet.

TABLE 4.—*Records of wells in*

Well No.	Location	Owner (lessor)	Driller	Date completed	Depth of well (feet)	Diameter of well (inches)
669	1 mile NW of Greggton.	H. C. Pederson		1937	20	36
670	In Greggton	Magnolia Petroleum Co.	Magnolia Petroleum Co.	1933	425	6⅝
671	do	do	do	1931	425	6⅝
672	do	LeBus Rotary Tool Works	W. L. Little	1932	250	7
673	do	Trinity Drilling Co		1931	260	
674	1¾ miles E of Greggton.	Royal Crown Bottling Co.	J. C. Boling	1940	350	6
675	do	Jack Nesbitt		1931	150±	8
676	1½ miles SE of Greggton.	Humble Oil & Refining Co. (E. B. Robertson).			300±	5
677	do	Humble-Gulf (E. B. Robertson No. 1).	Humble-Gulf	1937	10,284	
678	2 miles SE of Greggton.	Lone Star Gas Co	Layne-Texas Co	1941	423	7
679	3¼ miles S of Greggton.	Humble Oil & Refining Co		1937	300±	6
680	In Longview	R. G. Brown		1890	580	5
681	do	Texas & Pacific Ry. Co	Texas & Pacific Ry.	1892	603	10
682	6¼ miles NW of Kilgore.	Sabine School No. 3	O. B. Harris	1940	407	7
683	4½ miles NW of Kilgore.	North Chapel colored school.	J. C. Boling	1936	255	4½
684	3 miles NW of Kilgore.	Midfield Oil Co. (Benson "A").	Midfield Oil Co	1937	900±	4
685	2½ miles W of Kilgore.	Danciger Oil & Refining Co. (McNeeley).	L. O. Gandy	1937	625	6
686	2¼ miles W of Kilgore.	Jacob H. Wood	Jacob H. Wood	1941	3,598	
687	2 miles W of Kilgore.	do	do	1931	625	6
[6]688	2½ miles SW of Kilgore.	Gulf Oil Corp. (M. E. Peterson.	Layne-Texas Co	1937	440	16, 8⅝
[6]689	1¾ miles SW of Kilgore.	Tide Water Associated Oil Co. (Nat Bean "A").	do	1938	437	7
690	¾ mile W of Kilgore.	Tide Water Associated Oil Co. (J. B. Watson).	Fred Fielder		932	

See footnotes at end of table.

Gregg County, Tex.—Continued

Well No.	Height of measuring point above ground (feet)	Water level: Below measuring point (feet)	Water level: Date of measurement	Method of lift [1]	Use of water [2]	Remarks
669				C, E, ¼	D	Dug well.
670	0	[3] 75	1933	C, E, 5	P	Cased to bottom, perforated from 385 to 425 feet. Reported yield 3 gallons a minute.
671				None	N	Cased to bottom. Abandoned.
672	0	[3] 85	1932	C, E, 5	D, Ind	Cased to bottom. Reported yield 9 gallons a minute.
673				C, E	D	
674	0	[3] 80	1940	T, E, 3	Ind	Cased to bottom, perforated from 290 to 350 feet. Gravel-walled. Reported yield 60 gallons a minute.
675	2.0	84.47	Sept. 10, 1941	C, E	N	Formerly supplied tourist courts.
676				A	Ind	Reported yield 60 gallons a minute.
677						Oil test. Electrical log from 486 to 1,900 feet in files of the Texas State Board of Water Engineers shows thin sands between 486 and 875 feet.
678	0	[3] 107	1941	T, A, 80	Ind	Casing: 13⅜-inch to 302 feet, cemented; 7-inch from 0 to 423 feet. Screens at 313–338, 352–362, 371–381, 385–397, and 402–418 feet. Gravel-walled. Yield 200 gallons a minute with drawdown of 45 feet after 24 hours pumping. See log.
679				A	Ind	Reported yield 150 gallons a minute.
680				None	N	Water formerly used by ice factory; not suitable for boilers. Deussen No. 365.[5] See log.
681				None	N	Water formerly used for the manufacture of ice; not suitable for locomotives. Deussen No. 367.[5] See log.
682				C, E, 3	P	Cased to bottom, perforated from 384 to 407 feet. Estimated yield 10 gallons a minute, September 1941. See log.
683				C, E, 3	P	Cased to bottom. See log.
684	0	[3] 150	1937	C	D, Ind	
685		[3] 90	1937	C, E, 10	Ind	Cased to bottom. Reported yield 40 gallons a minute when drilled.
686						Oil test. Electrical log in files of Texas State Board of Water Engineers shows several sands between 150 and 1,000 feet.
687				C	D, S, Ind	Cased to bottom.
688	0	[3] 230	May 29, 1937	T, E, 25	D, Ind	Casing: 16-inch to 340 feet. Screen 8-5/8-inch from 340 to 440 feet. Reported yield 300 gallons a minute with drawdown of 72 feet after 24 hours pumping. See log.
[6] 689	0	[3] 170	1938	T, E, 20	Ind	Casing: 13⅜-inch to 260 feet and 7-inch from 0 to 437 feet. Screen from 354 to 437 feet. Gravel-walled. Reported yield 115 gallons a minute. See log.
690				None	N	See log.

TABLE 4.—*Records of wells in*

Well No.	Location	Owner (lessor)	Driller	Date completed	Depth of well (feet)	Diameter of well (inches)
691	In Kilgore	Shell Oil Co. (E. W. Willoughby No. 34).	Shell Oil Co	1941	3,600	
692	do	Kilgore Drilling Co. (Utzman No. 1).	Kilgore Drilling Co	1941	1,720	
693	do	Malcolm Crim	Bill Boling	1937	312	5½
694	1¼ miles E of Kilgore.	Doug Godfrey	Doug Godfrey	1938	272	5 3/16
695	1½ miles NE of Kilgore.	J. G. Beard (J. S. Elder No. 9).	J. G. Beard		3,588	
696	1½ miles N of Kilgore.	Houston Oil Co. (J. S. Elder).	Houston Oil Co	1933	416	6⅝
697	1¼ miles N of Kilgore.	Wickham Packing Co	J. C. Boling	1940	420	8
698	2¼ miles N of Kilgore.	Tide Water Associated Oil Co. (M. G. Barton).	Layne-Texas Co	1938	569	7
699	4 miles N of Kilgore	Jones-O'Brian (John Lloyd).	Jones-O'Brian	1931	800±	6⅝
700	4¼ miles N of Kilgore.	Hughey school	J. C. Boling	1935	190	
701	3¾ miles N of Kilgore.	M. B. Hughey	Bill Boling	1938	276	5 3/16
702	3¼ miles N of Kilgore.	Tide Water Associated Oil Co. (W. Clayton).	Bill Collins	1931	915	6⅝, 4
703	3 miles NE of Kilgore.	A. B. Spear	Layne-Texas Co	1938	433	7
704	4¼ miles NE of Kilgore.	Danville school	—Leach	1936	19	96
705	9 miles E of Kilgore	Gregg County airport	Layne-Texas Co	1941	603	16, 10

[1] T, Turbine; A, air, steam, or natural gas lift; C, cylinder; G, gasoline; E, electric. Number indicates horsepower.
[2] P, Public supply; D, domestic; S, stock; Ind, industrial; Irr, irrigation; N, not used.
[3] Water level reported by driller or owner.

