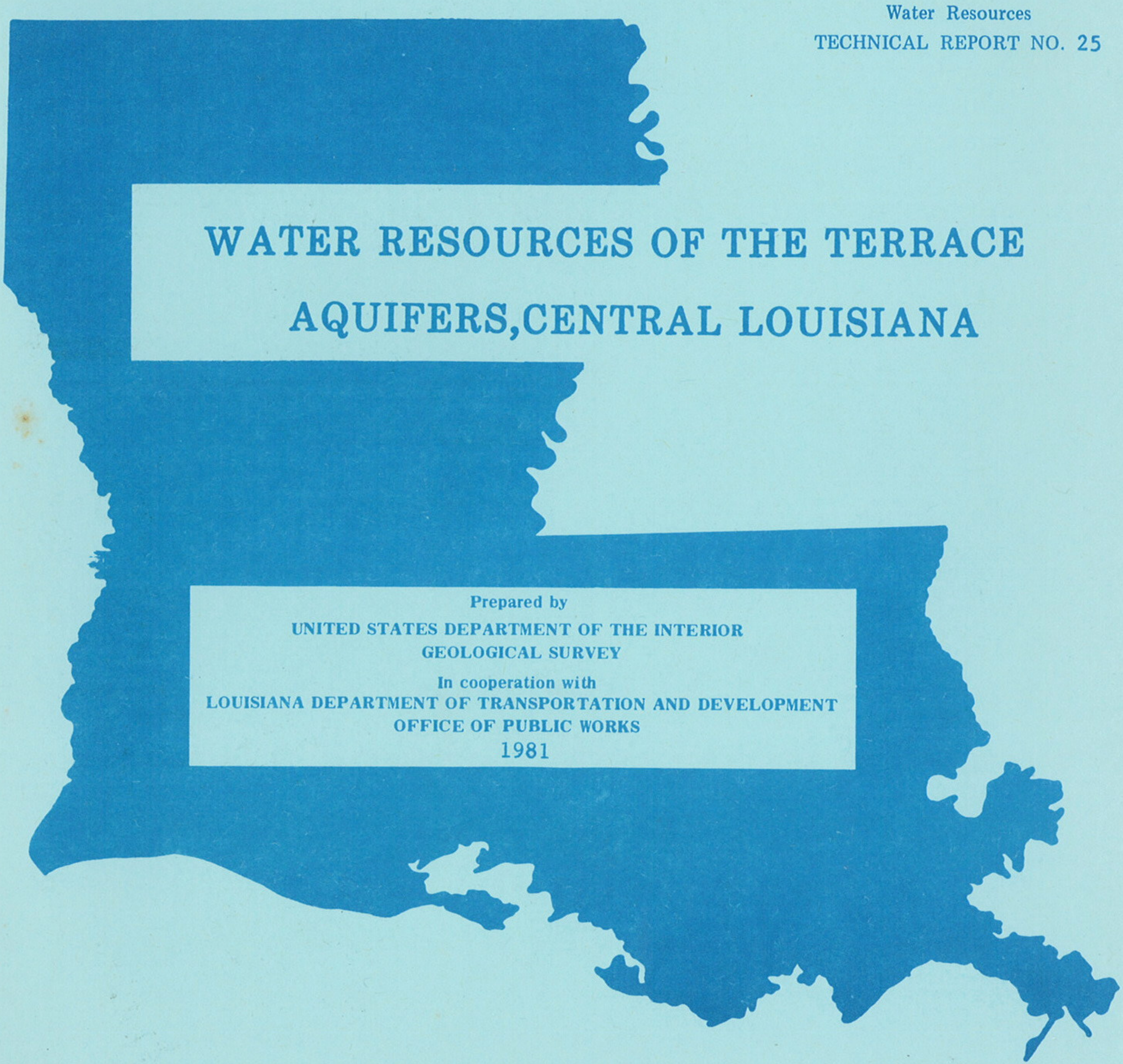
STATE OF LOUISIANA
DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
OFFICE OF PUBLIC WORKS

Water Resources
TECHNICAL REPORT NO. 25



WATER RESOURCES OF THE TERRACE AQUIFERS, CENTRAL LOUISIANA

Prepared by
UNITED STATES DEPARTMENT OF THE INTERIOR
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In cooperation with
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1981

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By

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U.S. Geological Survey

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GLOSSARY

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.

