TEXAS WATER DEVELOPMENT BOARD

REPORT 181

GROUND-WATER RESOURCES OF DUVAL COUNTY, TEXAS

By

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United States Geological Survey

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GROUND-WATER RESOURCES OF DUVAL COUNTY, TEXAS

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ABSTRACT

The geologic formations that yield fresh to moderately saline water in Duval County are, from oldest to youngest, the Catahoula Tuff, Oakville Sandstone, and Goliad Sand. All other geologic formations underlying the county are not known to yield water to wells or they yield only saline water.

About 5.3 mgd (million gallons per day) of ground water was used in 1970. Of this amount 0.6 mgd was pumped from the Catahoula Tuff, 0.7 mgd from the Oakville Sandstone, and 4.0 mgd from the Goliad Sand. Most of the large ground-water supplies are obtained from wells in the Goliad Sand.

During 1931-69, water levels declined as much as 55 feet in the artesian zone of the Goliad Sand in the east-central and southeastern parts of the county, as a result of pumping for irrigation, public supply, and industrial use. Changes in water levels in wells in the Catahoula Tuff have been relatively small. Probably only slight changes in water levels have occurred regionally in the Oakville Sandstone.

The ground water is characteristically high in dissolved solids, chloride, and hardness. Most of the water sampled does not meet the quality standards of the U.S. Public Health Service for drinking water, although water having chemical constituents in excess of the standards is used in the county for drinking. Water from the Goliad Sand is more suitable for irrigation than water from the Oakville Sandstone and Catahoula Tuff; however, water from any of the three aquifers should be used with careful management and as a supplement to rainfall.

The ground-water resources of the county are only partly developed. A total of 23 mgd (6 mgd from the Catahoula, 7 mgd from the Oakville, and 10 mgd from the Goliad) of fresh to slightly saline water is available, on a long-term basis without depleting the supply. This total is slightly more than four times as much water as was used for all purposes in 1970.

GROUND-WATER RESOURCES OF DUVAL COUNTY, TEXAS

INTRODUCTION

Purpose and Scope of the Investigation

The purpose of the investigation, which was made by the U.S. Geological Survey in cooperation with the Texas Water Development Board, was to determine the occurrence, availability, dependability, quality, and quantity of the ground-water resources of Duval County, with particular reference to the sources of water suitable for public supply, industrial use, and irrigation, and to identify areas of present or potential ground-water problems. The results of the study are presented as guides for developing, protecting, and obtaining maximum benefits from the available ground-water supplies.

The investigation specifically included: A delineation of the location and extent of sands containing fresh to slightly saline water (less than 3,000 milligrams per liter dissolved solids); a determination of the chemical quality of the water; a compilation of the quantity of water being withdrawn and an assessment of the effect of these withdrawals on water levels and water quality; a determination of the hydraulic characteristics of the important water-bearing sands; an estimate of the quantity of ground water available for development; and a consideration of all significant ground-water problems in the county.

The report includes records of 509 water wells (Table 7), 85 oil and gas wells (Table 8), water levels in 58 wells (Table 9), 37 drillers' logs (Table 10), and 174 chemical analyses of water samples (Table 11).

The technical terms used in discussing the ground-water resources of the area are defined in the section entitled "Definitions of Terms."

Location and Extent of the Area

Duval County is in the West Gulf Coastal Plain of south Texas. It is bounded on the south by Brooks and Jim Hogg Counties, on the west by Webb County, on the north by McMullen and Live Oak Counties, and on the east by Jim Wells County. San Diego, the county seat, is about 55 miles west of Corpus Christi. The county has an area of about 1,800 square miles (Figure 1).

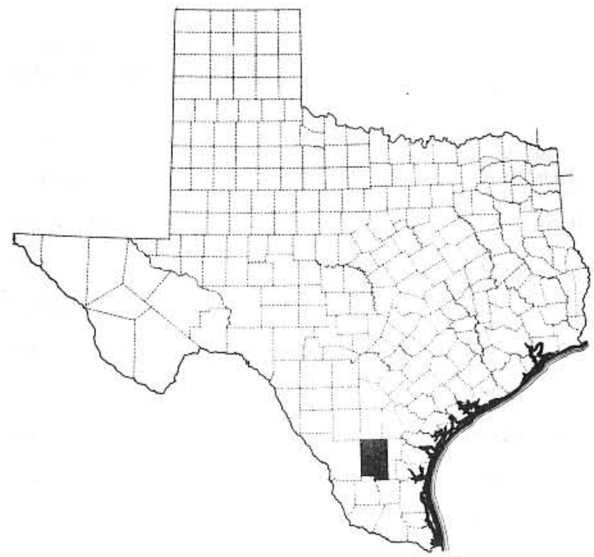


Figure 1.—Location of Duval County

Previous Investigations

Prior to this investigation, few comprehensive studies had been made of the ground-water resources of Duval County. The earliest significant ground-water investigation was made by Sayre (1937) who described the geology and ground-water resources of the county. The public water supplies of the towns of Benavides, Freer, and San Diego were described briefly by Broadhurst, Sundstrom, and Rowley (1950, p. 50-52). A reconnaissance of the ground-water resources of the Gulf Coast region, including Duval County, was made by Wood, Gabrysch, and Marvin (1963).

Detailed reports have been published on the ground-water resources of several neighboring counties, including Webb County, Lonsdale and Day (1937); Live Oak County, Anders and Baker (1961); Alice area of Jim Wells County, Mason (1963); La Salle and McMullen Counties, Harris (1965); Brooks County, Myers and Dale (1967); Kleberg, Kenedy, and southern Jim Wells Counties, Shafer and Baker (1973).

Water levels in observation wells in Duval County have been measured periodically since about 1931 as part of a statewide observation-well program undertaken jointly by the Texas Water Development Board and the U.S. Geological Survey. Some of the water-level measurements have been published in annual water-level reports of the Geological Survey, and many are included in Table 9.

Some of the data collected during previous well inventories are included in this report. Table 1 shows the well numbers used in Duval County by Sayre (1937) and corresponding numbers used in this report.

dome since 1934, is being used in large quantities by chemical industries at Corpus Christi as a basic raw material.

The county, which is served by numerous hard-surfaced roads and highways and one railroad, had a population of 11,722 in 1970. San Diego, the county seat, and largest town in the county, had a population in 1970 of 4,490 (including the part of the town in Jim Wells County).

Table 1.—Well Numbers Used in This Report and Corresponding Numbers Previously Used in Duval County by Sayre (1937)

NEW NUMBER	OLD NUMBER	NEW NUMBER	OLD NUMBER	NEW NUMBER	OLD NUMBER
JB-84-02-601	1	JB-84-29-308	145	JB-84-44-101	269
03-102	4	501	158	601	276
601	6	30-101	173	45-101	271
801	5	201	188	102	272
12-201	80	202	189	304	289
13-801	73	203	188a/	305	287
802	72	301	187	307	290
901	69	401	191	501	292
902	68	501	190	603	291a/
903	70	34-301	260	701	281
904	71	36-901	230	46-101	304
14-403	61	37-104	240	301	318
404	61a/	301	218a/	401	301
701	59	704	229	402	302
801	55	901	209a/	602	319
22-801	185	38-601	201	603	315
902	183	701	211	901	325a/
903	184	702	209	902	322a/
29-305	175	801	207	903	322b/
306	143	902	204	47-702	325
307	144	903	203	703	325b/

Economic Development

The economy of Duval County depends mainly on oil and gas production, large-scale ranching and farming, and the production of brine. According to the Texas Mid-Continent Oil and Gas Association, more than 450 million barrels of oil were produced in Duval County from 1905 through 1968. Grain sorghum, peanuts, forage crops, and a variety of vegetables are grown locally. Brine, which has been produced at Palangana salt

Topography and Drainage

The topography of Duval County varies from nearly flat in the southeastern part to gently rolling and hilly in the western and northern parts. The altitude ranges from about 200 feet above mean sea level in the valley of Cibolo Creek (southeastern part of the county) to more than 800 feet at a few places in the extreme western part of the county.

Physiographic features include cuestas, "knobs", plains, gravel hills, and escarpments, mainly in the western and northwestern parts of the county, many of which have been described by several of the earlier geologists working in the area. Much of the terrain in Duval County consists of open prairie grasslands. The brushy areas are covered with mesquite, cactus or prickly pear, scrub oak, cenizo, huisache, black chaparral, and other vegetation commonly found in south Texas.

All the stream channels in the county are dry except during and briefly after periods of heavy rainfall. The Nueces River and its tributaries drain a part of the terrain in the northwestern part of the county; the rest of the county is drained by several intermittent streams that flow eastward or southeastward toward the Gulf of Mexico.

Climate

The records of the National Weather Service for the town of Falfurrias in adjoining Brooks County provide the most complete climatological data that apply to Duval County. The average annual precipitation during 1940-69 was 24.15 inches (Figure 2). Thunderstorms in the spring and tropical disturbances in early fall result in peak monthly rainfall totals in May and September. Records show that as a result of Hurricane Beulah, 32.78 inches of rain fell in Falfurrias during September 1967; and for all of 1967, 55.15 inches of precipitation were recorded. Generally, March is the driest month.

The average annual temperature at Falfurrias during the period 1940-69 was 73.1°F (23°C). The average monthly temperature for the same period was lowest, 56.7°F (14°C), during January and highest, 86.5°F (30°C), during July (Figure 2). The average growing season is 298 days.

The average monthly gross lake-surface evaporation in Duval County for the period 1940-65 (Kane, 1967, p. 107) ranged from 2.7 inches in January to 10.3 inches in August (Figure 2). Average monthly evaporation was 5.9 inches, and the average annual was 70.9 inches.

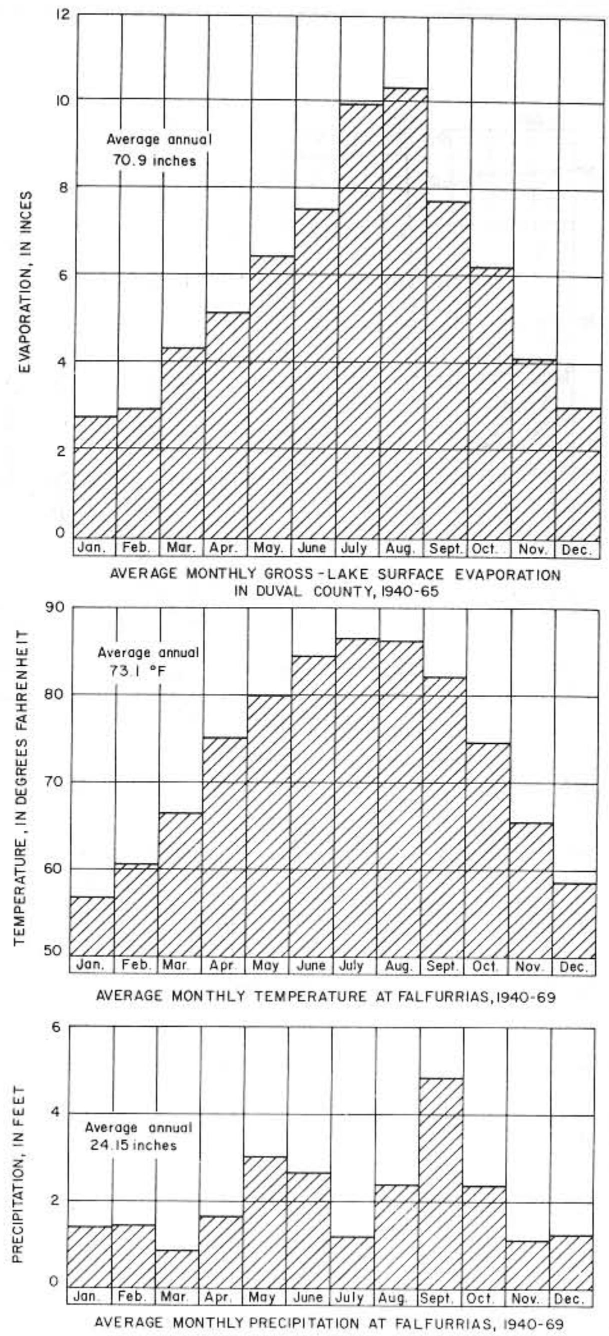
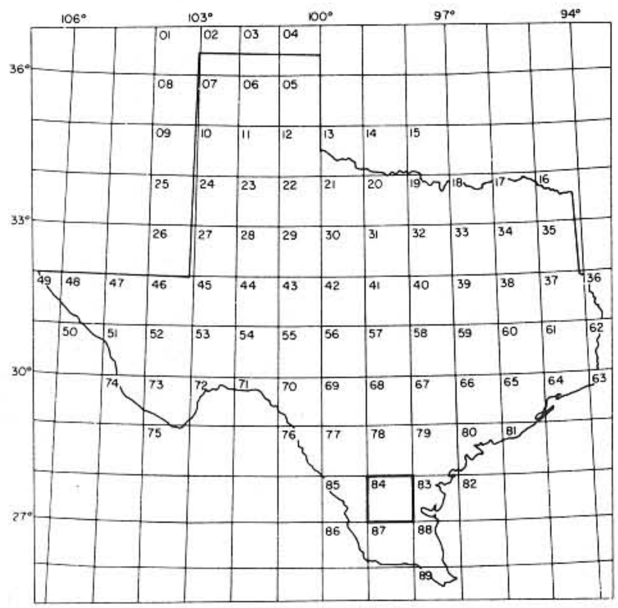


Figure 2.—Average Monthly Precipitation and Temperature at Falfurrias and Average Monthly Gross Lake-Surface Evaporation in Duval County

Well-Numbering System

The well-numbering system used in this report is the one adopted by the Texas Water Development Board for use throughout the State (Figure 3). Under this system, each 1-degree quadrangle in the State is given a number consisting of two digits from 01 to 89. These are the first two digits in the well number.

Each 1-degree quadrangle is divided into 7½-minute quadrangles which are given 2-digit numbers from 01 to 64. These are the third and fourth digits of the well number. Each 7½-minute quadrangle is divided into 2½-minute quadrangles which are given a single-digit number from 1 to 9. This is the fifth digit of the well number. Each well within a 2½-minute quadrangle is given a 2-digit number in the order in which it is inventoried. These are the last two digits of the well number. In addition to the 7-digit well number, a 2-letter prefix is used to identify the county. The prefix for Duval County is JB.



1 - degree Quadrangles

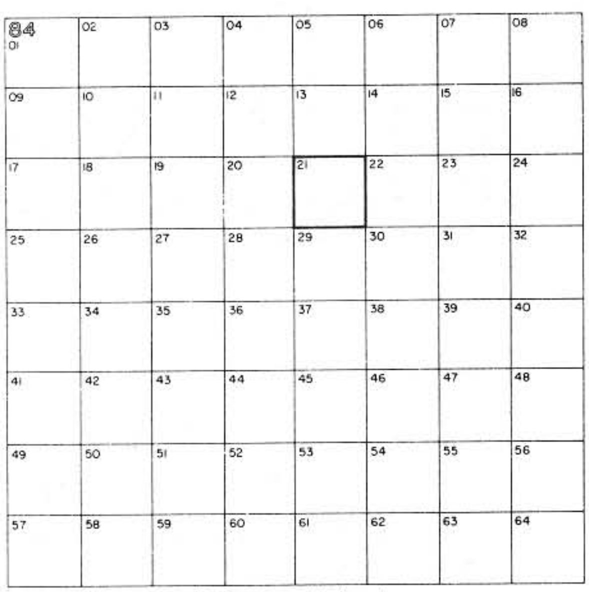
Location of Well 84-21-601

84 1 - degree quadrangle

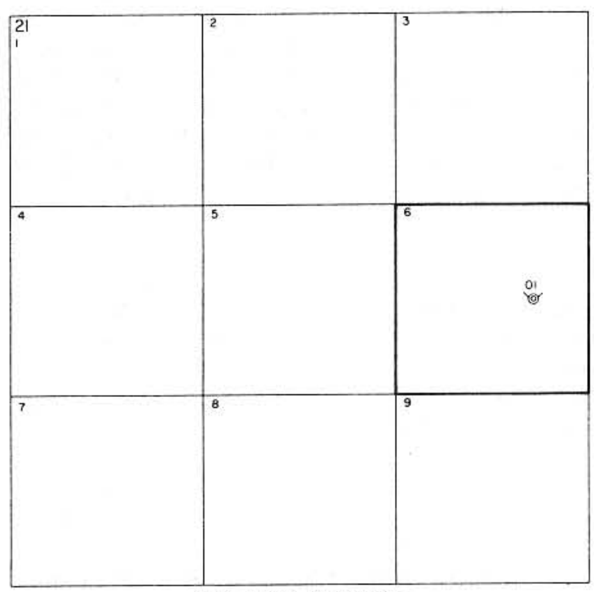
21 7 1/2 - minute quadrangle

6 2 1/2 - minute quadrangle

01 Well number within 2 1/2 - minute quadrangle



7 1/2 - minute Quadrangles



2 1/2 minute Quadrangles

Figure 3
Well-Numbering System

On the well-location map in this report (Figure 22), the 1-degree quadrangles are numbered in large bold numerals. The 7½-minute quadrangles are numbered in the northwest corners where possible. The 3-digit number shown with the well symbol contains the number of the 2½-minute quadrangle in which the well is located and the number in the order in which it is inventoried within that quadrangle.

Acknowledgments

The writer wishes to express his appreciation to the property owners in Duval County for granting access to their properties and for supplying information about their water wells; to the well drillers for providing logs and other information on water wells; to oil companies for their generous cooperation; and to State, county, town, and federal officials for their assistance. Many records used in this report were collected previously by personnel of the U.S. Geological Survey and the Texas Water Development Board.

GEOLOGY AS RELATED TO THE OCCURRENCE OF GROUND WATER

General Stratigraphy and Structure

The geologic units that yield fresh to moderately saline water to wells are, from oldest to youngest, the Catahoula Tuff and Oakville Sandstone of Miocene age and the Goliad Sand of Pliocene age. All of these units are exposed in Duval County. The Frio Clay of Oligocene (?) age, Fleming Formation of Miocene age, Lissie Formation of Pleistocene age, south Texas eolian-plain deposits of Pleistocene (?) and Holocene age, and alluvium of Holocene age are also exposed in Duval County, but are not known to yield water to wells.

The formations crop out in belts that trend roughly northeastward and parallel to the coast (Figure 4). Younger rocks crop out near the coast and successively older units crop out farther inland. Because of the different ages of the formations, the outcrops are progressively eroded and dissected inland. For example, the outcrop of the Lissie Formation is comparatively uneroded in contrast to the uneven and dissected outcrops of the Frio Clay and Catahoula Tuff.

The formations are composed chiefly of clay, silt, sand, and gravel, but because of the method of deposition, they vary in lithology and thickness. The sand beds, which may grade laterally into clay or silt within short distances, and other beds containing water are vertically interconnected with similar beds on a different level; therefore, a group of water-bearing beds within a formation may be in hydrologic continuity. A summary of the lithology, age, thickness, and water-bearing properties of the geologic units is given in Table 2.

The water-bearing units in Duval County form a monocline that dips gently toward the coast (Figures 5, 6, and 7). Dips of the formations generally range from 12 to 80 feet per mile. In the west-central part of the county, the Goliad Sand overlaps the upper part of the Catahoula Tuff and completely overlaps the Oakville Sandstone and Fleming Formation. At some places, the monoclinal structure is disrupted by doming, faulting, and folding.

Two salt domes are known to underlie the surface of Duval County; the Piedras Pintas dome, 2 miles northeast of Benavides, and the Palangana dome, 9 miles north of Benavides. The Palangana dome is the larger of the two. The Goliad Sand is continuous across the tops of these domes. The Oakville Sandstone and older formations have been more noticeably deformed. The extent to which the movement of ground water has been affected in the vicinity of these domes is not known, although Austin (1959, p. 5) reports poor quality water in the Oakville just east of Palangana dome.

Faults are fairly common in many of the formations (Figure 4). Displacements vary greatly among the faults, but the effect on movement and quality of the ground water probably is only local.

Physical Characteristics and Water-Bearing Properties of the Geologic Units

Jackson Group

The Jackson Group of Eocene age does not crop out in Duval County, but it underlies the entire county and is encountered in wells at increasingly greater depths southeastward. The Jackson Group consists of an estimated 1,000-1,600 feet of brown to buff sandy shale, fossiliferous sandstone, and beds of volcanic ash. The unit is reported to yield small quantities of moderately saline water to a few wells in the northwestern part of the county.

Frio Clay

The Frio Clay of Oligocene (?) age crops out in the northwestern part of the county where it has an estimated thickness of 400-600 feet. The Frio consists of gypsiferous clay and thin beds of sand and silt. At the outcrop, the Frio is distinguished from the Jackson by its clay content and by the general absence of fossils. The Frio is distinguished from the overlying Catahoula Tuff by the nonvolcanic character of the clay. It is not known to yield water to wells in Duval County.

Catahoula Tuff

The Catahoula Tuff of Miocene age crops out in a broad and irregular belt ranging in width from about 12 to 18 miles. It consists mainly of beds of tuffaceous clay and tuff that range in thickness from 0 to about 1,400 feet. Locally, the formation contains lenticular sandy clay and thin to thick beds of sand and conglomerate. The conglomerate consists of scoriaceous lava and pumice, pebbles of other types of igneous material, opalized wood, chalcedony, quartz, and chert.

The Catahoula dips southeastward at about 80 feet per mile. Near the southeast corner of the county, the top of the formation has an altitude of 2,200 feet below mean sea level (Figure 8).

In Duval County, the Catahoula Tuff is one of the major aquifers. It yields small to moderate quantities of fresh to moderately saline water to wells for public supply, rural-domestic supply, and stock use.

Oakville Sandstone

The Oakville Sandstone of Miocene age crops out in an irregular belt from 1 to 10 miles wide in the north-central part of Duval County. In places in the west-central part of the county, the Oakville is exposed as a thin narrow fringe bordering the Goliad Sand. Because the exposure is small, this fringe of Oakville is not shown on the geologic map (Figure 4).

The Oakville ranges from 0 to about 600 feet in thickness and consists of medium to fine sand, sandstone, silt, bentonitic clay, and small amounts of ash. Sayre (1937, p. 43) describes the Oakville along a county road about 10 miles northeast of Freer as follows: "a shallow section of thin-bedded, firmly cemented, dirty-buff, medium-grained Oakville Sandstone, consisting mostly of grains of clear quartz but with numerous grains of black chert and igneous rocks. It contains numerous tubular molds of silt or clay (possibly worm holes) and many pellets of ashy clay."

The Oakville dips southeastward 60-80 feet per mile. Altitude of the top of the formation near the southeast corner of the county is about 1,600 feet below mean sea level (Figure 9).

The Oakville Sandstone yields small to moderate quantities of fresh to slightly saline water to rural-domestic, stock, and industrial wells in the county. Near the Palangana dome, industrial well JB-84-22-401 was reported to produce about 460 gpm (gallons per minute) of water from a depth of 1,106 to 1,252 feet; the water contains 1,550 mg/l (milligrams per liter) of dissolved solids. Near the southern boundary of the county, a stock well (JB-84-45-301) which taps the Oakville flowed 40 gpm of water containing 1,000 mg/l dissolved solids. Because the Oakville occurs at a greater depth than the Goliad Sand, which is a more productive aquifer, and because the water from wells in the Goliad Sand is generally of better quality, the development of ground water supplies from the deeper Oakville Sandstone has been slow.

Fleming Formation

The Fleming Formation of Miocene age overlies the Oakville Sandstone and is completely overlapped by the Goliad Sand, except in a small area in the northeastern part of the county where the formation is exposed in tributaries to Lagarto Creek. The Fleming consists mainly of yellow to green calcareous or marly clay. Generally, it is massive, laminated, and tough. Locally, it contains thin seams of silty sand and lentils of coarse sand and gravel. The formation ranges in thickness from 0 to about 1,000 feet.

The Fleming Formation is not known to be tapped by wells in Duval County. Locally, some of the sand beds probably are capable of yielding small quantities of slightly saline water.

Goliad Sand

The outcrop of the Goliad Sand of Pliocene age makes up more than half of the land surface in Duval County. A large part of the outcrop consists of caliche, which is sufficiently indurated at some places to form a "cap rock." In some places, the outcrop is red and sandy, and in the extreme western part of the county, the hills developed on the Goliad Sand are capped by coarse gravel. In west-central Duval County, the Goliad completely overlaps the Oakville and upper part of the Catahoula Tuff. At some places northwest of the main outcrop, the Goliad is present as outliers that form mesas.

The Goliad consists of fine to coarse, mostly gray, calcareous sand interbedded with sandstone, gravel, and varicolored calcareous clay. Sayre (1937, p. 51-52) described a 17-foot section of outcrop in northeastern Duval County as light-gray to buff or grayish-brown sand, sandstone, and gravel with some buff to green clay. In this section, the sand and sandstone are fine to coarse-grained, crossbedded, and contain numerous caliche fragments. Electrical logs of wells in Duval County show that the Goliad Sand consists mainly of sand or sandstone with smaller amounts of finer clastic sediments.

The formation ranges in thickness from 0 to about 600 feet. In structurally undisturbed areas, the base of the Goliad dips east-southeastward at about 35 to 45 feet per mile. The altitude of the base of the Goliad in the southeastern part of the county is between 500 and 600 feet below mean sea level (Figure 10).

Table 2.—Geologic Formations and Their Water-Bearing Properties

SYSTEM	SERIES	GEOLOGIC FORMATION	APPROXIMATE THICKNESS (FT)	LITHOLOGY	WATER-BEARING PROPERTIES
Quaternary	Holocene	Alluvium	?	Very fine to fine sand, silt, and calcareous clay.	Not known to yield water to wells in the county.
	Holocene and Pleistocene (?)	South Texas eolian plain deposits	0- 10	Fine to very fine, tan to white sand.	Not known to yield water to wells in the county.
	Pleistocene	Lissie Formation	0- 100	Variegated red to brown calcareous clayey sand, some gravel near base.	Not known to yield water to wells in the county.
Tertiary	Pliocene	Goliad Sand	0- 600	Fine to coarse, mostly gray, calcareous sand interbedded with sandstone, gravel, and varicolored calcareous clay. An abundance of caliche over most of the outcrop.	Principal aquifer in the county. Yields small to large quantities of fresh to slightly saline water to public-supply, industrial, irrigation, rural-domestic, and stock wells.
	Miocene	Fleming Formation	0-1,000	Yellow to green calcareous or marly clay and some local seams of silty sand and lentils of coarse sand and gravel.	Not known to yield water to wells in the county.
		Oakville Sandstone	0- 600	Medium to fine sand, sandstone, silt, bentonitic clay, and small amount of ash.	Yields small to moderate quantities of fresh to slightly saline water to industrial, rural-domestic, and stock wells.
		Catahoula Tuff	0-1,400	Pink tuffaceous clay and tuff. Local lenses of sandy clay and thin to thick beds of sand and conglomerate.	Yields small to moderate quantities of fresh to moderately saline water to public-supply, rural-domestic, and stock wells.
	Oligocene (?)	Frio Clay	400- 600	Gypsiferous clay and thin beds of sand and silt.	Not known to yield water to wells in the county.
	Eocene	Jackson Group	1,000-1,600	Brown to buff, sandy shale, fossiliferous sandstone, and beds of volcanic ash. Does not crop out in the county.	Reported to yield small quantities of moderately saline water to a few wells in the northwest part of the county.

The Goliad Sand is the principal aquifer in Duval County. Wells tápping the formation yield small to large quantities of fresh to slightly saline water for public supply, industrial use, irrigation, and rural-domestic and stock use. The towns of Benavides, Concepcion, Realitos, and San Diego are supplied with water from wells in the Goliad. All of the wells in these towns are from 210 to 750 feet deep, and yield water having 730 to 1,390 mg/l dissolved solids. The wells have yields that range from 18 to 420 gpm. Some of the irrigation wells in the Goliad have reported yields as high as 1,800 gpm.

Lissie Formation

The Lissie Formation of Pleistocene age overlies the Goliad Sand and crops out in a narrow band which extends from near the southeastern corner of the county northward to near San Diego. The Lissie ranges in thickness from 0 to possibly 100 feet and consists of variegated red to brown calcareous clayey sand, and some chert gravel near the base. It dips east at about 12 feet per mile (Sayre, 1937, p. 64).

The Lissie is not known to yield water to wells in Duval County except for small quantities of slightly saline to moderately saline water that are obtained from a few stock wells in counties east of the report area.

South Texas Eolian-Plain Deposits

A sheet of fine to very fine tan to white windblown sand covers about 2,800 square miles in Kenedy, Brooks, Duval, Jim Hogg, Willacy, and Hidalgo Counties. According to Sayre (1937, p. 65) the sand covers only a small area in the southeastern part of Duval County. These deposits are not shown on the geologic map (Figure 4) because of their small areal extent. Part of the surface of this area is almost flat, but in adjacent counties, the sand forms sand dunes, some of which are about 40 or 50 feet above the surrounding terrain. The deposits in Duval County range in thickness from 0 to possibly 10 feet. The exact age of the deposits is not known. Price (1958, p. 49-50) assigned the age as Holocene to possible Pleistocene; Sayre (1937, p. 65) and Fisk (1959, p. 120) assigned the age as Holocene.

The eolian deposits are not an important source of water in Duval County, but they yield small quantities of slightly saline water and even brine with chloride concentrations as high as 28,000 mg/l in Kenedy County (Shafer and Baker, 1973, p. 40).

Alluvium

The alluvium of Holocene age consists mostly of very fine to fine sand, silt, and calcareous clay. Although not shown on the geologic map (Figure 4), the alluvium occurs along the channels of some of the larger streams. The age of part of the alluvium may be Pleistocene, but in this report, the deposits are considered to be Holocene. The alluvium is not known to yield water to wells in Duval County.

GROUND-WATER HYDROLOGY

Source and Occurrence of Ground Water

The general principles of the occurrence and movement of ground water in all types of rocks have been described in detail by many writers including Meinzer (1923, p. 2-142; 1942, p. 385-477) and Tolman (1937).

The source of ground water in Duval County is precipitation on the outcrops of the aquifers in the county and in adjacent counties to the west and north. A large part of the precipitation either runs off, is dissipated by evapotranspiration, or is stored in the soil until evaporated or transpired. A small part of the water infiltrates the soil and subsoil, moves downward to the water table, and becomes part of the ground water in storage. Factors affecting recharge include the intensity and amount of rainfall, the slope of the land surface, the type of soil, the type of material between the land surface and the water table, the hydraulic conductivity of the aquifer, and the rate of evapotranspiration.

Generally, water-table (unconfined) conditions prevail at shallow depths in the outcrop areas of the aquifers, and artesian (confined) conditions prevail downdip from the outcrop where the aquifers are overlain by less permeable sediments. Where the altitude of the land surface at a well is considerably below the general level of the area of outcrop, the pressure may be sufficient to cause the water to rise above the land surface, and the well will then flow. A few wells in Duval County flow, such as well JB-84-19-903 on the J. R. Dougherty Ranch west of Benavides, well JB-84-35-505 west of Realitos, and several other wells, mainly in the western part of the county.

Movement and Discharge of Ground Water

Ground water in the county moves normally from areas of natural recharge to areas of natural discharge. This pattern, however, has been interrupted in some areas because of large-scale pumping, which also has the effect of increasing the hydraulic gradient and rate of movement and causing water to move from all directions toward the center of pumping.

Figure 11, which shows the approximate altitude of water levels in wells tapping the Catahoula Tuff and the Goliad Sand in 1969-70, indicates in a general way the direction of movement of ground water. The water moves at right angles to the contours and in the direction of decreasing altitude.

The general direction of movement in the Catahoula and Goliad is southeastward, but this general direction of movement is significantly interrupted by concentrated pumping. A large cone of depression has developed in the Catahoula south of Freer as a result of pumping for public supply. Water is moving into this area from all directions. In the Goliad, the normal southeastward direction of movement has been noticeably altered a few miles north of Benavides near the Palangana dome as a result of heavy pumping for industrial purposes. Here a large northward component of movement has been developed. The depression of water levels around San Diego also reflects significant pumpage there.

Transpiration, evaporation, and interformational leakage are the principal means of natural discharge in Duval County. Some plants, including mesquite, whose roots reach the water table, remove water by transpiration. Extensive deposits of caliche near the surface prevent water in some places from infiltrating deep into the ground, and consequently, much of this water is lost by evaporation. Because the annual gross lake-surface evaporation in Duval County is about three times the average annual rainfall, losses of water by evaporation are significant. Interformational leakage—the transfer of water from one aquifer to another—is the principal means of subsurface discharge of ground water. As pressure in the aquifer is increased, as a result of recharge, larger quantities of water are discharged by this means.

Ground water is also discharged artificially in the report area, by pumping wells. In 1970 about 5.3 mgd was discharged in this manner.

Aquifer Tests

Aquifer tests in six wells tapping the Oakville Sandstone and Goliad Sand were made to determine the capacity of the sands to transmit and store water. The results of the tests are shown in Table 3. No tests were made in wells tapping the Catahoula Tuff because suitable wells were not available. All the test data were analyzed by the Theis non-equilibrium method (Theis, 1935) and the Theis recovery method (Wenzel, 1942, p. 95).

Aquifer tests in wells JB-84-21-502, JB-84-21-601, JB-84-21-603, and JB-84-21-801 tapping the Goliad Sand, and well JB-84-22-401 tapping the Oakville Sandstone were made during December 1965 and January 1966 by William F. Guyton and Associates, consulting ground-water hydrologists, Austin, Texas. During this investigation, aquifer tests were made in wells JB-84-29-309 and JB-84-29-310, which tap the Goliad Sand and supply water for Benavides.

The average transmissivity (for definition, see p. 54) of the Goliad Sand in the county is 700 square feet per day. In Jim Wells County, Mason (1963, p.29) reported an average transmissivity of 660 square feet per day from tests in 12 wells tapping the Goliad Sand. He states, however, that based on considerations of the test data, the construction of the wells tested, and the distribution of sand thickness, a figure of 1,000 square feet per day for the average transmissivity is probably more representative for the Goliad in the Alice area.

The transmissivity of the Oakville Sandstone was determined to be 2,000 square feet per day. This was determined by testing well JB-84-22-401, which is screened from 1,106 to 1,252 feet. Mason (1963, p. 22) reports that an aquifer test made in a well tapping the Oakville in the Alice area indicated a transmissivity of 950 square feet per day, and an aquifer test of the Oakville Sandstone near Premont in southern Jim Wells County indicated a transmissivity of 1,000 square feet per day.

Only one storage coefficient, 0.00062, was determined in Duval County. This was determined at well JB-84-29-310 tapping the Goliad Sand at Benavides.

The transmissivities and storage coefficients determined from aquifer tests may be used to predict the drawdown of water levels caused by pumping a well or by a general increase in pumping in an area. Figure 12 shows the theoretical relation of drawdown of water levels to distance and different transmissivities. The calculations of drawdown were based on a well or group of wells pumping 500 gpm continously for one year from an extensive aquifer having a storage coefficient of 0.0005 and transmissivites as shown on the different curves. As a result of pumping 500 gpm continuously for one year from an aquifer having a transmissivity of 1,300 square feet per day, the water level would decline about 44 feet at a distance of 1,000 feet from the pumped well; it would decline about 25 feet at 5,000 feet and about 10 feet at 20,000 feet. Because drawdown is directly proportional to the pumping rate, the drawdown for rates other than 500 gpm can be determined by multiplying the drawdown values shown in Figure 12 by the proper multiple or fraction of 500.

Figure 13 shows the theoretical relation of drawdown of water levels to time and distance. The calculations are based on a well or group of wells pumping 100 gpm from an extensive aquifer having a storage coefficient of 0.0005 and a transmissivity of 1,300 square feet per day. The figure shows that the rate of drawdown decreases with time, but the water level will continue to decline indefinitely until a source of recharge or point of discharge is intercepted to offset the pumpage and reestablish equilibrium in the aquifer. Because the drawdown is directly proportional to the pumping rate, the drawdown for rates other than 100 gpm can be determined by multiplying the drawdown values shown in Figure 13 by the proper multiple or fraction of 100.

Table 3.—Summary of Aquifer Tests

WELL	AQUIFER*	SCREENED INTERVAL (FT)	AVERAGE DISCHARGE DURING TEST (GPM)	TRANSMISSIVITY (FT^2/DAY)	SPECIFIC CAPACITY (GPM PER FT)	TIME (HOURS)	STORAGE COEFFICIENT	REMARKS
JB-84-21-502	Tg	258- 296 303- 367 369- 486 495- 543 605- 625	300	800	4.6	3	—	Recovery in pumped well after pumping 24 hours.
601	Tg	256- 276 288- 349	78	300	2.4	3	—	Recovery in pumped well after pumping 50 hours.
603	Tg	268- 286 297- 380	102	270	2.1	3	—	Recovery in pumped well after pumping 24 hours.
801	Tg	250- 350 352- 432 450- 530 595- 635	285	870	5.0	3	—	Recovery in pumped well after pumping about 24 hours.
22-401	To	1,106-1,202 1,212-1,252	500	2,000	9.5	3	—	Recovery in pumped well after pumping 29 hours.
29-309	Tg	332- 442 462- 527 552- 607	349	960	3.2	3	—	Drawdown in pumped well after pumping 3½ hours.
310	Tg	322- 422 442- 507 532- 596	—	990	—	—	0.00062	Drawdown interference from pumping well JB-84-29-309 at 349 gpm.

* To, Oakville Sandstone; Tg, Goliad Sand.