Gregg County, Tex.—Continued

Well No.	Height of measuring point above ground (feet)	Water level: Below measuring point (feet)	Water level: Date of measurement	Method of lift [1]	Use of water [2]	Remarks
691						Oil test. Electrical log in files of Texas State Board of Water Engineers shows several sands between 107 and 1,000 feet.
692						Oil test. Electrical log in files of Texas State Board of Water Engineers shows several sands between 100 and 1,000 feet.
693				C, E, 7½	D	Reported yield 23 gallons a minute in January 1942.
694		[3] 40	1938	C, E, 3	D, S	Casing: 12-inch to 100 feet, cemented; 5½-inch from 0 to 271 feet, perforated from 233 to 271 feet. Reported yield 20 gallons a minute in September 1941.
695						Oil test. Electrical log from 950 to 1,350 feet in files of Texas State Board of Water Engineers shows sand from 970 to 985 feet.
696	0	[3] 50	1933	C, A, 6	D	Cased to bottom, perforated from 367 to 412 feet. Reported yield 7 gallons a minute.
697	.2	134.52	Sept. 25, 1941	T, E, 5	Ind	Cased to bottom. Reported yield 50 gallons a minute.
698	0	[3] 123	May 24, 1938	T, E, 15	Ind	Casing: 13⅜-inch to 347 feet, cemented; 7-inch from 0 to 446 feet. Screens at 351–371 and 387–428 feet. Gravel-walled. Yield 105 gallons a minute with drawdown of 125 feet when drilled. Temperature 74° F. See log.
699	1.6	116.06	Sept. 24, 1941	A	N	
700		[3] 90	1935	C, E, 2	P	
701				C, E, 3	D	Cased to bottom, perforated from 256 to 276 feet. Reported yield 30 gallons a minute. See log.
702	3.2	125.79	Oct. 21, 1941	A	N	Cased to bottom, perforated from 645 to 915 feet.
703	0	[3] 117	July 3, 1938	T, E, 15	D, S, Irr	Casing: 13⅜-inch to 348 feet, cemented; 6⅝-inch from 0 to 425 feet. Screen from 355 to 413 feet. Gravel-walled. Yield 88 gallons a minute with drawdown of 173 feet when drilled. See log.
704	0	8.8	Sept. 2, 1941	C, E, ¼	P	Dug well.
705	2.0	95.86	Aug. 29, 1941	T, E, 10	D, Ind	Casing: 16-inch to 307 feet, cemented; 10-inch from 0 to 454 feet. Screens at 246-249, 311–331, 357–368, and 413–444 feet. Yield 168 gallons a minute with drawdown of 109 feet after 24 hours pumping. See log. Electrical log in files of the Texas State Board of Water Engineers shows several sands between 55 and 500 feet.

[4] This well is in Upshur County and is recorded in the Upshur County report of the Texas State Board of Water Engineers; it is included here because it is one of several wells used by the city of Gladewater.
[5] Number under which well is listed by Deussen in U. S. Geol. Survey Water-Supply Paper 335, 1914.
[6] In Rusk County.

WELL LOGS

TABLE 5.—*Drillers' logs, Gregg County, Tex.*

Well 30, Tidewater Associated Oil Co. (J. J. Flewellen), 7¾ miles north of Longview; Layne-Texas Co., driller

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Sandy soil	3	3	Fine-grained sand, streaks of shale	40	419
Hard red clay and rock	6	9	Sand and lignite	7	426
Sandy yellow clay	35	44	Sandy shale	21	447
Yellow sand and streaks of clay	45	89	Gray sand, good	20	467
Dark-brown sand	9	98	Shale	7	474
Rock	1	99	Gray sand, good	28	502
Brown sand, streaks of shale and boulders	39	138	Sand and shale	12	514
Sandy green shale	24	162	Shale and boulders	27	541
Sandy brown shale and boulders	33	195	Sandy shale and boulders	38	579
Rock	1	196	Shale	10	589
Sandy shale	37	233	Sand and gravel	10	599
Shale and streaks of sand	15	248	Sandy shale	44	643
Rock	1	249	Sand and shale	22	665
Shale and boulders, streaks of sand	28	277	Sand, streaks of shale	30	695
Hard shale	26	303	Gray sand	31	726
Gray sand	12	315	Rock	2	728
Sandy gray shale	15	330	Sand	40	768
Gray sand	12	342	Boulders	3	771
Sandy shale	22	364	Rock	3	774
Sandy streaks of shale	15	379	Gray sand	38	812

Well 62, Humble Oil & Refining Co. (G. W. Willingham), 7 miles northwest of Longview; Layne-Texas Co., driller

Clay	18	18	Coarse-grained white sand	16	195
Sand, fair	28	46	Sandy shale and boulders	88	283
Hard brown sand	25	71	Shale and lignite	55	338
Sandy shale, boulders	59	130	Black and gray sand	45	383
Brown sand	36	166	Sandy shale	7	390
Shale and boulders	13	179			

Well 84a, Judson Grove school, 5¼ miles north of Longview

Red beds	32	32	Water sand	8	218
Water sand	6	38	Brown shale	102	320
Blue shale	97	135	Water sand	6	326
Water sand	5	140	Blue shale	46	372
Blue shale	8	148	Water sand	12	384
Lime and shell	2	150	Blue shale	10	394
Brown shale	60	210			

Well 112, Magnolia Petroleum Co. (W. E. Jones), 7 miles northwest of Longview; Layne-Texas Co., driller

Sandy clay	15	15	Shale and boulders	77	499
Blue clay	18	33	Good sand	22	521
Muddy sand	54	87	Shale	17	538
Shale and boulders	16	103	Good sand	30	568
Sand with layers of shale	26	129	Sandy shale	36	604
Shale and boulders	15	144	Sand, fair	19	623
Brown sand	51	195	Shale	31	654
Shale and boulders	123	318	Shale and lignite	98	752
Shale	13	331	Sand	49	801
Fine-grained gray sand	60	391	Shale	10	811
Sandy shale	31	422			

TABLE 5.—*Drillers' logs, Gregg County, Tex.*—Continued

Well 214, Humble Oil & Refining Co. (W. W. Holland), 2 miles northeast of Gladewater

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Clay and rock	15	15	Shale and lignite	24	607
Sand	60	75	Sandy shale	54	661
Shale and boulders	98	173	White sand	72	733
Fine-grained white sand	18	191	Shale and layers of sand	52	785
Shale and boulders	104	295	Shale and sand	10	795
Fine-grained sand	23	318	Tough shale	42	837
Shale and lignite	6	324	Sand	12	849
Sand	26	350	Shale and boulders	49	898
Hard shale and lignite	90	440	Shale	48	946
Sand	22	462	Rock	2	948
Shale and lignite	33	495	Sand	4	952
Record lost	35	530	Rock	3	955
Shale	8	538	Shale and boulders	39	994
Sand with layers of shale	45	583	Shale	90	1,084