Artesian aquifer

An aquifer in which water is confined and water levels in wells will stand above the top of the aquifer.

Base flow

The discharge entering stream channels from ground water. The fair weather flow in a perennial stream.

Discharge

Outflow of water from an aquifer, which may be natural, as discharge to springs, lakes, and streams or as evapotranspiration, or manmade, as discharge to wells.

Effective porosity

The amount of interconnected pore space available for fluid transmission. Effective porosity is expressed as percentage of the total volume occupied by the interconnecting interstices.

Evapotranspiration

Water withdrawn from soil by evaporation and plant transpiration.

Hydraulic conductivity

The rate of flow of water transmitted through a porous medium of unit cross-sectional area under a unit hydraulic gradient at the prevailing kinematic viscosity. Replaces the term "field coefficient of permeability." The hydraulic conductivity multiplied by 7.48 is equal to the coefficient of permeability. For conversion of hydraulic conductivity in feet per day to meters per day, multiply by 0.3048.

Infiltration

The flow of a fluid into a substance through pores or small openings.

Perennial stream

One which flows continuously.

Potentiometric surface

The pressure surface of water in an aquifer. As related to an aquifer, it is defined by the levels to which water will rise in tightly cased wells.

Pumping cone

A cone of depression in a potentiometric surface caused by pumpage.

Specific capacity

The rate of discharge of water from a well divided by the drawdown of water level within the well, usually taken at 24 hours or at a specific time.

Storage coefficient

The volume of water an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in head.

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 is equal to an integration of the hydraulic conductivities across the saturated part of the aquifer perpendicular to the flow paths. (Formerly termed "transmissibility," defined as the rate of flow of water, at the prevailing water temperature, in gallons per day, through a vertical strip of the aquifer 1 foot wide extending the full saturated height of the aquifer under a unit hydraulic gradient.) The transmissivity multiplied by 7.48 is equal to the coefficient of transmissibility. For conversion of transmissivity in feet squared per day to meters squared per day, multiply by 0.093.

Water table

That surface in an unconfined ground-water body at which the pressure is atmospheric.

Well efficiency

The ratio of measured specific capacity of a well to theoretical specific capacity that is computed using values of transmissivity and storage coefficient of the aquifer in which the well is screened.

Well interference

The drawdown effects that pumping wells have on one another.

FACTORS FOR CONVERTING INCH-POUND UNITS TO INTERNATIONAL SYSTEM (SI) OF METRIC UNITS

Multiply	By	To obtain
foot (ft)	0.3048	meter (m)
foot per day (ft/d)	0.3048	meter per day (m/d)
foot per mile (ft/mi)	0.1894	meter per kilometer (m/km)
foot per year (ft/yr)	0.3048	meter per year (m/year)
foot squared per day (ft^2/d)	0.09290	meter squared per day (m^2/d)
gallon per day per foot [(gal/d)/ft]	0.01242	meter cubed per day per meter [(m^3/d)/m]
gallon per day per square foot [(gal/d)/ft^2]	0.04075	meter cubed per day per meter squared [(m^3/d)/m^2]
gallon per minute (gal/min)	0.06309	liter per second (L/s)
	3.785×10^{-3}	meter cubed per minute (m^3/min)
gallon per minute per foot [(gal/min)/ft]	0.2070	liter per second per meter [(L/s)/m]
gallon per minute per square mile [(gal/min)/mi^2]	0.02436	liter per second per square kilometer [(L/s)/km^2]
inch (in.)	2.540	centimeter (cm)
inch per year (in/yr)	25.40	millimeter per year (mm/year)
mile (mi)	1.609	kilometer (km)
million gallons per day (Mgal/d)	3.785×10^6	liter per day (L/d)
	3.785×10^3	meter cubed per day (m^3/d)
square mile (mi^2)	2.590	square kilometer (km^2)

To convert temperature in degree Celsius (°C) to degree Fahrenheit (°F), multiply by 9/5 and add 32.