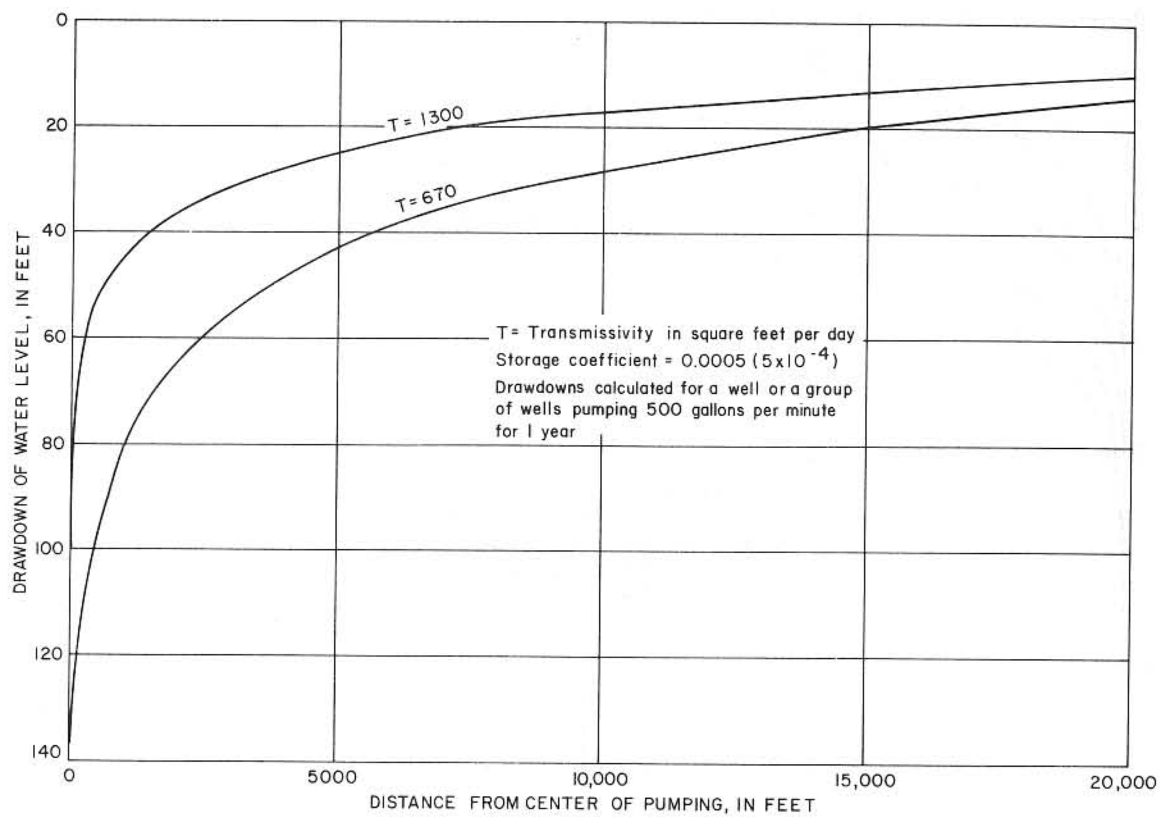


Figure 12.—Relation of Drawdown to Transmissivity and Distance

The specific capacity is useful in estimating the yield of a well at various drawdowns. The specific capacities of wells penetrating the same aquifer may vary widely, depending upon the thickness of sand screened, hydraulic conductivity, well construction, and duration of pumping. Specific capacities determined from tests on five wells in the Goliad Sand averaged 3.5 gallons per minute per foot of drawdown over a 3-hour period; the specific capacity determined from testing a well in the Oakville Sandstone was 9.5 gallons per minute per foot of drawdown for the same time period.

GROUND-WATER DEVELOPMENT

The well inventory made during this investigation included all the municipal, industrial, and irrigation wells, and a representative number of rural-domestic and stock wells. Records of 509 water wells are given in Table 7.

Table 4 gives the quantities of ground water pumped for different uses from 1955 to 1970. During 1970, about 5.3 mgd of ground water was used for all purposes in the report area. Of this amount, 0.6 mgd was supplied by the Catahoula Tuff, 0.7 mgd by the Oakville Sandstone, and 4.0 mgd by the Goliad Sand. Most of the large ground-water supplies are obtained from wells in the Goliad Sand.

Public Supply

The pumpage of ground water for all public supply increased from about 0.67 mgd in 1955 to about 0.99 mgd in 1970, an increase of about 48 percent in 15 years (Table 4). The 0.99 mgd of ground water used for public supply in 1970 was pumped by the towns of Benavides, Concepcion, Freer, Realitos, and San Diego. This is 19 percent of the ground water pumped for all purposes during that year. Water wells at oil-field camps generally are used for industrial and public-supply purposes, but the quantity used for public supply in these camps is insignificant.

Irrigation

Records indicate that prior to about 1958 there was very little irrigation from wells in Duval County. According to a report by Gillett and Janca (1965), only four irrigation wells were in use in the county in 1958, during which time about 0.12 mgd (140 acre-feet) of water was used; in 1964, the quantity of ground water

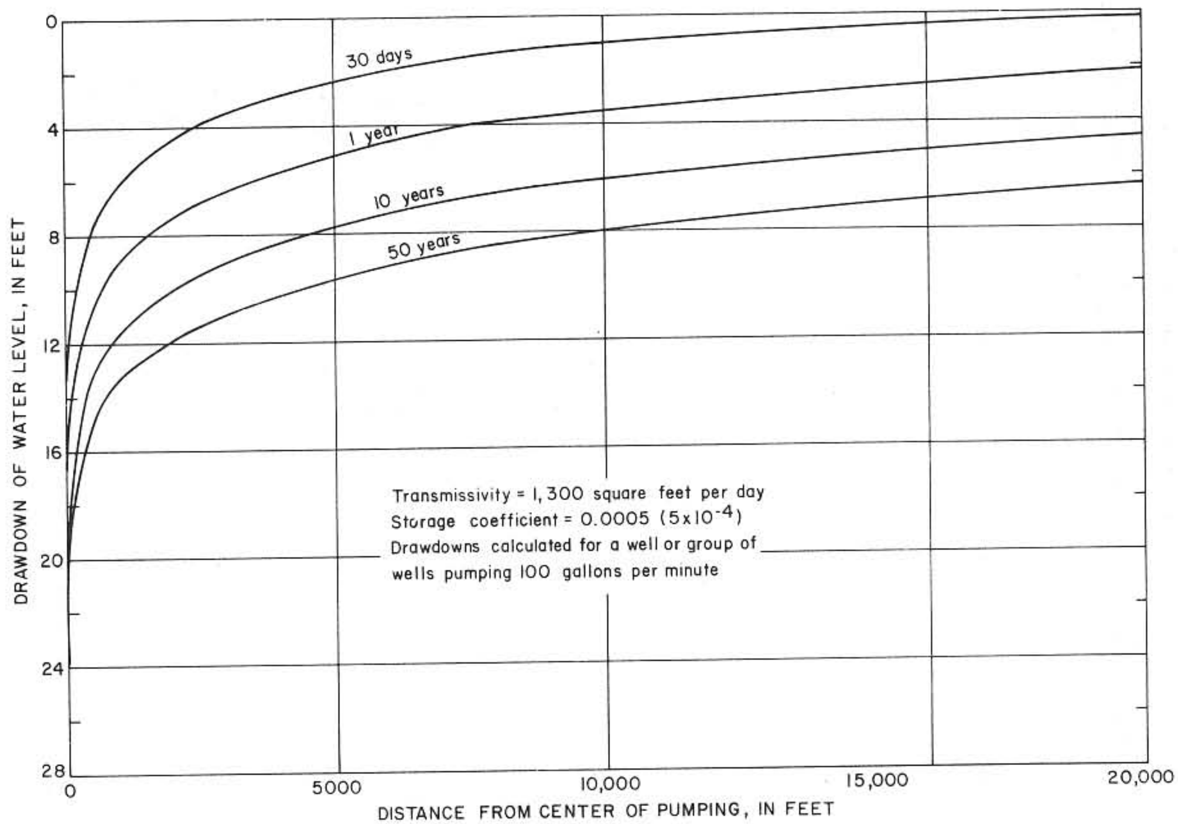


Figure 13.—Relation of Drawdown to Time and Distance

used had increased to about 0.86 mgd (960 acre-feet). Records of the Texas Water Development Board indicate that in 1969 the number of irrigation wells had increased to 32, and the pumpage to about 2.14 mgd (2,400 acre-feet), which is 41 percent of the ground water used for all purposes during that year (Table 4). The values shown in Table 4 for 1958, 1964, and 1969 were determined by inventory; the values for irrigation for the other years are estimates.

All ground water used for irrigation in the county is obtained from wells in the Goliad Sand. Most of the wells are concentrated in the southeastern part of the county because the Goliad is capable of yielding larger quantities of water in that area, the land is more suitable for irrigation, and the quality of the water is relatively good.

The acreage irrigated with ground water increased from about 300 acres during 1958 to about 4,100 acres during 1969. Irrigated crops included peanuts, hay, vegetables, cotton, grain sorghum, and forage crops.

Industrial Use

In 1970, 1.32 mgd of ground water was pumped from wells in Duval County for industrial use. This is 25 percent of the total quantity pumped for all purposes during that year (Table 4). The principal industrial use of ground water was for the production of brine by solution mining. Smaller amounts were used by the oil and gas industry mainly for cooling purposes.

Rural-Domestic and Stock Use

Rural-domestic and stock use of ground water in Duval County in 1970 was estimated to be 0.76 mgd. This is 14 percent of the total ground water used for all purposes that year (Table 4). Most of the wells that supply water for rural-domestic and stock needs are equipped with windmills, small gasoline engines, or electric pumps designed to pump only a few gallons a minute. In some areas, small ponds provide water for stock. A few ranchers in the extreme northwestern part of the county, where ground water is scarce or not available, depend upon water that is relayed through distribution pipes from wells in outlying areas.

The estimates of rural-domestic and stock use as given in Table 4 are based chiefly on the census of stock in the counties as of 1954, 1959, and 1964, and on the number of stock in 1969 as estimated by the U.S. Department of Agriculture and Texas Department of Agriculture. Estimates of ground water use by stock for

Table 4.—Use of Ground Water, 1955-70

(Figures are approximate because some of the pumpage is estimated. Totals are rounded to two significant figures. Other figures are shown to nearest 0.01 mgd and nearest 10 acre-feet).

YEAR	PUBLIC SUPPLY AC-FT PER YR	PUBLIC SUPPLY MGD	IRRIGATION AC-FT PER YR	IRRIGATION MGD	INDUSTRIAL AC-FT PER YR	INDUSTRIAL MGD	RURAL-DOMESTIC AND STOCK* AC-FT PER YR	RURAL-DOMESTIC AND STOCK* MGD	TOTAL AC-FT PER YR	TOTAL MGD
1955	750	0.67	100*	0.1 *	1,060	0.95	570	0.51	2,500	2.2
1956	900	.80	100*	.1 *	1,060	.95	590	.53	2,700	2.4
1957	900	.80	100*	.1 *	1,060	.95	610	.54	2,700	2.4
1958	1,270	1.13	130	.12	1,090	.97	630	.56	3,100	2.8
1959	1,060	.94	1,000*	.9 *	1,210	1.08	650	.58	3,900	3.5
1960	730	.65	800*	.7 *	1,280	1.14	650	.58	3,500	3.1
1961	610	.54	1,000*	.9 *	1,180	1.05	660	.59	3,500	3.1
1962	1,000	.89	1,000*	.9 *	1,220	1.09	670	.60	3,900	3.5
1963	770	.69	1,000*	.9 *	1,300	1.16	680	.61	3,800	3.4
1964	880	.78	960	.86	1,350	1.20	680	.61	3,900	3.5
1965	900	.80	800*	.7 *	1,460	1.30	720	.64	3,900	3.4
1966	920	.82	800*	.7 *	1,430	1.28	750	.67	3,900	3.5
1967	890	.80	700*	.6 *	1,410	1.26	770	.69	3,800	3.4
1968	900	.78	800*	.7 *	1,500	1.34	760	.68	4,000	3.5
1969	1,050	.94	2,400	2.14	1,550	1.38	840	.75	5,800	5.2
1970	1,110	.99	2,500*	2.2 *	1,480	1.32	850	.76	5,900	5.3

* Estimated

the other years listed in the table are subject to error because of lack of data. Rural-domestic usage was based on census of rural population for 1960 and 1970 and on estimates for other years.

Changes in Water Levels

Water levels in wells in the aquifers in Duval County rise or fall mainly in response to changes in the rates of recharge or discharge and rates of pumpage. During periods of drought, recharge to the aquifers is reduced and generally pumpage of water is increased, thereby reducing the quantity of ground water in storage—and the water levels decline; during periods of above normal rainfall, the process is reversed and the water levels rise. Periodic water-level measurements in selected observation wells in Duval County were made as early as 1931 (Table 9). These measurements were part of the statewide observation well program conducted by the U.S. Geological Survey and the Texas Water Development Board. Most of the observation wells having long records of measurements tap the Goliad Sand. Only relatively short records of measurements are available for wells tapping the Catahoula Tuff.

Periodic water-level measurements in the Catahoula Tuff were begun mostly in the 1960's. The relatively short period of record indicates that water levels in wells JB-84-04-701, JB-84-04-707, JB-84-12-101, JB-84-12-301, and JB-84-12-401 (Table 9) fluctuated considerably. The water level in well JB-84-12-401 rose 28.85 feet between 1960 and 1970, whereas the water level in JB-84-04-707 declined 4.82 feet between 1964 and 1970. Figure 11 shows that water levels are relatively low in the Catahoula a few miles south of Freer where public-supply pumpage has created a large cone of depression.

Little information is available regarding water-level fluctuations in the Oakville Sandstone. A flowing well in the Oakville (JB-84-45-301) had been used for observation purposes during recent years; however, by 1969 only three water-level measurements were available. The first measurement in the well was made February 25, 1967, at which time the water level was

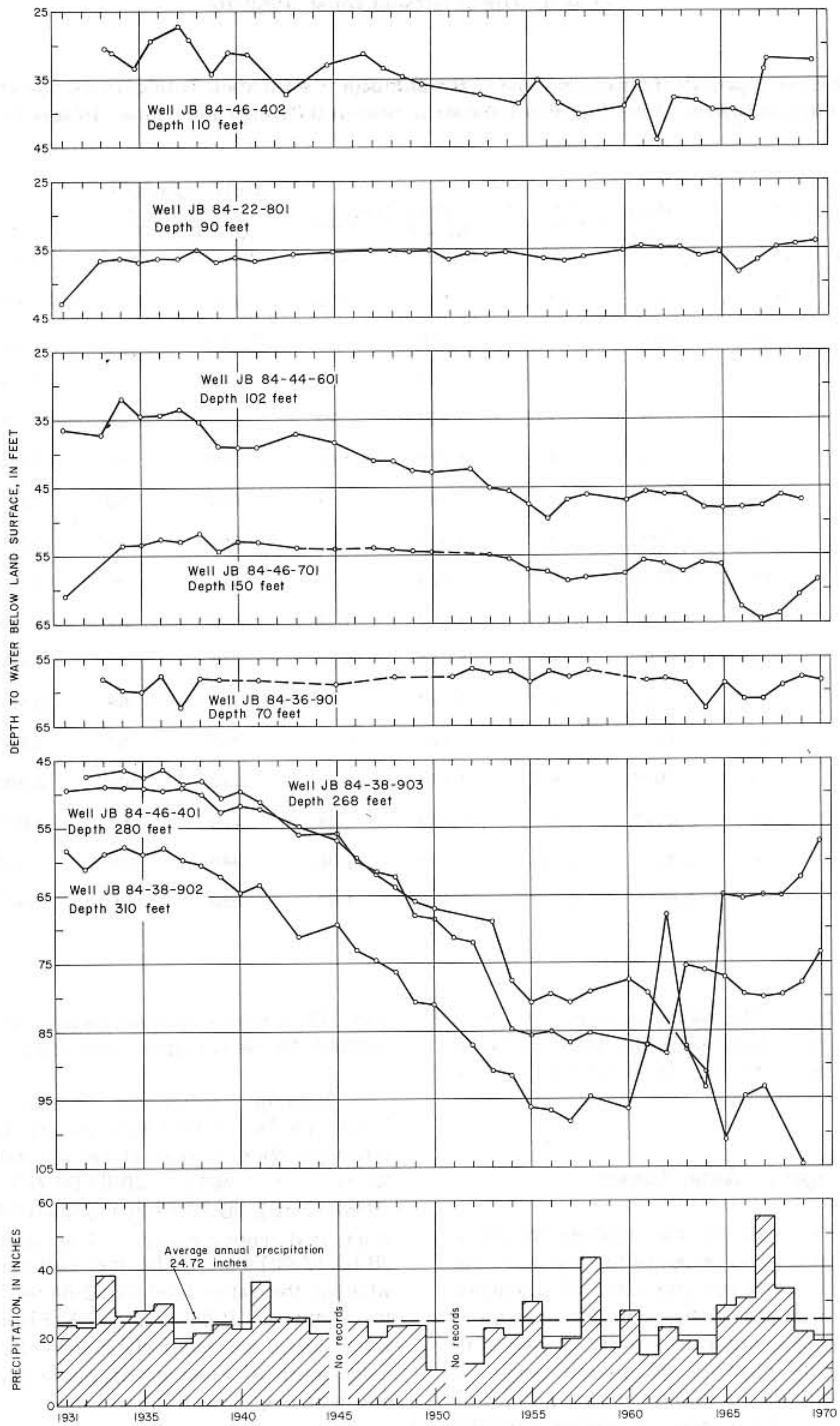


Figure 14

Hydrographs of Water Levels in Wells Tapping the Goliad Sand and Graph Showing Annual Precipitation at Falfurrias, 1931-70

3.8 feet above land surface. On March 20, 1969, the time of the last available measurement, the water level was 4.1 feet above land surface, indicating a rise of 0.3 feet. Water-level changes in other wells that tap the Oakville Sandstone in the report area are not known, but probably only slight changes in water levels have occurred regionally in Duval County. In Jim Wells County, however, Mason (1963, p. 33) states that the water level in an Oakville well used by Mobil Oil Corporation in southern Jim Wells County declined about 405 feet between 1947 and 1960.

Moderate to large declines in water levels have occurred in the Goliad Sand. These declines are mainly attributed to pumpage by irrigation, public-supply, and industrial wells that tap the Goliad Sand in the east-central and southeast part of the county.

Figure 14 shows the fluctuations in water levels in eight wells in the Goliad Sand and the annual precipitation at Falfurrias during the period 1931-70.

The water level in well JB-84-46-401, which taps the artesian zone, declined slowly during the 1930's and more rapidly thereafter. The increase in water-level decline is attributed to an increase in ground-water withdrawals in the southeastern part of the county and is not directly related to precipitation. The net water-level decline of 55 feet from 1931 to 1969 represents almost entirely a decrease in artesian pressure rather than a dewatering of the aquifer. This is contrasted by well JB-84-46-402 (110 feet deep) which taps that part of the Goliad under water-table conditions. This relatively shallow well, about half a mile from well JB-84-46-401, had a net decline in water levels of only 2 feet from 1933 to 1970.

Water levels in wells JB-84-38-902 and JB-84-38-903, which are about 1 mile apart and which tap the artesian zone, behaved similarly to those in well JB-84-46-401; however, in the 1960's the water level in the two wells rose substantially, indicating perhaps that salt water under higher head had entered the wells from above by way of leaky casings. Further evidence of this is shown by the change in the quality of water in well JB-84-38-902. When sampled in 1931, the water contained 771 mg/l of dissolved solids; on December 13, 1969, the water had a field conductance of about 3,300 which is equivalent to about 2,100 mg/l of dissolved solids.

Only small changes in water levels have occurred in those wells shown in Figure 14 that are less than about 150 feet deep. Sayre (1937, p. 63) observed that the water levels in some wells fluctuated very significantly, whereas water levels in other wells of similar depth showed very little fluctuation, and that water levels in some of the deeper wells showed greater fluctuations than in many of the shallower wells. He further stated, "the shallower wells, however, should respond rather quickly to recharge from precipitation, provided they are not separated from the surface by a more or less impermeable bed of caliche." Fluctuations of water levels in most of the shallow wells (Figure 14) less than about 150 feet deep show little relationship or response to precipitation.

CONSTRUCTION OF WELLS

Most of the water used for domestic purposes in Duval County during pioneer days was obtained from dug wells, some of which are still in existence. Generally, it was not necessary to install casings in the wells because much of the surface is covered by a hard caliche cap that is sufficiently indurated to serve as a natural well casing. The dug wells usually penetrated only a few feet of the saturated zone and yielded small supplies of water. Most of the wells completed since about 1930 have been drilled wells.

Figure 15 illustrates the construction of the two most common types of present-day wells, the straight-walled well and the underreamed and gravel-packed well. The straight-walled type is generally used for rural-domestic and stock wells, and to a lesser extent, for small irrigation, industrial, and public-supply wells. The underreamed and gravel-packed type is generally used where larger yields are desired.

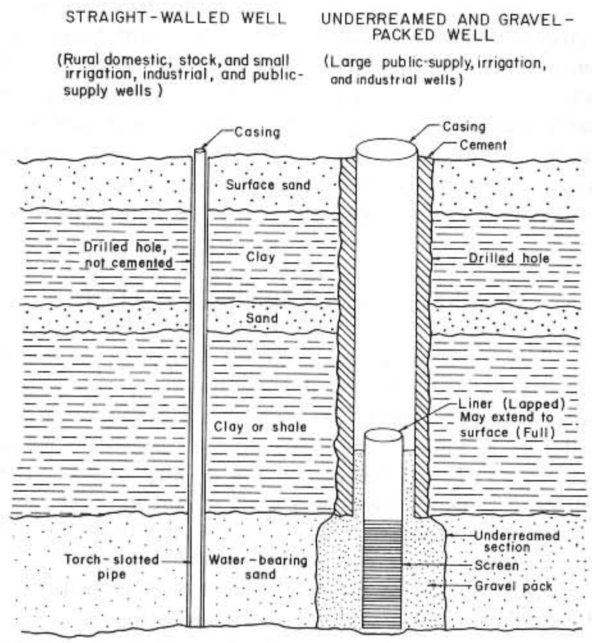


Figure 15.—Typical Construction of Rural-Domestic, Stock, Public-Supply, Industrial, and Irrigation Wells

Some of the municipal wells in Duval County that tap the Goliad Sand are underreamed, screened, and gravel packed in the water-bearing sands. The gravel pack increases the effective diameter of the wells and allows more water to enter at a reduced velocity. This reduces the drawdown and helps to prevent sand from entering the wells.

The industrial wells, some of which are underreamed and gravel packed, are generally designed to pump large quantities of water. In many wells, large-diameter casing (12-inch) is set in the upper parts of the wells, and 6- or 8-inch casing is set in the lower parts.

In most irrigation wells, torch-slotted casing is installed in the water-bearing sands, but a few wells are equipped with commercial screens. Little effort usually is made to correlate the width of the torch slots with the diameter of the sand particles. If slots are too large, sand enters freely, resulting in wear of the pumps and casing. If the slots are too small, or too few, excessive drawdowns of water levels result and the specific capacities of the wells are abnormally low.

At some places in Duval County, saline or moderately-saline water overlies fresh to slightly saline water. Wells drilled in these places should be cemented from the top of the fresh-water sands to the land surface to prevent the more saline water from corroding the casing, entering the wells, and contaminating the usable water.

Some abandoned oil or gas wells that have been properly plugged are later converted into water wells for various uses. The well construction is based on an examination of the well logs. The most productive water-bearing sands are selected and the well casing is "shot" or gun-perforated in these sands, allowing the water to enter the well. Several flowing wells in the report area have been completed by this method.

QUALITY OF GROUND WATER

All ground water contains dissolved chemical constituents. The chemical constituents in the ground water in Duval County are derived principally from the materials in the soil and rocks through which the water has moved. The difference in the quality of the water reflect, in a general way, the types of soil and rocks that have been in contact with the water and the length of time in contact. Usually, most deep ground water is free from contamination by organic matter; but, normally, the dissolved-solids content increases with depth. The source and significance of the dissolved-mineral constituents and properties of the water are summarized in Table 5, which is modified from Doll and others (1963, p. 39-43). The chemical analyses of water from 165 selected wells in Duval County are given in Table 11. The wells from which samples were taken are identified on the well-location map (Figure 22) by bars over the well numbers. Figure 16 shows the variation in chemical content of the sampled water throughout the report area.

Chemical-Quality Standards and Suitability of Water for Use

Various requirements have been established for most categories of water quality including bacterial content; physical characteristics such as turbidity, color, odor, and temperature; chemical substances; and radioactivity. However, the suitability of a water supply depends largely upon the chemical quality of the water and the limitations associated with the contemplated use of the water. Generally, the problems of bacteria and physical characteristics can be remedied economically, but the removal or neutralization of undesirable chemical constituents may be difficult and expensive.

The dissolved-solids or "total-salts" content is a major limitation on the use of water for many purposes. The classification of water based on the dissolved-solids content in milligrams per liter as used in this report is as follows (Winslow and Kister, 1956, p. 5):

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

Public Supply

Water used for public supply should not contain excessive amounts of harmful chemical substances; should be free of turbidity, odor, and color to the extent that it is not objectionable to the user; and must not be excessively corrosive to the water-supply system.

The U.S. Public Health Service has established and periodically reviews the standards for drinking water used on common carriers engaged in interstate commerce. The standards are designed to protect the public and are used to evaluate public water supplies. According to the standards, chemical substances should not be present in a water supply in excess of the listed concentrations whenever more suitable supplies are available or can be made available at reasonable cost. The principal chemical standards adopted by the U.S. Public Health Service (1962, p. 7-8) are as follows:

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

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

SUBSTANCE	CONCENTRATION MG/L
Chloride (Cl)	250
Fluoride (F)	.8 *
Iron (Fe)	.3
Manganese (Mn)	.05
Nitrate (NO_3)	45
Sulfate (SO_4)	250
Dissolved solids	500

* The permissible upper limit of fluoride is based upon the annual average of maximum daily temperature of 84.9°F (29.5°C) measured at Falfurrias over a 30-year period.

All the ground water presently used for public supplies in the report area is obtained from wells in the Goliad Sand and Catahoula Tuff.

Less than 20 percent of the water samples taken from wells in the county contained less than 250 mg/l chloride. The chloride concentration in 54 water samples from wells in the Catahoula Tuff ranged from 25 to 3,980 mg/l. All but six of the samples had a chloride content that exceeded 250 mg/l. Of the 14 wells sampled in the Oakville Sandstone, the minimum chloride concentration was 89 mg/l in well JB-84-05-602 (depth 65 feet), and the maximum was 2,010 mg/l in well JB-84-05-502 (depth 450 feet). The chloride content of 98 water samples from wells in the Goliad Sand in the report area ranged from 8.7 to 3,220 mg/l, exceeding 250 mg/l in 75 samples. Figure 16 shows that of the Goliad wells sampled, generally, the chloride concentration was lowest in water from those wells having a depth from 200 to about 700 feet.

The fluoride content of 89 water samples ranged from 0.1 to 5.2 mg/l, exceeding 0.8 mg/l in about half the samples. In 14 samples, the concentration exceeded 1.4 mg/l, a level which if exceeded constitutes grounds for rejection of a public water supply (U.S. Public Health Service, 1962, p. 8). The fluoride content in 28 samples from the Catahoula Tuff ranged from 0.1 mg/l to 5.2 mg/l and exceeded 0.8 mg/l in 18 samples. The maximum fluoride concentration of 5.2 mg/l was from a water sample taken from a flowing well, JB-84-44-104, which produces from a screened interval of 1,730 to 1,772 feet. In nine samples from wells in the Oakville Sandstone, the fluoride concentration ranged from 0.4 to 1.4 mg/l, exceeding 0.8 mg/l in three samples. The fluoride content of 52 samples from the Goliad Sand ranged from 0.2 to 2.0 mg/l, exceeding 0.8 mg/l in 24 samples.

The total iron content in water from 40 samples ranged from 0.00 to 4.3 mg/l, exceeding 0.3 mg/l in 10 samples. In 17 samples from wells in the Catahoula Tuff, the iron content exceeded 0.3 mg/l in five samples. Only four samples from the Oakville Sandstone were analyzed for iron; in two of these samples the iron content exceeded 0.3 mg/l. In 18 samples from wells in the Goliad Sand, the iron content exceeded 0.3 mg/l in only three samples.

The nitrate content in 100 water samples ranged from 0.00 to 226 mg/l. Of the 100 samples, 14 had nitrate concentrations exceeding 45 mg/l. Of the 14, five were from the Catahoula Tuff and nine were from the Goliad Sand. The water in wells JB-78-60-701, JB-84-37-401, and JB-84-45-104 contained nitrate contents of 133 mg/l, 134 mg/l, and 226 mg/l, respectively.

The sulfate content of 156 water samples ranged from 6.8 to 2,800 mg/l, exceeding 250 mg/l in 44 samples. Of 47 determinations of sulfate in water from wells tapping the Catahoula Tuff, slightly less than half exceeded 250 mg/l. Samples from eight of 13 wells in the Oakville Sandstone had a sulfate content that exceeded 250 mg/l. Of 92 determinations of sulfate in water from wells tapping the Goliad Sand, slightly less than 20 percent exceeded 250 mg/l.

The dissolved-solids content in 102 water samples ranged from 247 to 7,060 mg/l. Almost all of these samples were from wells in the Catahoula Tuff, Oakville Sandstone, and Goliad Sand. The dissolved solids exceeded 500 mg/l in 97 samples and exceeded 1,000 mg/l in 70 samples. The dissolved-solids content in water from seven public-supply wells in the Goliad Sand ranged from 730 to 1,540 mg/l; water from three public-supply wells in the Catahoula Tuff had dissolved solids that ranged from 1,290 to 1,480 mg/l. Only one of the 10 public-supply wells had water with dissolved solids less than 1,000 mg/l.

The hardness of water is important in a public water supply, although no limits for hardness have been established by the U.S. Public Health Service. Water used for ordinary domestic purposes does not become particularly objectionable until it reaches the level of about 100 mg/l (Hem, 1970, p. 225). A commonly accepted classification of water hardness is given in Table 5.

The hardness in 165 water samples ranged from 5 to 2,640 mg/l, exceeding 60 mg/l in 150 samples. In 15 samples, the hardness was less than 60 mg/l, and in 120 samples, the hardness was more than 180 mg/l. Generally, the softer water was obtained from relatively deep wells, most of which were from about 900 to 1,800 feet deep.

In summary, most of the ground water sampled from the Catahoula Tuff, Oakville Sandstone, and Goliad Sand in Duval County does not meet the quality standards of the U.S. Public Health Service for drinking water. Dissolved-solids and chloride contents were especially excessive. Water having chemical constituents in excess of the established limits, nevertheless, is used for drinking without any obvious adverse effects.

Irrigation

The suitability of water for irrigation depends upon the chemical quality of the water and other factors such as soil texture and composition, type of crops, irrigation practices, and climate. The most important chemical characteristics of water used for irrigation are the sodium concentration, the concentration of soluble salts, residual sodium carbonate, and the concentration of boron. Sodium is significant in evaluating the quality of irrigation water because of its potential deleterious effect on the soil. A high percentage of sodium in water tends to make soil plastic, thus restricting the movement of water and giving rise to problems of drainage and cultivation.

A system of classification commonly used for judging the quality of water for irrigation was proposed by the U.S. Salinity Laboratory Staff (1954, p. 69-82). The classification is based on the salinity hazard as measured by the electrical conductivity of the water and the sodium or alkali hazard as measured by the sodium adsorption ratio (SAR). The U.S. Salinity Laboratory Staff's classification of irrigation water is diagrammed in Figure 17, and results of analyses of water from 22 representative wells in the Catahoula Tuff, Oakville Sandstone, and Goliad Sand are plotted on the diagram.

The diagram indicates that the samples (10 from irrigation wells, 10 from domestic and stock wells, one from a public-supply well, and one from an industrial well) had a range in sodium and salinity hazards from low to very high and high to very high, respectively. Although water from each of the three aquifers represented on the diagram had a high to very high salinity hazard, the Goliad water had the lowest sodium hazard (low to medium range). On the basis of the diagram, irrigation in Duval County should be practiced with careful management, especially if water from the Oakville or Catahoula is used.

An excessive concentration of boron renders water unsuitable for irrigation. Scofield (1936, p. 286) indicated that boron concentrations of as much as 1 mg/l are permissible for irrigating most boron-sensitive crops, and that concentrations of as much as 3 mg/l are permissible for the more boron-tolerant crops. The boron concentration in water samples from 13 wells ranged from 0.63 to 2.1 mg/l. In nine samples from irrigation wells in the Goliad Sand, which supplies all the water for large-scale irrigation in the county, the boron concentration ranged from 0.63 to 2.0 mg/l, exceeding 1.0 mg/l in four samples.

Another factor used in assessing the suitability of water for irrigation is the residual sodium carbonate (RSC). Excessive RSC will cause the water to be alkaline. The organic material of the soil is dissolved by strong alkaline solutions, and the soil takes on a grayish-black color.

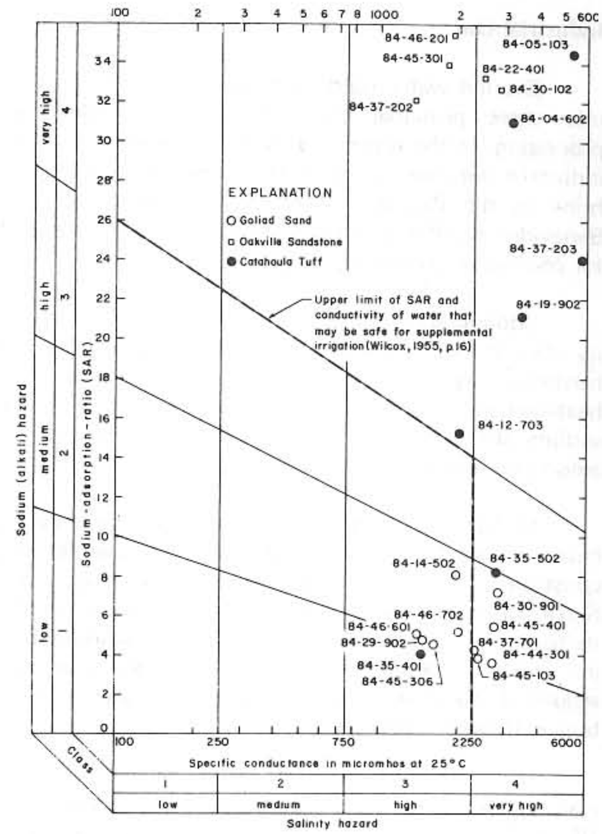


Figure 17.—Classification of Irrigation Waters

The soil thus affected is referred to as "black alkali." Wilcox (1955, p. 11) states that laboratory and field studies have resulted in the conclusion that water containing more than 2.5 me/l (milliequivalents per liter) RSC is not suitable for irrigation; water containing from 1.25 to 2.5 me/l is marginal; and water containing less than 1.25 me/l probably is safe. However, good irrigation practices and proper use of soil amendments might make it possible to use marginal water successfully. Furthermore, the degree of leaching will modify the permissible limit to some extent (Wilcox, Blair, and Bower, 1954, p. 265).

The RSC of 113 samples from wells ranged from 0.00 to 15.4 me/l. About one-fourth of the samples contained more than 2.5 me/l, and about two-thirds of the samples contained less than 1.25 me/l. Most of the high RSC values were associated with the Catahoula Tuff and Oakville Sandstone. RSC in water from the Goliad Sand generally was low.

In summary, the water from wells in the Goliad Sand is more suitable for irrigation than the water from wells in the Oakville Sandstone and the Catahoula Tuff; however, water from any of the three aquifers should be used with careful management and as a supplement to rainfall.

Industrial Use

Ground water used by industry may be classified into three principal categories—cooling, boiler, and processing. In the report area most of the water used for industrial purposes is used in the processing or mining of brine in the Palangana brine field, 6 miles north of Benavides; smaller quantities of industrial water are used for cooling at gas-cycling plants.

Cooling water generally is selected on the basis of its chemical quality and temperature. Silica, iron, and hardness may cause scale which adversely affects the heat-exchange surfaces in the cooling process; and sodium chloride, acids, oxygen, and carbon dioxide are among substances that make water corrosive.

Boiler water should be noncorrosive and should have a very low concentration of scale-forming constituents such as silica, calcium, and magnesium. Silica is particularly undesirable in boiler water because its tendency to form a hard scale increases with pressure in a boiler. The following table shows the maximum suggested concentrations of silica for water used in boilers (Moore, 1940, p. 263).

CONCENTRATION OF SILICA (MG/L)	BOILER PRESSURE (POUNDS PER SQUARE INCH)
40	Less than 150
20	150 to 250
5	251 to 400
1	More than 400

In Duval County the concentration of silica in 79 water samples ranged from 16 to 100 mg/l, exceeding 20 mg/l in 74 (about 94 percent) of the samples.

Water used as process water in manufacturing is subject to a wide range of quality requirements, which generally are rigidly controlled. For example, water used in textile manufacturing must be low in dissolved solids and free from the stain effects of precipitated iron and manganese. The beverage industry requires water that is free from iron, manganese, and organic substances. The chemical quality of water used in the process of brine production is not as critical as for cooling water or boiler water.

Most of the ground water in Duval County is alkaline. Of the 154 determinations of pH, all but six exceeded 7.0, which is neutral.

The odor of hydrogen sulfide gas (H_2S) was noticeable from many wells during the time they were being pumped. Although H_2S is an objectionable constituent, it can be removed by aeration.

Concentrations of iron, hardness, and dissolved solids, which also affect the suitability of water for industrial use, have been discussed in the section on suitability for public supply.

Pesticides Content of Water

To provide information on the presence of pesticidal contamination, samples of ground water from four wells in the report area were analyzed for the insecticides and herbicides recommended by the Subcommittee on Pesticide Monitoring of the Federal Committee on Pest Control (Green and Love, 1967, p. 13-16). The wells, which were sampled August 20, 1970, were JB-78-62-901, JB-84-35-101, JB-84-36-901, and JB-84-46-405 having depths of 39, 90, 70, and 42 feet, respectively (Figure 22). No pesticides were found in the water samples from any of these wells.

PROBLEMS

Salt-Water Disposal

A tabulation of the questionnaires that the Texas Railroad Commission sent to oilfield operators indicates that 104,035,676 barrels, or about 13,400 acre-feet, of salt water was produced in conjunction with the production of oil and gas in Duval County in 1967. The methods of disposal and the quantity disposed of are shown in Table 6. The locations of the brine-producing areas are shown on Figure 18.

Of the total amount of salt water disposed of in 1967, 13,336,236 barrels (13 percent) was placed in unlined surface pits and 90,699,440 barrels (87 percent) was injected into the zone from which it was produced (called water flooding) or into other zones below the base of fresh to slightly saline water. During the 1969-70 period of field study in Duval County, very few unlined surface pits were observed. The sparsity of pits is attributed to a no-pit order by the Texas Railroad Commission which went into effect throughout Texas on January 1, 1969.