Well 258, City of Gladewater No. 1 (Sam Kay), in Gladewater; Layne-Texas Co., driller

Soil	2	2	Fine-grained gray sand and shale	54	381
Boulders	1	3	Sticky shale	70	451
Sandy clay	9	12	Hard shale and lignite	20	471
Sand	10	22	Sticky shale	8	479
Red clay	4	26	Sandy shale	14	493
Sticky shale	20	46	Hard sticky lime	67	560
Fine-grained sand	15	61	Boulders	3	563
Sticky shale	34	95	Sticky shale	14	577
Fine-grained gray sand	47	142	Sand broken with shale	47	624
Boulders	1	143	Sticky shale	45	669
Shale and boulders	24	167	Sandy lime	70	739
Sandy shale	16	183	Fine-grained gray sand	10	749
Sticky lime	80	263	Sticky lime	22	771
Sandy lime and boulders	10	273	Boulders	1	772
Fine-grained sand and lignite	12	285	Sand	12	784
Shale and boulders	8	293	Sticky shale	42	826
Shale and streaks of sand	34	327			

Well 259, City of Gladewater No. 2, in Gladewater; Layne-Texas Co., driller

Rotary to surface	2	2	Fine-grained muddy gray sand	38	316
Soil	2	4	Gray sand, broken	40	356
Sandy clay	5	9	Shale and boulders	42	398
Fine-grained sand and streaks of clay	80	89	Shale and streaks of sand	50	448
			Shale and sandy lime	83	531
Green and white sand	36	125	Streaks of sand and shale	44	575
Shale, lignite and boulders	46	171	Shale, lignite, and boulders	19	594
Coarse-grained white sand	22	193	Rock	2	596
Shale and lignite	12	205	Shale, lignite, and boulders	73	669
Good gray sand	16	221	Tough sticky shale	31	700
Lignite and shale	41	262	Sandy lime	25	725
Shale and boulders	16	278			

Well 264, City of Gladewater No. 3, in Gladewater; Layne-Texas Co., driller

Clay	13	13	Sandy shale	17	248
Sand	16	29	Rock	1	249
Sandy shale and lignite	91	120	Sandy shale	31	280
Shale	35	155	Rock	1	281
Sand with lignite	22	177	Shale	152	433
Shale	29	206	Shale and boulders	50	483
Sandy shale	20	226	Sand with layers of shale	20	503
Rock	5	231	Sandy shale and lignite	57	560

TABLE 5.—*Drillers' logs, Gregg County, Tex.*—Continued

Well 265, Sinclair-Prairie Oil Co. (W. H. York), ½ mile southwest of Gladewater; Conway Bros., driller

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Soil	3	3	Brown shale	25	350
Sand	19	22	Water sand	10	360
Quicksand	13	35	Brown shale	80	440
Blue shale	50	85	Water sand	40	480
White sand	25	110	Shale	135	615
Lime	8	118	Water sand	25	640
Gray shale	62	180	Shale	20	660
Brown shale	5	185	Water sand	30	690
Sand	15	200	Blue shale	22	712
Brown shale	10	210	Broken sand	10	722
Blue shale	35	245	Blue shale	53	775
Water sand	20	265	Water sand	22	797
Brown shale	20	285	Broken sand	6	803
Gray shale	40	325	Blue shale	4	807

Well 275, Stanolind Oil Co. (L. E. Pearsons), 5¼ miles east of Gladewater; L. W. Little, driller

Surface material	3	3	Shale	43	356
Red clay	8	11	Sand	44	400
Sandy clay	9	20	Shale	11	411
Sand	3	23	Sand	12	423
Sandy shale	24	47	Shale	71	494
Sand	7	54	Sand	4	498
Shale	13	67	Shale	62	560
Sand	1	68	Sand	18	578
Sand and shale	14	82	Shale	70	648
Lime	1	83	Sandy shale	82	730
Sand	11	94	Sand	12	742
Lime	1	95	Shale	43	785
Sand	39	134	Lime	3	788
Shale	18	152	Shale	28	816
Sand and lime	19	171	Sand	12	828
Sand and shale	25	196	Shale	17	845
Shale	23	219	Sand	11	856
Sand	50	269	Shale	4	860
Soft sand	31	300	Sand	10	870
Lime and hard sand	13	313	Lime	2	872

Well 285, Gulf Oil Corp. (M. Smith), 7 miles east of Gladewater

Surface clay	20	20	Shale	39	400
Sand	5	25	Rock	1	401
Shale	4	29	Sand and shale	39	440
Rock	1	30	Sand and shale	40	480
Packsand	15	45	Gumbo	43	523
Rock	1	46	Hard rock	5	528
Sandy shale	18	64	Gumbo	30	558
Sandy gumbo	5	69	Shale and hard sand	32	590
Hard sand	11	80	Hard sand	34	624
Rock	1	81	White sand	34	658
Shale	39	120	Gray sand	100	758
Sand and boulders	18	138	White sand	30	788
Sandy shale	71	209	Sandy gumbo	17	805
Sticky shale	18	227	Rock	4	809
Sand and lignite	30	257	Hard sand	27	836
Hard sand	26	283	Sand	37	873
Gumbo	4	287	Sandy shale	20	893
Hard sand	42	329	Gumbo	67	960
Sandy shale	32	361	Gumbo and lime	4	964

Well 290, Tide Water Associated Oil Co. (E. M. Nettleton "A"), 5½ miles east of Gladewater; Mid-Kansas Oil Co., driller

Clay	10	10	Sand and shale	136	780
Sand, shale, and boulders	632	642	Water sand	63	843
Rock	2	644			

TABLE 5.—*Drillers' logs, Gregg County, Tex.*—Continued

Well 411, Sinclair-Prairie Oil Co. (M. T. Cole), 6¼ miles northwest of Kilgore; Layne-Texas Co., driller

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Sand	91	91	Sticky lime	46	580
Blue clay	44	135	Shale	8	588
Sand	19	154	Clay	14	602
Sand rock	2	156	Sand	14	616
Sand	14	170	Clay	1	617
Shale	17	187	Sand	16	633
Sand	31	218	Clay	4	637
Sticky lime	100	318	Sand	12	649
Sand	10	328	Sticky lime	53	702
Sticky lime	4	332	Sand	64	766
Sand	32	364	Lime	18	784
Lignite	25	389	Shale	4	788
Sand	11	400	Lime	18	806
Lignite	18	418	Sand	20	826
Sand	36	454	Lime	4	830
Shale	69	523	Sand	164	994
Sand	11	534	Clay	14	1,008

Well 468, City of Kilgore No. 4, in Kilgore City Park; Layne-Texas Co., driller

Red clay	16	16	Shale	8	239
Sand	10	26	Sandy shale	48	287
Sandy shale	51	77	Fine-grained sand	16	303
Rock	1	78	Shale, streaks of sand	76	379
Sandy shale	38	116	Shale	29	408
Shale	41	157	Sandy shale	199	607
Sandy shale	22	179	Sand	20	627
Shale, streaks of sand	51	230	Sand and shale	113	740
Rock	1	231	Sand	40	780