WATER RESOURCES OF THE TERRACE AQUIFERS, CENTRAL LOUISIANA

By J. L. Snider and T. H. Sanford, Jr.

ABSTRACT

The terrace aquifers of Pleistocene age have not been used as a source of ground water at some localities in central Louisiana because of concern about the capability of the aquifers to supply enough water for future needs and about the possibility of pollution. Total pumpage in 1975 averaged about 1 million gallons per day. The aquifers are relatively thin; the saturated thickness averages about 25 feet. The average hydraulic conductivity is about 220 feet per day. The aquifers consist of unconsolidated sand and gravel and are generally unconfined. Usually one-fourth to three-fourths of the aquifer thickness is saturated. In places, the terrace aquifers are a potential source of water for public-supply and industrial uses. Although pollution potential exists, little pollution occurs because most of the area is woodland.

The source of recharge to the terrace aquifers is mostly infiltration from rainfall. The average annual rate of infiltration is about 0.5 foot per year. This rate of infiltration would sustain a continuous yield of about 200 gallons per minute per square mile. In the southern part of the project area near Kolin, where a continuous clay layer retards infiltration, the yield that could be sustained would be lower. Well yields in the project area are as high as 400 gallons per minute.

Water levels in the terrace aquifers respond to long-term trends of precipitation. When infiltration from precipitation exceeds discharge from the aquifers, water goes into storage and the water level rises. When discharge exceeds infiltration, the water level declines. Relatively wet or dry periods that affect water-level trends may persist for several years. Water in the terrace aquifers moves laterally towards and is discharged into streams that have eroded valleys into the aquifers. Part or all of the base flow of the streams in the project area is sustained by water flowing out of the aquifers.

Water from the terrace aquifers in most of the project area is soft and is low in dissolved solids. Field pH ranges from 4.0 to 7.2.

Water with anomalously high concentrations of chloride--as high as 2,340 milligrams per liter--occurs in parts of the project area. Some of the chloride anomalies may be from leaky oil-field-brine disposal wells or leaky evaporation ponds. Other anomalies may result from inflow from underlying saltwater-bearing units.

INTRODUCTION

Ground-water use is increasing in central Louisiana, mostly because of population growth in the Alexandria-Pineville metropolitan area. The project area, which is north of the Red River, comprises about 1,300 mi^2 and includes parts of Avoyelles, Catahoula, Grant, La Salle, Rapides, and Winn Parishes (pl. 1). The area is mostly rural. The population of the project area, which was about 57,000 in 1970, increased about 20 percent between 1970 and 1978. In 1970 the population of the largest town, Pineville, was 9,400; but the population of most of the towns in the area was less than 2,500.

The terrace aquifers are a source of ground water that is not extensively used in the project area. Some potential users considering utilizing these aquifers are concerned about the capability of these aquifers to yield an adequate supply of water for future needs. In addition, because the terrace aquifers extend to or near the surface, they have a potential for contamination or pollution; in some parts of the area the deposits are contaminated by salty water. Approximately three-fourths of the area is woodland; otherwise the potential for pollution of the aquifers would be even greater than it is.

About 30 percent of the people in the area depend on the terrace aquifers for their water supply. The number of people using water from the aquifers has decreased since 1970 because some are now using water from public-supply systems served by wells screened in deeper aquifers. However, because of population and industrial growth, demand for water from the terrace aquifers probably will increase in the future. Therefore, the U.S. Geological Survey, in cooperation with the Louisiana Department of Transportation and Development, Office of Public Works, began a study of ground water in the terrace aquifers in July 1969.

Objectives and Scope

The principal objectives of the project were (1) to appraise the potential of the terrace aquifers, (2) to determine their water-yielding capability, and (3) to determine the quality of water available from the aquifers. Another objective was to evaluate the long-term yield of the aquifers by analyzing recharge by rainfall and discharge to streams.