The disposal of salt water into unlined surface pits is the most hazardous method with respect to contamination of shallow fresh water. Salt water in a pit seeps into the ground and eventually may contaminate the water in a shallow aquifer. The time required for the salt water to affect the quality of water in nearby wells may vary from a few months to several years, depending upon the permeability of the soil and the consequent rate of movement of the salt water. Generally, contamination of the fresh water is indicated by a significant increase in the salinity of the water, principally in the chloride content, without an accompanying increase in the sulfate content. Once a

Table 6.—Methods of Disposal and Quantity of Salt Water Disposed in 1967

(From Texas Railroad Commission)

AREA SHOWN ON FIGURE 18	FIELD	BRINE DISPOSAL IN BARRELS		
		TOTAL	UNLINED PITS	DISPOSAL OR INJECTION WELLS
1	Casa Blanca	1,241,819	12,459	1,229,360
	Charamousca	1,867,828	56,701	1,811,127
	Neely, East	3,566,454	525,967	3,040,487
	Total	6,676,101	595,127	6,080,974
2	Brelum	2,051	2,051	0
	Eagle Hill	1,535,380	1,887	1,533,493
	Hagist Ranch	1,121,688	104,851	1,016,837
	Piedre Lumbre	8,612,907	94,483	8,518,424
	Total	11,272,026	203,272	11,068,754
3	Labbe	31,019	730	30,289
	Seven Sisters	8,988,141	2,507,926	6,480,215
	Total	9,019,160	2,508,656	6,510,504
4	Gormac	103,827	1,398	102,429
	Lovia	7,200	7,200	0
	Petrox	482,359	323,050	159,309
	Welder	1,095	1,095	0
	Total	594,481	332,743	261,738
5	D. C. R. 79	856,440	0	856,440
	Seventy-Six	2,929,063	1,170,908	1,758,155
	Total	3,785,503	1,170,908	2,614,595
6	Government Wells, North	13,066,657	582,183	12,484,474
	Government Wells, South	1,703,989	283,847	1,420,142
	Loma Novia	5,443,351	1,074,690	4,368,661
	Lundell	7,940,447	96,283	7,844,164
	Total	28,154,444	2,037,003	26,117,441
7	Herbst	3,995	3,995	0
	Kreis	164,165	164,165	0
	Total	168,160	168,160	0
8	Rosita	30,385	1,080	29,305
	Squire	219,000	0	219,000
	Strake	2,920	2,920	0
	Total	252,305	4,000	248,305
9	Bridwell	330,724	330,724	0
	Chiltipin	2,555	2,555	0
	Fitzsimmons	21,600	21,600	0
	Johns	1,405,894	413,192	992,702
	Total	1,760,773	768,071	992,702
10	A. & H.	15,330	15,330	0
	Agua Prieta	144,345	144,345	0
	Cadena	111,750	111,750	0
	Lockhart, Thomas	1,182,600	1,182,600	0
	Robinson	147,460	147,460	0
	Tesoro	2,880	2,880	0
	Total	1,604,365	1,604,365	0
11	Hoffman	28,308,981	675,410	27,633,571
	Musgo	400	400	0
	Parilla	1,477	1,477	0
	Sarnosa	599,183	573,623	25,560
	Tarancahuas	2,224,000	0	2,224,000
	Total	31,134,041	1,250,910	29,883,131
12	Cedro Hill	2,641,485	167,747	2,473,738
	Colmena	1,585,233	235,425	1,349,808
	Forty-Nine	29,160	29,160	0
	Peters	430,756	430,756	0
	Rowden	4,890	4,890	0
	Tiger	69,832	69,832	0
	Total	4,761,356	937,810	3,823,546
13	Lopez	926,754	0	926,754
	Total	926,754	0	926,754

Table 6.—Methods of Disposal and Quantity of Salt Water Disposed in 1967—Continued

(From Texas Railroad Commission)

AREA SHOWN ON FIGURE 18	FIELD	BRINE DISPOSAL IN BARRELS		
		TOTAL	UNLINED PITS	DISPOSAL OR INJECTION WELLS
14	Kohler	215,598	0	215,598
	Rancho Solo	39,755	39,755	0
	Zaragosa	183	183	0
	Total	255,536	39,938	215,598
15	Gruy	341,634	341,634	0
	Rosalia	43,036	43,036	0
	Total	384,670	384,670	0
16	Cole	16,200	3,600	12,600
	Thanksgiving	198,000	183,600	14,400
	Total	214,200	187,200	27,000
17	Cox and Hamon	299,550	299,550	0
	Elva	900	900	0
	Total	300,450	300,450	0
18	Conoco-Driscoll	1,928,398	0	1,928,398
	Total	1,928,398	0	1,928,398
19	Atlee	2,190	2,190	0
	Benavides	34,312	34,312	0
	Buena Suerte	1,460	1,460	0
	Longhorn	9,835	9,835	0
	Peidras Pintas Dome	189,814	189,814	0
	Southland	12,775	12,775	0
	Woodley	40,150	40,150	0
	Total	290,536	290,536	0
20	Good Friday	27,375	27,375	0
	Jaboncillos Creek	106,583	106,583	0
	La Huerta	167,170	167,170	0
	Mesquite Bonita	10,605	10,605	0
	Orcones	11,133	11,133	0
	Total	322,866	322,866	0
21	Sejita	229,551	229,551	0
	Total	229,551	229,551	0
	County totals	104,035,676	13,336,236	90,699,440

source of contamination is eliminated, flushing and dilution of the contamination may require a considerably longer time than the period of original contamination.

No conclusive evidence of salt-water contamination was found during the investigation. This should not, however, be construed to mean that contamination is not occurring or did not occur during previous years when most or all salt water was disposed of in unlined pits and water-courses.

Improperly Cased Wells

Aquifers may be contaminated by the invasion of salt water through improperly cased oil or gas wells. In recent years, the Texas Water Development Board has made recommendations to the oil operators concerning the depths to which water-bearing formations are to be protected by cemented casing; however, the Oil and Gas Division of the Railroad Commission is responsible for protection of aquifers bearing fresh to slightly saline water from contamination in connection with oilfield operations. The Commission issues rules governing the depth of cemented surface casing required to protect such strata for many oilfields throughout the State, and often revises the rules when additional subsurface information becomes available.

An examination of the Commission's field rules indicates that the field rules for surface-casing requirements are adequate in most of the oilfields and gasfields in Duval County. The areas (Figure 18) that apparently are not protected adequately and the amount of unprotected strata containing fresh to slightly saline water are: Area 2, from 250 to 500 feet; area 8, about 500 feet in the Strake field; area 9, from 200 to 300 feet; area 10, from 650 to 800 feet (the 1,150-foot field rule for the A&H field is adequate); area 18, about 1,200 feet; and area 21, about 550 feet.

Several fields in Duval County do not have field rules. These fields are regulated on an individual-well basis, which usually provides adequate protection.

AVAILABILITY OF GROUND WATER

The Catahoula Tuff, Oakville Sandstone, and the Goliad Sand are the important aquifers in Duval County and are the sources of the fresh to slightly saline ground water presently being pumped. Of the three aquifers, the Goliad Sand is, by far, the most heavily tapped by wells. The Catahoula Tuff is hydrologically important because it is the only available source of fresh to slightly saline water in the northwestern part of the county. The Oakville Sandstone, although it contains fresh to slightly saline water in the eastern part of the county, is tapped by a relatively few wells.

Quantity of Ground Water Available for Development

The quantity of water that can be withdrawn from the aquifers on a long-term basis, without depleting the existing supply, can be determined from the amount of recharge or replenishment that the aquifers receive. Studies to determine precisely the amount of recharge were not a part of the present investigation, but estimates can be made by determining the amount of water that originally moved through the aquifers. The estimate of recharge can be computed by using the equation

$$Q = T\,I\,L$$

where Q = quantity of water, in gallons per day, moving through the aquifer;

T = transmissivity, in square feet per day;

I = original hydraulic gradient of the potentiometric surface, in feet per mile; and

L = length of the aquifer, in miles, through which the water moves.

Catahoula Tuff

The amount of water available for development from the Catahoula Tuff is difficult to determine because of a lack of appropriate data on the aquifer in Duval County. An approximation of the quantity of water originally moving through the aquifer can be made, however, with some assumptions.

Data are not available to determine the original hydraulic gradient of the potentiometric surface of the Catahoula Tuff. But assuming that the gradient, based on water-level measurements made in 1969-70, was about the same as the original gradient, then the hydraulic gradient was about 15 feet per mile. This gradient was determined for the area south of the well field that supplies water to Freer.

The average transmissivity of the sands bearing fresh to slightly saline water in the Catahoula is assumed to be about 1,200 square feet per day. This approximation was derived from an average sand-thickness of 80 feet along a north-south line through Freer and from an average hydraulic conductivity of 15 feet per day. Because aquifer tests could not be made in the Catahoula, the hydraulic conductivity of 15 feet per day was calculated from two tests on the Catahoula made in Karnes County, about 50 miles north-northeast of Duval County.

Based on a transmissivity of 1,200 square feet per day and a hydraulic gradient of 15 feet per mile, the quantity of ground water that originally moved through the Catahoula across the 48-mile length of western Duval County was about 6 mgd.

Oakville Sandstone

The original hydraulic gradient of the potentiometric surface in the Oakville was approximated by using water levels measured after 1946 in Duval and Jim Wells Counties. Although the potentiometric surface is depressed around a few centers of moderate to heavy pumping, water levels regionally are believed to have changed only slightly. On the basis of water levels that probably are not significantly affected by heavy pumping, the hydraulic gradient was about 10 feet per mile in 1969.

The average transmissivity of the sands bearing fresh to slightly saline water in the Oakville in eastern Duval County is 1,680 square feet per day. This was derived from an average sand-thickness of 120 feet along the Duval County-Jim Wells County line and from an average hydraulic conductivity of 14 feet per day. The 14 feet per day is the average of the hydraulic conductivities determined from three aquifer tests in Duval and Jim Wells Counties.

Based on the transmissivity of 1,680 square feet per day and on a hydraulic gradient of 10 feet per mile, the quantity of ground water that originally moved through the Oakville across the 56-mile length of eastern Duval County was about 7 mgd.

Goliad Sand

The original hydraulic gradient of the potentiometric surface of the Goliad Sand can be approximated by using water levels measured in Duval, Jim Wells, and Kleberg Counties in 1932 and 1933 before pumping began to affect the water levels regionally. In this way, the approximate hydraulic gradient was determined to be 9 feet per mile.

The average transmissivity of the sands bearing fresh to slightly saline water in the Goliad Sand along the Duval County-Jim Wells County line is about 2,650 square feet per day. This is derived from an average sand-thickness of 240 feet at the county line and from an average hydraulic conductivity of 11 feet per day. The 11 feet per day is the average of the hydraulic conductivities determined from 15 aquifer tests in Duval, Jim Wells, and Brooks Counties.

Based on a transmissivity of 2,650 square feet per day and a hydraulic gradient of 9 feet per mile, the quantity of ground water that originally moved through the Goliad Sand across the 56-mile length of Duval County was 10 mgd. This total quantity compares favorably with the 6 mgd that originally moved from southern Duval County into southern Jim Wells and Kleberg Counties as calculated by Shafer and Baker (1973, p. 106) plus the 3 mgd determined by Mason (1963, p. 50) to be flowing from northern Duval County through the Goliad Sand into the Alice area of northern Jim Wells County.

Areas Most Favorable for Future Development

The ground-water resources of Duval County are only partly developed. A total of 23 mgd of fresh to slightly saline water from the Catahoula, Oakville, and Goliad aquifers is available on a long-term basis without depleting the supply. This is slightly more than four times as much water as was used for all purposes in the county in 1970. Thus relatively large quantities of ground water remain for future development. The development of 23 mgd, however, would cause the aquifers to undergo hydrologic adjustments. Among these adjustments would be a lowering of water levels, changes in the rates of natural recharge or discharge, and possible encroachment of inferior quality water. Generally, the areas where sand thicknesses are large have the greatest potential for additional development of large quantities of ground water. Other factors should be considered, however, such as whether or not large quantities of ground water are already being pumped in the area.

Of the 6 mgd of ground water that may be considered to be available from the Catahoula Tuff, only 10 percent was used in 1970. The areas most favorable for development of large quantities of additional ground water from the Catahoula are along a line extending from the southwest corner of the county north-northeastward through Freer. This line may be considered to be the axis of thick accumulations of sand containing fresh to slightly saline water. From 5 to 20 miles east of this line, the thickness of sand containing fresh to slightly saline water decreases to zero.

The thickest accumulations of sand (at least 120 feet) are in a 12-square-mile area along State Highway 16 from 4 to 10 miles south of Freer and in a similarly sized area about 20 miles west of Benavides (Figure 19). The former area includes the well field for Freer, where concentrated pumping (0.3 mgd in 1970) has lowered the water levels and created an extensive cone of depression in the potentiometric surface (Figure 11). Additional large development in this area of concentrated pumping should be avoided if possible. The latter area is undeveloped.

Of the 7 mgd of ground water that may be considered perennially available from the Oakville Sandstone, only about 10 percent was used in 1970. Areas most favorable for development of large quantities of additional ground water from the Oakville are along the eastern side of the county where the sand section containing fresh to slightly saline water is thickest (Figure 20).

South of San Diego, an area of about 150 square miles contains a sand section in excess of 120 feet thick. Moderate to heavy pumping in southern Jim Wells County, however, has created cones of depression that probably extend into this area of thick sand in Duval County. Westward from the Duval County-Jim Wells County line in the direction of the outcrop or subcrop beneath the Goliad Sand, the thickness of sand in the Oakville decreases and development of ground water becomes less favorable. Water from the Oakville is not available in the area overlying the Palangana salt dome because of the absence of the aquifer on the dome.

Of the 10 mgd of ground water that may be considered available from the Goliad Sand, about 40 percent was used in 1969. Areas most favorable for development of large quantities of additional ground water from the Goliad are in the southeastern part of the county where the sand containing fresh to slightly saline water is thick. The thickest accumulation of sand (in excess of 340 feet) underlies an area a few miles southeast of Benavides. Westward from near the Duval County-Jim Wells County line in the direction of the edge of the Goliad outcrop, the sand gradually decreases in thickness, and the availability of large quantities of water becomes less favorable (Figure 21). Additional large developments of ground water in the area from 6 to 8 miles north of Benavides should be avoided, as large amounts of water currently are being pumped from the Goliad in this area.

NEEDS FOR CONTINUED DATA COLLECTION

The collection of basic data such as an inventory of pumpage, observations of water levels, and collection of water samples should be continued periodically in Duval County. Collection of water samples from selected wells for chemical analysis will provide up-to-date information on the status of possible salt-water encroachment.

The program for the observations of water levels should be expanded to include more wells in the Catahoula Tuff and Oakville Sandstone so that any trend in the water-level fluctuations can be established prior to any large-scale development. The number and distribution of observation wells in the Goliad Sand seems adequate at least for the present time.

DEFINITIONS OF TERMS

In this report certain technical terms, including some that are subject to different interpretations, are used. For convenience and clarification, these terms are defined as follows:

Acre-foot—The volume of water required to cover 1 acre to a depth of 1 foot (43,560 cubic feet), or 325,851 gallons.

Acre-foot per year—One acre-foot per year equals 892.13 gallons per day.

Alluvial deposits—Sediments deposited by streams; includes floodplain deposits and stream-terrace deposits.

Aquifer—A formation, group of formations, or part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs.

Aquifer test, pumping test—The test consists of the measurement at specific intervals of the discharge and water level of the well being pumped and the water levels in nearby observation wells. Formulas have been developed to show the relationships of the yield of a well, the shape and extent of the cone of depression, and the properties of the aquifer such as the specific yield, porosity, hydraulic conductivity, transmissivity, and storage coefficient.

Artesian aquifer, confined aquifer—Artesian (confined) water occurs where an aquifer is overlain by rock of lower hydraulic conductivity (e.g., clay) that confines the water under pressure greater than atmospheric. The water level in an artesian well will rise above the level at which it was first encountered in the well. The well may or may not flow.

Brine—Water containing more than 35,000 mg/l dissolved solids (Winslow and Kister, 1956, p. 5).

Cone of depression—Depression of the water table or potentiometric surface surrounding a discharging well or group of wells and is more or less shaped as an inverted cone.

Dip of rocks, attitude of beds—The angle or amount of slope at which a bed is inclined from the horizontal; direction is also expressed (for example 1 degree southeast; or 90 feet per mile southeast).

Drawdown—The lowering of the water table or potentiometric surface caused by pumping (or artesian flow). In most instances, it is the difference, in feet, between the static level and the pumping level.

Electric log—A graph showing the relation of the electrical properties of the rocks and their fluid contents penetrated in a well. The electrical properties are natural potentials and resistivities to induced electrical currents, some of which are modified by the presence of the drilling mud.

Evapotranspiration—Water withdrawn by evaporation from a land area, a water surface, moist soil, or the water table, and the water consumed by transpiration of plants.

Fresh water—Water containing less than 1,000 mg/l dissolved solids (Winslow and Kister, 1956, p. 5).

Ground water—Water in the ground that is in the saturated zone from which wells, springs, and seeps are supplied.

Head, static—The height above a standard datum of the surface of a column of water (or other liquid) that can be supported by the static pressure at a given point.

Hydraulic gradient—The change in static head per unit of distance in a given direction.

Hydraulic conductivity—The rate of flow of a unit volume of water in unit time at the prevailing kinematic viscosity through a cross section of unit area, measured at right angles to the direction of flow, under a hydraulic gradient of unit change in head over unit length of flow path. Formerly called field coefficient of permeability.

Moderately saline water—Water containing 3,000 to 10,000 mg/l dissolved solids (Winslow and Kister, 1956, p. 5).

Potentiometric surface—A surface which represents the static head. As related to an aquifer, it is defined by the levels to which water will rise in tightly cased wells. The water table is a particular potentiometric surface.

Slightly saline water—Water containing 1,000 to 3,000 mg/l dissolved solids (Winslow and Kister, 1956, p. 5).

Specific capacity—The rate of discharge of water from a well divided by the drawdown of water level in the well. It is generally expressed in gallons per minute per foot of drawdown.

Storage coefficient—The volume of water an aquifer releases from or takes into storage per unit of surface area of the aquifer per unit change in the component of head normal to that surface.

Transmissivity—The rate at which water of the prevailing kinematic viscosity is transmitted through a unit width of the aquifer under a unit hydraulic gradient. It replaces the term "coefficient of transmissibility" because by convention it is considered a property of the aquifer, which is transmissive, whereas the contained liquid is transmissible. Transmissivity can be converted to the formerly used coefficient of transmissibility by multiplying by the factor 7.48.

Very saline water—Water containing 10,000 to 35,000 mg/l dissolved solids (Winslow and Kister, 1956, p. 5).

Water level; static level, or hydrostatic level—In an unconfined aquifer, the distance from the land surface to the water table. In a confined (artesian) aquifer, the level to which the water will rise either above or below land surface.

Water table—That surface in an unconfined water body at which the pressure is atmospheric.

Water-table aquifer (unconfined aquifer)—An aquifer in which the water is unconfined; the upper surface of the zone of saturation is under atmospheric pressure only and the water is free to rise or fall in response to the changes in the volume of water in storage. A well penetrating an aquifer under water-table conditions becomes filled with water to the level of the water table.

Yield—The rate of discharge, commonly expressed as gallons per minute, gallons per day, or gallons per hour. In this report, yields are classified as small, less than 50 gpm (gallons per minute); moderate, 50 to 500 gpm; and large, more than 500 gpm.

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Table 7.--Records of Wells

All wells are drilled unless otherwise noted in remarks column.

Water level : Reported water levels given in feet; measured water levels given in feet and tenths.
Method of lift and type of power: A, airlift; B, bucket; C, cylinder; E, electric; G, gasoline, oil, butane, or diesel engine; H, hand; J, jet; N, none; S, submergible; T, turbine; W, windmill. Number indicates horsepower.
Use of water : D, domestic; Ind, industrial; Irr, irrigation; N, none; P, public supply; S, livestock.
Water-bearing unit : Tg, Goliad Sand; To, Oakville Sandstone; Tct, Catahoula Tuff; Tj, Jackson Group.

WELL	OWNER	DRILLER	DATE COM-PLET-ED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTI-TUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SUR-FACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
* JB-78-59-901	Duval County Ranch Co.	Magnolia Petroleum Co.	--	--	--	Tct	425	--	--	C,W	S	Converted oil test well. Reported strong supply.
60-401	John Martin Ranch	--	Old	63	4 1/2	do.	394	43.8	Sept. 30, 1970	C,W	S	
402	do.	--	--	--	4 1/2	Tct?	386	100	--	C,W	S	Converted oil test well.
* 701	James Foster	--	Old	102	8	Tct	530	33.0	Sept. 10, 1970	C,W	S	Reported weak supply.
702	do.	--	Old	104	64	do.	--	28.5	do.	C,W	S	Do.
703	do.	--	--	280	4 1/2	do.	--	35.8	do.	C,W	S	Do.
* 704	Atlantic Richfield Corp.	--	Old	170	6	do.	--	40	--	S,E,1 1/2	Ind	--
* 801	J.F. Welder Estate	Buck Page & Company	1967	360	--	do.	465±	107.3	Aug. 25, 1970	C,W	S	Aquilas mill.
802	John Martin Ranch	--	Old	250±	4 1/2	do.	414	50.4	Sept. 30, 1970	C,W	S	Pump setting, 210 ft.
* 901	Z. Campos Heirs	--	Old	200±	--	do.	--	--	--	C,E	D	Reported water not used for drinking.
902	J.R. Foster	Charles Wright	1924	220	6	do.	535	160.8	Sept. 10, 1970	C,W	D,S	Reported weak supply.
* 903	do.	Alonzo King	1938	240	5	do.	--	--	--	C,W	D,S	Do.
61-901	V.E. Cook	Martin Water Well Service	1967	835	4	Tct	634	--	--	C,E,1/2	S	--
62-701	J.R. Dougherty Ranch	--	--	227	6	To	546	211.0	Sept. 15, 1970	C,W	S	Rincon mill.
702	--Gardner	--	--	140	4 1/2	Tg	441	123.2	do.	C,G	S	--
703	Charles Houlihan	Richardson Water Well Service	1969	212	4 1/2	To	--	--	--	C,E,1	S	Slotted casing from 159 to 212 ft. 1/
* 901	M.B. Fernandez	--	Old	39	36	Tg	368	33.0	July 14, 1970	C,W	S	--
63-701	Pat Rogers	Buck Page & Company	1966	306	4 1/2	do.	--	132	1966	C,W	S,D	Slotted casing from 290 to 306 ft.
84-02-301	Duval County Ranch Co.	Humble Oil & Refining Co.	--	--	--	--	--	--	--	N	N	Originally supplied water for drilling oil wells.
601	do.	--	Old	300	7	--	--	129	Mar. 13, 1931	N	N	Reported water salty. Probable source Frio Clay.

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COM-PLET-ED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTI-TUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SUR-FACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
JB-84-03-101	Duval County Ranch Co.	Humble Oil & Refining Co.	--	--	--	--	--	--	--	N	S	Reported water sand from about 1,200 to 1,300 ft.
102	do.	S.R.C. Company	1931	617	6	Tj?	--	--	--	N	N	Formerly supplied water for SRC Camp. Reported water salty.
* 201	do.	--	--	65±	4	Tct	--	26.3	Nov. 19, 1970	S, E, 1/2	S	Reported water from about 46 to 60 ft.
301	do.	Mobil Oil Company	--	--	--	--	--	16.4	do.	C, W	S	--
501	do.	--Pursley	1959	750	5	Tj?	--	--	--	N	S	--
601	D.M. Johnson	--	Old	--	60	Tct	--	37.3	Apr. 21, 1931	C, W	S	--
801	Duval County Ranch Co.	--	--	300	5	do.	--	24.6	Mar. 11, 1931	C, W	S	--
* 901	Henry Wiederkehr	--	1958	210	4	do.	539.6	69.6	Nov. 17, 1970	C, W	D, S	--
902	do.	--	Old	216	8	do.	487.1	32.7	Nov. 18, 1970	C, W	S	--
903	do.	Oil Company	1927±	--	10	--	--	40.4	do.	C, W	S	Formerly drilled as oil test. Reported water salty.
* 04-102	Duval County Ranch Co.	--	--	350±	--	Tct	449.2	85.6	Nov. 19, 1970	C, W	S	--
* 201	J.F. Welder Estate	--Calloway	1956	365	4 1/2	do.	--	177.0	Aug. 25, 1970	C, W	S	Barena mill.
* 301	do.	do.	--	410	--	do.	663	204.5	do.	C, W, 6	S	San Cajo mill.
401	Humble Oil & Refining Co.	E.C. Hubble	1936	232	6	Tct	--	--	--	C, E, 5	N	Perforated casing from 148 to 232 ft. Formerly used for camp supply.
* 501	do.	Humble Oil & Refining Co.	--	729	4 1/2	do.	--	--	Aug. 25, 1970	C, E, 5	Ind	--
* 502	J.F. Welder Estate	--	1952	400±	6	do.	654.7	208.0	do.	C, W	S	Alto mill. Reported weak supply.
* 601	do.	--Calloway	1955	420	4 1/2	do.	--	248.5	do.	C, W	S	Gato mill.
* 602	do.	Buck Page & Co.	1964	1,000	4 1/2	do.	--	410	May 13, 1964	S, E, 1/2	D, S	4 1/2 casing, 0-615 ft; perforated 531-553 and 615-665 ft. 1/
701	Humble Oil & Refining Co.	Reynolds Well Service	1948	205	6	do.	--	66.4 60.3	Mar. 25, 1964 Mar. 18, 1970	N	N	Observation well. 2/ Perforated casing from 121 to 205 ft.

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COM-PLET-ED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTI-TUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SUR-FACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
JB-84-04-702	Humble Oil & Refining Co.	Humble Oil & Refining Co.	1940	204	7	Tct	--	53.1	Sept. 17, 1969	N	N	Perforated casing from 136 to 203 ft.
703	do.	do.	1940	206	7	do.	--	59.2	do.	N	N	Perforated casing from 136 to 204 ft.
707	--Whittaker	--	--	270	7	do.	--	105.9 110.7	Mar. 24, 1964 Mar. 18, 1970	C,E,3	S	Observation well. 2/
801	Humble Oil & Refining Co.	E.C. Hubble	1937	496	5 1/2	do.	--	326.6	Mar. 24, 1964	C,E,5	D	Observation well. Perforated casing from 413 to 486 ft.
802	do.	do.	1937	507	5 1/2	do.	--	--	--	C,E,5	D	Perforated casing from 437 to 506 ft.
803	do.	E.C. Hubble	1935	510	6	do.	--	345.6	Sept. 18, 1969	C,E,5	D	Perforated casing from 468 to 510 ft.
804	do.	do.	1936	517	6	do.	--	--	--	C,E,5	D	Estimated discharge 15 gpm. Perforated casing from 460 to 516 ft.
805	do.	do.	1935	520	6	do.	--	--	--	C,E,5	D	Measured discharge 15 gpm. Perforated casing from 458 to 519 ft. Temp. 88°F (31°C).
806	do.	do.	1935	510	6	do.	--	--	--	C,E,5	D	Estimated discharge 15 gpm. Perforated casing from 453 to 507 ft.
* 05-101	Bob Hill	"Pops" Reynolds	1968	410	3	do.	--	310	--	C,E,1/4	D,S	Reported not used for drinking. Pump set at 358 ft.
102	V.E. Cook	--	Old	190	4	do.	--	--	--	N	N	Dry at 190 ft when visited.
* 103	do.	Martin Water Well Service	1966	835	4	do.	663	312.2	July 9, 1970	S,E	S	Reported water salty.
104	R.C. Hoover	Buck Page & Company	1967	460	4 1/2	do.	--	415	July 13, 1967	C,E	S	Perforated casing from 430 to 452 ft.
301	V.E. Cook	--	Old	140	4	To	574	124.5	July 8, 1970	S,E,1/4	S	--
401	V.H. Lehman	Buck Page & Company	1966	780	4 1/2	Tct	--	--	--	S,E,3/4	D,S	Perforated casing from 742 to 780 ft. 1/
* 402	D. Serna	Raul Barrera	1963	300	4	To	--	--	--	C,W	D,S	--
403	J.W. Davidson	--	Old	200	4 1/2	To	--	60	--	C,W	S	Reported strong supply.
* 501	V.E. Cook	--	--	450	4	To	--	--	--	C,E,1	S	Pump set at 200 ft.
* 502	do.	--	--	450	--	do.	581	--	--	C,E,1	S	Do.

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COM-PLET-ED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTI-TUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SUR-FACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
JB-84-05-601	V.E. Cook	Martin Water Well Service	1965	120	4	Tg	511	87.3	July 8, 1970	C,E,1/2	S	--
* 602	do.	--	Old	65	4	To	480	--	July 9, 1970	C,E	D,S	--
603	do.	--	Old	90	4	do.	--	--	--	C,W	S	--
703	Raul Serna	Raul Barrera	1968	125	4 1/2	do.	600	101.5	May 5, 1970	C,W	S	--
704	Benjamin Salinas	do.	1950	400±	4 1/2	do.	670	275.2	do.	N	N	--
* 902	V.E. Cook	Martin Water Well Service	--	83	4	Tg	488	70.8	July 8, 1970	C,E,1/4	S	--
* 06-101	J.R. Dougherty Ranch	--	--	142	5	do.	476	133.5	Sept. 15, 1970	C,W	S	--
* 301	F. Benavides	E. Peña	1950	120	4	do.	420	95.0	July 14, 1970	C,W	D,S	--
* 302	J.R. Dougherty Ranch	--	--	105	5 1/2	Tg	406	85.5	Sept. 15, 1970	C,W	S	Orcones mill.
501	do.	--	--	175	4 1/2	do.	445	157.6	do.	C,E,1	D,S	--
601	Ed Canales	Rader Equipment Co.	1967	480	4 1/2	To	--	235	1967	C,W	S	Slotted casing from 460 to 480 ft. 1/
* 602	do.	Buck Page & Co.	1969	301	4 1/2	Tg	460	189.2	July 29, 1970	S,E,1	D,S	Slotted casing from 255 to 301 ft.
801	John Mew	Maley Well Service	1964	261	4 1/2	do.	--	226	1964	C,W	S	--
901	Isabel Garcia	Horne Drilling Co.	1959	425	4 1/2	do.	451	210.6	July 30, 1970	C,W	S	Slotted casing from 400 to 425 ft.
11-201	Duval County Ranch Co.	--	--	150±	4 1/2	Tct	--	--	--	S,E,1	S	--
* 501	do.	Buck Page & Company	1967	150	4 1/2	Tct?	658.5	72.6	Aug. 5, 1970	S,E,1	S	Slotted casing from 127 to 150 ft.
601	Humble Oil & Refining Co.	O.L. Boone	Old	237	8	do.	--	3.8	Sept. 17, 1969	C,E,5	D	--
602	do.	--	--	--	8	Tct	--	--	--	C,E,5	D	Measured discharge, 8 gpm Sept. 17, 1969. Temp. 81°F (27°C).
603	do.	--	--	640	8	do.	--	--	--	C,E,5	D	--
12-101	W.C. Kelley	Kelly Drilling Co.	--	500±	7	do.	--	166.9 148.3	Mar. 25, 1964 Mar. 18, 1970	N	N	Observation well. 2/
* 102	Kenneth Zuber	Johnny Rader	1970	255	4 1/4	do.	--	--	--	C,E,2	D	--

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COMPLETED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTITUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SURFACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
JB-84-12-103	"Shorty" McNare	Dillard Wied	1967	347	5 1/2	Tct	--	87	Apr. 18, 1967	S,E,1	D	Pump set at 157 ft in 1967. Perforated casing from 160 to 192 and 300 to 347 ft.
201	William Hubbard	--	Old	130	62	do.	--	116.4	Sept. 19, 1969	C,W	S	Dug well with rock curb. Observation well. Temp. 79°F (26°C).
* 301	Percy Howard	E.E. Hood	1959	503	7	do.	--	120.-- 145.0	Feb. 1959 Dec. 11, 1970	S,E,1	D,S	Observation well. 2/ Slotted casing from 160 to 190, 300 to 330, and 473 to 503 ft.
302	do.	--	1966	465	7	do.	--	135.3	Sept. 19, 1969	S,E,3/4	D	Perforated casing from 120 to 465 ft.
303	Bodine Ranch	--	Old	282	7	do.	--	88.3	Aug. 5, 1970	C,W	S	--
401	Ponciano Ruiz	--	Old	315	5	do.	659.5	150.3 121.4	Mar. 10, 1960 Mar. 18, 1970	C,W	D,S	Observation well. 2/ Temp. 82°F (28°C).
* 701	Freer W.C.I.D. #1 Well 6	H.&S. Water Well Service	1962	620	10 3/4	do.	686	354	Apr. 25, 1969	S,E,40	P	8 3/4-in. casing perforated from 518 to 608 ft. Reported discharge 200 gpm. Pump set at 483 ft. City Well 6. 1/ 3/
* 702	Freer W.C.I.D. #1 Well 4	do.	1962	590	10 3/4	do.	642	310	do.	S,E,40	P	8 3/4 in. casing perforated from 473 to 573 ft. Reported discharge 160 gpm. Pump set at 441 ft. City Well 4. 1/ 3/
703	Freer W.C.I.D. #1 Well 8	do.	1962	640	10 3/4	do.	695	360	Jan. 31, 1969	S,E,40	P	8 3/4-in. casing from 534 to 629 ft. Reported discharge 160 gpm. Pump set at 500 ft. City Well 8. 1/ 3/
801	Hoffman Ranch	--	--	330	4	do.	--	--	--	C,W	S	--
* 901	Perez Ranch	--	--	298	4 1/2	do.	538	288.4	Aug. 19, 1970	C,W	S	--
* 13-101	Jose Angel Ruiz	Ben Mendez	1939	267	6	To	520	172.9	May 4, 1970	C,W	D,S	--
* 201	Galo B. Castillo	--Labbe	1962	300	--	do.	540	134.0	May 5, 1970	C,W	D,S	--
* 401	Ramon P. Perez	Alonzo De La Fuente	Old	115	8	do.	484	93.8	May 4, 1970	C,E,1	D,S	Reported weak supply.
402	Juan Hasette	Dillard Wied	1967	133	5	do.	--	78	Mar. 20, 1967	S,E	D,S	Perforated casing from 110 to 133 ft. 1/
501	Keith Cook	Rader Equipment Co.	1964	800	4 1/2	Tct	--	300	--	E	S	Perforated casing from 520 to 600 ft.
* 502	Jose A. Canales	Richardson Water Well Service	1968	280	4 1/2	To	451	90.1	May 4, 1970	C,W	S	Perforated casing from 425 to 280 ft. Pump set at 140 ft. 1/

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COM-PLET-ED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTI-TUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SUR-FACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
JB-84-13-801	Severo Rangel	--	Old	40	72	Tg	445±	35.0 33.1	Sept. 26, 1933 Mar. 18, 1970	C,W	D,S	Dug well. 2/
* 802	Cecilio Valerio	--	Old	50	6	Tg	--	37.6 35.3	Apr. 2, 1931 Mar. 6, 1945	B,H	D	Formerly used as observation well. 2/
803	N. Gonzales	--	Old	135	4 1/2	do.	483±	106.8	Oct. 6, 1970	C,W	D,S	--
901	Juan Peralez	--	Old	140	4 1/2	do.	444	74.8 57.4	Sept. 26, 1933 May 1, 1970	C,W	D,S	Formerly used as observation well. 2/
902	Cantu Estate	--	Old	190	5	do.	425	79.0 41.1	Sept. 6, 1931 Mar. 18, 1970	C,W	S	Observation well. 2/
903	do.	--	1926	110	5	do.	--	56.0 54.0	June 9, 1931 July 13, 1960	C,W	--	Formerly used as observation well. 2/
904	Helena De Peña	--	Old	110	60	do.	--	43.5 36.1	June 9, 1931 May 1, 1970	T,E	S	Do.
* 14-101	Mrs. Ben G. Mew, Jr.	--	1930±	200±	4 1/2	To	404	84.4	May 6, 1970	S,E	D,S	Reported strong supply. Pump set at 80 ft.
102	do.	--Maley	1961	350±	4 1/2	do.	425	175.7	do.	C,W	S	--
* 201	Guadalupe Garza, Jr.	--	1937	180	--	Tg	456	147.5	July 30, 1970	C,W	D,S	--
301	Berta Garcia Estate	--	1961	250	6	do.	430	168.0	do.	C,W	D,S	--
403	J.M. Sepulveda	--	--	100±	60	do.	--	45.5 25.7	Sept. 26, 1933 July 13, 1960	B,H	D,S	Dug well, formerly used as observation well. 2/
404	Taylor Refining Company	--	--	--	4	Tg?	--	83.7 84.1	Feb. 12, 1947 Feb. 10, 1955	N	N	Formerly used as observation well. 2/
501	Archer Parr	Archer Parr	1964±	515	14	Tg	--	--	--	T,G,300	Irr	Measured discharge 720 gpm. Pump set at 440 ft. Perforated casing from 200 to 500 ft. Temperature 79°F (26°C).
* 502	do.	do.	1965±	500±	14	do.	--	--	--	T,G,300	Irr	Measured discharge 720 gpm. Pump set at 440 ft. Perforated casing from 200 to 500 ft.
601	A.E. Garcia	Raul Barrera	1966	300	4	do.	--	--	--	C,W	S	--
602	C.M. Robinson	Buck Page & Company	1968	184	4 1/2	do.	--	100	--	C,W	D	Perforated casing from 150 to 184 ft. 1/
603	Minerva C. Casas	Rader Equipment Co.	--	300	4 1/2	do.	--	150	--	S,E,1 1/2	D	4 1/2-in. casing from 0 to 300 ft; perforated from 280 to 300 ft.