Well 469, City of Kilgore No. 1, in Kilgore; Layne-Texas Co., driller

Surface material	1	1	Shale and lignite	89	433
Clay	6	7	Good sand	18	451
Sandy clay	15	22	Shale	4	455
Shale and boulders	56	78	Sand	36	491
Shale, layers of sand	63	141	Shale, streaks of sand	87	578
Shale	64	205	Sand	28	606
Sand	21	226	Shale and boulders	35	641
Shale	44	270	Shale and lignite	76	717
Shale, streaks of hard sand	56	326	Sticky shale	32	749
Coarse-grained gray sand	18	344	White sand, good	126	875

Well 470, City of Kilgore No. 3, in Kilgore; Layne-Texas Co., driller

Surface soil	1	1	Shale, sand, and lignite	286	523
Clay	6	7	Shale and boulders	52	575
Sandy clay	12	19	Sand	30	605
Shale and layers of sand	15	34	Shale and boulders	32	637
Shale and boulders	41	75	Shale, boulders, lignite	77	714
Sand rock	2	77	Sticky shale	15	729
Sand, boulders, and shale	80	157	Sand	9	738
Shale and sand	66	223	Sticky shale	9	747
Sandy shale	14	237	Sand	159	906

TABLE 5.—*Drillers' logs, Gregg County, Tex.*—Continued

Well 471, Humble Oil & Refining Co. (S. S. Laird "B"), ½ mile south of Kilgore; Layne-Texas Co., driller

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Surface sand	3	3	Lignite and sand	46	480
Clay	15	18	Lignite	6	486
Green sand	10	28	Shale and lignite	62	548
Shale and boulders	8	36	Rock	1	549
Green sand and boulders	27	63	Sandy shale and boulders	37	586
Rock	2	65	Sticky shale	46	632
Green sand	30	95	Rock	1	633
Lignite	4	99	Sandy shale	58	691
Shale and sand	19	118	Lignite	18	709
Shale, lignite, and boulders	76	194	Shale and lignite	25	734
Rock	4	198	Rock	1	735
Green sand and shale	31	229	Shale	10	745
Shale and lignite	28	257	Sand and lignite	22	767
Green sand	26	283	Lignite	17	784
Shale and lignite	34	317	Sand, lignite, and shale	66	850
Fine-grained gray sand and lignite	79	396	Gray sand	12	862
Gray sand	38	434	Sand and shale	20	882
			Shale	26	908

Well 607, United Gas Public Service Co., 3 miles south of Longview; Layne-Texas Co., driller

Surface sand	3	3	Shale	10	84
Sandy yellow clay	34	37	Sandy shale	21	105
Shale	13	50	Fine-grained white sand	11	116
Sandy shale	12	62	Sandy shale and water sand	144	260
Rock	1	63	Sandy shale	37	297
Shale	1	64	Sand, streaks of shale	25	322
Rock	1	65	Sandy shale and lignite	30	352
Shale	8	73	Sandy shale	26	378
Rock	1	74			

Well 640, City of Gladewater (test), in Gladewater City Park; Layne-Texas Co., driller

Red sandy clay	10	10	Blue shale	12	185
Fine-grained sand	5	15	Black shale	156	341
Brown clay	12	27	Shale	12	353
Rock	1	28	Rock	1	354
Sand	21	49	Sand	34	388
Sand and lignite	92	141	Shale	200	588
Fine-grained white sand	22	163	Brown shale and lignite	177	765
Coarse-grained sand and lignite	10	173			

Well 75,[1] City of Gladewater No. 4, 1½ miles northwest of Gladewater (in Upshur County); Layne-Texas Co., driller

Red clay	10	10	Shale	68	208
Sand	17	27	Sand	46	254
Rock	1	28	Shale	46	300
Black sand	26	54	Blue shale	12	312
Rock	1	55	Sand	25	337
Sand	16	71	Blue shale	118	455
Shale and lime	69	140			

[1] Recorded in Upshur County report of the Texas State Board of Water Engineers, but included here because it is one of several wells used by the city of Gladewater.

Well 641, City of Gladewater No. 5, ½ mile southwest of Gladewater; Layne-Texas Co., driller

Surface sand	3	3	Shale	50	208
Clay	10	13	Sand	60	268
Shale	121	134	Sandy shale	11	279
Sand	24	158			

TABLE 5.—*Drillers' logs, Gregg County, Tex.*—Continued

Well 642, Tide Water Associated Oil Co. (W. H. Richey), 1¾ miles northeast of Gladewater; Johnson and Sitton, driller

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Sand, clay, and shale	45	45	Water sand	15	375
Water sand	15	60	Shale	149	524
Shale and shells	300	360	Water sand	76	600

Well 643, Gulf Oil Corp. (J. H. Boseman), 2¾ miles northeast of Gladewater; R. L. Miles, driller

Surface sand	3	3	Rock	2	541
Red clay	7	10	Fine-grained sand	67	608
Sandy clay	25	35	Coarse-grained water sand	42	650
Sandy clay and gravel	66	101	Fine-grained sand	57	707
Sand and gravel	59	160	Sandy shale	10	717
Rock	1	161	Fine-grained sand	33	750
Rock, sand, and gravel	74	235	Sand and lignite	62	812
Lignite	10	245	Rock	1	813
Fine-grained sand and gravel	54	299	Fine-grained sand	17	830
Fine-grained sand	44	343	Coarse-grained water sand and gravel	6	836
Fine-grained sand and gravel	131	474	Sandy shale	187	1,023
Sand and boulders	65	539			

Well 645, Gulf Oil Corp. (M. O. Sheppard), 2½ miles southeast of Gladewater; H. L. Taylor, driller

Surface soil	3	3	Sandy shale	14	83
Red clay	12	15	Hard sand rock	3	86
Blue shale	10	25	Sandy shale	54	140
Quicksand	15	40	Blue shale	100	240
Blue shale	12	52	Gray sandy shale	21	261
Hard sand rock	3	55	Brown shale	22	283
Blue shale	12	67	Water sand	11	294
Hard sand rock	2	69	Sandy shale	10	304

Well 646, Gulf Oil Corp. (M. O. Sheppard), 2½ miles southeast of Gladewater; Bill Boling, driller

Clay	31	31	Blue shale	25	225
Quicksand	14	45	Brown shale	40	265
Gray shale	30	75	Blue shale	15	280
Blue shale	20	95	Water sand	25	305
Gray shale	105	200			

Well 647, Gulf Oil Corp. (F. M. Fonville), 1¾ miles southeast of Gladewater; Bill Boling, driller

Surface sand	63	63	Sandy gray shale	89	185
Lime and shell	1	64	Blue shale	32	217
Brown shale	8	72	Water sand	28	245
Blue shale	24	96	Brown shale	13	258

Well 648, Gulf Oil Corp. (E. L. Walker), 3¼ miles southeast of Gladewater; Bill Boling, driller

Sand	38	38	Blue shale	12	80
Black shale	28	66	Water sand	19	99
Lime and shell	2	68	Gray shale	5	104