Selected water wells were inventoried, water samples were collected for chemical analyses, and pumpage data were obtained. Lithologic and electrical logs were used in the mapping of the terrace deposits. Test holes were drilled to provide additional information on geology and to permit installation of test wells for measuring water levels and collecting water samples. Hydrographs were made using periodic water-level measurements of observation wells. Where possible, aquifer tests were made and analyzed to determine the water-yielding potential of the aquifers. In addition, recharge and discharge relationships to underlying aquifers were studied, and saltwater-bearing zones were mapped.

Acknowledgments

The authors wish to acknowledge the cooperation of water-supply managers, engineering firms, water-well drillers, and well owners who supplied data for the project. Electrical logs of oil-test wells in the project area were made available by the Louisiana Department of Natural Resources, Office of Conservation. Appreciation is expressed to the managers of the public water supplies at Dry Prong and Jena for allowing the U.S. Geological Survey to use their wells for aquifer tests.

Climate

Central Louisiana has a humid climate with hot summers. The average annual temperature at the Belah Fire Tower, 4 mi southwest of Jena, is about 66°F. The average monthly temperature ranges from about 40°F in January and February to about 84°F in July and August. The annual precipitation at rain gages near the U.S. Forest Service Stuart Seed Orchard (pl. 1) in the period 1951 through 1975 ranged from a low of 31.74 in. (1954) to a high of 87.22 in. (1961). Average annual precipitation is 54 in. Generally, from July through November, monthly precipitation is about 20 percent less than during other parts of the year. Streamflow ceases in some streams and decreases in the others during the drier parts of the year. Evapotranspiration is higher during the dry season, and infiltration of water to the aquifer is lower than during the rest of the year, at times probably diminishing to zero. The potential for infiltration is greater during the winter and early spring when evapotranspiration is less and when more water is generally available for infiltration.

Physiography

Topography

The altitude of the land surface ranges from about 320 ft above NGVD (National Geodetic Vertical Datum of 1929, formerly known as mean sea level) in the northwestern part of the project area to about 50 ft above NGVD in the southern part. Most of the project area is hilly; local relief is as much as 150 ft. Stream valleys in the project are mostly flat bottomed, and the flood plains are underlain by alluvium. At places, erosion has exposed underlying beds of Tertiary age (pls. 2A-2C).

The four alluvial terraces in the project area, from oldest to youngest (highest to lowest), are the Williana terrace, the Bentley terrace, the Montgomery terrace, and the Prairie terrace (Fisk, 1938, p. 51-75). The terrace surfaces have a general southerly slope. The Williana terrace occurs at the major drainage divides over the northern three-fourths of the project area. Erosion has produced a hilly terrain, and relief is as much as 150 ft. From the topography of the area, the approximate location of the Williana terrace surface ranges in altitude from about 320 ft above NGVD about 9 mi north of Verda to about 200 ft above NGVD 1 mi north of Camp Beauregard.

The Bentley terrace surface is about 30 ft lower than the Williana terrace surface in the central part of the project area (Fisk, 1938, pl. 4). Erosion has produced a hilly terrain similar to that of the Williana surface. The approximate location of the Bentley surface ranges from about 220 ft above NGVD 5 mi north of St. Maurice to about 160 ft above NGVD 6 mi east of Pineville.

The Montgomery terrace surface occurs in the northwestern part of the project area, in the southern part east of Pineville, and in the northeastern part along Bayou Funny Louis. The Montgomery surface is less eroded than the Williana and Bentley surfaces. Relief is about 70 ft in the northwestern part of the project area and about 50 ft in the southern part. The Montgomery surface ranges from about 180 ft in altitude in the northwestern part of the project area to about 105 ft in altitude in the southern part.

The Prairie terrace, the least eroded of the terraces, is about 40 ft below the Montgomery terrace in the northwestern part of the project area. In the southern part of the project area the boundary between the Prairie and Montgomery terraces is at the 100-foot topographic contour. The Prairie terrace extends along stream valleys in most of the project area. In northeastern Rapides and northwestern Avoyelles Parishes, in the southern part of the project area, the Prairie terrace forms a large plain that has less than 30 ft of relief. In the eastern part of the project area in La Salle Parish north of Lake Catahoula, the Prairie terrace surface is more dissected, especially southwest of Devils Creek. Relief in this area is as much as 70 ft.