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL		OWNER	DRILLER	DATE COM-PLET-ED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTI-TUDE OF LAND SURFACE (FT)	WATER LEVEL ABOVE (+) OR BELOW LAND SURFACE DATUM (FT)	WATER LEVEL DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
	JB-84-14-701	Cuellar Estate	--	--	150	--	Tg	--	64.0 61.4	June 9, 1931 Feb. 3, 1941	C,W	--	Formerly used as observation well. [2]
	801	L.N. Garcia	--	Old	80	72	do.	--	73.0 35.4	June 8, 1931 Mar. 15, 1961	N	N	Dug well, formerly used as observation well. [2]
	802	Archer Parr	Archer Parr	1964	607	14	do.	--	--	--	T,G,310	Irr	Reported discharge 800 gpm. Pump set at 460 ft. 110 ft of perforated casing between 222 and 442 ft. Open hole from 460 to 607 ft.
	803	do.	do.	1963	500±	14	do.	352±	158.3	Oct. 11, 1969	N	N	Drilled to supply water for irrigation. 110 ft of perforated casing between 222 and 442 ft.
	902	City of San Diego, Well 1	Flournoy Drilling Co.	1966	548	16, 10 3/4	do.	--	--	--	S,E,60	P	Screen intervals: 269-369; 384-404; 446-484; 504-547 ft. Reported discharge 330 gpm. [3] 6-in. col. pipe
	903	City of San Diego, Well 2	do.	1966	556	16 10 3 4	do.	--	--	--	S,E,60	P	Screen intervals: 330-405; 443-478; 498-548 ft. 16-in. casing, 0 to 330 ft. Reported 220 ft. drawdown after pumping 310 gpm for 17 hrs.
	15-105	F.N. Schroeder	Bryan Patterson	Old	170	4	do.	330	50.7	July 14, 1970	C,W	S	--
	401	Robert Hoffman	--Barrera	1945	245	4 1/2	do.	--	103.2	Mar. 1, 1961	C,W	S	--
*	402	F.N. Schroeder	Alonzo King	1952	160	4	do.	367±	92.3	July 14, 1970	S,E	D,S	--
	403	do.	do.	--	212	4	do.	--	--	--	C,W	S	--
*	702	City of San Diego, Old Well 1	Layne Texas Company	1937	509	13 3/8 6 5/8	do.	298	236.1 264.0	Mar. 24, 1964 Dec. 11, 1970	N	N	Screen: 402-468 and 484-505 ft. Observation well. [1,2]
	703	City of San Diego, Well 4	do.	1947	544	12 3/4	do.	315	--	--	T,E,50	P	Measured discharge 150 gpm. July 17, 1961. Pump set at 290 ft. Screen setting: 291 to 544 ft. Temperature 82°F (28°C).
*	704	City of San Diego, Well 3	Louis Labbe	1959	749	10 3/4	do.	298	182.7	Oct. 31, 1960	T,E,50	P	Measured discharge, 60 gpm in 1961. Pump set at 260 ft. Screen: 210-370; 390-440; 460-510, and 660-740 ft.
	705	F.N. Schroeder	Alonzo King	1948	150	4	do.	330	52.1	July 14, 1970	C,W	S	--

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COM-PLET-ED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTI-TUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SUR-FACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
JB-84-18-601	--Caldwell Las Lomas Ranch	--	Old	160	4 1/2	Tct	623	123.9	Oct. 7, 1970	C,W	S	Honco mill. Water reported unfit for drinking.
602	do.	Sid Katz	--	160±	6	do.	--	125.2	do.	C,E,1/2	D,S	--
* 603	do.	Oil Company	Old	--	6	--	--	123.7	do.	C,E,1/2	D	Originally drilled as oil test and later converted to water well.
901	Viggo Gruy Ranch	--	--	300±	4	Tct	791	55.5	July 16, 1970	C,W	S	Buena Suerte mill.
902	do.	Buck Page & Sons	1970	475	4	do.	762±	178.0	do.	C,W	S	Perez mill.
* 903	do.	--	--	300±	4	do.	697	77.9	do.	C,W	S	Relief mill.
* 19-101	Keith E. Cook	Buck Page & Sons	1969	448	4 1/2	do.	--	--	--	C,W	S	Leones mill.
201	do.	--	--	--	4	Tct?	--	20	--	S,E,1/2	S	--
* 202	J.R. Dougherty Ranch	--	Old	80	8	Tct	596	70.1	Aug. 18, 1970	C,W	S	Creek Pasture mill.
301	do.	--	Old	--	4 1/2	Tct?	663	128.0	do.	C,W	S	High mill.
* 401	--Caldwell Las Lomas Ranch	--	1931	187±	4	Tct	750	147.0	Oct. 8, 1970	C,W	S	Booboo mill.
501	J.R. Dougherty Ranch	--	Old	277±	4 1/2	do.	676	109.1	Aug. 18, 1970	C,W	N	Well is not in use at present.
* 502	Keith E. Cook	Oil Company	1930±	--	8	--	--	--	--	C,W	S	Converted oil test. 8 jts. col. pipe. Hell N Gone mill #2.
503	do.	--	Old	--	10	Tct?	--	--	--	S,E,1/2	S	Converted oil test. 12 jts. col. pipe. Hell N Gone mill #1.
504	do.	--	--	359	10	Tct	--	200±	--	C,W	S	Venado mill. Reported strong supply.
801	--Caldwell Las Lomas Ranch	--	Old	170	5	do.	699±	50.3	Oct. 7, 1970	C,W	S	En Medio mill.
901	J.R. Dougherty Ranch 5	--	Old	170	--	do.	627±	98.6	Aug. 6, 1970	C,W	S	--
* 902	do.	--	--	292	4 1/2	do.	--	--	--	S,E	D,S	Hdqrs. well.
903	do.	--	--	--	12	--	--	+	--	Flows	S	12-in. casing partly plugged with timber.
* 20-101	J.F. Stockwell	Oil Company	--	242?	10	Tct	572	94.0	Oct. 28, 1970	C,W	S	Originally drilled as oil test and later converted to water well.

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COM-PLET-ED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTI-TUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SUR-FACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
* JB-84-20-102	D.C. Chapa	--	Old	74	--	Tct	567	43.2	Oct. 28, 1970	C,W	S	Dug well.
201	do.	--	Old	208	--	do.	594	143.5	do.	C,W	S	Barrica mill.
* 202	Hoffman Ranch	--	Old	89?	6	do.	584	81.6	Nov. 10, 1970	C,W	S	Monte mill.
301	Michel Shamoun	Dillard Wied	1967	463	5 1/2	--	640±	135	Feb. 16, 1967	S,E,1 1/2	D	Test hole drilled to 483 ft. Slotted casing from 340 to 463 ft. 1/
* 302	M.B. Forbes	--	Old	300±	4	Tct	536	111.9	Sept. 9, 1970	C,W	D,S	Hdqrs. well.
303	Hoffman Ranch	--	--	452	6?	do.	599	199.3	Nov. 10, 1970	C,W	S	Little mill.
401	J.R. Dougherty Ranch 5	--	Old	150±	4 1/2	do.	614	--	--	C,W	S	Paisano mill.
402	do.	--	Old	148	4 1/2	do.	651	139.8	Aug. 6, 1970	C,W	S	Pita mill. Reported weak supply.
* 403	do.	--	Old	285±	4 1/2	do.	602	73.9	do.	C,W	S	Toro Gracho mill.
501	do.	--	Old	168	6	do.	521	50.3	do.	C,W	S	Yeguas mill.
701	do.	--	Old	196	5	do.	615	105.1	do.	C,W	S	Javelina mill.
801	do.	--	Old	200	5	do.	578	--	--	C,W	S	Blanco mill.
21-101	M.B. Forbes	--	--	320	4 1/2	Tg	561	185.3	Sept. 9, 1970	C,W	S	Alto mill.
201	--	--	--	166	--	do.	484	125.7	Sept. 17, 1970	C,E,1/2	S	--
* 202	Linwood Bland	--	Old	--	12	--	514	147.5	Oct. 6, 1970	C,W	S	--
301	P.P.G. Industries, Well 5	Layne Texas Company	1936	376	8, 13 3/8	Tg	420	--	--	T,E,15	Ind	254 ft of 13 3/8-in. casing; 103 ft of 8-in. casing slotted from 256 to 359 ft. Pump set at 210 ft. Reported discharge, 95 gpm.
302	P.P.G. Industries, Well 6	--Fawcett	1937	375	8, 13 3/8	do.	423	--	1968	T,E,15	Ind	257 ft of 13 3/8-in. casing; 8-in. casing slotted from 260 to 361 ft. Pump set at 230 ft. Reported discharge 73 gpm.
303	P.P.G. Industries, Well 7	Layne Texas Company	1938	370	8, 13 3/8	do.	430	124.7	Oct. 14, 1969	N	Ind	Test hole drilled to 1,344 ft and plugged back to 370 ft. 266 ft of 13 3/8-in. casing; 8-in. casing slotted from 266 to 368 ft. Used by company as observation well.

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COM-PLET-ED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTI-TUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SUR-FACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
JB-84-21-304	P.P.G. Industries, Well 8	Layne Texas Company	1938	568	8 5/8, 13 3/8	Tg	432	--	--	T, E, 15	Ind	404 ft of 13 3/8-in. casing; 8-in. casing slotted from 404 to 520 ft, and 530 to 566 ft. Pump set at 300 ft. Reported discharge 96 gpm.
305	P.P.G. Industries, Well 9	do.	1939	578	8, 13 3/8	do.	432	141.2	Oct. 14, 1969	N	N	440 ft of 13 3/8-in. casing; 8-in. casing slotted from 439 to 578 ft.
* 401	M.B. Forbes	--	--	320	4 1/2	do.	500	135.0	Sept. 9, 1970	C, W	S	Corrales mill.
* 402	M.E. Wiederkehr	--	Old	225	6	do.	524	128.9	Nov. 10, 1970	C, W	S	Vibora mill.
403	do.	--	Old	120+	8	do.	492	108.3	do.	C, W	S	Arroyo mill.
* 404	do.	--Upton	1948	280	--	do.	--	--	--	C, E	D, S	Hdqrs. well.
405	do.	Oil Company	Old	500	--	do.	--	--	--	C, W	S	Drilled as oil test, plugged back to 500 ft and completed as water well. Reported water sands at 260 and 280 ft.
501	P.P.G. Industries, Well 13	Layne Texas Company	1951	648	8, 10, 16	do.	449	136.7	Oct. 14, 1969	N	N	16-in. casing from 0 to 226 ft. Slotted casing: 238 to 293, 317 to 362, 377 to 458, 478 to 533, and 568 to 638 ft. 1/ 3/
* 502	P.P.G. Industries, Well 10	do.	1939	640	8, 10, 16	do.	437	--	1968	T, E, 40	Ind	Test well drilled to 2,179 ft and plugged back to 640 ft. Pump set at 240 ft. Reported discharge 293 gpm. Slotted casing: 258-296, 303-367, 369-486, 495-543, 605-625 ft.
503	P.P.G. Industries, Well 11	do.	1941	650	8, 10, 16	do.	434	147.9	Oct. 14, 1969	T, E, 40	Ind	16-in. casing from 0 to 240 ft. Slotted casing: 247-298, 318-368, 370-480, 499-539, 599-640. Pump set at 240 ft. Reported discharge 290 gpm.
504	P.P.G. Industries, Well 10A	--	1932±	440±	6 5/8	do.	437	--	--	N	N	--
505	Linwood Bland	--	Old	180	4 1/2	do.	492	145.9	Oct. 27, 1970	C, W	S	--
* 601	P.P.G. Industries, Well 1	Layne Texas Company	1933	451	8, 12 1/2	do.	425	--	--	T, E, 15	Ind	255 ft of 12 1/2-in. casing 8-in. casing slotted from 256 to 276 and 288 to 349 ft. Reported discharge 74 gpm in 1968.

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COM-PLET-ED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTI-TUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SUR-FACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
JB-84-21-602	P.P.G. Industries, Well 2	Layne Texas Company	1933	455	8, 12 1/2	Tg	420	125.3	Oct. 14, 1969	--	N	12 1/2-in. casing from 0-323 ft; 8-in. from 183 to 455 ft (40 overlap) slotted from 223-293 and 314 to 355 ft.
603	P.P.G. Industries, Well 3	do.	1934	455	8, 12	do.	416	--	Feb. 10, 1968	T,E,15	Ind	12-in. casing from 0 to 264 ft; 8-in. slotted casing from 268 to 286 and 297 to 380 ft. Pump set at 230 ft. Reported discharge 90 gpm.
604	P.P.G. Industries, Well 4	do.	1933	450	8, 12 1/2	do.	415	119.7	Oct. 14, 1969	N	N	12 1/2-in. casing from 0 to 252 ft; 8-in. slotted casing from 252 to 312 and 323 to 365 ft. 1/
701	M.E. Wiederkehr	--	Old	69	72	do.	455	57.7	Nov. 10, 1970	C,W	S	Indio mill. Dug well.
702	do.	--	Old	59	--	do.	433	40.5	do.	C,E,1/2	S	Blanco mill.
703	do.	--Corkill	1935±	230	8	do.	451	52.8	do.	C,W	S	Caso mill.
801	P.P.G. Industries, Well 12	Layne Texas Company	1948	637	8 5/8, 10 3/4, 16	do.	427	133.4	Nov. 14, 1969	T,E,40	Ind	16-in. casing from 0 to 244 ft; 10 3/4-in. from 0 to 352 ft; 8 5/8-in. from 352 to 637 ft; slotted casing from 250-350, 352-432, 450-530 and 595-635 ft.
802	Columbia Southern Chemical Corp.	Columbia Southern Chemical Corp.	1955	1,394	--	--	425±	--	--	N	N	Test well No. 2. 3/
22-103	Gerald A. O'Hanlon	Luther Casey	1966	310	--	Tg	--	60	--	S,E,1	D,S	--
* 104	Willie Davila	Rader Equipment Co.	1969	330	4	do.	--	116.3	Nov. 11, 1970	C,W	D,S	--
* 401	P.P.G. Industries, Well 14	Layne Texas Company	1955	1,264	8 5/8 14	To	397	207	1955	T,E,75	Ind	Reported discharge 460 gpm. Pump set at 340 ft. See geologic section C-C'. Slotted casing from 1,106-1,202 and 1,212-1,252. 1/
* 402	Linwood Bland	--	--	180?	4 1/2	Tg	398±	105.6	Oct. 27, 1970	S,E,1	D,S	--
403	do.	--	--	176	6	do.	395	107.4	do.	C,W	S	--
404	J.D. Glover	Disbro Water Well Service	1966	336	4 1/2	do.	--	100	--	C,E,1/2	D,S	80' perforated casing at bottom.
405	Columbia Southern Chemical Corp.	Columbia Southern Chemical Corp.	1955	1,271	--	--	451	--	--	--	N	Water test #7.
* 501	John Martin, Jr.	--Maley	1961	350	6	Tg	--	40	1970	S,E	D,S	Hdqrs. well.

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COM-PLET-ED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTI-TUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SUR-FACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
JB-84-22-601	John Martin, Jr.	--	Old	70±	40±	Tg	325	58.3	Apr. 30, 1970	C,W	S	Beecher mill. Dug well with rock curb.
602	do.	--	Old	47	40±	do.	316	36.1	do.	C,W	S	Clemente mill. Dug well with rock curb.
703	do.	--	--	300±	6	do.	387	68.7	May 1, 1970	C,W	S	Cadena mill.
704	do.	--	Old	50	72	do.	367	43.3	do.	C,W	S	Ebano mill. Dug well with rock curb.
* 801	C. Saenz	Antonio Garcia	Old	90±	6	do.	320±	41.0 33.5	May 25, 1931 Mar. 18, 1970	C,E,W	D,S	Observation well. 2/
802	John Martin, Jr.	--	--	300±	--	do.	--	--	--	C,W	S	Blanco mill.
803	do.	--	Old	60	--	do.	357	51.7	Apr. 30, 1970	C,W	S	Ranchito mill. Dug well.
* 804	do.	--	--	400±	6	do.	400±	151.7	do.	C,W	S	Alto mill.
* 805	Pablo C. Saenz	--Saenz	1902	40	36±	do.	345	32.4	Apr. 29, 1970	C,W	D,S	Dug well with rock curb.
* 902	--Garcia	--	Old	80	7	do.	--	57.5 57.5	May 15, 1931 Feb. 5, 1953	C,W	D	Formerly used as observation well. 2/
903	Alaniz Estate	--	Old	90	6	do.	--	45.5 42.9	Sept. 28, 1933 Feb. 5, 1953	C,W	S	Do.
904	John Martin, Jr.	--	1942±	300±	6	do.	341	49.5	Apr. 30, 1970	C,W	S	South Beecher mill.
905	do.	--	--	300±	6	do.	343	69.0	do.	C,W	S	Gudjillo mill.
23-401	Hart Mussey	--	1935±	175	7	do.	--	94.5	Feb. 23, 1961	C,W	S	--
704	M.L. Saenz	--	1959	400±	4	do.	297	120.3 117.4 125.4	Oct. 31, 1960 Mar. 26, 1964 Mar. 20, 1969	C,W	S	Observation well. Formerly supplied water for oil well drilling rigs.
26-301	Viggo Gruy Ranch	--	Old	500±	4	Tct	780	165.5	July 16, 1970	C,W	S	Callejon mill. Reported strong supply.
601	J.H. Dinn	E.R. David	Old	400±	7	do.	797	150.0	Apr. 10, 1970	C,W	S	--
* 602	do.	do.	Old	400±	7	Tct?	--	--	--	S,E	D,S	Hdqrs. well.
603	Viggo Gruy Ranch	--	Old	350±	4	Tct	705	124±	--	C,W	S	Salado mill.
604	do.	Humble Oil & Refining Co.	--	350±	--	do.	730±	160±	--	S,E	S	--
605	do.	--	Old	500±	4	do.	791	146.6	July 16, 1970	C,W	S	No. 2 mill.
902	J.H. Dinn	--	Old	400±	4 1/2	do.	--	--	--	C,W	S	Antonio mill.

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COM-PLET-ED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTI-TUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SUR-FACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
* JB-84-26-903	J.H. Dinn	E.R. David	Old	400±	4 1/2	Tct	735	87.0	Apr. 10, 1970	C,W	S	United Gas mill.
904	do.	--	Old	300±	--	do.	728	121.8	do.	C,W	S	Muerto mill.
* 27-101	Viggo Gruy Ranch	--	Old	400±	4	do.	755	--	--	S,E	D,S	Hdqrs. well.
102	do.	Ramido Molina	1964	580	4	do.	810	138.0	July 16, 1970	C,W	S	Mellones mill.
* 201	do.	--	Old	350±	4	do.	702	--	--	C,W	S	Javelina mill. 10 jts. col. pipe.
301	do.	--	Old	350±	4	do.	704	140.7	July 15, 1970	C,W	S	Nuevo mill.
* 401	R.C. Perez	--	1954	100	4 1/2	do.	691	62.0	Mar. 23, 1970	C,W	D,S	--
402	Consuela Perez	--	1956	90	4 1/2	do.	--	--	--	C,W	D,S	--
* 403	Viggo Gruy Ranch	--	Very old	400±	4	do.	765	186.4	July 16, 1970	C,W	S	Pita mill.
501	Josephine B. Musgrave	--	Old	--	4 1/2	--	501	--	--	C,W	S	Originally drilled as oil test. Plugged back.
502	Viggo Gruy Ranch	--	Old	250±	4	Tct	670	75.7	July 15, 1970	C,W	S	Chapa mill.
503	do.	--	Old	350±	5	do.	700	76.8	July 16, 1970	C,W	S	Piedra mill.
* 504	Argo Oil Corp.	Argo Oil Corp.	--	1,317	--	do.	--	--	--	--	D	Equipped with 1 HP submergible pump in 1960. Perforated casing from 1,307 to 1,317 ft.
* 701	J.H. Dinn	--	Old	300±	--	do.	765	154.5	Apr. 9, 1970	C,W	S	Chapote mill.
702	do.	Oil Company	Old	--	--	Tct?	710	19.0	Apr. 10, 1970	C,W	S	Originally drilled to 1,700 ft and later plugged back. Formerly flowed. Temperature 93°F (34°C).
703	do.	--	Old	300±	--	Tct	--	--	--	C,W	S	Conejo mill.
* 801	Josephine B. Musgrave	--	Old	160	4 1/2	Tg	659	115.5	Mar. 19, 1970	C,W	S	North mill.
802	do.	--	--	--	--	--	637	52.1	do.	C,W	S	Originally drilled as oil test, later converted to water well. Strong supply reported.
* 901	do.	--	Old	--	--	Tct?	660	15.8	do.	C,W	S	Charlie mill, formerly flowed.
902	do.	Dillard Wied	--	443	4 1/2	Tct	665	84	--	C,W	S	10 jts. 2-in. col. pipe.

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COMPLETED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTITUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SURFACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
JB-84-27-903	Josephine B. Musgrave	Dillard Wied	1969	416	--	Tct	--	--	--	N	N	Reported dry from 0 to 416 ft.
904	Driscoll Estate	--	Old	400±	4 1/2	do.	--	--	--	C, W	S	Savage mill.
905	do.	--	Old	300±	4 1/2	do.	--	--	--	C, W	S	--
* 28-201	Joe Garza	--O'Neal	1958	156	5 1/2	Tg	503	122.7	Mar. 24, 1970	C, W	S	--
301	Francisco Vaello	Cliff Whitman	Old	420±	3 7/8	do.	--	180±	do.	C, E, 3/4	S	--
302	--Vela	--	Old	140±	4	do.	465	116.0	Sept. 16, 1970	C, W	S	--
* 501	Joe Garza	Dillard Wied	1968	186	5 1/2	do.	521	95.1	Mar. 24, 1970	C, W	D, S	1/
* 701	Continental Oil Company	Continental Oil Company	Old	1,850	7	Tct	--	+	--	Flows	Ind	Estimated flow 10 gpm.
801	Driscoll Estate	E.R. David	1925±	--	2	--	--	+	--	Flows	Ind	Drilled as oil test and later converted to water well. Water reported brackish. Temp. 86°F (30°C).
802	do.	do.	Old	208	7	Tg	528	205	--	C, W	S	Reported weak supply.
* 803	Continental Oil Co.	Continental Oil Co.	--	2,125	--	Tct	--	+	--	Flows	N	Drilled as oil test. Plugged and gun perforated from 2,115 to 2,125 ft. Reported weak supply.
901	Driscoll Estate	E.R. David	Old	300	7?	Tg	467	143.0	Apr. 13, 1970	C, W	S	Curva mill.
902	do.	do.	Old	300±	--	do.	459	--	--	C, W	S	Tresquillas mill.
* 29-101	E. Carrillo, Jr.	--Morris	1965	110	4 1/2	do.	420	71.7	Sept. 16, 1970	C, W	D, S	--
* 201	City of Benavides, Well 4	Gus Delaney	1938	328	8	do.	380±	--	--	T, E, 20	P	Measured discharge 270 gpm. Pump set at 230 ft.
203	Santos Hinojosa	--	Old	150±	4	do.	425	58.1	Sept. 16, 1970	C, W	S	--
* 302	City of Benavides, Old well 2	Layne Texas Company	1943	615	8 5/8, 12 3/4	do.	379	93.9 62.7	Mar. 25, 1964 Mar. 18, 1970	N	N	2/ Perforated casing: 209-244; 259-275; 327-356; 450-462; 483-518 ft. 1/
* 303	City of Benavides, Well 3	Carl Vickers	1952	520	12 3/4	do.	379	--	--	T, E, 20	P	Perforated casing from 420 to 520 ft.
305	Mrs. Tom Cavanaugh	--	Old	80	48	do.	--	50.4 49.1	Sept. 27, 1933 Feb. 25, 1967	--	S	Formerly used as observation well. 2/
306	S. Ruiz	--	--	40	36	do.	--	41.4 34.4	Oct. 26, 1933 Mar. 20, 1969	B, H	D, S	Observation well. 2/

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COMPLETED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTITUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SURFACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
JB-84-29-307	Ramon Peña	--	--	48	6 5/8	Tg	--	45.0 34.8	Sept. 20, 1933 Feb. 18, 1954	N	N	Formerly used as observation well. 2/
308	do.	--	--	48	48	do.	--	45.7 35.5	Sept. 20, 1933 Feb. 13, 1947	N	N	Do.
309	City of Benavides, Well 1	Flournoy Drilling Co.	1966	618	10 3/4, 16	do.	--	166.3	Oct. 22, 1970	S,E,60	P	Perforated casing from 332-442; 462-527; and 552-607 ft. Pump set at 310 ft Sept. 23, 1969.
* 310	City of Benavides, Well 2	do.	1966	600	10 3/4	do.	--	165.3	do.	S,E,50	P	Perforated casing from 322-422; 442-507; and 532-596 ft. Pump set at 300 ft Sept. 23, 1969.
501	M. Gomez	--	--	132	5 3/16	do.	--	95.2 91.8	Sept. 27, 1933 Mar. 22, 1962	C,W	D,S	Formerly used as observation well. 2/
502	Floyd Emerson	--	--	140	5 3/16	do.	426	93.3 113.9	Sept. 9, 1933 Mar. 18, 1970	C,W	D,S	Observation well. 2/
* 902	Atlee Parr	Flournoy Drilling Co.	1967	500±	--	do.	385	--	--	T,G,200	Irr	Measured discharge 820 gpm.
903	do.	do.	1967	500±	--	do.	385	--	--	T,G,40	Irr	Measured discharge 990 gpm. Temp. 81°F (27°C).
904	do.	--	--	--	12	--	--	116.5	Nov. 2, 1969	T,G	Irr	--
905	M.M. Miller & Sons	--	Old	118	4	Tg	386	95.2	Oct. 30, 1969	C,W	D,S	Temp. 79°F (26°C).
906	do.	--	--	--	4	do.	363	--	--	S,E,3/4	S	Temp. 81°F (27°C).
907	do.	Hiawatha Oil Company	1967	542	9 7/8	do.	383	--	--	S,E,3/4	S	Drilled as oil test. Plugged 542-572 for water well. Pump set at 168 ft. Temp. 82°F (28°C).
30-101	Ismael Garcia	--	--	80±	48	do.	--	44.9 55.0	Sept. 28, 1933 Feb. 6, 1950	N	N	Formerly used as observation well. 2/
* 102	Anselmo Elizondo	Buck Page & Company	1966	1,155	5 1/2	To	397	227.5	Sept. 29, 1970	S,E,1	D,S	5 1/2-in. casing from 0 to 1,000 ft; perforated from 1,000 to 1,155 ft. 1/
201	Encarnacion Peña	--Hinojosa	1932	130	8	Tg	336±	74.6 75.8	Sept. 28, 1933 Feb. 14, 1950	N	N	Formerly used as observation well. 2/
* 202	Mateo Lopez	--	1922	100	6	do.	--	63.0 66.8	May 15, 1931 Feb. 18, 1954	S,E,1/4	D,S	Do.
203	--Garcia	--	--	240	--	do.	337±	136.0	Jan. 15, 1970	C,E,1	S	--

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COM-PLET-ED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTI-TUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SUR-FACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
JB-84-30-301	Mrs. Veronica Cuellar	--	Old	70	36	Tg	285±	40.5 39.2	May 25, 1931 Mar. 18, 1970	N	N	Observation well. 2/
401	M. Bazan Estate	Domingo Ramirez	1928	107	8	do.	--	53.0 29.7	May 28, 1931 Sept. 28, 1933	C,W	D,S	Formerly used as observation well.
* 501	--Saenz	--	Old	90	60	do.	300±	38.1 44.6	Oct. 26, 1933 Mar. 18, 1970	C,W	D,S	Observation well. 2/
601	Fred Quinn	Raul Barrera	1968±	300	4 1/2	do.	269	--	--	S,E,3/4	D,S	--
* 602	Raul Barrera	do.	1968	360	4 1/2	do.	300	136.9	Sept. 29, 1970	C,W	D,S	--
603	E.C. Cude	Dillard Wied	1967	328	4 1/2	do.	287	124.2	Jan. 17, 1970	S,E,1/2	D,S	4 1/2-in. casing from 0 to 328 ft. Packer set at 278 ft.
604	do.	--	--	--	8	--	--	--	--	T,G	Irr	--
701	Atlee Parr	--	Old	103?	4	Tg	337	91.3	Nov. 1, 1969	C,W	S	--
* 702	do.	--	--	121	6	do.	318	68.5	do.	C,W	S	--
* 901	Mrs. Luther Reese	Disbro Water Well Service	1964	340	10 3/4	do.	--	134.9	Sept. 21, 1969	T,G	Irr	Measured discharge 450 gpm. 1/
34-301	Houston Oil Company	--	--	306	6	Tct?	--	--	--	N	N	Reported water salty.
* 302	J.H. Dinn	Oil Company	Old	300±	4 1/2	Tct	--	53.9	Apr. 9, 1970	C,W	S	Hilburn mill.
35-101	Roach Estate	--	Old	90	--	Tg	684	67.2	Apr. 8, 1970	C,W	S	Dug well with caliche walls.
102	J.H. Dinn	--	Old	300±	4 1/2	Tct	722	104.0	Apr. 9, 1970	C,W	S	Lauderbach well.
* 103	do.	--	Old	101	--	Tg	647±	60	1963	S,E,3/4	D,S	Hdqrs. well. Pump set at 94 ft.
* 201	Josephine B. Musgrave	Dillard Wied	1965	185	--	do.	--	--	--	C,W	D,S	Hdqrs. well.
301	do.	--	--	225±	4,10	do.	555	71.4	Mar. 20, 1970	N	S	Turkey mill.
* 302	Josephine B. Musgrave	Oil Company	Old	1,300±	10	Tct	585	+	do.	Flows	S	Estimated flow 8 gpm. Drilled as oil test and converted to water well. "Artesian #4."
303	do.	do.	Old	1,500±	--	--	583	+	do.	Flows	S	Oil test converted to water well. 4-in. discharge. Estimated discharge 10 to 15 gpm. Temperature 99°F (37°C). "Artesian #3."
304	do.	--	Old	--	--	--	--	70.3	Mar. 18, 1970	C,W	--	Working on well when visited Mar. 18, 1970.

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COM-PLET-ED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTI-TUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SUR-FACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
* JB-84-35-401	Juan Benavides	--	1954	946	--	Tct	690	28.5	Mar. 25, 1970	S,E	D,S	Hdqrs. well.
402	do.	J. Long	1930±	360	--	do.	704	96.9	Apr. 7, 1970	C,W	S	North mill.
501	Charlie Roddy, Jr.	--	Old	100	--	Tg	590	76	--	S,E,1/3	D,S	--
* 502	Heberto Benavides	R. Molina	1969	403	7	do.	--	65	1969	S,E,1	D,S	Hdqrs. well. Perforated casing 110-120 ft; 170-175 ft; 260-270 ft.
503	do.	Dillard Wied	1969	1,200	--	Tct	--	--	--	N	N	Reported supply not adequate for windmill. 1/
504	do.	--	--	260	5 1/2	do.	646	87.5	Mar. 25, 1970	C,W	S	--
* 505	Juan Benavides	Oil Company	1949	960±	--	do.	632	+	do.	Flows	S	Formerly supplied water for oil well drilling rigs. Measured flow 9 gpm.
506	do.	R. Molina	--	430	--	do.	673	--	--	C,W	S	Rogers mill.
* 507	do.	--Ramirez	1927	260	--	Tg	622	--	--	- C,W	S	--
601	Dan Meany Ranch	Patterson Drilling Co.	1956	507	4 1/2	To	583	205.7	Mar. 19, 1970	C,W	S	Janero mill.
* 602	do.	--	--	225±	7	Tg	--	100	--	C,E,1/2	D,S	Melones well.
603	Josephine B. Musgrave	--	Old	550	4 1/2	To	--	--	--	C,W	S	Sulphur well.
801	Hermando Benavides	R. Molina	1967	430	4 1/2	To	--	--	--	C,W	S	Palo Blanco mill.
802	do.	E.R. David	Old	360	4 1/2	do.	628	--	--	C,W	S	Agua Negra mill.
* 901	Dan Meany Ranch	Fritz Volmering	1945±	460	7	Tct	561	177.9	Mar. 19, 1970	C,W	S	Pump set at 200 ft.
902	Herberto Benavides	Dillard Wied	1969	344	4	To	635	185	Sept. 1969	C,W	S	Guiterrez mill.
36-101	Oscar Wyatt	--	--	234	7	Tg	545	214.5	Dec. 18, 1969	C,W	S	--
102	Driscoll Estate	E.R. David	Old	185	--	do.	545	175.1	Apr. 14, 1970	C,W	S	Haner mill. Reported weak supply.
103	do.	do.	Old	500	--	To	604	290±	do.	C,W	S	Longoria mill.
* 104	do.	--	Old	--	4 1/2	--	534	186±	do.	C,W	S	Huerta mill.
201	M.C. Haner	--	--	185	5	Tg	495	164.7	Dec. 18, 1969	C,W	S	--
202	Driscoll Estate	--	Old	300±	7	do.	510	186.1	Apr. 14, 1970	C,W	S	Palo Blanco mill.
* 301	do.	E.R. David	Old	300±	7	do.	520	192.4	do.	C,W	S	Cuatros mill.

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COM-PLET-ED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTI-TUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SUR-FACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
JB-84-36-401	Oscar Wyatt	Dillard Wied	1968	255	5	Tg	514	181	Sept. 7, 1968	S,E,1/3	S	Slotted casing from 187 to 255 ft. Pump set at 197 ft. 1/
402	do.	--	--	213	5	do.	512	155	July 27, 1968	S,E,1/3	S	Pump set at 207 ft.
403	do.	Dillard Wied	1968	540	5 1/2	To	527	113	July 22, 1968	C,W	S	Slotted casing from 504 to 540 ft. Pump set at 210 ft. 1/
* 501	Wright Brothers Materials Company	Vickers Water Well Service	1964	890±	8, 12	do.	--	--	--	T,E,125	Ind	Reported discharge 710 gpm. Pump set at 200 ft.
502	Oscar Wyatt	--	Old	228	4 1/2	Tg	501	173	1969	S,E,1/3	S	Measured discharge at 5.3 gpm. Pump set at 189 ft. Temp. 79°F (26°C).
* 601	City of Realitos, Well 1	--	--	210	10	do.	444	121.7	Sept. 23, 1969	T,E,25	P	Reported 18 ft drawdown after pumping 30 hrs. at 270 gpm. Pump set at 180 ft.
602	Bob Victor	--	1915±	114±	5?	do.	422	112.0	Nov. 5, 1969	S,E,3/4	S	Measured discharge 15 gpm.
* 603	D.P. McBride	--	1920±	145	5?	do.	445	128.0	do.	C,W	S	--
604	Emede Guerra	--	Old	137	6	do.	435	109.7	do.	C,W	S	Pump set at 128 ft.
701	Oscar Wyatt	--	--	192±	5	do.	531	174.8	Dec. 17, 1969	C,W	S	Temp. 79°F (26°C).
702	do.	--	--	429	5	To	536	206.3	do.	S,E,1/3	S	Pump set at 221 ft. Temp. 82°F (28°C).
703	--	--	1967?	195±	5	Tg	510	181.1	do.	C,W	S	Temp. 79°F (26°C).
801	--	--	--	199±	5	do.	510	181.9	Dec. 18, 1969	C,E,1/2	S	--
802	Charles S. Williams Estate	--	1850±	75	72	do.	477	67.0	do.	C,W, S,E,1/3	S	Dug well. Pump set at 69 ft.
* 901	Leroy Denman	--	Old	70	72	do.	443	57.7 58.7	Oct. 30, 1933 Mar. 19, 1970	C,W	S	Observation well. 2/
902	Southwestern Fruit Co.	Buck Page & Company	1968	286	16	do.	--	111.2	Oct. 6, 1969	T,G,210	Irr	Perforated casing from 172 to 280 ft. Reported discharge 825 gpm.
903	Douglas Risinger	--Molina	1967	290	16	do.	425±	100.5	do.	T,G	Irr	Perforated casing from 230 to 290 ft. Reported discharge 1,200 gpm. Temp. 81°F (27°C).
904	P.S. Wright	Vickers Water Well Service	1967	345	12 3/4	do.	423	104.6	Oct. 11, 1969	T,G	Irr	Perforated casing from 186 to 345 ft. Reported discharge 1,000 gpm. Pump set at 180 ft.

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COM-PLET-ED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTI-TUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SURFACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
JB-84-36-905	Douglas Risinger	Dillard Wied	1967	225	5	Tg	427	113	Mar. 8, 1967	S,E,3/4	S	Perforated casing from 192 to 225 ft. 1/
* 37-101	M.M. Miller & Sons	--	--	156	4	do.	449	114.7	Oct. 31, 1969	C,W	S	--
102	do.	--	--	--	4	do.	425	--	--	C,W	S	Temp. 79°F (26°C).
* 103	do.	--	--	400±	10 3/4	do.	426	117.4	Oct. 30, 1969	C,W	S	--
104	Gus Minges	--	1928	154	4 1/2	do.	418	93.0 100.0	Feb. 22, 1933 Nov. 4, 1969	C,W	S	Formerly used as observation well. 2/
* 201	M.M. Miller & Sons	--	1936±	112	4	do.	379	64.6	Oct. 30, 1969	C,W	S	--
* 202	do.	Longhorn Drilling Co.	1930±	1,600±	--	To	374	60.1	do.	C,W	S	--
* 203	do.	--	--	2,300	7	Tct	371	+	--	Flows	S	Measured flow 90± gpm. Drilled as oil test; converted to water well.
204	do.	--	--	102	4	Tg	369	67.5	Oct. 30, 1969	C,W	S	Temp. 79°F (26°C).
205	do.	--	--	102±	4	--	379	69.4	do.	C,W	S	Temp. 77°F (25°C).
206	Leroy Denman	--	1935±	100±	--	Tg	369	57.4	Nov. 4, 1969	C,W	S	Temp. 77°F (25°C).
207	Atlantic Richfield Co.	Hiawatha Oil Co.	1951	350	4	do.	350	--	--	J,A	Ind	Perforated casing from 334 to 350 ft.
* 301	Atlee Parr	do.	--	282±	7	do.	378	75.9 88.3	Feb. 5, 1948 Mar. 18, 1970	N	N	Observation well. 2/
302	Refugio Garcia	--	--	90?	4	do.	359	79.6	Oct. 29, 1969	C,W	S	--
303	Atlee Parr	--	--	269	6	do.	363	107.5	Nov. 1, 1969	C,W	S	Temp. 78°F (26°C).
304	do.	--	--	138	6	do.	343	80.2	do.	C,W	S	Temp. 75°F (24°C).
305	do.	--	1963±	233	6	do.	340	80.0	do.	C,W	S	Temp. 77°F (25°C).
306	do.	--	--	200	6	do.	352	82.8	do.	C,W	S	Temp. 78°F (26°C).
* 401	Leroy Denman	--	1916±	150±	4?	do.	--	81.6	Nov. 4, 1969	C,W	S	--
* 402	do.	--	1903±	2,300±	7?	Tct	396	+	do.	Flows	S	Measured flow 25 gpm.
403	do.	--	1905	111	5?	Tg	403	91.5	do.	C,W	S	Venado mill.
404	do.	--	1932	126±	4	do.	427	84.0	do.	C,W	S	Chopete mill.
405	do.	--	1900±	93	72	do.	379	52.9	do.	C,W	S	Louis mill.