TABLE 5:—*Drillers' logs, Gregg County, Tex.*—Continued

Well 649, Erle P. Halliburton, Inc. (W. D. Lacy "B"), 3½ miles southeast of Gladewater; Dan Kerr, driller

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Surface clay	45	45	Brown shale	15	360
Red sand	20	65	Sandy shale	22	382
Shale and sand	25	90	Hard sand	23	405
Sand rock	2	92	Shale and boulders	33	438
Sand and boulders	8	100	Water sand	31	469
Gravel	26	126	Sandy gravel	40	509
Sandy shale	26	152	Packsand	10	519
Rock	2	154	Hard shale	28	547
Shale	11	165	Packsand	13	560
Shale and boulders	15	180	Hard shale	18	578
Water sand	85	265	Sand	20	598
Lignite	2	267	Hard shale	34	632
Sand rock	2	269	Brown shale	39	671
Lignite	2	271	Water sand	52	723
Hard shale	43	314	Sandy shale	42	763
Packsand	31	345			

Well 650, Gulf Oil Corp. (J. C. Judge), 5¼ miles southeast of Gladewater; H. L. Taylor, driller

Surface clay sand, and boulders	60	60	Coarse-grained water sand	7	256
Sandy shale	17	77	Fine-grained hard sand	19	275
Black shale and boulders	68	145	Shale	3	278
Shale and boulders	6	151	Coarse-grained hard sand	16	294
Sandy shale	83	234	Fine-grained hard sand	8	302
Water sand	15	249			

Well 651, Atlantic Refining Co., 5 miles southeast of Gladewater; J. C. Boling, driller

Surface soil	150	150	Shale	8	310
Shale	138	288	Water sand	15	325
Water sand	14	302	Shale	15	340

Well 654, Sinclair-Prairie Oil Co. No. 2 (D. Moore), 5 miles southeast of Gladewater; W. A. Meller, driller

Surface sand and clay	17	17	Gumbo	15	366
Surface sand	26	43	Water sand	16	382
Sand	54	97	Gumbo	33	415
Gumbo and boulders	44	141	Water sand	8	423
Shale	28	169	Gumbo	14	437
Water sand	55	224	Water sand	21	458
Shale, gumbo, and boulders	116	340	Gumbo	18	476
Water sand	11	351			

Well 655, Sinclair-Prairie Oil Co. No. 3 (D. Moore), 5 miles southeast of Gladewater; W. A. Meller, driller

Surface clay	12	12	Water sand	55	234
Surface sand	35	47	Gumbo	7	241
Shale and boulders	132	179			

Well 656, Sinclair-Prairie Oil Co. No. 4 (D. Moore), 5 miles southeast of Gladewater; W. A. Meller, driller

Surface clay and sand	13	13	Water sand	19	353
Surface sand	54	67	Gumbo	18	371
Sandy shale	51	118	Water sand	37	408
Gumbo and boulders	68	186	Gumbo and shale	48	456
Shale and gumbo	148	334			

TABLE 5.—*Drillers' logs, Gregg County, Tex.*—Continued

Well 657, Tide Water Associated Oil Co. (E. M. Nettleton "A"), 3½ miles west of Greggton; W. A. Meller, driller

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Surface sand and clay	30	30	Sand and shale	68	270
Surface sand	32	62	Blue sand	52	322
Rock	1	63	Rock	1	323
Sand and rock	18	81	Blue sand	82	405
Gumbo	4	85	Sand	38	443
Sand	37	122	Hard shale	7	450
Sandy shale	55	177	Shale	7	457
Gumbo	8	185	Well sanded up, could not pull casing, another well drilled at camp.		
Rock	1	186			
Gumbo	16	202			

Well 658, Tide Water Associated Oil Co. No. 2 (E. M. Nettleton "A"), 3½ miles west of Greggton; Layne-Texas Co., driller

Sandy clay	15	15	Sandy shale	45	251
Sand	13	28	Shale and lignite	23	274
Rock	1	29	Good sand	22	296
Sand	43	72	Sandy shale	22	318
Rock	1	73	Sand rock	33	351
Hard sand	44	117	Rock	2	353
Shale	22	139	Shale	8	361
Sand with shale breaks	23	162	Good sand	80	441
Hard shale	44	206	Shale	17	458

Well 661, Gulf Oil Corp. (Lacy-Snider), 3 miles northwest of Greggton; Bill Boling, driller

Clay	25	25	Blue shale	58	178
Quicksand	13	38	Sandy lime	4	182
Black shale	16	54	Brown shale	13	195
Blue shale	26	80	Water sand	25	220
Gray shale	25	105	Brown shale	8	228
Brown shale	15	120			

Well 663, White Oak school No. 2, 4 miles northwest of Greggton; Layne-Texas Co., driller

Soil and clay	13	13	Sand	18	382
Yellow sand	14	27	Shale	2	384
Shale	16	43	Sandy shale	11	395
Sand	52	95	Rock	1	396
Rock	1	96	Shale and lignite	9	405
Sand breaks of shale	23	119	Rock	1	406
Sandy shale and boulders	17	136	Fine-grained hard sand	30	436
Rock	1	137	Shale and lignite	13	449
Sandy shale	24	161	Rock	1	450
Shale and lignite	36	197	Shale and lignite	19	469
Sandy lime and shale	24	221	Shale	15	484
Shale and boulders	18	239	Shale and lignite	72	556
Rock	1	240	Rock	2	558
Hard sand, lime, and rock layers	27	267	Shale and lignite	11	569
Shale and lignite	69	336	Sand and sandy shale	28	597
Rock	1	337	Shale and lignite	25	622
Shale and lignite	27	364			

Well 664, Greggtex Gasoline Corp., 4¾ miles north of Greggton; Bill Boling, driller

Red clay	12	12	Coarse-grained gray water sand	25	140
Yellow sand, 2 gallons a minute	43	55	Shale	21	161
Shale	60	115			

TABLE 5.—*Drillers' logs, Gregg County, Tex.*—Continued

Well 678, Lone Star Gas Co., 2 miles southeast of Greggton; Layne-Texas Co., driller

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Soil	1	1	Sharp sand and layers of shale	10	338
Red sand, clay, and iron boulders	15	16	Shale and streaks of sand	6	344
Dark-gray shale	2	18	Sand rock	3	347
Sharp gray sand	11	29	Shale and sand breaks	8	355
Shale and fine-grained gray sand	39	68	Sand and streaks of shale	7	362
Gray sand with thin streaks of lignite	25	93	Shale	4	366
Gray sandy shale with layers of rock	20	113	Clean sharp gray sand	15	381
Hard shale and lignite	9	122	Shale	2	383
Sandy shale and lignite	5	127	Clean sharp gray sand	12	395
Shaly hard sand and lignite	9	136	Gray sand, few thin streaks of shale and lignite	7	402
Sandy shale and lignite	17	153	Clean sharp gray sand	20	422
Gray sand	6	159	Breaks of sand, shale, and lignite	3	425
Gray shale	35	194	Gray sand	38	463
Sand and shale	63	257	Fine-grained hard gray sand with streaks of shale	54	517
Shale	5	262	Fine-grained gray sand with thin layers of shale and lignite	26	543
Sand and shale	9	271	Shale, sand breaks, and lignite	15	558
Sand, hard layers of boulders	4	275			
Coarse-grained smooth gray sand	28	303			
Sharp light-gray sand and layers of shale	25	328			

Well 680 (Deussen No. 365),[1] R. G. Brown, in Longview

Mount Selman formation:			**Wilcox formation**—Continued		
Sand and clay	90	90	Interstratified rock and clay	100	352
Wilcox formation:			Gray water sand; water did not rise to surface; cased off	98	450
Lignite	10	100	Clay (?)	?	
Shale	2	102	Water-bearing sand	?	580
Blue sand	150	252			

[1] Number under which well is listed by Deussen in U. S. Geol. Survey Water-Supply Paper 335, 1914.