Drainage

Large streams in or near the project area are the Red River, the Ouachita River, and the Little River (pl. 1). The major tributaries of the Red River are Saline Bayou (on the northwest edge of the project area) and Bayou Rigolette, which drains Lake Iatt. Dartigo Creek flows into Lake Iatt. Nantachie Creek flows into Lake Nantachie, which is drained by Bayou Nantachie to the Red River. The major streams flowing into the Little River are Fish Creek, Big Creek (in the central part of the project area), Trout Creek, and Bayou Funny Louis. The Little River, Flagon Bayou, Hemphill Creek, and Devils Creek flow into Lake Catahoula. Bushley Bayou flows into the Ouachita River. In the southern part of the project area, Big Saline Bayou flows into Big Creek (Rapides Parish), which in turn flows into Saline Lake east of the project area.

One component of streamflow is overland runoff. The average annual overland runoff at the gaging station on Big Creek at Pollock is about 9 in. In most of the project area, downcutting by streams has breached the water-bearing part of the terrace aquifers, and the base flow of the streams is sustained by water discharging from the aquifers. Streams that have not cut into the water-bearing part of the aquifers have no flow during dry seasons.

GEOLOGIC FRAMEWORK

The terraces were formed during Pleistocene time on unconsolidated alluvial deposits of Pleistocene age. These alluvial deposits overlie beds of Tertiary age (Miocene to Eocene). Beds of Miocene age underlie the terrace aquifers in the southern two-thirds of the project area. Freshwater sands of Miocene age are a source of water to wells in most of this part of the project area. However, sands of Miocene age contain salty water in parts of northeastern Rapides Parish and in Avoyelles Parish. Thick clays of the Vicksburg and Jackson Groups of Oligocene and Eocene age, respectively, underlie the terrace deposits in northern Grant and southwestern Winn Parishes, including the Hargis and Williana localities (pl. 1). The Vicksburg and Jackson Groups do not yield water to wells. In the northwestern corner of Grant Parish and in southwestern Winn Parish (in an area including the St. Maurice, Wheeling, and Atlanta localities) the terrace deposits overlie beds of the Claiborne Group of Eocene age. These beds mostly contain freshwater sands, which are a potential source of water to wells. In the extreme northern part of the project area the terrace deposits occur as erosional remnants in the form of isolated hills up to about 1 mi^2 in area. In the south the terrace deposits form a continuous plain more than 100 mi^2 in area. In the project area the terrace deposits range in thickness from 0 to about 240 ft and average about 70 ft. The thickest section noted is at well Av-271[1/], 1 mi northwest of Effie (pls. 1, 2C), near the southern tip of the project area.

[1/] Wells in a parish are numbered in approximate order of inventory. This number prefixed by a symbol for the parish constitutes the well number; for example, well Av-1 is the first well inventoried in Avoyelles Parish.

The terrace deposits were mapped in central Louisiana by Chawner (1936), Fisk (1938 and 1940), and Huner (1939). Fisk (1940, p. 175) divided the terrace deposits into four formations corresponding to the overlying terrace surface; the Williana, Bentley, Montgomery, and Prairie Formations (pls. 2A-2C). Each formation generally consists of an upper clay and silt layer and a lower sand and gravel layer.

The sand and gravel layers are referred to in this report as the terrace aquifers. The aquifers are named for the corresponding formation; for example, the sand and gravel layer in the lower part of the Prairie Formation is the Prairie aquifer. In most of the project area the sand and gravel of the Williana aquifer appears to grade laterally into that of the Bentley aquifer. Thus, in this report the two units are combined as the Williana-Bentley aquifer except in areas where only one of the units occurs.