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COMPLETED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTITUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SURFACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
JB-84-37-501	Dr. George Estes	Adcock Supply Company	1960	450	10	Tg	375	50	--	T,G,100	Irr	Perforated casing from 200 to 450 ft. Reported drawdown 50 ft after pumping for 48 hrs. at 1,200 gpm. Pump set at 250 ft.
502	do.	Disbro Water Well Service	1960	270	6?	do.	375	73.6	Nov. 5, 1969	T,E	Irr	Reported drawdown 40 ft after pumping 48 hrs. at 500 gpm.
503	Leroy Denman	--	1935±	140	6	do.	378	68.5	Nov. 4, 1969	C,W	S	--
504	Dr. George Estes	--	--	103	5	do.	384	82.0	Nov. 5, 1969	C,W	S	Temp. 79°F (26°C).
505	Leroy Denman	--	1916±	150±	4	do.	391	78.9	Nov. 4, 1969	C,W	S	--
* 601	M.M. Miller & Sons	--	Old	120±	--	do.	335	40.2	Oct. 30, 1969	C,W	D	--
602	do.	M.M. Miller & Sons	1941	827	7	do.	340	--	--	S,E	D	Perforated casing from 348 to 353 ft and 355-360 ft.
603	Pedro H. Saenz	--	1906±	125	5	do.	352	65.3	Nov. 5, 1969	S,E,1/2	D,S	--
* 701	W.O. Skidmore	Mopac Drilling Co.	1965	301	16	do.	421	103.6	Oct. 6, 1969	T,G	Irr	Perforated casing from 190 to 300 ft. Measured discharge 1,100 gpm.
702	P.S. Wright & Henry Berry	Vickers Water Well Service	1965	347	12 3/4	do.	413	--	--	T,G	Irr	Perforated casing from 180 to 347 ft. Reported discharge 1,000 gpm.
703	H.O. Miller	--	--	111	5	do.	434	86.5	Nov. 6, 1969	C,W	S	Temp. 75°F (24°C).
* 704	William Mann	--	Old	130	6	do.	404	60	1969	S,E,3/4	D,S	--
* 705	R.G. Garcia	--	--	120	5?	do.	407	75.9	Nov. 6, 1969	C,W	S	--
706	do.	--	Old	105?	5	do.	415	81.9	do.	C,W	S	Temp. 77°F (25°C).
707	do.	--	--	83	5?	do.	382	53.3	do.	C,W	S	Temp. 79°F (26°C).
801	Dr. George Estes	Koch Oil Company	1960?	450	10	do.	366	60	--	T,G	Irr	Perforated casing from 200 to 450 ft. Reported drawdown 60 ft after pumping 48 hrs. at 1,200 gpm.
802	E. Ramirez	--	1960	105	6	do.	404	70.7	Nov. 6, 1969	C,W	D	Temp. 79°F (26°C).
* 901	G.R. Martinez	--	Old	99	5	do.	328	49.2 47.1	Feb. 6, 1948 Mar. 17, 1970	C,W C,W	S S	Observation well. 2/
902	Mrs. H.P. Salinas	--	Old	90	7	do.	345	45.4	Nov. 6, 1969	C,W	D	Reported water salty. Temp. 75°F (24°C).

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COM-PLET-ED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTI-TUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SURFACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
JB-84-37-903	H. Ramirez	--	Old	93	6	Tg	329	55.3	Nov. 21, 1969	C,W	D,S	Open hole from 0 to 93 ft. Temp. 77°F (25°C).
904	Charles Cruz	--	1935	86	5	do.	336	60.2	do.	C,W	D,S	Open hole from 60 to 86 ft. Temp. 77°F (25°C).
38-101	Atlee Parr	--	--	152	6	do.	328	82.7	Nov. 1, 1969	C,W	S	--
102	do.	--	--	142	4	do.	323	87.0	do.	C,W	S	--
* 103	do.	--	--	155	4	do.	322	102.1	do.	C,W	S	--
104	Atlee Parr	--	--	150	5?	do.	332	87.3	Nov. 1, 1969	C,W	S	Temp. 79°F (26°C).
105	do.	--	--	124	5	do.	343	93.4	do.	C,W	S	--
201	Y. Valadez	--	1953	127	6	do.	287	60.9	Dec. 12, 1969	C,W	S	--
202	A.B. Canales	--	--	136	5	do.	280	63.2	do.	C,W	S	--
* 301	I. Garcia	--	Old	300	4	do.	252	73±	1969	C,W,E,3/4	S	Pump set at 84 ft.
* 302	Madro Rios	--	Old	100	4	do.	242	24.1	Dec. 13, 1969	C,E,3/4	D,S	--
401	Atlee Parr	--	--	158	5?	do.	294	67.0	Nov. 1, 1969	C,W	S	Temp. 77°F (25°C).
* 402	do.	--	Old	150	6	do.	315	68.5	do.	C,W	S	--
403	do.	--	--	130	6	do.	327	74.4	do.	C,W	S	Temp. 77°F (25°C).
501	Francisca Chapa	R. Barrera	1949	285	4	do.	283	112.6	Dec. 12, 1969	S,E,3/4	D,S	Reported strong supply.
502	Mrs. F. Salinas	--	Old	100	6	do.	278	65.8	do.	C,W	S	Reported water salty.
601	Eluterio Saenz	--	1916	--	4	do.	253	77.8 83.6	May 26, 1931 July 13, 1960	N	N	Originally drilled to 125, but partially filled in 1969. Formerly used as observation well. 2/
* 602	Guadalupe Vera	John Rader	1966±	105?	4	do.	255	71.1	Dec. 12, 1969	S,E,1/2	D	--
603	Mariana Saenz	Raul Barrera	1955±	350	4	do.	256	124.6	Dec. 13, 1969	C,W	D	--
604	Mateo Rios	do.	1962	257	4	do.	257	123.9	do.	C,W	D,S	Temp. 79°F (26°C).
701	J. Carrilo	Santiago Barrera	1927	93	5 3/4	do.	295	49.5 37.0	May 29, 1931 May 17, 1970	N	N	Observation well. 2/
* 702	C.S. Hinojosa, Jr.	Guillermo Perez	1931	114±	6	do.	297	44.3 37.2	May 29, 1931 Dec. 10, 1969	C,E	S	Formerly used as observation well. 2/
* 703	Concepcion Cumminity Well 1	Flournoy Drlg. Co.	1966	350	10 3/4	do.	302	78.5	Sept. 23, 1969	T,E,40	P	Perforated casing from 267 to 370 ft. Measured discharge 370 gpm. Temp. 81°F (27°C). 3/

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COMPLETED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTITUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SURFACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
JB-84-38-801	Guadalupe Silva	--	--	81	6	Tg	--	60.5 50.3	Feb. 22, 1933 Mar. 7, 1945	N	N	Filled. Formerly used as observation well. 2/
* 802	C.G. Glasscock	--	1937	350±	5	do.	272	107.6	Nov. 24, 1969	C, E, 1	D	--
803	do.	--	--	350?	8	do.	270	--	--	T, E, 15	Irr	4-in. disch. pipe. Estimated discharge 250 gpm.
804	do.	R. Barrera	1945	148	4	do.	266	59.6	Dec. 10, 1969	C, W	S	Slotted casing from 128 to 148 ft.
805	do.	--	1937±	155	6	do.	252	68.4	do.	C, W	S	Tecolote mill.
806	do.	--	1937±	150±	4	do.	263	95.5	do.	C, W	S	Pila Blanca mill.
807	do.	Oil Company	1941	227	4 3/4	do.	261	98.7	do.	C, W	S	Reported strong supply.
808	E. Manlado	--	1900±	73	5	do.	267	40.8	Dec. 11, 1969	C, W	S	Temp. 77°F (25°C).
809	Manuel S. Saenz	--	1914	75	5	do.	277	52.1	do.	C, W	S	Temp. 77°F (25°C).
901	Mrs. Brigeda Moreno	Disbro Water Well Service	1963	264	4 1/2	do.	240	106.4	Dec. 13, 1969	C, W	D, S	1/
* 902	Hilario Saenz Estate	--	1927	310?	7	do.	253	58.4 68.6	May 26, 1931 Mar. 17, 1970	C, W	D, S	Observation well. 2/
903	Santos Canales	Fermin Sauceda	--	268?	4	do.	244	46.6 57.0	Jan. 7, 1933 Mar. 17, 1970	C, W	D	Observation well. 2/
904	Roosevelt Martinez	Richardson Water Well Service	1964	517	10	do.	253	137.2	Dec. 13, 1969	T, E, 40	Irr	Estimated discharge 300 gpm; 6-in. disch. pipe.
905	C.G. Glasscock	R. Barrera	1951	280	4	do.	261	99.0	Dec. 10, 1969	C, W	S	20 ft. perforated casing at bottom.
906	Ernesto Vera	Disbro Water Well Service	1967	273	5	do.	--	--	--	S, E, 3/4	D	Reported salty water at 66 ft. 1/
* 907	Saturnino Vera	do.	1961	257	4	do.	242	111.2	Dec. 11, 1969	S, E, 3/4	D, S	Estimated discharge 12 gpm.
* 908	Gregoria V. Rios	R. Barrera	1961	197	5?	do.	238	109.0	Dec. 12, 1969	C, E, 1/2	D	Reported not used for drinking.
909	Thomas Gonzales	Buck Page & Co.	1966	281	4 1/2	do.	246	107.5	do.	S, E, 1/2	D	Slotted casing from 241 to 281 ft. 1/
910	Augustine Cantu	--	1875±	80	5	do.	241	53.2	do.	C, W	S	--
43-101	Adalberto Trevino Est.	Valor Oil Company	1959	3,190	--	--	656	--	--	--	--	Oil test. 1/
* 44-101	Oscar Wyatt	--	1913±	1,600	4	Tct	496	+	Dec. 17, 1969	Flows	D, S	Measured flow 15 gpm June 12, 1931; 8 gpm Dec. 17, 1969.

See footnotes at end of table.

Table 2.--Records of Wells and Test Holes in Galveston County--Countinued

WELL	OWNER	DRILLER	DATE COM-PLET-ED	DEPTH OF WELL (FT)	CASING		ALTI-TUDE OF LAND SURFACE (FT)	WATER LEVEL		METHOD OF LIFT	USE OF WATER	REMARKS
					DIAM-ETER (IN)	DEPTH (FT)		ABOVE (+) OR BELOW LAND SUR-FACE DATUM (FT)	DATE OF MEASUREMENT			
* JB-84-44-102	Dillard Wied	Dillard Wied	1962	604	3 1/2, 5 1/2	To	550±	50	1962	S,E,1	D	Perforated casing from 420 to 440 and 560 to 588 ft. Pump set at 210 ft.
103	do.	do.	1951	232	4	Tg	538	197.3	Dec. 15, 1969	C,E,1/2	S	Perforated casing from 212 to 232 ft. Pump set at 210 ft.
* 104	Oscar Wyatt	Lone Star Producing Co.	1960	1,772	4 1/2, 10 3/4	Tct	509	+	Dec. 17, 1969	Flows	S	Originally drilled to 1,800 ft. Plugged back to 1,772 ft. Perforated casing from 1,730 to 1,772 ft. Measured flow 12 gpm.
105	do.	--	--	557	4	To?	535	175	1968	S,E,1/2	D,S	Reported water unfit for drinking.
106	Tom Arnold	La Gloria Corporation	--	1,680	5	Tct	500	+	Dec. 18, 1969	Flows	S	Drilled as oil test and converted to water well by plugging back to 1,680 ft. Casing perforated from 1,640 to 1,680 ft. Water level reported 37 ft above G.L. in 1968.
107	Perry Wied	Dillard Wied	1969	450	5 1/2	To	515±	--	--	S,E,1 1/2	D,S	Perforated casing from 350 to 450 ft. Reported discharge 12 gpm. Pump set at 273 ft.
201	Alberta Garcia	--	--	150±	5	Tg	440	126	1969	C,E,3/4	D,S	Pump set at 147 ft.
301	Douglas Risinger	--Johnson	1964	240	16	do.	--	--	--	T,G	Irr	60 ft perforated casing at bottom. Pump set at 150 ft. Reported discharge 1,200 gpm.
302	do.	--Molina	1967	290	16	do.	425	107.4	Oct. 6, 1969	T,G	Irr	Perforated casing from 230 to 290 ft. Pump set at 150 ft. Reported discharge 1,200 gpm.
601	A.C. Jones	T.M. Coleman	1914	102?	6	do.	421	36.6 46.9	May 30, 1931 Mar. 20, 1969	C,W	S	Observation well. 2/
* 45-101	J. Mann	--	--	90?	5 3/16?	do.	415	75.9 85.5	Sept. 28, 1933 Feb. 25, 1967	N	N	Filled and abandoned. Formerly used as observation well. 2/
* 102	San Antonio Loan and Trust Company	--	--	100±	--	do.	418	83.8 84.2	Sept. 28, 1933 July 16, 1937	N	N	Dug well, partially filled. Formerly used as observation well. 2/
* 103	Cliff V. Harborth	Mopac Drilling Company	1967	370	12	do.	428	--	--	T,E,75	Irr	Perforated casing from 200 to 370 ft. Pump set at 200 ft. Measured discharge 875 gpm.

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COM-PLET-ED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTI-TUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SUR-FACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
* JB-84-45-104	R.G. Garcia	--	1946±	150±	6	Tg	305	--	--	S, E, 3/4	D	Reported supplies water for 2 houses.
105	do.	--	1927±	--	--	Tg?	378	57.9	Nov. 6, 1969	C, W	S	Temp. 75°F (24°C).
106	Hofstetter Bros.	Dillard Wied	1968	250	4 1/2	Tg	390	77.2	Nov. 18, 1969	S, E, 1/3	S	Perforated casing from 215 to 250 ft. Temp. 79°F (26 1/2°C). 1/
201	R.G. Garcia	--	Old	83±	5?	do.	380	58.9	Nov. 19, 1969	C, W	S	Temp. 77°F (25°C).
* 202	Octavio Guerra	--	1962	120	5	do.	347	31.0	Nov. 20, 1969	J, E, 1/2	D, S	--
* 301	Trinity Gas Corp. Well 3	Fritz Vollmer	1944	1,527	9 5/8	To	297	+ 3.8 + 3.9 + 4.1	Feb. 25, 1967 Feb. 20, 1968 Mar. 20, 1969	Flows	S	Perforated casing from 1,340 to 1,400 ft. Observation well. Measured flow 40 gpm. 3/
302	Trinity Gas Corp. Well 2	do.	1944	1,522	7 7/8 6 3/4	do.	305	--	--	--	N	Reported plugged in in 1969. Formerly flowed. Casing perforated from 1,325 to 1,385 ft.
303	Trinity Gas Corp. Well 1	Trinity Gas Corporation	1944	1,520	7 7/8 6 3/4	do.	304	--	--	--	N	Reported plugged in in 1968. Formerly flowed. Casing perforated from 1,350 to 1,400 ft.
* 304	Abraham Garcia	--	Old	80±	4	Tg	330	45.7 23.8	Aug. 22, 1933 Mar. 20, 1969	C, W	S	Observation well. 2/
* 305	Gilberto Ramirez	--	1931±	71±	6	do.	353	48.3 39.7	June 3, 1931 Nov. 6, 1969	J, E, 3/4	D	Observation well. 2/
* 306	Trinity Gas Corp., Well 4	Richardson Water Well Drilling Co.	1968	425	7, 4	do.	304	--	--	J, G	Ind	Perforated casing from 274 to 425 ft. Pump set at 160 ft. Measured discharge 45 gpm. 1/
307	Mrs. H.B. Salinas	--	Old	115	6	do.	330	52.0 21.8	June 3, 1931 Nov. 19, 1969	C, W	D	Formerly used as observation well. 2/
* 308	Duval County School Dist. #5 Ramirez School	--	Old	150	6	do.	325	18.1	Nov. 19, 1969	S, E, 3/4	P	Supplies water for school and 3 families.
309	Adolph Garcia	--	--	62	5	do.	344	31.0	do.	C, W	S	Temp. 77°F (25°C).
310	C. Palacios	--	--	145	5	do.	326	52.1	Nov. 21, 1969	C, W	S	--

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COM-PLET-ED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTI-TUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SUR-FACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
* JB-84-45-401	Gilberto Villa	H.&S. Water Well Service	1967	409	12	Tg	414	97.7	Apr. 14, 1967	T,G	Irr	Perforated casing from 245 to 260, 270 to 290, 296 to 339, and 345 to 407 ft. Pump set at 408 ft. Estimated discharge 1,000 gpm. 1/
402	Abraham Guerra	Pontiac Refining Co.	1953	500	10 3/4	do.	406	84.4	Oct. 7, 1969	T,G,100	Irr	Originally drilled as oil test to 5,350 ft. Plugged back to 500 ft in 1967. Pump set at 240 ft. Reported discharge 650 gpm.
403	Benito Villarreal	--	--	168	4	do.	375	62.7	Nov. 18, 1969	C,W	S	Temp. 77°F (25°C).
404	Ysidoro Almaraz	--	--	70	6	do.	383	30.7	do.	C,W	S	--
* 501	Mills Bennett	--	Old	67	--	do.	344	28.5 31.7	May 29, 1931 Mar. 19, 1970	C,W	S	Observation well. 2/
502	Carl Hofstetter	H.&S. Water Well Service	1965	422	12	do.	365	66.7	Oct. 7, 1969	T,G	Irr	Slotted casing from 190 to 420 ft. Pump set at 240 ft. Reported discharge 1,250 gpm.
503	W.H. Armstrong	do.	1966	374	12 3/4	do.	345	59.1	Oct. 8, 1969	T,G	Irr	Slotted casing from 240 to 370 ft. 1/
* 504	Charles Goates	--	Old	123	4	do.	369	30.3	Nov. 18, 1969	J,E,1/2	D	--
505	Fred Bowman	--	--	130±	6	do.	340	61.4	Nov. 19, 1969	--	S	--
601	A. Ramirez	--	--	150±	6	do.	330	31.5	Nov. 20, 1969	C,W	S	Temp. 77°F (25°C).
602	Fred Bowman	--	--	134	5?	do.	352	50.8	do.	C,W	D,S	--
603	Trinity Gas Corp.	--	--	155	4	do.	327	59.6 57.3 57.9 59.8	Feb. 14, 1957 Mar. 4, 1958 July 13, 1960 Mar. 15, 1961	N	N	Formerly used as observation well.
604	O. Garcia	--	1958	250	4	do.	318	86.0	Nov. 21, 1969	C,W	D,S	--
* 701	Leroy Denman	T.M. Coleman	1914	117	6	do.	374	36.5 34.5 30.6 31.6	May 30, 1931 Aug. 21, 1933 Feb. 17, 1934 Apr. 14, 1935	N	N	Destroyed. Formerly used as observation well.
703	do.	--	--	77?	6	do.	399	36.8	Nov. 18, 1969	C,W	S	--
802	Oscar Carrillo	Ramido Molino	1969	410	12	do.	347	49.7	Oct. 8, 1969	--	Irr	Pump not installed when visited. Perforated casing from 265 to 410 ft. Temp. 82°F (28°C).

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COM-PLET-ED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTI-TUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SUR-FACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
JB-84-45-803	Oscar Carrillo	Ramido Molino	1969	410	12	Tg	--	--	--	--	Irr	Pump not installed when visited. Perforated casing from 265 to 410 ft.
804	Mills Bennett	--	Old	80	5	do.	348	22.8	Nov. 17, 1969	C,W	S	--
805	Eulalio Carbajal, Jr.	--	1910±	90±	6	do.	366	30	1969	S,E,1/3	D,S	Water reported salty.
902	Horatio Ramirez	Ramido Molino	1969	412	12	do.	328	79.7	Oct. 8, 1969	T	Irr	Perforated casing from 262 to 412 ft. Pump set at 261 ft.
903	Mills Bennett	--	1969	325?	6	do.	319	44.5	Nov. 20, 1969	--	S	Temp. 77°F (25°C).
* 905	O.C. Garcia	--Barrera?	1929	125±	8	do.	308	39.6	Nov. 21, 1969	C,W	S	--
46-101	Rafael Garcia	--	--	90±	6	do.	312	62.6 60.3	May 28, 1931 Mar. 17, 1970	C,W	S	Temp. 77°F (25°C). 2/
* 201	C.G. Glasscock	C.G. Classcock	1950	1,200±	12	To	275	+	Nov. 24, 1969	Flows	S	Measured flow 20 gpm.
202	do.	do.	1937	150	4	Tg	273	98.5	Dec. 10, 1969	C,W	S	Temp. 77°F (25°C).
203	do.	--	1937±	134	6	do.	279	106.6	Nov. 24, 1969	C,W	S	Temp. 77°F (25°C).
301	A. Saenz	--	--	240	4	do.	225	26.7 26.8 58.8	May 26, 1931 Sept. 10, 1933 Dec. 16, 1969	N	N	Formerly used as observation well.
302	Ben Schutz	H.&S. Water Well Service	1967	448	12 3/4	do.	243	112.5	Oct. 10, 1969	N	N	Drilled for irrigation, but never used. Slotted casing from 268 to 444 ft. Water reported salty from 131-146 ft. 1/
303	Jose Mendez	Richardson Bros.?	--	--	--	do.	215	115.0	Oct. 9, 1969	T,E,15	Irr	--
304	C.G. Glasscock	--	1937±	100	6	do.	240	44	Nov. 24, 1969	C,G,3	S	Temp. 77°F (25°C).
305	do.	--	1940±	145	5 1/2	do.	256	--	--	C,W	S	Pumping level 128.7, Nov. 24, 1969.
* 401	Mrs. Virginia Garcia	--	1917	280±	6	do.	283	49.6 104.8	June 29, 1931 Nov. 22, 1969	C,W C,W	D,S D,S	Observation well. 2/
402	Rafael Garcia	--	Old	115±	6	do.	285	30.5 32.4	Sept. 29, 1933 Mar. 17, 1970	C,W	S	Do.
403	Tony Jataine	Disbro Water Well Service	1963	276	10 3/4	do.	303	--	--	T,G	Irr	Perforated casing from 236 to 276 ft.
404	do.	Vickers Water Well Service	1969	--	--	do.	310	--	--	--	Irr	Drilling in progress when visited Oct. 10, 1969.

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COMPLETED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTITUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SURFACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
* JB-84-46-405	Virginia Garcia	--	1880's	42	--	Tg	277	31.2	Nov. 22, 1969	C, W	S	Dug well with 8 x 5 ft curb.
* 406	Houston Nat. Gas Co.	Houston Nat. Gas Co.	1956	300	4	do.	--	70	1969	C, E, 3	D	Perforated casing from 290 to 300 ft.
407	C.G. Glasscock	Oil Company	1953	127±	4	do.	282	117.3	Nov. 24, 1969	C, W	S	Temp. 79°F (26°C).
501	D.O. Frazier	Richardson Bros.	1966	280	12	do.	258	119.7	Oct. 11, 1969	--	Irr	Pump removed for repairs.
502	Marvin Dismukes	do.	1967	405	12 3/4	do.	255	--	--	T, G	Irr	Perforated casing from 248 to 405 ft. Reported discharge 1,500 gpm. Temp. 79°F (26°C). 1/
503	C.G. Glasscock	--	1937±	120	6	do.	270	93.0	Nov. 24, 1969	C, W	S	Temp. 79°F (25 1/2°C).
504	do.	--	1937±	100±	6	do.	266	42.4	do.	C, W	S	Temp. 77°F (25°C).
* 601	M.T. Dismukes, Well 1	Disbro Water Well Service	1956	314	12	do.	232	84.3 87.9 86.6 84.4	June 20, 1960 Feb. 25, 1967 Feb. 20, 1968 Mar. 21, 1969	T, G	S, Irr	Slotted casing from 264 to 314 ft. Pump set at 175 ft. Measured discharge 1,470 gpm. Observation well.
602	Leroy Denman	--	--	340	6	do.	202	23.1 66.5	May 27, 1931 Feb. 8, 1956	--	N	Perforated casing at 180 ft and 300 ft. Destroyed. Formerly used as observation well. 2/
603	Ruben Schultz	--	--	280	6	do.	--	47.6 56.1	Dec. 9, 1932 Feb. 15, 1957	N	N	Destroyed. Formerly used as observation well. 2/
* 701	San Antonio Loan and Trust Company	--	Old	150	4 1/2	do.	292	60.5 58.4	May 29, 1931 Mar. 17, 1970	C, W	S	Observation well. 2/
* 702	D.O. Frazier	Richardson Water Well Service	1965	280	12	do.	290	127.8	Oct. 9, 1969	T, E, 75	Irr	Perforated casing 140 to 280 ft. Pump set at 240 ft. Measured discharge 760 gpm. Measured drawdown 70 ft pumping 760 gpm for 5 hours.
* 703	O.C. Garcia	--	1900±	34	--	do.	289	23.5	Nov. 21, 1969	C, W	S	Dug well with 5 x 8 ft curb.
802	Walter Blumer	Richardson Water Well Service	1965	315	12 3/4	do.	286±	144.2	Oct. 11, 1969	T, G, 75	Irr	Perforated casing from 230 to 300 ft. Pump set at 260 ft. Reported discharge 900 gpm. 1/
803	Antonio Recio	Disbro Water Well Service	1967	317	7	do.	245	126.6	Dec. 15, 1969	S, E, 1 1/2	S, Irr	Irrigated 50 fruit trees in 1969. Slotted casing 287 to 317 ft. Reported discharge 15 gpm. 1/

See footnotes at end of table.

Table 7.--Records of Wells--Continued

WELL	OWNER	DRILLER	DATE COMPLETED	DEPTH OF WELL (FT)	DIAMETER OF CASING (IN)	WATER BEARING UNIT	ALTITUDE OF LAND SURFACE (FT)	WATER LEVEL: ABOVE (+) OR BELOW LAND SURFACE DATUM (FT)	WATER LEVEL: DATE OF MEASUREMENT	METHOD OF LIFT	USE OF WATER	REMARKS
JB-84-46-901	Rufino Garcia, Jr.	Argo Oil Company	--	200±	4 1/2	Tg	197	53.7 96.1	Feb. 6, 1948 Mar. 17, 1970	N	N	Observation well. 2/
902	Santana Hinojosa Estate	do.	1938	63±	3	do.	226	60.4 64.5 68.8	Feb. 14, 1947 Feb. 6, 1948 Feb. 20, 1949	N	N	Perforated casing from 440 to 444 ft. Originally drilled to 970 ft and plugged back to 444 ft. Drilled to 63 ft when visited in 1969. Formerly used as observation well.
903	do.	Rupp Water Well Service	1953	330±	5	do.	230	81.3 121.7	Feb. 5, 1953 Dec. 15, 1969	C,W	S	Formerly used as observation well. 2/
47-404	Walter Storm	H.&S. Water Well Service	1965	537	30,12	do.	200	111.0	Jan. 16, 1968	T,G	Irr	Perforated casing from 308 to 533 ft. 30-in. casing from 0 to 245 ft; 12-in. from 0 to 537 ft. Reported discharge 1,300 gpm. 1/
406	do.	A. Porter & Son	1961±	460	--	do.	190	113.8	do.	T,G	Irr	Perforated casing from 348 to 380 ft, and 393 to 460 ft. Pump set at 200 ft. Reported discharge 1,000 gpm.
407	Ramon Garza	H.&S. Water Well Service	1963	517	12	do.	198	111.0	Dec. 15, 1969	S,E,2	S	Perforated casing from 377 to 517 ft. Temp. 81°F (27°C).
702	Clyde Crook	--	1915	295	5 3/4	do.	198	36.5 76.2	Jan. 6, 1932 Feb. 18, 1954	--	N	Destroyed. Formerly used as observation well. 2/
703	do.	--	1948	180?	5 1/2	do.	198	57.4 76.2	Feb. 6, 1948 Feb. 18, 1934	S,E,1/2	D,S	Formerly used as observation well. 2/
710	Clyde Burdette	A. Porter & Son	1963	412	7	do.	186	121.4 120.3	Jan. 18, 1968 Dec. 14, 1969	S,E,1 1/2	D,S	Perforated casing from 375 to 407 ft. Pump set at 147 ft. 1/
711	Rufino Garcia, Jr.	Argo Oil Company	--	--	10 3/4	do.	197	--	--	T,G	Irr	500 ft surface casing. Converted to water well in 1965. Estimated discharge 700 gpm.

* Chemical analysis available, see Table 11.
1/ Driller's log available, see Table 10.
2/ Additional water levels available, see Table 9.
3/ Electric log available in U.S. Geological Survey or Texas Water Development Board files.

Table 8.—Oil and Gas Wells Selected as Data-Control Points

WELL	OPERATOR	LEASE AND WELL	SURVEY SECTION OR GRANT	DATE OF LOG
JB-78-58-801	Texita Oil Company and E. W. Gill	F. L. Friedrichs No. 1	J. N. Gibson No. 344	Jan. 13, 1955
60-705	Atlantic Refining Company	J. R. Foster No. 30	J. R. Foster No. 200	Mar. 17, 1955
61-501	Gorman Drilling Company	Ferguson-State No. 2	Labbe No. 104	Sept. 17, 1953
701	Gorman and DeLange	Gray Ranch No. 1	E. R. Gray No. 560	May 15, 1950
62-501	Morgan and Wynne	T. M. Brookshire No. 1	J. Poitevent No. 79	Nov. 16, 1947
84-02-302	Richardson Oil Company	Warden and Drought No. 2	Juan L. Saen No. 154	Apr. 19, 1949
901	Magnolia Petroleum Co.	D.C.R.C. No. 1	G.C. & S.F. No. 273	June 23, 1946
03-602	Sun Oil Co.	L. Wiederkehr No. 134	J. Poitevent No. A-430	Nov. 23, 1954
701	Magnolia Petroleum Co.	D.C.R.C. No. 9	C.C.S.D. & G.N.G. A-699	Apr. 2, 1954
04-103	The Texas Co.	D.C.R.C. "B" NCT 32 No. 1	J. Poitevent No. 203	Sept. 11, 1955
302	Blanco Oil Co. & Al Buchanan	Jas. F. Welder Heirs No. W-1	J. Poitevent No. 385	June 27, 1952
901	J. W. Gorman	Leo Welder No. 1	Arnold and Barrett A-47 No. 551	Feb. 8, 1955
05-404	Gorman Drilling Co.	Farmers Life Insurance Co.	S.K. & K. No. 557	Feb. 13, 1946
901	Camp Oil Co. & R. L. Kirkwood	J. F. Welder No. 1	A. J. Ridder No. 222	May 6, 1957
06-201	Leavitt Corning, Jr.	Duwel Co. No. 3	E. G. Garza No. 92	Sept. 25, 1954
401	H. & J. Drilling Co. and S. E. Thomas	Duwel Co. No. 1	E. G. Garza No. 142	Aug. 19, 1964
701	H. J. Porter	D. Fitzsimmons C-1	J. Poitevent No. 293	Sept. 20, 1956
802	Clardy & Barnett	First Natl. Bank of Mathis No. 1	S. Blankenship A-1593	May 6, 1958
11-604	Duval Oil Company	Bishop Cattle Co. No. 39	G.B. & C.N.G. No. 135	July 28, 1958
12-104	The Texas Company	D.C.R.C. (NCT 54) No. 1	Gonzalo Garza No. 76	Mar. 10, 1950
802	Sun Oil Company	W. K. Hoffman No. 2	B.S. & F. No. 115	July 6, 1950
13-202	American Republics Corporation	Duwel Co. No. 4	Julian Reyes No. 550	Aug. 20, 1949
403	H. L. Hunt	C. G. Palacios No. 1	F. R. Knight No. 8	June 27, 1951
601	J. B. Blanchard	E. A. Parr No. 1-134	N. Rogers No. 134	Mar. 5, 1941
602	Bridwell Oil Co.	--Parr B-1	E. Pena No. 64	Jan. 28, 1942
804	Argo Oil Company	M. H. Cohn Est. No. 1	A. Cantu No. 184	Dec. 10, 1944
905	J. B. Blanchard	V. Carrillo Heirs No. 1	A. Cantu No. 310	Sept. 16, 1941
906	The Texas Co.	Cenobia Cantu, Jr. No. 1	Benito Ramos No. 11	Apr. 4, 1949
14-103	C. C. Winn	C. G. Rogers No. 6	J. Poitevent No. 273	June 27, 1958
503	Taylor Rfg. Co.	Parr Moffett No. G-2	S.A. & M.G. No. 6	Dec. 9, 1951
702	G. L. Rowsey	Mrs. A. B. Cuellar No. 1	B.S. & F. No. 305	Mar. 1, 1956
904	Sun Oil Co.	E. B. Garcia No. 1	San Diego de Arriba Grant	Aug. 25, 1959
19-203	Gasoline Prod. Co. et al	Arnstine (Weil) No. 1	B. Elizondo No. 568	Oct. 23, 1949
402	Tiger Minerals, Inc. et al	W. R. Peters No. B-2	G.B. & C.N.G. No. 37	Jan. 9, 1957

Table 8.—Oil and Gas Wells Selected as Data-Control Points—Continued

WELL	OPERATOR	LEASE AND WELL	SURVEY SECTION OR GRANT	DATE OF LOG
JB-84-19-505	Jake L. Hamon	Dougherty Unit HG-56	B.S. & F. No. 195	Oct. 15, 1958
701	Humble Oil & Refining Co.	V. Kohler No. A-63	J. Poitevent No. 163	Aug. 26, 1950
20-103	George D. Weatherston et al	O. Carrillo, Sr. et al No. 1	J. Poitevent No. 493	Aug. 25, 1957
601	Oliver Oil Co.	K. L. Shaeffer No. 1	A. Collins No. 146	—
702	Cox and Hamon	C. Driscoll No. 1	Santa Rosalia Grant	Aug. 22, 1944
21-102	Russell Maguire	A. J. Wiederkehr No. 1	J. Poitevent No. 129	May 2, 1939
203	Luling Oil & Gas. Company	Danciger Oil & Refining Co. No. 1	J. Salinas No. 18	Oct. 19, 1941
306	Argo Oil Company	Carrillo Heirs No. 1	A.B. & M. No. 183	Mar. 4, 1945
506	H. H. Howell	Jane Schallert No. 1	S.M. & S. No. 255	Dec. 21, 1946
507	do.	Lizzie Singer C-1	S.K. & K. No. 247	Sept. 20, 1947
605	do.	Lizzie Singer No. 3	Geo. Cumberland No. 4	July 28, 1946
704	O. Neathery, Jr.	J. P. Luby No. 1	S.G.I. Co. No. 147	Dec. 3, 1952
22-603	Magnolia Pet. Co.	W. K. Hoffman No. 1	S.A. & M.G. No. 111	Apr. 7, 1938
705	Frank J. Gravis	J. C. Megerle No. 1	J. Broyles No. 245	Aug. 7, 1938
26-302	Hiawatha Oil & Gas Company	Gruy Estate No. 1	Jas. Stephenson No. 251	Nov. 20, 1958
27-202	Hamon, Cox, & Coates	Dagmar-Gruy No. 1	N. Gussett No. 28	May 26, 1952
404	Pantex Corporation	A. Perez et al	T. & N.O. No. 141	Nov. 29, 1948
601	The Texas Company	D. C. Chapa No. 6	J. Poitevent No. 149	Dec. 27, 1955
906	Argo Oil Corp.	J. M. Bennett No. 19	C.E.P.I. & M. Co. No. 37	June 20, 1952
28-101	Hamon, Camp, Maguire, and Cox	C. Driscoll Est. A-8	Santa Rosalia Grant 476	Feb. 10, 1958
804	Continental Oil Company	C. Driscoll Est. B-42	U. Lott No. 484	Nov. 2, 1943
29-204	Lee Corkill	Mrs. R. G. Tonkin No. 1	P. Benavides No. 428	May 2, 1939
503	Pratt-Hewitt Oil Corp.	V. M. Hooper No. 1	Sweden Farm Lots Sec. No. 17	Jan. 1, 1958
30-103	Mills Bennett-DelMar Drilling Company	Oliveria No. 1	H. & G.N. Sec. 373	May 30, 1958
402	Sun Oil Company	Hermilio Salinas No. 1	San Andreas Grant	Aug. 16, 1956
403	Sun Oil Company	L. Garcia "B" No. 1	San Andreas Grant	Sept. 18, 1955
502	Ussery Drilling Co.	A. McNeil Est. 1-A	Las Anaguas Vicente Ynojosa Grant	June 20, 1955
902	Lewis Maples	F. C. and C. C. Allen No. 1	Las Anaguas Vicente Ynojosa Grant	July 9, 1957
34-901	Graham & McClain	Juan Benavides et al	Mesquite Oil & Gas and J. Carpenter Subd. 1 Sh5	Feb. 2, 1956
35-403	Hamill & Smith	Juan Benavides No. 2	Mesquite Oil & Gas and J. Carpenter Subd. 3	Aug. 19, 1936
508	Cox and Hamon	Juan Benavides No. 1	B.S. & F. No. 462	Nov. 17, 1949
604	Frank Zoch, Jr.	John Dunn No. 1	Diego Ynojosa Grant A-629	July 11, 1949
903	C. G. Glasscock	Mary Dunn No. 1-A	do.	Nov. 19, 1952
36-503	W. L. Cotton et al	K. L. Shaeffer No. 1	Jas. Luby Sh.3, Tr. 7	Sept. 4, 1957