Well 681 (Deussen No. 367),[1] Texas & Pacific Ry. Co., in Longview; Texas & Pacific Ry. Co., driller

Mount Selman formation:			**Wilcox formation**—Continued		
Clay	35	35	Sand rock	24	269
Limestone (probably sandstone)	10	45	Shale	76	345
Wilcox formation:			Slate	25	370
Shale	31	76	Shale	110	480
Sand rock	72	148	Slate	11	491
Black shale	8	156	Sand rock	19	510
Shale	44	200	Sand	12	522
Sand rock	20	220	Shale	45	567
Shale	25	245	Packsand	36	603

[1] Number under which well is listed by Deussen in U. S. Geol. Survey Water-Supply Paper 335, 1914.

Well 682, Sabine school No. 3, 6¼ miles northwest of Kilgore; O. B. Harris, driller

Shale	15	15	Brown shale	32	180
Quicksand	13	28	Blue shale	72	252
Sandy shale	42	70	Water sand	8	260
Quicksand	32	102	Blue shale	135	395
Brown shale	23	125	Water sand	7	402
Blue shale	17	142	Brown shale	5	407
Water sand	6	148			

TABLE 5.—*Drillers' logs, Gregg County, Tex.*—Continued

Well 683, North Chapel colored school, 4½ miles northwest of Kilgore; J. C. Boling, driller

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Surface material	35	35	Water sand	15	235
Quicksand	60	95	Shale	20	255
Shale	125	220			

Well 688,[1] Gulf Oil Corp. (M. E. Peterson), 2½ miles southwest of Kilgore; Layne-Texas Co., driller

Surface soil	4	4	Shale	13	154
Clay	3	7	Sandy shale	9	163
Sand	15	22	Rock	2	165
Clay	32	54	Shale and boulders	25	190
Shale	5	59	Shale and layers of sand	23	213
Sand	8	67	Hard shale	20	233
Shale	33	100	Shale and lignite	29	262
Rock	2	102	Sand	15	277
Shale	16	118	Sandy shale	8	285
Sand	18	136	Sand	16	301
Shale	4	140	Sandy shale	45	346
Rock	1	141	Sand	94	440

[1] In Rusk County

Well 689,[1] Tide Water Associated Oil Co. (Nat Bean "A"), 1¾ miles southwest of Kilgore; Layne-Texas Co., driller

Red clay	25	25	Fine-grained light-gray sand	39	292
Rock	1	26	Soft shale	5	297
Gray sand	28	54	Light-gray sand	55	352
Rock	1	55	Soft shale	7	359
Soft brown shale	47	102	Good water sand	10	369
Soft gray shale and fine-grained sand	60	162	Soft shale and thin layers of sand	28	397
Soft gray shale	91	253	Good water sand	16	413
			Hard blue shale	24	437

[1] In Rusk County

Well 690, Tide Water Associated Oil Co. (J. B. Watson), ¾ mile west of Kilgore; Fred Fiedler, driller

Sandy clay	38	38	Sand, shale, and lignite	58	400
Shale and gumbo	232	270	Gray shale	65	465
Shale and lignite	15	285	Sandy shale	75	540
Sand and boulders	15	300	Blue shale	134	674
Blue gumbo	40	340	Sand and shale	41	715
Rock	2	342	Water sand	217	932

Well 698, Tide Water Associated Oil Co. (M. G. Barton), 2¼ miles north of Kilgore; Layne-Texas Co, driller

Yellow clay	25	25	Hard shale	251	347
Sand	3	28	Sand and breaks of shale	27	374
Shale	43	71	Shale	9	383
Rock	2	73	Sand and breaks of shale	49	432
Sandy shale	5	78	Sandy shale	69	501
Rock	1	79	Sand	25	526
Sandy shale	16	95	Sandy shale	43	569
Rock	1	96			

Well 701. M. B. Hughey, 3¾ miles north of Kilgore; Bill Boling, driller

Surface clay and shale	240	240	Shale	21	276
Sand	15	255			

TABLE 5.—*Drillers' logs, Gregg County, Tex.*—Continued

Well 703. A. B. Spear, 3 miles northeast of Kilgore; Layne-Texas Co., driller

	Thickness (feet)	Depth (feet)		Thickness (feet)	Depth (feet)
Red sandy clay	10	10	Lignite and shale	46	164
Red sand	3	13	Hard shale	42	206
Yellow clay	15	28	Sandy shale	14	220
Rock	1	29	Rock	1	221
Sand	10	39	Sand rock	9	230
Rock	1	40	Sandy shale	46	276
Sand	5	45	Good sand	45	321
Rock	1	46	Shale	30	351
Sand	9	55	Rock	1	352
Rock	2	57	Good sand	69	421
Sand	56	113	Shale	12	433
Shale	5	118			

Well 705. Gregg County airport, 9 miles east of Kilgore; Layne-Texas Co., driller

Red clay	12	12	Gray sand and streaks of shale, water	25	331
Sandy clay	11	23	Shale	19	350
Gray sand	5	28	Gray sand, water	17	367
Gray shale	22	50	Gray shale and streaks of lignite	21	388
Rock	2	52	Sandy shale	7	395
Hard shale and rock	4	56	Gray sand and streaks of shale	7	402
Brown sand and lignite	17	73	Shale	3	405
Rock	2	75	Gray sand and streaks of shale, water	37	442
Sand and lignite	3	78	Broken sand and shale	22	464
Hard brown sand	9	87	Gray sand	10	474
Rock	1	88	Rock	2	476
Hard brown sand	8	96	Sand and shale	14	490
Hard gray sand	17	113	Sandy shale and lignite	46	536
Hard gray shale and streaks of sand	61	174	Shale and lignite	11	547
Gray shale and streaks of sand	33	207	Sandy shale and lignite	5	552
Gray shale	42	249	Shale and lignite	8	560
Gray shale and streaks of sand	17	266	Sandy shale and lignite	43	603
Rock	1	267			
Gray shale and streaks of sand	39	306			

ANALYSES OF GROUND WATER

TABLE 6.—*Partial analyses of water from wells in Gregg County, Tex.*

[Analyzed under the direction of Dr. E. P. Schoch, Director of the Bureau of Industrial Chemistry, of the University of Texas, and W. W. Hastings, chemist, U. S. Geological Survey. Results are in parts per million. Well numbers correspond to numbers in table 4]