The upper clay-silt layers that occur in each of the terrace formations range from 0 to about 95 ft in thickness and average about 25 ft; the greatest thicknesses are in the southern part of the project area. The clay-silt layer consists of clay that may be sandy, silty, or gravely and silt that may be sandy, clayey, or gravely. The clay-silt layer contains calcareous concretions in places in the southern part of the project area. Lignite is also present locally. Predominant colors of the clay and silt are red, brown, brownish red, gray, yellow, and orange. Sand, mostly very fine to fine grained, occurs locally in the clay-silt layer. These sand beds, ranging from 0 to 30 ft in thickness, can be distinguished from the main body of the terrace aquifer by correlation with logs of nearby wells. The sand may be clean, silty, clayey, or gravely. Most of the sand beds are not saturated, but locally they are water bearing and are a source of water for shallow domestic wells. Predominant colors of the sand are red, brown, tan, and orange.

In the valleys of larger streams the terrace deposits are overlain by Holocene alluvium. The alluvium generally ranges from 2 to 25 ft in thickness and consists of an upper clay and silty clay layer and a lower sand and gravel layer. The clay and silty clay layer ranges from 0 to about 10 ft in thickness, and the sand and gravel layer ranges from 1 to 25 ft in thickness. The sand in the basal layer is fine grained or silty at the top and is coarser and contains gravel at the base. In places, the sand and gravel layer is in contact with the terrace aquifers. Where streams have cut through the terrace aquifer, and beds of Tertiary age are exposed on the valley walls, the terrace deposits obviously are not in contact with the alluvium. Where streams have cut only into the clay-silt layer of the terrace deposits, the clay-silt layer isolates the alluvium from the terrace aquifers.

TERRACE AQUIFERS

Description

In the project area the terrace aquifers range from 0 to 150 ft in thickness and average about 45 ft. The thickest occurrence mapped is at well Av-271 near the southern tip of the project area (pl. 2C). Where the terrace deposits are highly dissected, erosion has limited the areal extent and reduced the thickness of the aquifers. In the southern part of the project area the aquifers are not eroded and form a blanket deposit. The aquifers are unconsolidated, poorly to well sorted, generally gravel bearing, very fine to very coarse, siliceous sands that typically are oxidized to depths of as much as 100 ft. At most localities the grain size increases with depth, and coarse to very coarse sand occurs in the lower part of the aquifer. The predominant color is tan; other colors are yellow, red, orange, gray, and white.

Generally, gravel occurs in the lower three-fourths of the aquifers, and at some places the size of the gravel increases with depth. Most of the gravel in drill cuttings from water-test holes ranges from 1/5 to 1 1/2 in. in diameter; the largest gravel from test holes is about 3 in. in diameter. Huner (1939, p. 171) reports gravel as large as 8 in. in diameter from outcrops in Winn Parish, and in Rapides Parish at Esler Field (pl. 1) gravel as large as 18 in. in diameter occurs on the surface. Similar sizes probably occur in the aquifer.

At some localities the terrace aquifers are silty or clayey sands, mostly in the upper part; and locally, the aquifers contain lignite. In places, the aquifers contain clay beds that are mostly 2 ft or less in thickness. The maximum observed thickness of a clay bed is about 20 ft.

About 2 mi northeast of Holloway at wells R-1107 and R-1109 (pls. 1, 2C) a blue sand and gravel occurs at a depth where the terrace aquifer in the Prairie Formation would be expected; however, these dark deposits probably are of Tertiary age. They probably are in hydraulic connection laterally with the terrace aquifer.

The altitude of the base of the terrace aquifers ranges from about 240 ft above NGVD in the northern part of the project area to about 140 ft below NGVD in the southern part (pls. 3A-3C).

The Williana-Bentley aquifer ranges from 3 to 150 ft in thickness and averages about 50 ft. Generally, the base of the Williana-Bentley aquifer is higher than the base of the younger, adjacent terrace aquifers. In parts of the project area the Williana-Bentley aquifer is separated from the other terrace formations by outcrops of beds of Tertiary age (pl. 10). However, west of Kolin the Williana-Bentley aquifer is in hydraulic connection with the Montgomery aquifer, and hydraulic connection between the Williana-Bentley aquifer and the younger terrace aquifers may occur elsewhere in the project area. The base of the Williana-Bentley aquifer slopes irregularly to the south from about 240 ft above NGVD at Williana to 60 ft above NGVD 3 mi east of Pineville, La.