Table 8.—Oil and Gas Wells Selected as Data-Control Points—Continued

WELL	OPERATOR	LEASE AND WELL	SURVEY SECTION OR GRANT	DATE OF LOG
JB-84-36-704	John F. Camp	E. J. Miller No. 1	Marcelo Hinojosa Grant A-628	Apr. 6, 1953
37-105	M. M. Miller & Sons	Miller Fee No. E-1	Ball Ranch Subd. Santos Flores Grant	Apr. 26, 1955
406	Southern Minerals Corporation	Leroy Denman No. 1	Copita Farms and Gardens Subd. Blk. 84	June 10, 1949
506	F. William Carr	M. M. Miller No. 1	Ball Ranch Subd., San Andreas Grant	Nov. 21, 1967
38-106	Synura Corporation	Atlee Parr No. E-2	Tr. 55, Wheeler Splane Subd.	Apr. 7, 1958
303	Daubert & Dolch	Thomas Saenz No. 1	La Huerta Grant Blk. 6	June 18, 1954
810	Finley Company	Alfredo Stillman No. 1	La Huerta Grant Share 8	Sept. 9, 1956
43-101	Valor Oil Co.	J. T. Rogers No. 1	Santa Maria de los Angeles de Abajo	—
44-202	Farenthold & Pitcairn	E. Canales No. 1	Marcelo Hinojosa Grant, Share 28	June 6, 1958
45-605	Trinity Gas Corp.	Guerra No. 1	Pedro de Charco Redondo	Feb. 20, 1944
704	Frank Zoch, Jr.	Leroy Denman No. 2	Copita Farm and Garden Tracts	June 12, 1954
46-306	Head, Welsh & Lufkin	H. Wolfe No. 1	San Francisco Grant A-216, Lot 5	Aug. 23, 1957
307	Appell Drilling Co.	T. S. Del Mendez No. 1	San Francisco Grant A-216	Jan. 17, 1955
408	Don H. Marsh et al	O. G. de Olivares No. 2	Santa Cruz de la Concepcion Blk. 7	Nov. 7, 1954
505	Santa Clara Oil Company	Glasscock No. 1	Santa Cruz de la Concepcion Grant	Mar. 13, 1936
604	Argo Oil Company	Kuntz Lumber Company No. 1	Los Olmos Grant A-346	Oct. 7, 1947
906	do.	R. Garcia No. 1	do.	Sept. 26, 1944

Table 9.—Water Levels in Wells

(Depth to water in feet below land surface)

DATE		WATER LEVEL
Well JB-84-04-701		
Owner: Humble Oil & Refg. Co.		
Mar.	25, 1964	66.44
Feb.	15, 1965	63.78
Feb.	21, 1966	64.59
Feb.	25, 1967	64.88
Feb.	21, 1968	65.09
Mar.	19, 1969	63.82
Mar.	18, 1970	60.33
Well JB-84-04-707		
Owner: --Whittaker		
Mar.	24, 1964	105.93
Feb.	15, 1965	103.04
Feb.	21, 1966	106.30
Feb.	25, 1967	113.64
Feb.	21, 1968	108.88
Oct.	19, 1969	139.0
Mar.	18, 1970	110.75
Well JB-84-12-101		
Owner: W. C. Kelley		
Mar.	25, 1964	166.90
Feb.	15, 1965	156.80
Feb.	21, 1966	161.19
Feb.	25, 1967	162.34
Feb.	21, 1968	159.92
Mar.	19, 1969	156.83
Mar.	18, 1970	148.32
Well JB-84-12-301		
Owner: Percy Howard		
Feb.	1959	120. --
Mar.	24, 1964	150.00
May	28, 1964	154.08
July	23, 1964	145.69
Oct.	3, 1964	139.76
Nov.	19, 1964	146.28
Feb.	15, 1965	137.42
Mar.	26, 1965	167.94

DATE		WATER LEVEL
Well JB-84-12-301—Continued		
May	20, 1965	138.21
July	26, 1965	139.28
Sept.	24, 1965	169.60
Nov.	20, 1965	139.86
Jan.	27, 1966	138.27
May	23, 1966	139.37
July	29, 1966	138.83
Sept.	23, 1966	138.23
Nov.	17, 1966	136.92
Jan.	23, 1967	139.29
Feb.	25, 1967	137.44
Mar.	10, 1967	139.00
May	27, 1967	149.25
July	21, 1967	143.87
Oct.	19, 1967	171.60
Nov.	17, 1967	142.81
Feb.	1, 1968	144.09
Mar.	23, 1968	149.49
May	25, 1968	146.26
July	9, 1968	138.15
Sept.	12, 1968	136.26
Nov.	19, 1968	140.16
Jan.	23, 1969	147.29
Mar.	19, 1969	139.94
May	19, 1969	138.89
July	23, 1969	144.81
Sept.	24, 1969	143.39
Oct.	13, 1969	143.09
Dec.	9, 1969	144.02
Feb.	13, 1970	138.70
Apr.	10, 1970	138.82
June	19, 1970	141.12
Aug.	11, 1970	144.80
Oct.	20, 1970	143.89
Dec.	11, 1970	145.04

DATE		WATER LEVEL
Well JB-84-12-401		
Owner: Ponciano Ruiz		
Mar.	10, 1960	150.27
Mar.	25, 1964	122.50
Feb.	15, 1965	117.28
Feb.	21, 1966	119.67
Feb.	25, 1967	121.24
Feb.	21, 1968	118.68
Mar.	19, 1969	118.17
Sept.	19, 1969	129.90
Mar.	18, 1970	121.42
Well JB-84-13-801		
Owner: Severo Rangel		
Sept.	26, 1933	35.02
Feb.	16, 1934	36.23
Dec.	11, 1934	37.73
Apr.	12, 1935	37.40
Jan.	31, 1936	36.32
July	15, 1937	34.86
Jan.	25, 1938	35.82
Oct.	14, 1938	37.29
Apr.	6, 1939	36.06
Oct.	5, 1939	35.21
Feb.	12, 1940	36.17
Feb.	3, 1941	34.20
Feb.	9, 1943	31.34
Mar.	6, 1945	33.45
Feb.	12, 1947	33.81
Feb.	5, 1948	34.80
Feb.	5, 1949	34.06
Feb.	6, 1950	35.67
Feb.	26, 1951	35.60
Feb.	7, 1952	34.81
Feb.	5, 1953	36.58
Feb.	18, 1954	34.66
Feb.	10, 1955	34.88
Feb.	8, 1956	36.12

Table 9.—Water Levels in Wells—Continued

DATE		WATER LEVEL
Well JB-84-13-801—Continued		
Feb.	14, 1957	35.51
Mar.	4, 1958	29.71
July	13, 1960	30.27
Mar.	15, 1961	31.88
Mar.	23, 1962	32.92
Feb.	14, 1963	34.20
Mar.	24, 1964	34.47
Feb.	15, 1965	35.70
Feb.	21, 1966	36.43
Feb.	25, 1967	34.65
Oct.	19, 1967	31.91
Nov.	17, 1967	32.61
Feb.	21, 1968	33.81
Mar.	19, 1969	29.91
Mar.	18, 1970	33.06
Well JB-84-13-802		
Owner: Cecilio Valerio		
Apr.	2, 1931	37.60
Aug.	22, 1933	38.41
Feb.	16, 1934	37.71
Apr.	12, 1935	39.08
Feb.	18, 1936	37.50
July	15, 1937	37.14
Jan.	25, 1938	37.13
Apr.	6, 1939	39.12
Feb.	12, 1940	35.70
Feb.	3, 1941	35.56
Feb.	9, 1943	33.51
Mar.	6, 1945	35.35
Well JB-84-13-901		
Owner: Juan Peralez		
Sept.	26, 1933	74.79
Feb.	16, 1934	74.58
Apr.	12, 1935	75.63
Feb.	18, 1936	74.15
July	15, 1937	71.40
Jan.	25, 1938	71.54

DATE		WATER LEVEL
Well JB-84-13-901—Continued		
Apr.	6, 1939	75.44
Feb.	12, 1940	72.16
Feb.	3, 1941	72.49
Feb.	9, 1943	75.44
Mar.	6, 1945	75.79
Feb.	12, 1947	67.34
Feb.	5, 1948	69.83
Feb.	15, 1949	69.50
Feb.	6, 1950	67.67
Feb.	7, 1952	69.70
Feb.	5, 1953	73.05
Feb.	18, 1954	74.88
Feb.	10, 1955	77.09
Feb.	8, 1956	76.75
Feb.	14, 1957	78.06
Mar.	4, 1958	70.76
July	13, 1960	73.02
Mar.	15, 1961	61.50
Mar.	23, 1962	83.88
Feb.	14, 1963	64.54
May	1, 1970	57.41
Well JB-84-13-902		
Owner: Cantu Estate		
Sept.	6, 1931	79.00
Oct.	25, 1933	60.80
Feb.	16, 1934	59.87
Dec.	11, 1934	62.50
Apr.	12, 1935	62.62
Jan.	31, 1936	55.84
July	15, 1937	54.69
Jan.	25, 1938	54.45
May	3, 1938	61.90
Apr.	6, 1939	57.27
Oct.	5, 1939	61.10
Feb.	12, 1940	58.56
Feb.	3, 1941	58.82
Feb.	9, 1943	49.66

DATE		WATER LEVEL
Well JB-84-13-902—Continued		
Feb.	6, 1950	51.21
Feb.	26, 1951	58.51
Feb.	7, 1952	55.90
Feb.	5, 1953	60.53
Feb.	18, 1954	60.89
Feb.	10, 1955	61.62
Feb.	8, 1956	65.44
Feb.	14, 1957	66.15
Mar.	14, 1958	61.27
July	13, 1960	62.74
Mar.	15, 1961	50.53
Mar.	23, 1962	53.00
Feb.	14, 1963	48.00
Mar.	24, 1964	49.80
Feb.	15, 1965	51.71
Feb.	21, 1966	57.24
Feb.	25, 1967	56.82
Feb.	21, 1968	55.13
Mar.	19, 1969	54.44
Mar.	18, 1970	41.12
Well JB-84-13-903		
Owner: Cantu Estate		
June	9, 1931	56.00
Aug.	22, 1933	49.18
Feb.	16, 1934	48.97
Feb.	18, 1936	45.95
July	15, 1937	46.42
Jan.	25, 1938	53.14
Apr.	6, 1939	51.79
Feb.	12, 1940	51.11
Feb.	3, 1941	51.47
Feb.	5, 1948	48.44
Feb.	15, 1949	51.17
Feb.	6, 1950	47.53
Feb.	26, 1951	52.16
Feb.	7, 1952	52.10
Feb.	5, 1953	56.10

Table 9.—Water Levels in Wells—Continued

Well JB-84-13-903—Continued

DATE		WATER LEVEL
Feb.	18, 1954	54.76
Feb.	10, 1955	56.31
Feb.	8, 1956	57.10
Feb.	14, 1957	56.83
Mar.	4, 1958	52.63
July	13, 1960	53.96

Well JB-84-13-904

Owner: Helena de Peña

DATE		WATER LEVEL
June	9, 1931	43.50
Aug.	22, 1933	40.27
Feb.	16, 1934	37.89
Apr.	12, 1935	45.06
Jan.	31, 1936	40.75
July	15, 1937	29.31
Jan.	25, 1938	29.80
Apr.	6, 1939	41.00
Feb.	12, 1940	40.63
Feb.	3, 1941	44.23
Feb.	9, 1943	27.39
Mar.	6, 1945	28.60
Feb.	12, 1947	41.28
Feb.	5, 1948	39.48
Feb.	15, 1949	40.49
Feb.	6, 1950	39.23
Feb.	26, 1951	45.77
Feb.	7, 1952	41.11
Feb.	5, 1953	44.40
Feb.	18, 1954	42.65
Feb.	10, 1955	44.02
Feb.	8, 1956	44.77
Feb.	14, 1957	44.45
Mar.	4, 1958	39.65
July	13, 1960	42.60
Mar.	15, 1961	34.90
Mar.	23, 1962	35.54
Feb.	14, 1963	37.20
May	1, 1970	36.07

Well JB-84-14-403

Owner: Jose Maria Sepulveda

DATE		WATER LEVEL
Sept.	26, 1933	45.46
Feb.	16, 1934	43.49
Apr.	12, 1935	54.28
Jan.	31, 1936	30.52
July	15, 1937	41.06
Jan.	25, 1938	43.83
Oct.	5, 1939	43.20
Feb.	12, 1940	43.40
Feb.	3, 1941	45.25
Feb.	9, 1943	36.87
Mar.	6, 1945	46.28
Feb.	12, 1947	36.06
Feb.	5, 1948	39.85
Feb.	15, 1949	43.66
Feb.	7, 1952	44.87
Feb.	18, 1954	34.90
Feb.	10, 1955	40.56
Feb.	8, 1956	42.10
Feb.	14, 1957	41.91
Mar.	14, 1958	22.46
July	13, 1960	25.72

Well JB-84-14-404

Owner: Taylor Refining Company

DATE		WATER LEVEL
Feb.	12, 1947	83.73
Feb.	5, 1948	85.28
Feb.	15, 1949	87.00
Feb.	7, 1952	87.22
Feb.	18, 1954	81.85
Feb.	10, 1955	84.10

Well JB-84-14-701

Owner: Cuellar Estate

DATE		WATER LEVEL
June	9, 1931	64.00
Aug.	22, 1933	61.58
Sept.	9, 1933	61.51
Sept.	25, 1933	61.20
Oct.	11, 1933	60.77

Well JB-84-14-701—Continued

DATE		WATER LEVEL
Nov.	16, 1933	60.74
Dec.	11, 1934	63.61
Apr.	12, 1935	64.12
Jan.	31, 1936	57.20
Feb.	18, 1936	57.62
July	15, 1937	57.88
Jan.	31, 1938	59.31
Oct.	14, 1938	62.13
Apr.	6, 1939	61.27
Oct.	5, 1939	60.85
Feb.	12, 1940	62.10
Feb.	3, 1941	61.38

Well JB-84-14-801

Owner: L. N. Garcia

DATE		WATER LEVEL
June	8, 1931	73.00
Aug.	22, 1933	53.63
Feb.	16, 1934	49.72
Apr.	12, 1935	48.14
Jan.	31, 1936	39.40
July	15, 1937	57.71
Jan.	25, 1938	41.03
Apr.	6, 1939	49.90
Feb.	12, 1940	54.35
Feb.	3, 1941	50.47
Mar.	6, 1945	48.38
Feb.	12, 1947	61.82
Feb.	5, 1948	50.02
Feb.	15, 1949	50.27
Feb.	6, 1950	52.93
Feb.	5, 1953	50.42
Feb.	18, 1954	44.44
Feb.	10, 1955	48.72
Feb.	8, 1956	49.87
Feb.	14, 1957	50.23
Mar.	4, 1958	44.26
July	13, 1960	45.17
Mar.	15, 1961	35.41

Table 9.—Water Levels in Wells—Continued

DATE		WATER LEVEL
Well JB-84-15-702		
Owner: City of San Diego, old well 1		
Mar.	24, 1964	238.11
May	28, 1964	238.22
July	23, 1964	255.08
Oct.	3, 1964	234.44
Nov.	19, 1964	255.88
Feb.	15, 1965	227.42
Mar.	26, 1965	235.39
May	20, 1965	255.73
Sept.	24, 1965	286.50
Nov.	20, 1965	244.67
Jan.	27, 1966	216.20
Feb.	21, 1966	229.88
Mar.	28, 1966	229.58
May	23, 1966	234.75
July	29, 1966	244.25
Sept.	23, 1966	241. --
Nov.	17, 1966	194.98
Jan.	23, 1967	181.11
Feb.	25, 1967	178.10
Mar.	10, 1967	184.91
May	27, 1967	233.07
July	21, 1967	260.10
Oct.	19, 1967	242.90
Nov.	17, 1967	225.80
Feb.	1, 1968	227.68
Mar.	23, 1968	233.41
May	25, 1968	230.60
July	9, 1968	227.85
Sept	2, 1968	228.68
Nov	19, 1968	225.91
Jan	23, 1969	229.22
Mar.	19, 1969	228.81
May	19, 1969	211.22
Sept.	22, 1969	248.00
Oct.	13, 1969	213.48
Dec.	9, 1969	214.22
Well JB-84-15-702—Continued		
Feb.	13, 1970	211.10
Apr.	10, 1970	225.18
June	19, 1970	244.90
Aug.	11, 1970	203.22
Oct.	20, 1970	258.92
Dec.	11, 1970	264.00
Well JB-84-22-801		
Owner: Cervando Saenz		
May	25, 1931	41.00
Oct.	27, 1933	35.62
Feb.	16, 1934	35.52
Apr.	13, 1935	36.00
Feb.	1, 1936	35.30
July	16, 1937	35.48
Jan.	25, 1938	34.10
Apr.	6, 1939	36.05
Feb.	13, 1940	35.28
Feb.	3, 1941	35.83
Feb.	9, 1943	34.88
Mar.	6, 1945	34.68
Feb.	13, 1947	34.28
Feb.	5, 1948	34.31
Feb.	15, 1949	34.70
Feb.	6, 1950	34.50
Feb.	26, 1951	35.77
Feb.	7, 1952	34.98
Feb.	5, 1953	35.02
Feb.	18, 1954	34.70
Feb.	8, 1956	35.66
July	14, 1957	36.04
Mar.	4, 1958	35.47
July	13, 1960	34.60
Mar.	15, 1961	33.90
Mar.	22, 1962	34.21
Feb.	14, 1963	34.31
Mar.	24, 1964	35.38
Feb.	15, 1965	34.84
Well JB-84-22-801—Continued		
Feb.	21, 1966	37.96
Feb.	25, 1967	36.20
Oct.	19, 1967	34.00
Nov.	17, 1967	34.63
Feb.	19, 1968	34.17
Mar.	20, 1969	33.68
Mar.	18, 1970	33.50
Well JB-84-22-902		
Owner: --Garcia		
May	15, 1931	57.50
Aug.	22, 1933	56.08
Feb.	16, 1934	55.80
Feb.	1, 1936	53.15
July	16, 1937	52.52
Jan.	25, 1938	52.89
Apr.	6, 1939	53.55
Feb.	13, 1940	54.34
Feb.	4, 1941	55.27
Feb.	9, 1943	52.22
Mar.	6, 1945	49.61
Feb.	13, 1947	49.27
Feb.	5, 1948	50.80
Feb.	15, 1949	52.29
Feb.	6, 1950	59.41
Feb.	26, 1951	56.34
Feb.	7, 1952	53.70
Feb.	5, 1953	57.50
Well JB-84-22-903		
Owner: Alaniz Estate		
Sept.	28, 1933	45.45
Oct.	15, 1933	45.78
Feb.	16, 1934	46.45
Apr.	13, 1935	46.90
Feb.	17, 1936	41.35
July	16, 1937	42.99
Jan.	25, 1938	43.52
Apr.	6, 1939	46.32

Table 9.—Water Levels in Wells—Continued

DATE	WATER LEVEL
Well JB-84-22-903—Continued	
Feb. 13, 1940	45.53
Feb. 3, 1941	45.87
Feb. 9, 1943	38.63
Mar. 6, 1945	39.79
Feb. 13, 1947	39.30
Feb. 5, 1948	41.11
Feb. 15, 1949	42.83
Feb. 6, 1950	40.88
Feb. 26, 1951	43.75
Feb. 7, 1952	37.89
Feb. 5, 1953	42.85
Well JB-84-29-302	
Owner: City of Benavides, old well 2	
Mar. 25, 1964	93.91
Feb. 15, 1965	86.16
Feb. 22, 1966	83.45
Feb. 25, 1967	69.24
Feb. 19, 1968	67.02
Mar. 20, 1969	67.72
Mar. 18, 1970	62.66
Well JB-84-29-305	
Owner: Mrs. Tom Cavanaugh	
Sept. 27, 1933	50.43
Oct. 26, 1933	48.14
Feb. 11, 1934	48.39
Dec. 7, 1934	51.01
Apr. 13, 1935	52.15
Jan. 31, 1936	42.92
July 16, 1937	42.55
Jan. 25, 1938	43.56
Oct. 17, 1938	44.39
Apr. 7, 1939	44.49
Oct. 6, 1939	45.54
Feb. 13, 1940	42.98
Feb. 3, 1941	46.48
Feb. 9, 1943	40.07
Mar. 7, 1945	40.36

DATE	WATER LEVEL
Well JB-84-29-305—Continued	
Feb. 13, 1947	43.74
Feb. 5, 1948	44.85
Feb. 15, 1949	46.34
Feb. 7, 1950	46.31
Feb. 26, 1951	57.78
Feb. 4, 1952	46.40
Feb. 5, 1953	47.37
Feb. 18, 1954	45.08
Feb. 10, 1955	46.38
Feb. 18, 1956	46.07
Feb. 14, 1957	47.20
Mar. 4, 1958	44.24
July 13, 1960	44.52
Mar. 16, 1961	44.11
Mar. 22, 1962	44.69
Feb. 14, 1963	43.80
Mar. 24, 1964	45.46
Feb. 15, 1965	48.26
Feb. 21, 1966	51.32
Feb. 25, 1967	49.14
Well JB-84-29-306	
Owner: S. Ruiz	
Oct. 26, 1933	41.43
Feb. 5, 1934	40.50
Apr. 13, 1935	41.08
Jan. 31, 1936	40.00
July 15, 1937	39.96
Jan. 25, 1938	40.11
Oct. 17, 1938	40.17
Apr. 6, 1939	41.29
Feb. 13, 1940	39.88
Feb. 3, 1941	38.02
Feb. 9, 1943	36.70
Mar. 7, 1945	34.44
Feb. 13, 1947	35.16
Feb. 5, 1948	35.75
Feb. 15, 1949	36.35

DATE	WATER LEVEL
Well JB-84-29-306—Continued	
Feb. 6, 1950	34.34
Feb. 26, 1951	35.90
Feb. 7, 1952	36.34
Feb. 5, 1953	33.85
Feb. 18, 1954	33.58
Feb. 10, 1955	34.42
Feb. 8, 1956	34.00
Feb. 14, 1957	35.71
Mar. 4, 1958	32.69
July 3, 1960	31.17
Mar. 15, 1961	32.82
Mar. 22, 1962	33.97
Feb. 14, 1963	34.66
Mar. 24, 1964	34.80
Feb. 15, 1965	36.16
Feb. 21, 1966	44.88
Feb. 25, 1967	36.31
Oct. 19, 1967	34.15
Nov. 17, 1967	34.00
Feb. 19, 1968	34.64
Mar. 20, 1969	34.39
Mar. 18, 1970	38.44
Well JB-84-29-307	
Owner: Ramon Peña	
Sept. 20, 1933	45.00
Feb. 5, 1934	44.10
Apr. 13, 1935	45.15
Jan. 31, 1936	43.65
July 16, 1937	41.82
Jan. 25, 1938	42.63
Oct. 6, 1939	41.97
Feb. 13, 1940	40.64
Feb. 3, 1941	39.99
Feb. 9, 1943	35.40
Mar. 7, 1945	35.15
Feb. 13, 1947	34.98
Feb. 5, 1948	36.16

Table 9.—Water Levels in Wells—Continued

DATE	WATER LEVEL
Well JB-84-29-307—Continued	
Feb. 15, 1949	36.88
Feb. 6, 1950	34.28
Feb. 18, 1954	34.78
Well JB-84-29-308	
Owner: Ramon Peña	
Sept. 20, 1933	45.67
Feb. 5, 1934	45.30
Apr. 13, 1935	46.30
Feb. 17, 1936	43.76
July 16, 1937	42.76
Jan. 25, 1938	43.45
Apr. 6, 1939	43.90
Feb. 13, 1940	41.54
Feb. 3, 1941	41.11
Feb. 9, 1943	36.06
Mar. 7, 1945	36.29
Feb. 13, 1947	35.52
Well JB-84-29-501	
Owner: M. Gomez	
Sept. 27, 1933	95.15
Feb. 5, 1934	96.14
Apr. 13, 1935	96.13
Feb. 17, 1936	95.68
July 16, 1937	94.56
Jan. 26, 1938	96.12
Apr. 6, 1939	94.53
Feb. 13, 1940	94.51
Feb. 3, 1941	94.41
Feb. 9, 1943	92.00
Mar. 7, 1945	92.63
Feb. 5, 1948	92.20
Feb. 15, 1949	92.26
Feb. 26, 1951	93.10
Feb. 7, 1952	90.60
Feb. 5, 1953	92.25
Feb. 18, 1954	91.90
Feb. 10, 1955	93.12

DATE	WATER LEVEL
Well JB-84-29-501—Continued	
Feb. 8, 1956	93.90
Feb. 14, 1957	95.35
Mar. 4, 1958	91.79
July 13, 1960	92.37
Mar. 22, 1962	91.75
Well JB-84-29-502	
Owner: Floyd Emerson	
Sept. 9, 1933	93.27
Feb. 5, 1934	92.09
Apr. 13, 1935	92.45
Jan. 30, 1936	90.90
July 16, 1937	91.38
Jan. 25, 1938	90.27
Apr. 7, 1939	89.65
Feb. 14, 1940	90.65
Feb. 4, 1941	90.61
Mar. 7, 1945	88.42
Feb. 5, 1948	89.28
Feb. 15, 1949	88.47
Feb. 7, 1950	88.57
Feb. 26, 1951	90.63
Feb. 7, 1952	90.15
Feb. 5, 1953	89.08
Feb. 18, 1954	85.68
Feb. 10, 1955	87.90
Feb. 8, 1956	88.37
Feb. 14, 1957	87.48
Mar. 4, 1958	86.33
July 13, 1960	85.03
Mar. 15, 1961	86.61
Feb. 14, 1963	89.45
Mar. 24, 1964	109.80
Feb. 15, 1965	90.20
Feb. 22, 1966	107.98
Feb. 25, 1967	114.00
Feb. 19, 1968	110.21
Mar. 20, 1969	107.88
Mar. 18, 1970	113.88

DATE	WATER LEVEL
Well JB-84-30-101	
Owner: Ismael Garcia	
Sept. 28, 1933	44.85
Feb. 17, 1934	45.17
Apr. 13, 1935	48.05
Feb. 1, 1936	44.52
July 16, 1937	44.80
Jan. 25, 1938	46.96
Apr. 6, 1939	48.99
Feb. 13, 1940	48.57
Feb. 3, 1941	49.83
Feb. 3, 1943	46.30
Mar. 7, 1945	46.81
Feb. 13, 1947	46.56
Feb. 5, 1948	48.43
Feb. 15, 1949	50.26
Feb. 6, 1950	49.95
Well JB-84-30-201	
Owner: Encarnacion Peña	
Sept. 28, 1933	74.61
Feb. 17, 1934	74.54
Apr. 13, 1935	74.71
Feb. 1, 1936	74.32
July 16, 1937	73.57
Jan. 25, 1938	74.57
Apr. 6, 1939	74.39
Feb. 13, 1940	74.56
Feb. 3, 1941	74.75
Feb. 9, 1943	74.82
Mar. 6, 1945	74.71
Feb. 13, 1947	74.52
Feb. 5, 1948	74.59
Feb. 15, 1949	74.57
Feb. 6, 1950	75.72
Feb. 26, 1951	80.79
Feb. 7, 1952	75.06
Feb. 5, 1953	74.34
Feb. 18, 1954	73.70

Table 9.—Water Levels in Wells—Continued

DATE	WATER LEVEL
Well JB-84-30-201—Continued	
Feb. 10, 1955	76.47
Feb. 8, 1956	74.16
Feb. 14, 1957	75.84
Well JB-84-30-202	
Owner: Mateo Lopez	
May 15, 1931	63.00
Aug. 22, 1933	61.84
Dec. 12, 1934	61.27
Apr. 13, 1935	61.26
Feb. 1, 1936	60.94
July 16, 1937	60.50
Jan. 25, 1938	60.31
Apr. 6, 1939	61.05
Feb. 13, 1940	60.70
Feb. 4, 1941	61.36
Feb. 9, 1943	61.17
Mar. 7, 1945	60.84
Feb. 13, 1947	60.73
Feb. 5, 1948	60.13
Feb. 15, 1949	61.28
Feb. 6, 1950	62.03
Feb. 27, 1951	60.19
Feb. 7, 1952	64.94
Feb. 5, 1953	66.70
Feb. 18, 1954	66.76
Well JB-84-30-301	
Owner: Mrs. Veronica Cuellar	
May 25, 1931	40.50
Aug. 22, 1933	49.68
Dec. 12, 1934	42.38
Apr. 13, 1935	42.32
July 16, 1937	41.67
Jan. 25, 1938	41.83
Oct. 16, 1938	42.49
Apr. 6, 1939	44.08
Oct. 6, 1939	42.68
Feb. 13, 1940	42.96
Well JB-84-30-301—Continued	
Feb. 3, 1941	42.49
Feb. 9, 1943	42.24
Mar. 6, 1945	42.56
Feb. 5, 1948	43.73
Feb. 15, 1949	45.19[a]/
Feb. 6, 1950	45.48
Feb. 26, 1951	42.91
Feb. 7, 1952	43.23
Feb. 5, 1953	46.41
Feb. 18, 1954	43.52
Feb. 10, 1955	43.73
Feb. 8, 1956	42.30
Feb. 14, 1957	43.06
Mar. 4, 1958	42.64
July 13, 1960	41.92
Mar. 15, 1961	41.92
Mar. 22, 1962	42.18
Feb. 14, 1963	43.16
Mar. 24, 1964	44.79
Feb. 15, 1965	43.55
Feb. 21, 1966	43.21
Feb. 25, 1967	43.60
Oct. 10, 1967	44.52
Nov. 17, 1967	43.74
Feb. 19, 1968	41.68
Mar. 20, 1969	38.97
Mar. 18, 1970	39.17
Well JB-84-30-501	
Owner: --Saenz	
Oct. 26, 1933	38.12
Dec. 12, 1934	42.27
Apr. 13, 1935	42.88
Feb. 1, 1936	41.10
July 16, 1937	41.79
Jan. 25, 1938	43.42
Apr. 6, 1939	43.37
Feb. 13, 1940	42.44
Well JB-84-30-501—Continued	
Feb. 4, 1941	43.57
Feb. 9, 1943	41.37
Mar. 7, 1945	41.54
Feb. 13, 1947	40.93
Feb. 5, 1948	42.52
Feb. 15, 1949	43.57
Feb. 6, 1950	43.73
Feb. 26, 1951	43.92
Feb. 7, 1952	42.39
Feb. 5, 1953	43.73
Feb. 18, 1954	43.52
Feb. 10, 1955	44.13
Feb. 8, 1956	44.32
Feb. 14, 1957	44.69
Mar. 4, 1958	42.25
July 13, 1960	41.73
Mar. 15, 1961	43.26
Mar. 22, 1962	43.39
Feb. 14, 1963	44.26
Mar. 24, 1964	44.84
Feb. 15, 1965	45.10
Feb. 21, 1966	45.40
Feb. 25, 1967	45.56
Oct. 18, 1967	40.46
Nov. 17, 1967	37.54
Feb. 19, 1968	39.11
Mar. 20, 1969	37.61
Mar. 18, 1970	44.60
Well JB-84-36-901	
Owner: Leroy Denman	
Oct. 30, 1933	57.70
Feb. 17, 1934	59.70
Apr. 14, 1935	59.82
Feb. 1, 1936	57.58
July 16, 1937	62.33
Jan. 26, 1938	57.96
Apr. 7, 1939	58.23

Table 9.—Water Levels in Wells—Continued

DATE	WATER LEVEL
Well JB-84-36-901—Continued	
Feb. 13, 1940	63.67[a]
Feb. 4, 1941	58.28
Feb. 10, 1943	63.44[a]
Mar. 7, 1945	59.09
Feb. 13, 1947	57.24[a]
Feb. 5, 1948	57.78
Feb. 15, 1949	62.25[a]
Feb. 7, 1950	58.43[a]
Feb. 26, 1951	57.96
Feb. 7, 1952	56.65
Feb. 5, 1953	57.40
Feb. 18, 1954	57.10
Feb. 10, 1955	58.70
Feb. 8, 1956	57.11
Feb. 14, 1957	57.75
Mar. 4, 1958	56.87
Mar. 15, 1961	58.40
Mar. 21, 1962	58.08
Feb. 14, 1963	58.65
Mar. 24, 1964	62.46
Feb. 15, 1965	58.89
Feb. 21, 1966	61.25
Feb. 25, 1967	61.40
Oct. 18, 1967	59.90
Nov. 17, 1967	58.47
Feb. 20, 1968	59.32
Mar. 20, 1969	58.18
Mar. 19, 1970	58.67
Well JB-84-37-104	
Owner: Gus Minges	
Feb. 22, 1933	93.05
Feb. 5, 1934	92.03
Apr. 13, 1935	93.08
Jan. 30, 1936	92.65
July 16, 1937	92.54
Jan. 25, 1938	93.20
Apr. 7, 1939	93.02

DATE	WATER LEVEL
Well JB-84-37-104—Continued	
Feb. 13, 1940	94.40
Feb. 3, 1941	93.40
Feb. 10, 1943	92.83
Mar. 7, 1945	94.55
Feb. 13, 1947	95.22
Feb. 5, 1948	92.80
Feb. 15, 1949	97.97
Feb. 7, 1950	94.07
Feb. 5, 1953	94.94
Feb. 18, 1954	94.47
Feb. 8, 1956	95.64
Feb. 14, 1957	97.02
Mar. 4, 1958	96.92
July 13, 1960	97.50
Mar. 15, 1961	96.58
Mar. 21, 1962	97.15
Well JB-84-37-301	
Owner: Atlee Parr	
Feb. 5, 1948	75.93
Feb. 20, 1949	77.25
Feb. 7, 1950	76.97
Feb. 27, 1951	77.76
Feb. 7, 1952	77.70
Feb. 5, 1953	78.62
Feb. 18, 1954	79.08
Feb. 10, 1955	80.04
Feb. 8, 1956	80.22
Feb. 14, 1957	80.63
Mar. 4, 1958	80.14
July 13, 1960	80.48
Mar. 15, 1961	79.81
Mar. 22, 1962	81.98
Feb. 14, 1963	82.41
Mar. 24, 1964	84.23
Feb. 15, 1965	86.45
Feb. 22, 1966	86.40
Feb. 25, 1967	86.82

DATE	WATER LEVEL
Well JB-84-37-301—Continued	
Feb. 20, 1968	85.74
Mar. 20, 1969	85.25
Mar. 18, 1970	88.17
Well JB-84-37-901	
Owner: G. R. Martinez	
Feb. 6, 1948	49.18
Feb. 20, 1949	48.42
Feb. 4, 1950	49.17
Feb. 27, 1951	49.96
Feb. 7, 1952	49.25
Feb. 5, 1953	51.60
Feb. 18, 1954	50.62
Feb. 10, 1955	48.20
Feb. 8, 1956	49.67
Feb. 14, 1957	49.36
Mar. 4, 1958	48.57
July 13, 1960	49.35
Mar. 15, 1961	43.66
Feb. 14, 1963	48.32
Mar. 24, 1964	50.25
Feb. 15, 1965	51.64
Feb. 22, 1966	52.40
Feb. 25, 1967	53.22
Feb. 20, 1968	51.81
Mar. 20, 1969	51.07
Mar. 17, 1970	47.15
Well JB-84-38-601	
Owner: Eluterio Saenz	
May 26, 1931	77.80
Aug. 22, 1933	77.31
Feb. 5, 1934	77.10
Apr. 15, 1935	76.60
Feb. 2, 1936	75.20
July 17, 1937	73.30
Jan. 26, 1938	73.62
Apr. 7, 1939	74.56
Feb. 13, 1940	74.86

Table 9.—Water Levels in Wells—Continued

Well JB-84-38-601—Continued

DATE		WATER LEVEL
Feb.	4, 1941	75.60
Feb.	11, 1943	72.84
Mar.	7, 1945	72.37
Mar.	13, 1946	73.01
Feb.	14, 1947	73.92
Feb.	6, 1948	74.92
Feb.	20, 1949	75.62
Feb.	4, 1950	76.32
Feb.	27, 1951	80.63
Feb.	7, 1952	82.10
Feb.	5, 1953	78.90
Feb.	18, 1954	81.05
Feb.	10, 1955	82.97
Feb.	8, 1956	83.65
Feb.	15, 1957	84.27
Mar.	4, 1958	82.52
July	13, 1960	83.61

Well JB-84-38-701

Owner: J. Carrillo

DATE		WATER LEVEL
May	29, 1931	49.50
Aug.	22, 1933	46.85
Feb.	5, 1934	45.59
Apr.	15, 1935	45.85
Feb.	2, 1936	40.92
July	17, 1937	35.68
Jan.	26, 1938	37.53
Apr.	7, 1939	40.10
Feb.	13, 1940	41.10
Feb.	3, 1941	41.99
Feb.	10, 1943	37.22
Feb.	13, 1947	39.53
Feb.	6, 1948	40.18
Feb.	20, 1949	40.70
Feb.	4, 1950	40.89
Feb.	27, 1951	42.62
Feb.	7, 1952	42.28
Feb.	5, 1953	42.49

Well JB-84-38-701—Continued

DATE		WATER LEVEL
Feb.	8, 1954	42.41
Feb.	10, 1955	42.44
Feb.	8, 1956	43.05
Feb.	14, 1957	44.08
Mar.	4, 1958	41.82
July	13, 1960	42.56
Mar.	15, 1961	39.35
Mar.	22, 1962	41.40
Feb.	14, 1963	42.94
Mar.	24, 1964	43.26
Feb.	15, 1965	45.50
Feb.	22, 1966	46.58
Feb.	25, 1967	48.30
Oct.	18, 1967	42.52
Nov.	17, 1967	44.11
Feb.	20, 1968	44.64
Mar.	20, 1969	42.61
Mar.	17, 1970	37.03

Well JB-84-38-702

Owner: C. S. Hinojosa, Jr.