Well No.	Owner (lessor)	Depth (feet)	Date of collection	Total dissolved solids	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)
30	Tide Water Associated Oil Co. (J. J. Flewellen).	812	Mar. 23, 1936	2,299	12	4	872	360	------	1,234	------	------	47
62	Humble Oil & Refining Co. (G. W. Willingham).	390	June 15, 1936	323	(1)	4	120	159	19	98	------	------	27
84A	Judson Grove school	394	July 29, 1936	50	------	------	------	36	------	13	------	------	------
112	Magnolia Petroleum Co. (W. E. Jones)	811	Mar. 19, 1936	1,983	12	3	777	463	------	960	------	------	40
178	Dr. —— Hurst	348	June 1, 1936	128	28	26	------	6	8	63	------	------	176
214	Humble Oil & Refining Co. (W. W. Holland)	1,084	Mar. 31, 1936	967	6	4	372	244	40	425	------	------	32
258	City of Gladewater No. 1	826	Apr. 27, 1936	1,199	5	6	473	537	21	430	------	------	39
259	City of Gladewater No. 2	388	----do	663	6	------	266	402	23	170	------	------	15
259	----do	388	------	------	------	------	------	------	30	132	------	------	20
264	City of Gladewater No. 3	213	Mar. 30, 1936	854	6	4	337	513	35	220	------	------	32
265	Sinclair-Prairie Oil Co. (W. H. York)	807	Apr. 29, 1936	2,427	(1)	------	973	573	------	1,170	------	------	4
275	Stanolind Oil & Gas Co. (L. E. Pearsons)	872	Apr. 6, 1936	2,575	5	9	1,020	775	------	1,160	------	------	50
285	Gulf Oil Corp. (M. Smith)	964	Oct. 7, 1941	1,738	(1)	5.1	696	726	3	670	1.8	------	33
290	Tide Water Associated Oil Co. (E. M. Nettleton "A").	843	Mar. 27, 1936	1,725	(1)	3	698	757	------	650	------	------	17
411	Sinclair-Prairie Oil Co. (M. T. Cole)	1,008	Apr. 29, 1936	1,981	------	4	800	751	8	800	------	------	16
468	City of Kilgore No. 4	780	Apr. 14, 1936	1,688	6	(2)	678	720	8	640	------	------	27
468	----do	780	Oct. 8, 1941	1,595	(1)	------	636	604	23	630	.5	------	27
469	City of Kilgore No. 1	875	Apr. 14, 1936	1,683	6	4	674	720	------	645	------	------	32
469	----do	875	------	1,732	10	------	665	677	60	588	------	------	25
469	----do	------	------	------	------	------	------	588	10	595	------	------	2
469	----do	875	Oct. 3, 1941	1,777	------	3.9	711	598	27	740	.7	------	17
470	City of Kilgore No. 3	906	Apr. 14, 1936	2,084	6	9	826	743	------	880	------	------	50
470	----do	906	Oct. 3, 1941	1,826	------	5.1	728	586	23	780	.6	------	23
471	Humble Oil & Refining Co. (S. S. Laird "B").	908	Apr. 15, 1936	732	6	3	295	604	29	102	------	------	27
471	----do	908	------	951	15	3	335	639	34	155	------	------	30
471	----do	------	------	------	------	------	------	------	25	140	------	------	12
476	Shell Oil Co., Inc. (W. W. Elder)	500	Apr. 13, 1936	448	------	4	184	457	21	14	------	------	16
503	D. H. Jones	467	June 30, 1936	2,028	(1)	4	808	555	------	940	------	------	22

See footnotes at end of table.

TABLE 6.—*Partial analyses of water from wells in Gregg County, Tex.*—Continued

Well No.	Owner (lessor)	Depth (feet)	Date of collection	Total dissolved solids	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)
525	Magnolia Pipe Line Co	218	Apr. 24, 1936	536	(1)	4	217	525	37	18			22
531	Atlantic Pipe Line Co	365	do	680			292	732	8	20			1
607	United Gas Public Service Co	378	June 24, 1936	1,111	7	6	439	665	42	290			44
[3] 641	City of Gladewater No. 5	279	Jan. 22, 1942	687	11	(2)	267	451	34	150	0.4	(4)	37
[5] 75	City of Gladewater No. 4	294	Apr. 4, 1940	766			311	394	26	238	0	3.0	28
[5] 75	do	294	Jan. 22, 1942	871	32	6.1	311	427	30	282	.2	(4)	104
644	J. H. Bozeman	400	Sept. 18, 1941	102	11	5.1	21	31	2	48	.3	(4)	48
645	Gulf Oil Corp. (M. O. Sheppard)	304	Sept. 2, 1941	550	12	(2)	216	512	31	36	.6	(4)	36
[3] 646	Gulf Oil Corp. (M. O. Sheppard)	305	Jan. 22, 1942	276	47	4.9	52	207	52	18	.2	(4)	138
647	Gulf Oil Corp. (F. N. Fonville)	258	do	488	6.0	7.3	187	451	30	36	.1	(4)	45
[3] 649	E. P. Halliburton Inc. (W. D. Lacy "B")	485	do	455	(1)	(2)	187	433	25	24		(4)	11
650	Gulf Oil Corp. (J. C. Judge)	302	Aug. 28, 1941	462	(1)	(2)	185	445	31	20		(4)	22
651	Atlantic Refining Co. (Martin Hays)	340	do	505	(1)	(2)	207	506	10	31	.9	(4)	22
652	Atlantic Refining Co. (S. C. Fishburn)	214+	Sept. 23, 1941	801	(1)	(2)	336	634	12	140		(4)	1
[3] 653	Superior Oil Co. (W. E. Pasture)	512	Sept. 18, 1941	815	(1)	(2)	336	610	18	158		(4)	12
654	Sinclair-Prairie Oil Co. No. 2 (D. Moore)	476	Aug. 27, 1941	667	8.4	3.9	267	592	14	83		(4)	37
655	Sinclair-Prairie Oil Co. No. 3 (D. Moore)	241	do	469	(1)	(2)	189	397	27	52	.2	(4)	16
656	Sinclair-Prairie Oil Co. No. 4 (D. Moore)	456	do	669	(1)	(2)	279	604	14	74	.9	(4)	10
[3] 658	Tide Water Associated Oil Co. No. 2 (E. M. Nettleton "A").	458	Aug. 28, 1941	538	8.4	(2)	213	506	31	34		(4)	32
659	Texas-Empire Pipe Line Co. (E. M. Nettleton "A").	375	Oct. 21, 1941	680	7.2	3.4	273	586	15	93	.2	(4)	32
660	Atlantic Refining Co. (P. B. Harris)	362	Sept. 17, 1941	630	6.0	(2)	255	506	16	102		(4)	21
661	Gulf Oil Corp. (Lacy-Snider)	228	Jan. 22, 1942	475	11	(2)	187	482	15	22	.3	(4)	36
[3] 663	White Oak school No. 2	470	Aug. 29, 1941	706	(1)	3.9	291	580	12	113	.7	(4)	17
[3] 664	Greggtex Gasoline Corp	161	Jan. 22, 1942	161	14	8.5	37	122	20	21	.1	(4)	70
665	do	410	do	1,147	18	6.1	429	250	20	550	.2	(4)	69
[3] 666	do	420	do	1,175	24	6.1	433	250	26	562	.3	(4)	84
[3]667	Mabee Oil & Gas Co. (H. F. Whitehurst)	320	Nov. 20, 1941	400	(1)	(2)	165	293	8	80	.5	(4)	5
668	Leroy Ziegler	148	Sept. 19, 1941	183	21	12	29	37	27	76		(4)	103
669	H. C. Pederson	20	Aug. 29, 1941	22	(1)	(2)	2.3	18	2	3.0		(4)	16
[3] 670	Magnolia Petroleum Co	425	Sept. 11, 1941	1,350	8.8	5.1	520	262	27	660		(4)	43
672	LeBus Rotary Tool Works	250	Sept. 10, 1941	1,335	20	3.9	502	226	27	670		(4)	67
674	Royal Crown Bottling Co	350	do	1,584	12	3.9	615	336	2	785		(4)	47
676	Humble Oil & Refining Co. (E. B. Robertson)	300±	Sept. 8, 1941	100	6.4	(2)	26	37	31	16		(4)	27
[3] 678	Lone Star Gas Co	423	Oct. 1, 1941	1,673	6.4	(2)	662	427	2	790	.3	(4)	27
679	Humble Oil & Refining Co	300±	Sept. 8, 1941	723	(1)	3.9	297	616	5	110	1.2	(4)	22