In the northwestern part of the project area the Montgomery aquifer ranges from 0 to 100 ft in thickness and averages about 30 ft. In the southern part of the project area the Montgomery aquifer ranges from about 15 to 100 ft in thickness and averages about 50 ft. In the southern part of the project area the base of the Montgomery aquifer is at the same altitude as that of the Prairie aquifer--thus, the aquifers are continuous there but generally are separate units in the northern part of the project area. The altitude of the base of the Montgomery aquifer ranges from 135 ft above NGVD in the northwestern part of the project area to 45 ft below NGVD in the southern part.

In the northern part of the project area the Prairie terrace deposits extend along stream valleys (pl. 2A). In places in these valleys the Prairie terrace deposits consist only of clay or silt beds, which may be gravely; and the Prairie aquifer is missing. The thickness of the Prairie aquifer is as much as 56 ft along the river valleys and as much as 32 ft along the valleys of tributary streams.

In the eastern and southern parts of the project area, where the Prairie terrace deposits form plains, the Prairie aquifer underlying the plains ranges from 10 to 130 ft in thickness. The thickest occurrence is in the southern part of the project area.

The altitude of the base of the Prairie aquifer ranges from 90 ft above NGVD in the valley deposits in the northern part of the project area to about 140 ft below NGVD beneath the plains in the southern part.

Aquifer Characteristics and Well Yields

Hydraulic conductivity of the terrace aquifers, determined from aquifer tests, ranges from about 150 to 270 ft/d, or 1,100 to 2,000 (gal/d)/ft^2, and averages 220 ft/d, or 1,600 (gal/d)/ft^2. Transmissivity ranges from about 3,200 to 13,000 ft^2/d, or 24,000 to 97,000 (gal/d)/ft, and averages about 8,200 ft^2/d, or 61,000 (gal/d)/ft. The coefficient of storage ranges from 0.0001 (typical of confined or artesian aquifers) to 0.18 (typical of unconfined or water-table aquifers). This range of values is applicable to each of the terrace aquifers. The transmissivity of the Williana-Bentley aquifer near Pollock in the Big Creek drainage area (Grant Parish) was determined using the recession curve (Rorabaugh, 1960) of Big Creek for the 1955 water year, a low rainfall year chosen to minimize the effects of rainfall on the recession curve. The storage coefficient was assumed to be 0.1, and the average saturated thickness was 20 ft. Transmissivity was 6,000 ft^2/d, or 45,000 (gal/d)/ft. Hydraulic conductivity was 300 ft/d, or 2,200 (gal/d)/ft^2. These results are compatible with those obtained from pumping tests of the terrace aquifers in central Louisiana.

The terrace aquifers are unconfined at most localities. Generally, from one-fourth to three-fourths of the aquifer thickness is saturated. The known saturated thickness is as much as 111 ft, and the average thickness ranges from about 25 to 30 ft. The thickest occurrence is at well Av-302 in the southern part of the area. In the southern part of the project area, east of Kolin, and at a few other localities the terrace aquifers are confined (pl. 11). Locally, the basal sand and gravel layer of the terrace deposits is not saturated.

Saturated-sand thicknesses for the terrace aquifers in parts of the project area are shown on plates 6-12. Where the terrace aquifers are unconfined, the saturated-sand thickness varies with changes in the water level. Increased saturated thickness during periods of high water level results in increased transmissivity for the aquifer. The upper part of the aquifers, at many places in the project area, is finer or siltier and less permeable than the lower part. Therefore, the average hydraulic conductivity of the aquifers during periods of high water level will be less than during periods of low water level. However, more water is in storage in the aquifers; thus more is available for development.

The sustained yield of the terrace aquifers depends mostly on infiltration of precipitation, which is generally about 0.5 ft/yr. (See section "Infiltration.") This much recharge would sustain a continuous yield of about 200 (gal/min)/mi^2 indefinitely. The amount of infiltration varies from year to year depending on the amount, intensity, and seasonal distribution of rainfall. At places, infiltration is retarded by clay beds above the aquifers. Where clays are thick and extensive, the annual rate of infiltration to the aquifers may be less than 1 in. An infiltration rate of 1 in. could sustain a yield of about 33 (gal/min)/mi^2.