DATE		WATER LEVEL
May	29, 1931	44.30
Jan.	1, 1933	46.05
Feb.	22, 1933	45.63
May	31, 1933	45.54
June	26, 1933	42.16
July	24, 1933	44.90
Aug.	10, 1933	40.09
Aug.	22, 1933	34.96
Sept.	11, 1933	30.12
Sept.	29, 1933	29.10
Oct.	18, 1933	30.20
Oct.	30, 1933	31.30
Nov.	11, 1933	31.41
Feb.	5, 1934	38.27
Dec.	10, 1934	44.28
Apr.	15, 1935	43.85
Feb.	2, 1936	29.70

Well JB-84-38-702—Continued

DATE		WATER LEVEL
Feb.	15, 1936	30.22
July	17, 1937	35.11
Jan.	26, 1938	38.96
Oct.	18, 1938	40.73
Apr.	7, 1939	41.98
Oct.	6, 1939	31.50
Feb.	13, 1940	38.25
Feb.	4, 1941	44.14
Feb.	10, 1943	38.39
Dec.	10, 1969	37.2

Well JB-84-38-801

Owner: Guadalupe Silva

DATE		WATER LEVEL
Feb.	22, 1933	60.51
Feb.	5, 1934	57.22
Apr.	15, 1935	59.04
Feb.	2, 1936	52.88
Jan.	26, 1938	52.83
Apr.	7, 1939	56.73
Feb.	13, 1940	53.40
Feb.	4, 1941	55.34
Feb.	10, 1943	51.91
Mar.	7, 1945	50.31

Well JB-84-38-902

Owner: Hilario Saenz Estate

DATE		WATER LEVEL
May	26, 1931	58.40
Dec.	9, 1932	61.10
Aug.	22, 1933	58.79
Feb.	5, 1934	57.84
Apr.	15, 1935	59.14
Feb.	2, 1936	58.06
July	17, 1937	59.84
Jan.	26, 1938	60.49
Apr.	7, 1939	62.10
Feb.	13, 1940	64.64[a]/
Feb.	4, 1941	63.39
Nov.	11, 1943	71.27
Mar.	7, 1945	69.28

Table 9.—Water Levels in Wells—Continued

Well JB-84-38-902—Continued

DATE		WATER LEVEL
Mar.	12, 1946	73.14
Feb.	14, 1947	74.63
Feb.	6, 1948	76.28
Feb.	20, 1949	80.78
Feb.	4, 1950	81.11
Feb.	7, 1952	87.03
Feb.	5, 1953	91.00
Feb.	18, 1954	91.60
Feb.	10, 1955	96.17
Feb.	8, 1956	96.84
Feb.	15, 1957	98.35
Mar.	4, 1958	94.71
July	13, 1960	96.53
Mar.	15, 1961	87.08
Mar.	22, 1962	88.45
Feb.	14, 1963	75.40
Mar.	24, 1964	76.09
Feb.	15, 1965	77.08
Feb.	22, 1966	79.66
Feb.	25, 1967	80.08
Feb.	20, 1968	79.79
Mar.	20, 1969	78.18
Mar.	17, 1970	68.63

Well JB-34-38-903

Owner: Santos Canales

DATE		WATER LEVEL
Jan.	7, 1933	46.55
Feb.	5, 1934	45.75
Apr.	15, 1935	46.88
Feb.	2, 1936	45.94
July	17, 1937	47.92
Jan.	26, 1938	47.51
Apr.	7, 1939	50.10
Feb.	13, 1940	49.25
Feb.	4, 1941	50.69
Nov.	11, 1943	55.60
Mar.	7, 1945	55.35
Mar.	13, 1946	59.74

Well JB-84-38-903—Continued

DATE		WATER LEVEL
Feb.	14, 1947	61.22
Feb.	6, 1948	61.98
Feb.	20, 1949	67.68
Feb.	4, 1950	67.92
Feb.	27, 1951	70.94
Feb.	7, 1952	71.50
Feb.	18, 1954	84.40
Feb.	10, 1955	85.41
Feb.	8, 1956	84.62
Feb.	15, 1957	86.51
Mar.	4, 1958	84.95
Mar.	15, 1961	86.87
Mar.	22, 1962	67.50
Feb.	14, 1963	87.00
Mar.	24, 1964	93.20
Feb.	15, 1965	64.61
Feb.	22, 1966	65.39
Feb.	25, 1967	64.91
Feb.	20, 1968	65.04
Mar.	20, 1969	62.34
Mar.	17, 1970	57.02

Well JB-84-44-601

Owner: A. C. Jones

DATE		WATER LEVEL
May	30, 1931	36.60
Aug.	22, 1933	37.43
Feb.	7, 1934	31.95
Apr.	14, 1935	34.50
Feb.	2, 1936	34.36
July	16, 1937	33.62
Jan.	26, 1938	35.30
Oct.	6, 1939	38.90
Feb.	14, 1940	39.18
Feb.	4, 1941	39.19
Nov.	9, 1943	37.25
Mar.	7, 1945	38.45
Feb.	13, 1947	41.07
Feb.	5, 1948	41.26

Well JB-84-44-601—Continued

DATE		WATER LEVEL
Feb.	15, 1949	42.56
Feb.	7, 1950	42.94
Feb.	7, 1952	42.18
Feb.	5, 1953	45.00
Feb.	18, 1954	45.41
Feb.	10, 1955	47.40
Feb.	8, 1956	49.53
Feb.	14, 1957	46.70
Mar.	4, 1958	45.95
July	13, 1960	46.93
Mar.	15, 1961	45.72
Mar.	21, 1962	45.92
Feb.	14, 1963	46.11
Mar.	24, 1964	47.95
Feb.	15, 1965	48.10
Feb.	22, 1966	47.89
Feb.	25, 1967	47.66
Oct.	17, 1967	45.70
Nov.	17, 1967	45.94
Feb.	20, 1968	46.24
Mar.	20, 1969	46.87

Well JB-84-45-101

Owner: J. Mann

DATE		WATER LEVEL
Sept.	28, 1933	75.87
Dec.	5, 1934	75.47
Apr.	14, 1935	75.50
Feb.	1, 1936	75.42
July	16, 1937	78.34
Jan.	26, 1938	71.11
Apr.	7, 1939	75.52
Feb.	13, 1940	75.75
Feb.	4, 1941	76.03
Feb.	10, 1943	74.84
Mar.	7, 1945	74.69
Feb.	13, 1947	75.00
Feb.	5, 1948	75.38
Feb.	15, 1949	77.29

Table 9.—Water Levels in Wells—Continued

DATE	WATER LEVEL
Well JB-84-45-101—Continued	
Feb. 7, 1950	85.52
Feb. 26, 1951	86.76
Feb. 7, 1952	83.90
Feb. 5, 1953	89.01
Feb. 18, 1954	89.86
Feb. 10, 1955	90.08
Feb. 8, 1956	90.83
Feb. 14, 1957	91.50
Mar. 4, 1958	89.60
Mar. 15, 1961	90.48
Mar. 21, 1962	90.86
Feb. 14, 1963	92.90
Mar. 24, 1964	93.01
Feb. 15, 1965	95.47
Feb. 21, 1966	94.28
Feb. 25, 1967	85.51
Well JB-84-45-102	
Owner: San Antonio Loan & Trust Co.	
Sept. 28, 1933	83.84
Feb. 19, 1934	84.57
Apr. 14, 1935	84.55
Feb. 15, 1936	84.78
July 16, 1937	84.20
Well JB-84-45-304	
Owner: Abraham Garcia	
Aug. 22, 1933	45.69
Feb. 17, 1934	45.50
Apr. 16, 1935	45.40
Feb. 1, 1936	44.48
July 17, 1937	43.06
Oct. 18, 1938	43.95
Apr. 7, 1939	44.35
Feb. 13, 1940	44.66
Feb. 4, 1941	44.92
Feb. 10, 1943	43.57
Mar. 7, 1945	44.49
Feb. 13, 1947	44.25

DATE	WATER LEVEL
Well JB-84-45-304—Continued	
Feb. 5, 1948	44.21
Feb. 20, 1949	44.87
Feb. 7, 1950	45.64
Feb. 27, 1951	47.67
Feb. 7, 1952	46.68
Feb. 5, 1953	48.58 b/
Feb. 18, 1954	45.76
Feb. 10, 1955	46.34
Feb. 8, 1956	46.90
Feb. 14, 1957	45.27
Mar. 4, 1958	43.83
Mar. 15, 1961	26.61
Mar. 21, 1962	28.79
Feb. 14, 1963	28.11
Mar. 24, 1964	28.91
Feb. 15, 1965	30.00
Feb. 22, 1966	29.13
Feb. 25, 1967	29.10
Oct. 17, 1967	24.80
Nov. 17, 1967	24.48
Feb. 20, 1968	25.83
Mar. 20, 1969	23.82
Well JB-84-45-305	
Owner: Gilberto Ramirez	
June 3, 1931	48.30
Aug. 22, 1933	48.70
Feb. 17, 1934	47.08
Apr. 16, 1935	47.44
Feb. 1, 1936	45.60
July 17, 1937	43.19
Jan. 26, 1938	44.77
Apr. 7, 1939	46.90
Feb. 13, 1940	47.56
Feb. 4, 1941	48.01
Feb. 9, 1943	45.25
Mar. 7, 1945	46.98

DATE	WATER LEVEL
Well JB-84-45-305—Continued	
Feb. 13, 1947	47.92
Nov. 6, 1969	39.70
Well JB-84-45-307	
Owner: Mrs. H. B. Salinas	
June 3, 1931	52.00
Aug. 22, 1933	52.20
Feb. 17, 1934	51.57
Apr. 16, 1935	51.24
Feb. 15, 1936	50.48
July 17, 1937	49.30
Jan. 26, 1938	49.15
Feb. 13, 1940	49.95
Feb. 4, 1941	50.02
Feb. 10, 1943	49.06
Mar. 7, 1945	49.33
Feb. 13, 1947	49.47
Feb. 5, 1948	49.39
Feb. 20, 1949	49.41
Feb. 7, 1950	49.72
Feb. 27, 1951	53.36
Feb. 7, 1952	50.55
Feb. 5, 1953	52.72
Feb. 18, 1954	49.90
Feb. 10, 1955	50.09
Feb. 8, 1956	51.17
Feb. 14, 1957	49.34
Mar. 4, 1958	48.85
July 13, 1960	49.23
Nov. 19, 1969	21.80
Well JB-84-45-501	
Owner: Mills Bennett ?	
May 29, 1931	28.50
Aug. 22, 1933	29.01
Feb. 17, 1934	26.28
Apr. 14, 1935	27.42
Feb. 2, 1936	27.33

Table 9.—Water Levels in Wells—Continued

DATE		WATER LEVEL
Well JB-84-45-501—Continued		
July	17, 1937	26.93
Jan.	26, 1938	28.26
Apr.	7, 1939	29.99
Feb.	13, 1940	30.80
Feb.	4, 1941	31.65
Feb.	13, 1947	33.06
Feb.	5, 1948	33.13
Feb.	20, 1949	33.93
Feb.	7, 1950	34.63
Feb.	27, 1951	34.21
Feb.	7, 1952	33.70
Feb.	5, 1953	34.93
Feb.	18, 1954	34.72
Feb.	10, 1955	35.05
Feb.	8, 1956	35.24
Feb.	14, 1957	37.52
Mar.	4, 1958	36.90
July	13, 1960	37.80
Mar.	15, 1961	36.74
Mar.	21, 1962	34.29
Feb.	14, 1963	39.02
Mar.	24, 1964	39.50
Feb.	15, 1965	39.29
Feb.	22, 1966	39.88
Feb.	25, 1967	40.44
Feb.	20, 1968	39.77
Mar.	20, 1969	40.32
Mar.	19, 1970	31.68
Well JB-84-46-101		
Owner: Rafael Garcia		
May	28, 1931	62.60
Sept.	11, 1933	57.10
Dec.	11, 1934	54.83
Apr.	16, 1935	55.03
Feb.	2, 1936	53.55
July	17, 1937	49.40
Jan.	26, 1938	49.92

DATE		WATER LEVEL
Well JB-84-46-101—Continued		
Apr.	7, 1939	52.42
Feb.	13, 1940	52.67
Feb.	4, 1941	53.74
Feb.	10, 1943	53.81
Mar.	7, 1945	55.74
Feb.	14, 1947	56.99
Feb.	6, 1948	58.10
Feb.	20, 1949	58.19
Feb.	4, 1950	59.00
Feb.	7, 1952	60.40
Feb.	5, 1953	60.25
Feb.	18, 1954	61.42
Feb.	10, 1955	61.03
Feb.	8, 1956	57.44
Feb.	14, 1957	58.79
Mar.	4, 1958	60.60
July	13, 1960	59.72
Mar.	15, 1961	59.15
Mar.	22, 1962	59.30
Feb.	14, 1963	60.50
Mar.	24, 1964	65.42
Feb.	15, 1965	62.33
Feb.	22, 1966	62.89
Feb.	25, 1967	62.45
Oct.	17, 1967	62.44
Nov.	17, 1967	61.96
Feb.	20, 1968	62.13
Mar.	21, 1969	60.84
Nov.	22, 1969	56.00
Mar.	17, 1970	60.27
Well JB-84-46-401		
Owner: Mrs. Virginia Garcia		
June	29, 1931	49.60
Mar.	30, 1933	49.00
Feb.	15, 1934	49.14
Apr.	16, 1935	49.22
Feb.	2, 1936	49.85

DATE		WATER LEVEL
Well JB-84-37-401—Continued		
July	17, 1937	49.18
Jan.	26, 1938	50.18
Apr.	7, 1939	52.65
Feb.	13, 1940	51.77
Feb.	4, 1941	52.37
Feb.	10, 1943	54.94
Mar.	7, 1945	56.93
Feb.	14, 1947	61.89
Feb.	6, 1948	63.67
Feb.	20, 1949	65.95
Feb.	4, 1950	66.80
Feb.	5, 1953	68.90
Feb.	18, 1954	77.60
Feb.	10, 1955	80.62
Feb.	8, 1956	79.49
Feb.	14, 1957	80.70
Mar.	4, 1958	79.22
July	13, 1960	77.45
Mar.	15, 1961	79.42
Feb.	14, 1963	87.20
Mar.	24, 1964	91.04
Feb.	15, 1965	101.20
Feb.	22, 1966	94.53
Feb.	25, 1967	93.35
Nov.	22, 1969	104.80
Well JB-84-46-402		
Owner: Rafael Garcia		
Sept.	29, 1933	30.55
Feb.	15, 1934	31.11
Apr.	16, 1935	33.48
Feb.	2, 1936	29.42
July	17, 1937	27.18
Jan.	26, 1938	29.22
Apr.	7, 1939	34.40
Feb.	13, 1940	31.01
Feb.	4, 1941	31.44
Feb.	10, 1943	37.24

Table 9.—Water Levels in Wells—Continued

DATE		WATER LEVEL
Well JB-84-46-402—Continued		
Mar.	7, 1945	32.98
Feb.	14, 1947	31.30
Feb.	6, 1948	33.40
Feb.	20, 1949	34.67
Feb.	4, 1950	35.72
Feb.	5, 1953	37.42
Feb.	10, 1955	38.59
Feb.	8, 1956	35.30
Feb.	14, 1957	38.65
Mar.	4, 1958	40.31
July	13, 1960	39.08
Mar.	15, 1961	35.58
Mar.	22, 1962	44.08
Feb.	14, 1963	37.77
Mar.	24, 1964	38.33
Feb.	15, 1965	39.62
Feb.	22, 1966	39.53
Feb.	25, 1967	41.06
Oct.	17, 1967	33.60
Nov.	17, 1967	32.04
Mar.	17, 1970	32.45
Well JB-84-46-602		
Owner: Leroy Denman		
May	27, 1931	23.10
Feb.	22, 1933	23.08
Feb.	15, 1934	22.31
Apr.	14, 1935	22.82
Feb.	2, 1936	22.62
July	17, 1937	24.14
Jan.	27, 1938	24.24
Apr.	7, 1939	25.55
Feb.	4, 1941	27.50
Mar.	11, 1943	31.82
Mar.	8, 1945	36.18
Mar.	12, 1946	41.13
Feb.	14, 1947	44.38
Feb.	6, 1948	47.79
Well JB-84-46-602—Continued		
Feb.	20, 1949	52.24
Feb.	4, 1950	52.68
Feb.	27, 1951	57.17
Feb.	7, 1952	56.70
Feb.	5, 1953	62.22
Feb.	18, 1954	64.84
Feb.	10, 1955	65.35
Feb.	8, 1956	66.55
Well JB-84-46-603		
Owner: Ruben Schultz		
Dec.	9, 1932	47.60
Feb.	22, 1933	47.79
Feb.	15, 1934	47.72
Apr.	14, 1935	47.53
Feb.	2, 1936	47.90
July	17, 1937	47.07
Jan.	27, 1938	47.31
Apr.	7, 1939	49.27
Feb.	4, 1941	50.70
Feb.	11, 1943	51.74
Mar.	8, 1945	43.31
Mar.	12, 1946	44.14
Feb.	14, 1947	45.82
Feb.	6, 1948	47.45
Feb.	20, 1949	49.06
Feb.	4, 1950	49.81
Feb.	27, 1951	58.97
Feb.	7, 1952	58.09
Feb.	5, 1953	51.62
Feb.	18, 1954	53.81
Feb.	10, 1955	54.27
Feb.	8, 1956	54.90
Feb.	15, 1957	56.13
Well JB-84-46-701		
Owner: San Antonio Loan & Trust Company		
May	29, 1931	60.50
Aug.	22, 1933	52.74
Well JB-84-46-701—Continued		
Dec.	8, 1934	52.52
Apr.	14, 1935	52.60
Feb.	2, 1936	51.90
July	17, 1937	52.18
Jan.	27, 1938	51.01
Apr.	7, 1939	53.77
Feb.	14, 1940	52.29
Feb.	4, 1941	52.32
Feb.	11, 1943	53.28
Mar.	8, 1945	53.36
Feb.	14, 1947	53.36
Feb.	6, 1948	53.63
Feb.	20, 1949	53.89
Feb.	7, 1950	54.13
Feb.	27, 1951	75.40[a]/
Feb.	7, 1952	76.22[a]/
Feb.	5, 1953	54.47
Feb.	18, 1954	55.18
Feb.	10, 1955	56.80
Feb.	8, 1956	56.98
Feb.	14, 1957	58.40
Mar.	4, 1958	57.83
July	13, 1960	57.34
Mar.	16, 1961	55.33
Mar.	21, 1962	55.98
Feb.	14, 1963	57.18
Mar.	24, 1964	55.74
Feb.	16, 1965	56.07
Feb.	22, 1966	62.46
Feb.	25, 1967	64.24
Feb.	20, 1968	63.46
Mar.	21, 1969	60.61
Mar.	17, 1970	58.42
Well JB-84-46-901		
Owner: Rufino Garcia, Jr.		
Feb.	6, 1948	53.67
Feb.	20, 1949	58.41

Table 9.—Water Levels in Wells—Continued

DATE		WATER LEVEL
Well JB-84-46-901—Continued		
Feb.	4, 1950	58.23
Feb.	27, 1951	62.75
Feb.	7, 1952	62.42
Feb.	5, 1953	69.37
Feb.	18, 1954	72.01
Feb.	10, 1955	73.86
Feb.	8, 1956	74.43
Feb.	15, 1957	76.39
Mar.	4, 1958	74.21
July	13, 1960	73.85
Mar.	21, 1962	70.40
Feb.	14, 1963	65.87
Mar.	24, 1964	87.78
Feb.	16, 1965	99.28
Feb.	25, 1967	100.41
Feb.	20, 1968	99.82

DATE		WATER LEVEL
Well JB-84-46-901—Continued		
Mar.	21, 1969	95.47
Mar.	17, 1970	96.08
Well JB-84-46-903		
Owner: Santana Hinojosa		
Feb.	5, 1953	81.33
Feb.	18, 1954	82.10
Feb.	10, 1955	83.35
Feb.	8, 1956	88.10
Feb.	15, 1957	90.05
Mar.	4, 1958	90.76
Mar.	15, 1961	89.1-
Dec.	15, 1969	121.7
Well JB-84-47-702		
Owner: Clyde Crook		
Jan.	6, 1932	36.55

DATE		WATER LEVEL
Well JB-84-47-702—Continued		
Nov.	9, 1943	40.01
Mar.	4, 1944	39.86
Mar.	8, 1945	41.59
Mar.	12, 1946	44.20
Feb.	14, 1947	43.02
Feb.	7, 1952	67.07
Feb.	18, 1954	76.19
Well JB-84-47-703		
Owner: Clyde Crook		
Feb.	6, 1948	57.39
Feb.	20, 1949	62.23
Feb.	27, 1951	67.53
Feb.	7, 1952	67.07
Feb.	18, 1954	76.19

a/ Pumping.

b/ Pumped recently.

Table 10.—Drillers' Logs of Wells

	THICKNESS (FEET)	DEPTH (FEET)
Well JB-78-62-703		
Owner: Charles Houlihan Driller: Richardson Water Well Drilling Co.		
Surface soil and clay	30	30
Caliche, hard	16	46
Sand, with hard sand streaks	32	78
Caliche and sand	12	90
Clay, red shale, and hard streaks	26	116
Sand, hard, fine	14	130
Clay and hard shale	10	140
Sand, free	9	149
Sand, hard	2	151
Sand, free	8	159
Shale and clay	3	162
Sand	2	164
Shale and clay	6	170
Sand	30	200
Shale	12	212
Well JB-84-04-602		
Owner: J. F. Welder Estate Driller: Buck Page & Co.		
Surface sand	30	30
Shale	397	427
Shale, sandy	22	449
Shale	58	507
Sand, hard	26	533
Shale	61	594
Sand	50	644
Shale	213	857
Sand, hard	30	887
Shale	113	1,000
Well JB-84-05-401		
Owner: V. H. Lehman Driller: Buck Page & Co.		
Sand	18	18
Shale	29	47
Caliche	17	64
Shale	344	408
Well JB-84-05-401—Continued		
Sand	7	415
Shale	158	573
Sand	111	684
Shale	16	700
Sand	29	729
Shale	51	780
Well JB-84-06-601		
Owner: Ed Canales Driller: Rader Equipment Co.		
Topsoil and clay	5	5
Caliche	95	100
Clay	140	240
Clay, sandy	10	250
Clay, hard	210	460
Sand, broken	20	480
Well JB-84-12-701		
Owner: Freer W.C.I.D. No. 1, well 6 Driller: H & S Water Well Service		
Caliche	20	20
Shale, red, with streaks of caliche	275	295
Shale, with streaks of sand	45	340
Shale	45	385
Shale, with thin streaks of sand	50	435
Shale, with streaks of sand	55	490
Sand, hard	18	508
Sand, soft	5	513
Sand, hard	4	517
Sand, soft	4	521
Shale, soft, with hard streaks of sand	19	540
Sand, with fine gravel	60	600
Shale	16	616
Sand	10	626
Shale, hard, blue	16	642

Table 10.—Drillers' Logs of Wells—Continued

	THICKNESS (FEET)	DEPTH (FEET)
Well JB-84-12-702		
Owner: Freer W.C.I.D. No. 1, well 4 Driller: H & S Water Well Service		
Sand	210	210
Shale	160	370
Shale, sandy	40	410
Shale	27	437
Sand	13	450
Shale	20	470
Sand, and gravel	100	570
Shale	20	590
Well JB-84-12-703		
Owner: Freer W.C.I.D. No. 1, well 8 Driller: H & S Water Well Service		
Caliche, with streaks of shale	40	40
Shale	140	180
Shale, red	185	365
Shale	90	455
Shale, sticky	85	540
Gravel	17	557
Sand, hard, with streaks of gravel	8	565
Shale	5	570
Sand, hard, and gravel	15	585
Gravel, with thin streaks of shale	30	615
Sand, hard	2	617
Shale, sandy	13	630
Shale, limy hard streaks	2	632
Shale, hard	8	640
Well JB-84-13-402		
Owner: Juan Hasette Driller: Dillard Wied		
Topsoil	4	4
Caliche	5	9
Seep	36	45
Caliche, hard	3	48
Clay, yellow	8	56
Clay, white	24	80
Clay, brown	8	88
Well JB-84-13-402—Continued		
Sand, shaley	12	100
Sand with clay breaks	21	121
Clay	12	133
Well JB-84-13-502		
Owner: Jose A. Canales Driller: Richardson Water Well Service		
Surface soil	6	6
Caliche, hard	42	48
Caliche, with streaks of sand	19	67
Caliche	18	85
Clay and caliche	30	115
Shale, streaky	57	172
Sandstone, hard	2	174
Shale	71	245
Shale, with small sand streaks	35	280
Well JB-84-14-602		
Owner: C. M. Robinson Driller: Buck Page & Co.		
Caliche	30	30
Sand, hard	70	100
Sand and shale	50	150
Sand	34	184
Well JB-84-15-702		
Owner: City of San Diego, old well 1 Driller: Layne Texas Co.		
Soil	5	5
Sand and caliche	60	65
Clay, red, and caliche	48	113
Clay, red	110	223
Clay, sandy	150	373
Caliche, hard	23	396
Sand	18	414
Clay	21	435
Sand	4	439
Clay	36	475
Sand	26	501
Sand, tough	8	509

Table 10.—Drillers' Logs of Wells—Continued

	THICKNESS (FEET)	DEPTH (FEET)
Well JB-84-20-301		
Owner: Michel Shamoun Driller: Dillard Wied		
Topsoil	5	5
Caliche and clay	96	101
Clay, red and brown	85	186
Sand, shaley	30	216
Clay, brown	32	248
Sand, shaley, and fine sand	29	277
Clay	61	338
Sand, shaley, and sand and clay	46	384
Clay, red	2	386
Clay, shaley sand, and sand (good)	65	451
Clay, white	7	458
Clay, grey	25	483
Well JB-84-21-501		
Owner: P.P.G. Industries, well 13 Driller: Layne Texas Co.		
Caliche	22	22
Caliche and sand streaks	24	46
Clay, hard, red, and caliche streaks	167	213
Sand, fine, and caliche streaks	54	267
Shale, hard	34	301
Sand and shale layers	43	344
Shale	10	354
Shale, hard, sandy	28	382
Lime, hard, sandy	25	407
Lime layers and streaks	20	427
Sand and lime layers	25	452
Sand and shale streaks	29	481
Shale, hard	12	493
Sand, hard	23	516
Shale and sand streaks	40	556
Sand and sandy shale	10	566
Shale	10	576
Sand and shale layers	48	624
Sand, hard	14	638
Shale and sand streaks	8	646

	THICKNESS (FEET)	DEPTH (FEET)
Well JB-84-21-604		
Owner: P.P.G. Industries, well 4 Driller: Layne Texas Co.		
Surface soil	6	6
Sandy shale	4	10
Sand, fine	5	15
Shale, sandy	2	17
Sand, fine	2	19
Caliche	3	22
Sand, fine, hard layers	24	46
Shale	176	222
Sand	11	233
Shale	21	254
Sand	5	259
Shale, sand, fine	11	270
Sand	30	300
Shale	27	327
Sand, hard	10	337
Shale	10	347
Sand, hard	23	370
Shale	21	391
Shale, sandy	21	412
Sand	16	428
Caliche	6	434
Shale	23	457
Sand	5	462
Shále	4	466
Shale, sandy	8	474
Shale	7	481
Well JB-84-22-401		
Owner: P.P.G. Industries, well 14 Driller: Layne Texas Co.		
Caliche	35	35
Caliche and clay	89	124
Shale	181	305
Shale, sandy, and shale	75	380
Shale	277	657
Shale, hard, and celenite	277	934

	THICKNESS (FEET)	DEPTH (FEET)
Well JB-84-22-401—Continued		
Rock, hard	3	937
Shale, hard	83	1,020
Shale and sandy shale	78	1,098
Sand, and thin shale breaks	69	1,167
Shale	5	1,172
Sand	31	1,203
Shale, sandy	10	1,213
Sand	45	1,258
Shale	6	1,264
Well JB-84-28-501		
Owner: Joe Garza Driller: Dillard Wied		
Topsoil	3	3
Caliche	9	12
Gravel, with clay breaks	59	71
Clay	59	130
Sand, shaley	10	140
Clay and shaley sand	4	144
Sand	1	145
Clay, with sand breaks	3	148
Sand and dirt	2	150
Sand	5	155
Sand, with clay breaks	7	162
Clay	5	167
Sand	2	169
Clay	17	186
Well JB-84-29-302		
Owner: City of Benavides, old well 2 Driller: Layne Texas Co.		
Soil	3	3
Sand, hard, and caliche	17	20
Caliche and sand	23	43
Caliche, hard	17	60
Clay and caliche	24	84
Sand	5	89
Caliche, hard	14	103
Clay, sandy	43	146

	THICKNESS (FEET)	DEPTH (FEET)
Well JB-84-29-302—Continued		
Clay	39	185
Clay, sandy	25	210
Sand, fine-grained	35	245
Clay, sandy	15	260
Sand, clay, sandy	66	326
Sand, broken	29	355
Clay	14	369
Sand	4	373
Clay, sand breaks	44	417
Clay	13	430
Clay, sandy	20	450
Sand, broken	12	462
Clay	21	483
Sand	12	495
Clay, sandy	3	498
Sand	19	517
Clay, tough	28	545
Clay, sandy	26	571
Clay, tough	44	615
Well JB-84-30-102		
Owner: Anselmo Elizando Driller: Buck Page & Co.		
Caliche	81	81
Shale	30	111
Sand	34	145
Sand, and sandy shale	116	261
Shale	39	300
Sand, and sandy shale	90	390
Shale	30	420
Sand, hard, and shale	142	562
Shale, sand, streaked, and sand rock	58	620
Shale and sandy shale	80	700
Sand, hard, and shale and lime	130	830
Shale, sandy	55	885
Shale	115	1,000
Sand, with shale streaks	105	1,105
Shale	50	1,155

	THICKNESS (FEET)	DEPTH (FEET)
Well JB-84-30-901		
Owner: Mrs. Luther Reese Driller: Disbro Water Well Service		
Surface soil	8	8
Caliche and rock	152	160
Shale, hard, red	88	248
Shale, soft, red	64	312
Sand	26	338
Shale	2	340
Well JB-84-35-503		
Owner: Heberto Benavides Driller: Dillard Wied		
Topsoil	2	2
Clay	6	8
Caliche	24	32
Clay, brown	19	51
Sand	8	59
Gravel, dry	18	77
Cement rock	19	96
Clay, yellow	10	106
Clay, brown	26	132
Sand, shaley, grey	6	138
Shale, sandy, grey	9	147
Clay, grey	22	169
Sand, shaley, brown	8	177
Clay	9	186
Sand, shaley	1	187
Clay	11	198
Sand, shaley	12	210
Clay (drilled like sand)	39	249
Clay	3	252
Clay (drilled like sand)	39	291
Clay, hard, brown	159	450
Clay, light brown	12	462
Clay, brown, with soft streaks	17	479
Sand, shaley	4	483
Clay, hard, brown	106	589
Clay, white and brown	11	600

	THICKNESS (FEET)	DEPTH (FEET)
Well JB-84-35-503—Continued		
Clay	6	606
Sand, green, shaley	4	610
Sand, hard, shaley	22	632
Clay, brown	46	678
Clay, soft	5	683
Clay, hard, brown	21	704
Clay, grey	31	735
Sand, shaley	5	740
Clay	4	744
Sand, shaley	2	746
Clay, grey	2	748
Clay	3	751
Sand, shaley	10	761
Clay (drilled like sand)	45	806
Clay	54	860
Sand, shaley	4	864
Clay	16	880
Sand, shaley	2	882
Clay	-3	879
Sand, shaley	4	883
Clay	49	932
Clay, hard	4	936
Clay, brown	67	1,003
Sand, shaley	6	1,009
Clay	22	1,031
Clay, hard	4	1,035
Sand, shaley	5	1,040
Clay	16	1,056
Sand, shaley	20	1,076
Clay, brown and green	22	1,098
Sand, shaley	25	1,123
Clay	52	1,175
Sand, shaley	1	1,176
Clay	24	1,200

Table 10.—Drillers' Logs of Wells—Continued

	THICKNESS (FEET)	DEPTH (FEET)
Well JB-84-36-401		
Owner: Oscar Wyatt Driller: Dillard Wied		
Topsoil	2	2
Caliche	84	86
Clay, brown	43	129
Gravel	15	144
Clay, red	6	150
Gravel	4	154
Clay	20	174
Gravel and clay	17	191
Gravel and sand	8	199
Clay	2	201
Sand	3	204
Clay	6	210
Gravel	6	216
Clay	2	218
Gravel	3	221
Clay	34	255
Well JB-84-36-403		
Owner: Oscar Wyatt Driller: Dillard Wied		
Topsoil	4	4
Caliche	62	66
Clay, brown	14	80
Sandstone	4	84
Gravel and sand	56	140
Clay	2	142
Sand, shaley	2	144
Sand	4	148
Gravel	1	149
Sandstone	7	156
Sandstone, hard	4	160
Clay, white	2	162
Sand, shaley	2	164
Clay, white	23	187
Sand, shaley	9	196
Clay, grey	21	217

	THICKNESS (FEET)	DEPTH (FEET)
Well JB-84-36-403—Continued		
Sand, shaley, and clay	2	219
Sand, shaley	5	224
Clay, red	3	227
Sand	4	231
Sand, shaley	6	237
Sand, with dirt	4	241
Clay, red	3	244
Sand, shaley	2	246
Clay, brown	48	294
Clay	23	317
Sand, shaley	8	325
Clay, brown	14	339
Sand, shaley	2	341
Clay, grey	20	361
Sand, shaley	4	365
Sand, with clay breaks	2	367
Clay, grey	3	370
Sand, shaley	8	378
Clay, grey	3	381
Sand, shaley	5	386
Clay, grey	2	388
Sand, shaley	2	390
Clay	6	396
Sand, shaley	2	398
Clay	3	401
Sand, shaley	1	402
Clay	8	410
Clay, porous	52	462
Clay, grey	36	498
Clay, blue	7	505
Sand, shaley	4	509
Sand	9	518
Clay	5	523
Sand	17	540

Table 10.—Drillers' Logs of Wells—Continued

	THICKNESS (FEET)	DEPTH (FEET)
Well JB-84-36-905		
Owner: Douglas Risinger Driller: Dillard Wied		
Topsoil	2	2
Caliche	54	56
Caliche, and clay	12	68
Clay, brown	114	182
Sand, shaley	4	186
Clay	5	191
Sand, shaley	2	193
Clay	2	195
Sand	14	209
Gravel and sand	18	227
Well JB-84-38-901		
Owner: Mrs. Brigeda Moreno Driller: Disbro Water Well Service		
Surface soil	10	10
Gravel and rock	100	110
Caliche	27	137
Shale, hard, red	66	203
Shale, streaky, red	37	240
Sand and gravel	24	264
Well JB-84-38-906		
Owner: Ernesto Vera Driller: Disbro Water Well Service		
Surface soil	6	6
Caliche	54	60
Sand, salt	6	66
Caliche and limestone	72	138
Shale, hard, red	22	160
Shale, sandy	22	182
Shale, hard, red	56	238
Sand	35	273
Rock	1	274
Well JB-84-38-909		
Owner: Thomas Gonzales Driller: Buck Page & Co.		
Caliche	31	31

	THICKNESS (FEET)	DEPTH (FEET)
Well JB-84-38-909—Continued		
Gravel	17	48
Caliche	94	142
Shale	99	241
Sand	40	281
Well JB-84-43-101		
Owner: Adalberto Trevino Estate Driller: Valor Oil Co.		
Surface rock and gravel, loose	110	110
Rock and water sand	105	215
Shale, red	275	490
Shale, blue, with hard streaks	197	687
Caprock and water sand	20	707
Shale to sandy shale	886	1,593
Shale, hard, broken	954	2,547
Sand, broken, and salt water	22	2,569
Well JB-84-45-106		
Owner: Hofstetter Bros. Driller: Dillard Wied		
Sand	4	4
Caliche	102	106
Clay, and caliche	14	120
Clay, brown	97	217
Sand, shaley	3	220
Sand	7	227
Sand, shaley	3	230
Sand	16	246
Gravel	1	247
Sand	3	250
Well JB-84-45-306		
Owner: Trinity Gas Corp. Driller: Richardson Water Well Drilling Co.		
Surface soil	5	5
Clay	15	20
Sand	7	27
Caliche, hard	38	65
Flintrock	8	73
Caliche, hard	37	110

Table 10.—Drillers' Logs of Wells—Continued

	THICKNESS (FEET)	DEPTH (FEET)
Well JB-84-45-306—Continued		
Clay, and red shale	68	178
Sand, fine	32	210
Shale, red	2	212
Sand	6	218
Shale, red	3	221
Sand	4	225
Shale, red	5	230
Sand	15	245
Shale	1	246
Sand and gravel	22	268
Shale	6	274
Sand	34	308
Clay	12	320
Sand	27	347
Shale	7	354
Sand, with gravel streaks	18	372
Shale, sandy	16	388
Sand	9	397
Shale, sandy	4	401
Sand	21	422
Shale	1	423
Sand	2	425
Well JB-84-45-401		
Owner: Gilberto Villa		
Driller: H & S Water Well Service		
Surface soil	2	2
Shale	4	6
Caliche	6	12
Sandstone, red	22	34
Sandrock	11	45
Shale, sandy	25	70
Caliche	20	90
Caliche, with sand streaks	18	108
Clay, red	32	140
Clay, hard streaks	3	143
Clay, red, with hard streaks	102	245
Sand	15	260
Well JB-84-45-401—Continued		
Shale, with clay streaks	10	270
Sand	20	290
Clay	6	296
Sand and gravel	36	332
Sand	7	339
Shale	6	345
Sand and gravel	25	370
Sand	37	407
Clay	2	409
Well JB-84-45-503		
Owner: W. H. Armstrong		
Driller: H & S Water Well Service		
Surface sand	8	8
Clay and caliche	17	25
Sand	2	27
Caliche and sandstone	75	102
Sand with hard caliche streaks	26	128
Shale and sandy shale	112	240
Sand and gravel	72	312
Clay	4	316
Sand with clay streaks	23	339
Clay	3	342
Sand with hard streaks	28	370
Hard streaks with clay	4	374
Well JB-84-46-302		
Owner: Ben Schutz		
Driller: H & S Water Well Service		
Surface soil and clay	8	8
Caliche	25	33
Clay, with caliche streaks	37	70
Clay, with sandy clay	15	85
Caliche, hard streaks, and sandstone streaks	40	125
Clay, sandy, with caliche streaks	6	131
Clay, with sand, and sandstone streaks	15	146
Clay	6	152
Clay, sandy	13	165

Table 10.—Drillers' Logs of Wells—Continued

	THICKNESS (FEET)	DEPTH (FEET)
Well JB-84-46-302—Continued		
Shale	54	219
Shale, with caliche and sand streaks	19	238
Shale	30	268
Sand and gravel	21	289
Shale	3	292
Sand and gravel	9	301
Shale	2	303
Sand and gravel	15	318
Shale	2	320
Sand and gravel	14	334
Hard streaks	3	337
Shale, with sand streaks	7	344
Sand and gravel	19	363
Shale, with sand streaks	36	399
Sand and gravel	47	446
Shale	2	448
Well JB-84-46-502		
Owner: Marvin Dismukes Driller: Richardson Water Well Drilling Co.		
Surface soil	3	3
Clay	6	9
Clay and caliche	33	42
Caliche, heavy, and clay	31	73
Flint rock	44	117
Caliche	3	120
Sand, with hard streaks	17	137
Caliche	11	148
Shale, red	101	249
Sand	35	284
Sand and gravel	40	324
Shale	5	329
Sand and gravel	39	368
Shale, red	16	384
Sand	16	400
Shale	5	405

	THICKNESS (FEET)	DEPTH (FEET)
Well JB-84-46-802		
Owner: Walter Blumer Driller: Richardson Water Well Service		
Surface soil	5	5
Clay	5	10
Caliche	47	57
Sand, hard	60	117
Shale, red	123	240
Sand	60	300
Gravel	15	315
Well JB-84-46-803		
Owner: Antonio Recio Driller: Disbro Water Well Service		
Surface soil	20	20
Caliche	70	90
Sand, salt	6	96
Shale, hard, red	191	287
Sand	30	317
Well JB-84-47-404		
Owner: Walter Storm Driller: H & S Water Well Service		
Surface soil	4	4
Clay	12	16
Caliche	14	30
Clay, hard, gray	39	69
Shale, sandy	23	92
Caliche	4	96
Shale, sandy	18	114
Caliche, with clay streaks	20	134
Sand streaks, and caliche	10	144
Caliche, hard	24	168
Clay, and caliche streaks	10	178
Rock with sand streaks	4	182
Clay, with hard streaks	21	203
Sand, salty	20	223
Shale, with hard streaks	85	308
Sand	38	346

Table 10.—Drillers' Logs of Wells—Continued

	THICKNESS (FEET)	DEPTH (FEET)
Well JB-84-47-404—Continued		
Hard streaks	6	352
Sand and gravel	29	381
Shale	5	386
Sand and gravel	26	412
Hard streaks	1	413
Clay, with hard streaks	8	421
Sand	11	432
Shale	15	447
Sand	4	451
Shale	4	455
Sand and gravel	37	492
Shale, sandy	18	510
Sand and gravel	23	533
Shale	4	537

Well JB-84-47-710

Owner: Clyde Burdette
Driller: A. Porter & Son

	THICKNESS (FEET)	DEPTH (FEET)
Surface soil	12	12
Caliche rock	16	28
Sand, fine, slightly salty	4	32
Caliche rock	32	64
Rock and shale	207	271
Shale, red	109	380
Sand	32	412

Table 11.--Chemical Analyses of Water From Wells

(Analyses given in milligrams per liter, except percent sodium, sodium-adsorption ratio, residual sodium carbonate, specific conductance, and pH).