682	Sabine school No. 3	407	Sept. 11, 1941	376	(1)	(2)	155	354	31	14	.4	(4)	5
[3] 683	North Chapel colored school	255	do	186	19	5.1	48	146	20	22	.1	(4)	68
685	Danciger Oil & Refining Co. (McNeeley)	625	do	368	12	(2)	134	305	35	34	.2	(4)	42
[4] 687	Jacob H. Wood	625	Sept. 3, 1941	411	8	(2)	163	421	23	8.0	----------	(4)	26
688	Gulf Oil Corp. (M. E. Peterson)	440	Aug. 28, 1941	359	8	(2)	140	354	27	8.0	----------	(4)	26
689	Tide Water Associated Oil Co. (Nat Bean "A").	437	Oct. 4, 1941	389	(1)	(2)	158	372	38	6.0	----------	(4)	10
693	Malcom Crim	312	Jan. 21, 1942	424	(1)	(2)	172	397	41	10	.4	(4)	11
694	Doug Godfrey	272	Sept. 3, 1941	461	(1)	(2)	184	421	54	10	----------	(4)	16
696	Houston Oil Co. (J. S. Elder)	416	Jan. 19, 1942	1,950	117	60	443	250	1,104	102	.3	(4)	537
[3] 698	Tide Water Associated Oil Co. (M. G. Barton).	569	Sept. 25, 1941	513	(1)	(2)	207	506	35	15	----------	(4)	22
[3] 700	Hughey school	190	Sept. 11, 1941	456	(1)	(2)	185	415	46	16	1.0	(4)	11
701	M. B. Hughey	276	Sept. 11, 1941	502	(1)	(2)	201	476	42	18	----------	(4)	22
703	A. B. Spear	433	Sept. 5, 1941	565	7.6	(2)	231	573	31	13	.4	(4)	20
[3] 704	Danville school	19	Sept. 2, 1941	102	12	9.7	8.5	37	46	8.0	.1	(4)	71
[3] 705	Gregg County airport	603	do	673	(1)	5.1	272	549	38	86	.5	(4)	23
[6] 176	J. W. Johnson (H. W. Norvell)	20	Oct. 27, 1941	86	7.6	6.1	8.7	6	3	14	.1	(4)	44
[6] 481	Tide Water Associated Oil Co. (J. M. Blackman).	955	Sept. 25, 1941	1,507	.4	2.7	607	622	31	560	----------	0	12

[1] Less than 5 parts per million.
[2] Less than 3 parts per million.
[3] Analyses of water from selected wells are given in milligram equivalents per liter in table 7.
[4] Less than 20 parts per million.
[5] In Upshur County and recorded in Upshur County report of the Texas State Board of Water Engineers; included here because it is one of several wells used by the city o Gladewater.
[6] Well records in Texas State Board of Water Engineers report on Gregg County, Feb. 15, 1937.

TABLE 7.—*Analyses of water from selected wells in Gregg County, Tex.*

[In milligram equivalents per liter]

Well No.	Owner (lessor)	Depth (feet)	Date of collection	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)
641	City of Gladewater No. 5	279	Jan. 22, 1942	0.54	0.20	11.61	7.40	0.702	4.23	0.02	0	0.74
646	Gulf Oil Corp. (M. O. Sheppard)	305	do	2.36	.40	2.25	3.40	1.092	.51	.01	0	2.76
649	F. P. Halliburton	485	do	.12	.10	8.12	7.10	.52	.68		.04	.22
653	Superior Oil Co. (S. C. Fishburn)	512	Sept. 18, 1941	.02	.22	14.59	10.00	.37	4.46			.24
658	Tide Water Associated Oil Co. No. 2	458	Aug. 28, 1941	.42	.22	9.26	8.30	.64	.96			.64
663	White Oak school No. 2	470	Aug. 29, 1941	.02	.32	12.64	9.50	.25	3.19	.04		.34
664	Greggtex Gasoline Corp	161	Jan. 22, 1941	.70	.70	1.62	2.00	.42	.59	.005	0	1.40
666	do	420	do	1.18	.50	18.84	4.10	.546	15.85	.015	0	1.68
667	Mabee Oil & Gas Co	320	Nov. 20, 1941	.06	.04	7.18	4.80	.17	2.26	.03	.02	.10
670	Magnolia Petroleum Co	425	Sept. 11, 1941	.44	.42	22.61	4.30	.56	18.61			.86
678	Lone Star Gas Co	423	Oct. 1, 1941	.32	.22	28.78	7.00	.04	22.28	.015		.54
683	North Chapel colored school	255	Sept. 11, 1941	.94	.42	2.08	2.40	.42	.62	.005		1.36
687	Jacob H. Wood (McNeeley)	625	Sept. 3, 1941	.40	.12	7.09	6.90	.48	.23			.52
693	Malcom Crim	312	Jan. 21, 1942	.12	.10	7.46	6.50	.858	.28	.02	.02	.22
698	Tide Water Associated Oil Co. (M. G. Barton).	569	Sept. 25, 1941	.22	.22	9.00	8.30	.72	.42			.44
700	Hughey school	190	Sept. 11, 1941	.10	.12	8.04	6.80	.96	.45	.05		.22
704	Danville school	19	Sept. 2, 1941	.62	.80	.37	.60	.96	.23	.005		1.42
705	Gregg County airport	603	do	.04	.42	11.80	9.00	.80	2.43	.03		.46

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