When no potassium (K) is reported, sodium and potassium are calculated and reported as sodium (Na).
Bicarbonate (HCO_3) includes any carbonate (CO_3) present.

Water-bearing unit: Tg, Goliad Sand; To, Oakville Sandstone; Tct, Catahoula Tuff; Tj, Jackson Group.

WELL	DEPTH OR PRODUCING INTERVAL (FT)	DATE OF COLLECTION	WATER BEARING UNIT	SILICA (SiO_2)	IRON (Fe)	CALCIUM (Ca)	MAGNESIUM (Mg)	SODIUM AND POTASSIUM		BICARBONATE (HCO_3)	SULFATE (SO_4)	CHLORIDE (Cl)	FLUORIDE (F)	NITRATE (NO_3)	BORON (B)	DISSOLVED SOLIDS	HARDNESS AS $CaCO_3$	PERCENT SODIUM	SODIUM ADSORPTION RATIO (SAR)	RESIDUAL SODIUM CARBONATE (RSC)	SPECIFIC CONDUCTANCE (MICROMHOS AT 25° C)	pH	WATER TEMPERATURE	
								Na	K														°C	°F
JB-78-60-701	102	Sept. 10, 1970	Tct	52	0.04 [1]	910	91	443	--	166	656	1,900	1.2	133	--	4,270	2,640	27	37	0.00	6,750	7.2	--	--
704	170	Sept. 30, 1970	do.	--	--	51	18	--	--	274	1,250	1,180	--	--	--	--	201	--	--	.47	6,240	7.7	--	--
801	360	Aug. 25, 1970	do.	52	--	197	102	2,370	--	268	228	3,980	.3	--	--	7,060	911	85	--	.00	12,300	7.2	--	--
901	200±	Sept. 10, 1970	do.	--	--	55	23	--	--	598	424	580	--	--	--	--	232	--	--	5.19	3,390	8.4	--	--
903	240	do.	do.	92	--	48	19	654	--	564	328	575	.6	4.1	--	2,000	198	88	20	5.28	3,140	7.9	--	--
62-901	39	July 14, 1970	Tg	--	--	508	214	--	--	292	486	1,650	--	--	--	--	2,150	--	--	.00	6,100	7.2	--	--
84-03-201	46- 65	Nov. 18, 1970	Tct	53	--	500	25	1,300	--	386	2,800	690	1.3	1.6	--	5,560	1,400	68	15	.00	7,060	6.9	--	--
901	210	Nov. 17, 1970	do.	--	--	82	33	--	--	356	280	810	--	--	--	--	340	--	--	.00	3,470	7.2	--	--
04-102	350±	Nov. 20, 1970	do.	61	--	100	25	1,900	--	204	110	3,000	.8	.0	--	5,300	350	92	44	.00	9,380	7.0	--	--
201	365	Aug. 25, 1970	do.	--	--	257	104	--	--	204	808	3,650	--	--	--	--	1,070	--	--	.00	12,100	7.3	--	--
301	410	do.	do.	--	--	84	36	--	--	432	360	840	--	--	--	--	358	--	--	.00	3,790	8.1	--	--
501	729	do.	do.	82	4.3 [1]	27	6.8	543	--	466	122	542	.9	1.5	--	1,560	96	93	24	5.73	2,590	8.2	--	--
502	400+	do.	do.	--	--	28	6.4	--	--	408	--	265	--	--	--	--	96	--	--	4.76	1,880	7.9	--	--
601	420	do.	do.	--	--	118	38	--	--	340	--	1,430	--	--	--	--	451	--	--	.00	5,410	7.2	--	--
602	531- 553 615- 665	do.	do.	96	.16 [1]	24	4.6	633	--	432	224	608	.6	11	--	1,810	79	95	31	5.50	3,020	8.2	--	--
05-101	410	July 7, 1970	do.	--	--	193	80	--	--	280	538	2,200	--	--	--	--	810	--	--	.00	7,930	7.3	--	--
103	835	July 9, 1970	Tct	62	--	25	5.8	1,140	--	352	366	1,330	--	24	--	3,130	86	97	53	4.04	5,390	7.8	--	--
402	300	Oct. 1, 1970	To	--	--	110	41	--	--	368	370	1,300	--	--	--	--	443	--	--	.00	5,130	7.3	--	--
501	450	July 9, 1970	do.	--	--	--	--	--	--	306	1,900	--	--	--	--	--	--	--	--	--	6,820	6.6	--	--
502	450	do.	do.	--	--	92	22	--	--	348	428	2,010	--	--	--	--	420	--	--	.00	7,380	7.8	--	--
602	65	do.	do.	52	.00	94	24	83	--	444	15	89	.4	8.9	--	584	333	35	2.0	.62	962	7.5	--	--
902	83	July 8, 1970	Tg	--	--	382	48	--	--	368	1,140	640	--	--	--	--	1,150	--	--	.00	4,140	6.9	--	--
06-101	142	Sept. 15, 1970	do.	55	.02 [1]	325	117	374	--	188	190	1,220	.5	37	--	2,410	1,290	39	4.5	.00	4,180	7.4	--	--
301	120	Sept. 14, 1970	do.	--	.00	145	64	--	--	360	128	492	--	--	--	--	625	--	--	.00	2,270	7.1	--	--
302	105	Sept. 15, 1970	do.	--	--	131	37	--	--	362	150	410	--	--	--	--	479	--	--	.00	2,010	7.8	--	--
602	255- 301	July 29, 1970	do.	32	.11 [1]	70	26	501	--	334	153	655	1.8	13	--	1,620	282	79	13	.00	2,830	7.6	--	--
11-501	127- 150	Aug. 5, 1970	Tct	84	.19 [1]	385	93	768	--	170	14	1,980	.1	82	--	3,490	1,340	55	9.1	.00	6,350	7.1	--	--
12-102	255	Aug. 25, 1970	do.	26	.86 [1]	10	3.6	389	--	534	280	108	.9	1.1	--	1,080	40	95	27	7.97	1,680	8.7	--	--
[2] 301	160- 190 300- 330 473- 503	May 12, 1969	do.	98	--	52	30	378	--	350	158	437	1.0	24	--	1,350	254	--	--	--	2,150	7.6	27	81

See footnotes at end of table.

Table 11.--Chemical Analyses of Water From Wells--Continued

WELL	DEPTH OR PRODUCING INTERVAL (FT)	DATE OF COLLECTION	WATER BEARING UNIT	SILICA (SiO_2)	IRON (Fe)	CALCIUM (Ca)	MAGNESIUM (Mg)	SODIUM AND POTASSIUM		BICARBONATE (HCO_3)	SULFATE (SO_4)	CHLORIDE (Cl)	FLUORIDE (F)	NITRATE (NO_3)	BORON (B)	DISSOLVED SOLIDS	HARDNESS AS $CaCO_3$	PERCENT SODIUM	SODIUM ADSORPTION RATIO (SAR)	RESIDUAL SODIUM CARBONATE (RSC)	SPECIFIC CONDUCTANCE (MICROMHOS AT 25° C)	pH	WATER TEMPERATURE	
								Na	K														°C	°F
2/ JB-84-12-701	518- 608	June 26, 1969	Tct	--	< 0.02	23	6	423	--	343	208	360	1.2	24	--	1,390	82	--	--	--	2,380	8.0	--	--
2/ 702	473- 573	do.	do.	--	< .02	14	19	448	--	406	265	321	1.1	9.0	--	1,480	116	--	--	--	2,480	7.9	--	--
703	534- 629	Apr. 11, 1962	do.	56	.06	29	13	399	18	292	224	350	1.3	52	2.1	1,290	126	85	15	--	2,010	7.5	--	--
2/ 703	534- 629	June 26, 1969	do.	--	< .02	29	22	364	--	293	186	344	1.6	36	--	1,280	162	--	--	--	2,240	7.8	--	--
901	298	Aug. 19, 1970	do.	96	--	25	4.6	969	--	498	296	1,000	1.9	70	--	2,710	82	96	47	6.53	4,340	8.1	--	--
13-101	267	May 4, 1970	To	--	--	125	39	--	--	326	440	1,080	--	--	--	--	472	--	--	.00	4,480	7.7	--	--
201	300	May 5, 1970	do.	--	--	206	82	--	--	208	--	1,290	--	--	--	--	852	--	--	.00	4,430	7.2	--	--
401	115	May 4, 1970	do.	--	--	110	49	--	--	420	--	1,560	--	--	--	--	476	--	--	.00	6,320	7.5	--	--
502	280	do.	do.	51	.23	57	21	580	--	432	310	570	1.4	5.9	--	1,810	228	85	17	2.51	2,910	7.6	--	--
802	50	June 12, 1931	Tg	--	--	48	--	140	--	320	32	114	--	8.3	--	505	159	--	--	--	--	--	--	--
14-101	200±	May 6, 1970	do.	44	.06	91	31	712	--	470	390	780	1.9	8.7	--	2,290	354	81	16	.61	3,690	7.2	--	--
201	180	July 30, 1970	do.	--	--	286	111	--	--	242	86	1,020	--	--	--	--	1,170	--	--	--	3,610	7.1	--	--
502	200- 500	Oct. 11, 1969	do.	35	--	69	26	300	--	284	88	420	.9	15	1.3	1,100	279	70	7.8	.00	1,930	7.8	28	82
15-402	160	July 14, 1970	do.	29	--	90	65	169	--	330	111	325	1.6	15	--	968	492	43	3.3	.00	1,710	7.4	--	--
702	509	Mar. 6, 1945	do.	25	.09	29	12	231	8.0	364	94	158	.7	15	--	754	122	--	--	--	1,310	7.8	27	81
704	210- 370 390- 440	Mar. 27, 1961	do.	22	.31	34	16	189	9.0	312	72	150	.9	23	.93	670	151	72	6.7	--	1,150	7.2	--	--
2/ 704	460- 510 660- 740	May 23, 1969	do.	24	--	28	12	223	--	354	94	156	1.1	16	--	730	120	--	--	--	1,200	7.6	27	81
18-603	--	Oct. 7, 1970	--	91	--	36	3.9	260	--	346	120	190	1.0	.0	--	872	110	84	11	3.55	1,350	7.3	--	--
903	300±	July 16, 1970	Tg	--	--	330	126	--	--	304	266	1,500	--	--	--	--	1,340	--	--	.00	5,400	7.1	--	--
19-101	448	Aug. 26, 1970	Tct	53	--	134	37	1,770	--	344	632	2,410	.2	--	--	5,210	486	89	35	.00	8,730	7.7	--	--
202	80	Aug. 18, 1970	do.	--	--	59	19	--	--	354	--	740	--	--	--	--	225	--	--	1.30	3,620	7.8	--	--
401	187	Oct. 8, 1970	do.	--	--	4.8	1.6	--	--	708	12	960	--	--	--	--	18	--	--	11.3	3,870	8.6	--	--
502	--	Aug. 26, 1970	--	--	--	11	1.7	--	--	982	--	850	--	--	--	--	34	--	--	15.4	4,080	7.7	--	--
902	292	Aug. 6, 1970	Tct	100	--	46	22	703	--	516	302	690	1.0	28	--	2,150	206	88	21	4.35	3,420	8.1	--	--
20-101	242?	Oct. 28, 1970	do.	74	.12 1/	4.0	1.5	110	--	334	30	25	1.0	3.5	.71	413	110	69	4.6	3.35	668	8.2	--	--
102	74	do.	do.	--	--	120	26	--	--	474	21	120	.5	--	--	--	410	--	--	.00	1,140	7.2	--	--
202	89?	Nov. 10, 1970	do.	--	--	140	41	--	--	260	60	930	--	--	--	--	520	--	--	.00	3,340	7.4	--	--
302	300±	Sept. 9, 1970	do.	36	--	64	17	587	--	390	230	638	1.7	54	--	1,820	230	85	17	1.80	3,020	7.4	--	--
403	285±	Aug. 6, 1970	do.	42	2.4 1/	592	205	454	--	88	152	2,180	.6	--	--	3,670	2,320	30	4.1	.00	6,770	6.2	--	--
21-101	320	Sept. 9, 1970	Tg	--	.68 1/	136	53	--	--	240	152	1,250	--	--	--	--	558	--	--	--	4,460	7.6	--	--
202	--	Oct. 6, 1970	--	42	--	42	11	270	--	282	85	280	1.6	27	--	898	150	80	9.6	1.62	1,520	7.7	--	--
401	320	Sept. 9, 1970	Tg	--	--	175	38	--	--	438	145	432	--	--	--	--	593	--	--	.00	2,240	7.1	--	--

See footnotes at end of table.

Table 11.--Chemical Analyses of Water From Wells--Continued

WELL	DEPTH OR PRODUCING INTERVAL (FT)	DATE OF COLLECTION	WATER BEARING UNIT	SILICA (SiO_2)	IRON (Fe)	CALCIUM (Ca)	MAGNESIUM (Mg)	SODIUM AND POTASSIUM		BICARBONATE (HCO_3)	SULFATE (SO_4)	CHLORIDE (Cl)	FLUORIDE (F)	NITRATE (NO_3)	BORON (B)	DISSOLVED SOLIDS	HARDNESS AS $CaCO_3$	PERCENT SODIUM	SODIUM ADSORPTION RATIO (SAR)	RESIDUAL SODIUM CARBONATE (RSC)	SPECIFIC CONDUCTANCE (MICROMHOS AT 25° C)	pH	WATER TEMPERATURE	
								Na	K														°C	°F
JB-84-21-402	225	Nov. 10, 1970	Tg	--	--	300	60	--	--	180	--	820	--	--	--	--	1,000	--	--	0.00	2,860	7.0	--	--
404	280	do.	do.	83	0.27	80	16	130	--	336	28	150	0.4	32	--	684	270	--	--	--	1,080	7.7	--	--
502	258- 296 303- 367 396- 486 495- 543 605- 625	Oct. 14, 1969	do.	35	--	65	20	193	--	266	72	250	1.0	19	--	786	244	63	5.4	.00	1,360	7.7	27	81
601	256- 276 288- 349	do.	Tg	40	--	109	30	147	--	266	42	310	.5	18	--	828	396	45	3.2	.00	1,490	7.7	27	81
22-104	330	Nov. 11, 1970	do.	--	--	140	63	--	--	280	73	470	--	--	--	--	610	--	--	.00	1,990	7.3	--	--
401	1,106-1,202 1,212-1,252	Oct. 14, 1969	To	19	--	10	1.7	543	--	234	536	325	1.3	.1	--	1,550	32	97	42	3.20	2,490	8.2	36	97
402	180?	Oct. 27, 1970	Tg	40	--	74	21	190	--	268	44	280	.7	16	--	798	270	60	5.0	.00	1,400	7.3	--	--
501	350	Apr. 30, 1970	do.	30	--	56	18	149	--	288	51	162	.9	22	--	631	214	60	4.4	.45	1,080	7.6	--	--
2/ 801	90±	May 28, 1969	do.	80	--	178	60	496	--	315	208	940	1.1	13	--	2,130	690	--	--	--	3,410	7.4	26	79
804	400±	Apr. 30, 1970	do.	--	.02	130	43	--	--	278	87	475	--	--	--	--	502	--	--	.00	2,080	7.2	--	--
805	40	Apr. 29, 1970	do.	--	--	45	38	--	--	440	--	51	--	--	--	--	269	--	--	1.83	894	7.5	--	--
902	80	June 13, 1931	do.	--	1.6	80	--	328	--	314	177	676	--	9.6	--	1,600	690	--	--	--	--	--	--	--
902	80	Apr. 29, 1970	do.	--	--	174	102	--	--	298	--	790	--	--	--	--	854	--	--	.00	3,060	7.1	27	81
26-602	400±	Feb. 10, 1970	Tct	30	--	24	12	412	--	394	202	332	.9	2.4	--	1,210	110	89	17	4.27	2,010	7.3	--	--
903	400±	Apr. 10, 1970	do.	--	--	9.8	3.5	--	--	380	--	173	--	--	--	--	39	--	--	5.45	1,310	7.7	--	--
27-101	400±	July 15, 1970	do.	74	.00	84	28	369	--	246	57	588	1.8	41	--	1,360	324	71	8.9	.00	2,380	7.3	--	--
201	350±	July 14, 1970	do.	--	--	43	12	--	--	346	187	342	--	--	--	--	157	--	--	2.53	2,000	7.7	--	--
401	100	Mar. 23, 1970	do.	--	--	192	61	--	--	396	--	840	--	--	--	--	730	--	--	.00	3,590	7.4	--	--
403	400±	July 16, 1970	do.	--	--	52	14	--	--	360	222	540	--	--	--	--	187	--	--	2.16	2,710	7.6	--	--
3/ 504	1,317	Oct. 19, 1960	Tct	--	.00	2	.1	615	--	610	185	465	--	--	--	1,500	5	--	--	--	--	8.6	--	--
701	300±	Feb. 9, 1970	do.	--	--	124	23	--	--	266	71	415	--	--	--	--	404	--	--	.00	1,830	7.0	--	--
801	160	Mar. 19, 1970	Tg	--	--	45	9.9	--	--	250	34	146	--	--	--	--	153	--	--	1.04	958	7.4	--	--
901	--	do.	--	--	--	5.2	.5	--	--	480	248	365	--	--	--	--	15	--	--	7.57	2,330	8.2	--	--
28-201	156	Mar. 24, 1970	Tg	--	--	165	17	--	--	364	--	205	--	--	--	--	482	--	--	.00	1,260	6.9	--	--
501	140- 186	do.	do.	16	--	103	18	255	--	238	50	452	.3	.0	--	1,010	331	63	6.1	.00	1,840	7.2	--	--
701	1,850	Mar. 13, 1970	Tct	--	--	5.5	.4	--	--	608	216	650	--	--	--	--	15	--	--	9.61	3,260	8.1	--	--
803	2,115-2,125	do.	do.	16	.09 1/	30	1.5	2,730	--	448	28	3,980	--	--	--	7,010	81	99	--	5.72	12,500	7.7	--	--
29-101	110	Sept. 16, 1970	Tg	81	--	252	86	382	--	204	176	1,000	.8	62	--	2,140	982	46	5.3	.00	3,570	7.6	--	--
201	328	Mar. 7, 1945	do.	22	.02	42	17	392	12	330	253	345	1.0	25	--	1,270	175	--	--	--	2,190	7.8	27	81
302	615	do.	do.	29	.02	41	17	364	12	297	231	338	.8	20	--	1,200	172	--	12	--	2,060	7.8	27	81

See footnotes at end of table.

Table 11.--Chemical Analyses of Water From Wells--Continued

WELL	DEPTH OR PRODUCING INTERVAL (FT)	DATE OF COLLECTION	WATER BEARING UNIT	SILICA (SiO_2)	IRON (Fe)	CALCIUM (Ca)	MAGNESIUM (Mg)	SODIUM AND POTASSIUM		BICARBONATE (HCO_3)	SULFATE (SO_4)	CHLORIDE (Cl)	FLUORIDE (F)	NITRATE (NO_3)	BORON (B)	DISSOLVED SOLIDS	HARDNESS AS $CaCO_3$	PERCENT SODIUM	SODIUM ADSORPTION RATIO (SAR)	RESIDUAL SODIUM CARBONATE (RSC)	SPECIFIC CONDUCTANCE (MICROMHOS AT 25° C)	pH	WATER TEMPERATURE	
								Na	K														°C	°F
[2] JB-84-29-303	520	Jan. 1960	Tg	--	0.2	34	22	288	--	--	155	298	1.1	17	--	1,250	174	--	--	--	1,875	7.9	--	--
[2] 310	322- 422 442- 507 532- 596	Aug. 12, 1969	do.	--	.04	38	18	393	--	315	263	339	1.1	18	--	1,390	170	--	--	--	2,415	7.8	--	--
902	500±	Oct. 6, 1969	do.	45	--	78	25	184	--	220	74	302	.5	15	0.73	832	298	57	4.6	0.00	1,460	7.7	27	81
30-102	1,000-1,115	Sept. 29, 1970	To	19	1.2 [1]	22	2.1	626	--	248	636	395	1.4	.0	--	1,820	64	96	34	2.79	2,830	7.8	--	--
202	100	Sept. 17, 1970	Tg	--	--	150	54	--	--	210	--	830	--	--	--	--	596	--	--	.00	3,070	7.2	--	--
[2] 501	90	May 28, 1969	Tg	74	--	166	54	495	--	265	199	880	1.2	36	--	2,040	630	--	--	--	3,300	7.2	80	26
602	360	Sept. 24, 1970?	do.	--	--	36	14	--	--	322	111	285	--	--	--	--	148	--	--	2.33	1,610	7.9	--	--
702	121	Nov. 1, 1969	do.	--	--	173	52	--	--	444	75	502	--	--	--	--	646	--	--	--	2,350	7.0	25	77
901	340	Sept. 21, 1969	do.	46	--	122	60	388	--	340	152	670	1.6	12	2.0	1,620	552	60	7.2	.00	2,810	7.8	28	82
34-302	300±	Apr. 9, 1970	Tct	--	--	38	18	--	--	204	20	392	--	--	--	--	169	--	--	.00	1,610	7.2	--	--
35-103	101	Apr. 10, 1970	Tg	99	.06 [1]	105	53	402	--	372	167	600	1.1	31	--	1,640	480	65	8.0	.00	2,680	7.2	--	--
201	185	Mar. 19, 1970	do.	86	--	34	20	360	--	500	122	282	2.0	13	--	1,160	168	82	12	4.85	1,860	8.1	--	--
302	1,300±	Mar. 20, 1970	Tct	--	--	13	1.2	--	--	480	310	455	--	--	--	--	38	--	--	7.12	2,760	8.0	35	95
401	946	Mar. 25, 1970	do.	17	--	3.5	1.0	314	--	296	47	272	.7	23	--	824	12	98	3.9	4.61	1,430	8.5	--	--
502	403	do.	do.	70	.87	148	40	430	--	356	446	492	.7	22	--	1,820	534	64	8.1	.00	2,770	7.3	--	--
[4] 505	960±	Feb. 18, 1950	do.	23	1.7	5.5	2.5	207	--	242	95	125	--	--	--	676	--	--	--	--	--	--	37	99
505	960±	Apr. 7, 1970	do.	--	.03 [1]	5.8	.6	--	--	412	--	111	--	--	--	--	17	--	--	6.41	1,220	8.0	--	--
507	260	do.	Tg	--	--	167	48	--	--	344	128	498	--	--	--	--	614	--	--	.00	2,270	7.1	--	--
602	225±	Mar. 19, 1970	do.	94	--	118	16	368	--	290	536	235	.7	40	--	1,550	360	69	8.4	.00	2,230	7.4	--	--
901	460	do.	Tct	--	--	86	43	--	--	494	--	820	--	--	--	--	392	--	--	.27	3,480	7.6	--	--
36-104	--	Apr. 14, 1970	--	--	--	112	27	--	--	306	96	345	--	--	--	--	390	--	--	.00	1,710	7.0	--	--
301	300±	do.	Tg	--	--	119	21	--	--	256	90	342	--	--	--	--	384	--	--	.00	1,640	7.0	--	--
501	890±	Dec. 16, 1969	To	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2,540	--	--	--
[2] 601	210	July 30, 1970	Tg	--	< .02	151	40	198	--	300	91	447	.7	11	--	1,240	540	--	--	--	2,240	7.6	--	--
603	145	Nov. 5, 1969	do.	--	--	224	58	--	--	224	90	700	--	--	--	--	798	--	--	--	2,660	7.0	26	79
901	70	Dec. 5, 1934	do.	--	--	--	--	326	--	312	161	650	.4	45	--	1,590	668	--	--	--	--	--	25	77
[1] 901	70	May 28, 1969	do.	46	--	130	52	308	--	270	143	560	1.0	33	--	1,410	540	--	--	--	2,380	7.5	27	81
37-101	156	Oct. 30, 1969	do.	--	--	260	71	--	--	212	110	970	--	--	--	--	940	--	--	--	3,460	7.5	26	79
103	400±	do.	do.	--	--	66	27	--	--	272	336	220	--	--	--	--	276	--	--	--	1,730	7.7	26	79
201	112	do.	do.	--	--	186	46	--	--	264	77	502	--	66	--	--	653	--	--	--	2,160	7.5	26	79
202	1,600±	do.	To	23	--	6.0	.2	291	--	284	162	175	.6	.2	--	798	16	98	32	4.33	1,330	8.1	--	--
203	2,300	do.	Tct	40	--	211	4.2	1,270	--	180	2,420	448	3.5	.1	--	4,490	544	84	24	.00	5,970	7.9	27	80

See footnotes at end of table.

Table 11.--Chemical Analyses of Water from Wells--Continued

WELL	DEPTH OR PRODUCING INTERVAL (FT)	DATE OF COLLECTION	WATER BEARING UNIT	SILICA (SiO_2)	IRON (Fe)	CALCIUM (Ca)	MAGNESIUM (Mg)	SODIUM AND POTASSIUM Na	K	BICARBONATE (HCO_3)	SULFATE (SO_4)	CHLORIDE (Cl)	FLUORIDE (F)	NITRATE (NO_3)	BORON (B)	DISSOLVED SOLIDS	HARDNESS AS $CaCO_3$	PERCENT SODIUM	SODIUM ADSORPTION RATIO (SAR)	RESIDUAL SODIUM CARBONATE (RSC)	SPECIFIC CONDUCTANCE (MICROMHOS AT 25° C)	pH	WATER TEMPERATURE °C	°F
JB-84-37-301	282±	Feb. 13, 1947	Tg	--	--	45	18	234	--	298	133	218	--	5.8	--	874	186	--	--	--	1,370	--	--	--
401	150±	Nov. 4, 1969	do.	--	--	92	36	--	--	396	160	530	--	134	--	--	378	--	--	--	2,690	7.5	--	--
402	2,300±	do.	Tct	--	--	79	--	--	--	112	2,400	425	--	--	--	--	--	--	--	--	6,050	8.0	27	81
601	120	Oct. 30, 1969	Tg	52	--	181	27	217	--	336	342	242	0.3	75	--	1,300	562	46	4.0	0.00	1,930	7.9	--	--
701	190- 300	Oct. 6, 1969	do.	58	--	158	48	242	--	244	124	535	.7	40	0.95	1,330	592	47	4.3	.00	2,300	7.9	25	77
704	130	June 12, 1931	do.	--	--	46	--	200	--	324	70	266	--	23	--	826	297	--	--	--	--	--	26	79
704	130	Nov. 6, 1969	do.	--	--	64	25	--	--	308	82	270	--	78	--	--	262	--	--	--	1,590	7.9	--	--
705	120	do.	do.	--	--	91	39	--	--	352	67	290	--	--	--	--	388	--	--	--	1,560	7.6	26	79
901	99	May 28, 1961	do.	80	--	98	45	373	--	351	234	500	1.4	4.5	--	1,510	432	--	--	--	2,370	7.5	26	79
38-103	155	Nov. 1, 1969	do.	--	--	104	31	--	--	304	70	385	--	--	--	--	387	--	--	--	1,800	7.2	25	77
301	300	Dec. 12, 1969	do.	--	--	--	--	--	--	--	75	222	--	--	--	--	--	--	--	--	1,300	--	--	--
302	100	Dec. 13, 1969	do.	--	--	--	--	--	--	--	--	--	--	79	--	--	--	--	--	--	2,380	--	25	79
402	150	Nov. 1, 1969	do.	--	--	116	29	--	--	254	85	375	--	--	--	--	409	--	--	--	1,730	7.7	26	79
2/ 602	105?	Aug. 20, 1968	do.	44	--	157	105	590	--	423	329	1,050	1.4	< .4	--	2,480	820	--	--	--	4,000	7.3	--	--
702	156	June 13, 1931	do.	--	--	56	--	27	--	223	12	8.7	--	22	--	247	166	--	--	--	--	--	--	--
702	156	Dec. 10, 1934	do.	--	--	--	--	16	--	244	13	9.0	.3	9.4	--	250	199	--	--	--	--	--	--	--
702	156	Dec. 11, 1969	do.	49	--	95	9.8	17	--	348	6.8	10	.2	8.6	--	367	278	12	.4	.15	575	7.7	--	--
2/ 703	350	July 30, 1970	do.	--	< 0.02	160	--	196	--	216	80	464	.6	21	--	1,170	510	--	--	--	2,192	7.7	--	--
802	350±	Nov. 24, 1969	do.	--	--	105	30	--	--	236	87	368	--	--	--	--	386	--	--	.00	1,740	7.8	27	81
902	310	June 13, 1931	do.	--	--	80	--	200	--	278	103	229	--	20	--	771	240	--	--	--	--	--	--	--
2/ 907	257	Aug. 20, 1968	do.	42	--	69	19	183	--	266	88	247	.7	12	--	790	250	--	--	--	1,350	7.5	--	--
2/ 908	197	do.	do.	62	--	434	353	1,570	--	383	1,020	3,220	1.8	< .4	--	6,800	2,530	--	--	--	9,650	6.9	--	--
44-101	1,600	Mar. 22, 1913	Tct	--	.3	13	3	400	--	278	190	345	--	--	--	1,170	45	--	--	--	--	--	35	95
102	420- 440 560- 588	Dec. 17, 1969	To	25	--	49	15	208	--	258	80	228	.4	23	--	755	184	71	6.7	.55	1,300	8.2	--	--
104	1,730-1,772	do.	Tct	24	--	3.6	.2	621	--	516	318	420	5.2	.0	--	1,650	--	99	85	8.27	2,690	8.5	42	108
301	240	Oct. 6, 1969	Tg	49	--	230	60	228	--	196	130	705	.4	32	.77	1,530	821	38	3.5	.00	2,710	7.8	27	81
45-101	90	Dec. 5, 1934	do.	--	--	--	--	167	--	250	216	510	.5	29	--	1,370	810	--	--	--	--	--	--	--
102	100	do.	do.	--	--	--	--	47	--	264	26	14	.2	5.6	--	287	165	--	--	--	--	--	--	--
103	200- 370	Oct. 12, 1969	do.	50	--	188	53	217	--	212	126	590	.4	28	.74	1,360	687	41	3.6	.00	2,390	7.8	27	81
104	150±	Nov. 6, 1969	do.	--	--	132	67	--	--	256	96	472	--	226	--	--	605	--	--	--	2,350	7.3	--	--
202	120	Nov. 20, 1969	do.	--	--	232	97	--	--	240	315	1,120	--	--	--	--	978	--	--	.00	4,170	7.4	--	--
2/ 301	1,340-1,400	May 28, 1969	To	43	--	106	32	181	--	224	59	377	.7	14	--	920	396	--	--	--	1,620	7.6	28	82
301	1,340-1,400	Oct. 29, 1969	do.	22	.72	4.0	.3	376	--	272	146	320	.8	.1	--	1,000	11	99	49	4.24	1,720	8.4	39	102

See footnotes at end of table.

Table 11.--Chemical Analyses of Water From Wells--Continued

WELL	DEPTH OR PRODUCING INTERVAL (FT)	DATE OF COLLECTION	WATER BEARING UNIT	SILICA (SiO_2)	IRON (Fe)	CALCIUM (Ca)	MAGNESIUM (Mg)	SODIUM AND POTASSIUM		BICARBONATE (HCO_3)	SULFATE (SO_4)	CHLORIDE (Cl)	FLUORIDE (F)	NITRATE (NO_3)	BORON (B)	DISSOLVED SOLIDS	HARDNESS AS $CaCO_3$	PERCENT SODIUM	SODIUM ADSORPTION RATIO (SAR)	RESIDUAL SODIUM CARBONATE (RSC)	SPECIFIC CONDUCTANCE (MICROMHOS AT 25° C)	pH	WATER TEMPERATURE	
								Na	K														°C	°F
JB-84-45-304	80±	Nov. 6, 1969	Tg	--	--	318	258	--	--	328	--	2,200	--	--	--	--	--	--	--	--	7,450	7.0	--	--
305	170	Dec. 8, 1934	do.	--	--	--	--	874	--	422	330	1,540	1.2	41	--	3,350	1,000	--	--	--	--	--	--	--
306	274- 425	Oct. 29, 1969	do.	42	0.29	97	29	190	--	226	65	360	.6	16	--	911	362	53	4.4	0.00	1,610	7.8	27	81
308	150	Nov. 19, 1969	do.	92	--	121	54	340	--	386	166	500	1.5	80	--	1,540	524	59	6.5	.00	2,500	7.7	--	--
401	245- 260 270- 290 296- 339 345- 407	Oct. 7, 1969	do.	50	--	164	59	309	--	160	153	715	.4	30	1.3	1,560	652	51	5.3	.00	2,750	7.4	28	82
501	67	Dec. 8, 1934	do.	--	--	--	--	192	--	312	277	960	.3	38	--	2,240	1,010	--	--	--	--	--	--	--
504	123	Nov. 18, 1969	do.	--	--	134	62	--	--	328	191	655	--	--	--	--	590	--	--	.00	2,820	7.9	--	--
701	117	June 13, 1931	Tg	--	--	120	--	316	--	269	154	691	--	26	--	1,580	690	--	--	--	--	--	--	--
905	125	Nov. 21, 1969	do.	--	--	307	168	--	--	328	496	1,850	--	--	--	--	1,460	--	--	.00	6,720	7.5	--	--
46-201	1,200	Nov. 24, 1969	To	23	--	3.9	.3	410	--	280	254	288	.8	.0	1.6	1,120	10	99	56	4.39	1,870	8.4	40	104
401	200- 280	June 13, 1931	Tg	--	--	120	--	358	--	243	54	560	--	29	--	1,220	291	--	--	--	--	--	--	--
401	200- 280	Nov. 22, 1969	do.	46	--	95	34	214	--	226	63	400	.5	34	--	998	377	55	4.8	.00	1,770	7.5	27	81
405	42	do.	do.	98	--	53	56	725	--	636	378	720	--	11	--	2,350	362	81	17	3.17	3,710	8.3	24	75
406	290- 300	do.	do.	--	--	52	22	--	--	316	26	230	--	--	--	--	220	--	--	.78	1,240	7.7	27	81
601	264- 314	Oct. 10, 1969	do.	44	--	70	24	187	--	266	80	249	.6	31	.63	817	273	60	4.9	.00	1,390	7.9	26	79
2/ 701	150	May 27, 1969	do.	67	--	218	105	530	--	260	228	1,200	1.1	10	--	2,490	980	--	--	--	4,050	7.2	27	81
702	140- 280	Oct. 9, 1969	do.	44	--	100	41	245	--	192	60	490	.7	46	1.0	1,120	418	56	5.2	.00	2,010	7.7	26	79
703	34	Nov. 21, 1969	do.	--	--	--	--	--	--	130	480	--	--	--	--	--	--	--	--	--	2,400	--	23	73

1/ Fe dissolved.
2/ Analyzed by Texas State Health Department.
3/ Analyzed by Trinity Testing Laboratories.
4/ Analyzed by Texas Testing Laboratories.