An example of the water-yielding potential of the terrace aquifers is as follows: Assume that a sand has a hydraulic conductivity of 220 ft/d, a storage coefficient of 0.2, and a saturated thickness of 25 ft. If a continuous yield of 100 gal/min were pumped from a well screened in the sand, the area underlain by the pumping cone at the end of 1 year, assuming no recharge, and assuming drawdown at the pumping cone's limit to be 0.1 ft, would be about 3 mi^2. An annual infiltration rate as low as 1 in. in the area of the pumping cone would sustain this continuous yield of 100 gal/min. The area of the pumping cone would be smaller with increasing infiltration to the aquifer. An extended dry period with decreasing infiltration to the aquifer would cause the area of the pumping cone to enlarge.

The specific capacity of a water well is dependent on the hydraulic characteristics of the aquifer and the construction and development of the well. Specific capacities of public-supply and industrial wells in the project area range from about 1 to 50 (gal/min)/ft of drawdown. The lower values are from wells where the transmissivity is unusually low, or from inefficient wells.

The yield of a well depends on the saturated thickness of the aquifer, well construction, and other factors. Some factors that affect the long-term yield of a well screened in a terrace aquifer include the areal extent of the aquifer, the rate of recharge to the aquifer, and interference from other wells. The amount of water available to wells is reduced by water that moves laterally and discharges into streams that have eroded valleys into the aquifers. Development of wells would "capture" some of this water, thereby reducing flow of some of the streams. Water derived from aquifer storage would augment well yields during dry seasons.

Yields of public-supply and industrial wells in the project area have been reported to be as high as 400 gal/min (table 2). Higher yields could be pumped for short periods of time from wells with high specific capacities. For example, a well with a specific capacity of 50 (gal/min)/ft of drawdown could yield 750 gal/min with 15 ft of drawdown. Large sustained yields could be pumped in areas where the hydraulic characteristics and areal extent of the aquifer and the available drawdown are favorable. A well in such a favorable area could develop a pumping cone of several square miles in areal extent, and the sustained yield could be as much as 1,000 gal/min.

Water Levels and Movement

Relation of Water Surface to Land Surface

Generally at a locality, the higher the altitude of the land surface, the deeper it is to the water surface. The altitude of the water surface (potentiometric surface) in the terrace aquifers is lower near the streams than in interstream areas. As the land surface generally slopes toward the streams more steeply than does the water surface, the water level in wells near streams is closer to land surface than the water level in wells in interstream areas.

Water levels in the terrace aquifers in central Louisiana average about 40 ft in depth below land surface. The deepest measured water level is about 82 ft at well La-206, 3 mi east of Jena (pl. 2B).

Water-Level Fluctuations

Water levels in the terrace aquifers respond to both seasonal changes in evapotranspiration and long-term excesses or deficiencies in precipitation. Water levels tend to rise during wet winter and spring seasons when evapotranspiration is low and decline during summer and fall seasons when evapotranspiration is high. During the wet seasons, infiltration exceeds discharge and the water level rises. During dry seasons, discharge exceeds infiltration and the water level declines. Because the amount of rainfall varies annually, the amount of water that infiltrates to the aquifers varies annually. During a sequence of wet years, infiltration exceeds discharge, water goes into storage, and the water level rises above the long-term average. During relatively dry periods of several years duration, discharge exceeds infiltration; and the water level declines below the long-term average. Figure 1 shows long-term water-level trends of wells screened in the terrace aquifers and cumulative departure from average rainfall at the Belah Fire Tower (pl. 1). The hydrographs of well G-127 (and replacement wells G-127A and G-127B) and well La-42 show seasonal fluctuations and also show long-term trends that correlate with the graph of cumulative departure from average rainfall. The hydrograph of well R-861, which is in the southern part of the project area, shows a similar response but less fluctuation.

In most of the project area, for example in the vicinity of wells G-127B and La-42 (pls. 2B and 2C), the land-surface relief is relatively high; and the clay layer above the terrace aquifers has been breached by erosion (pls. 7B and 10B). Thus, conditions for infiltration are favorable. In these areas, water-level fluctuations average about 10 ft

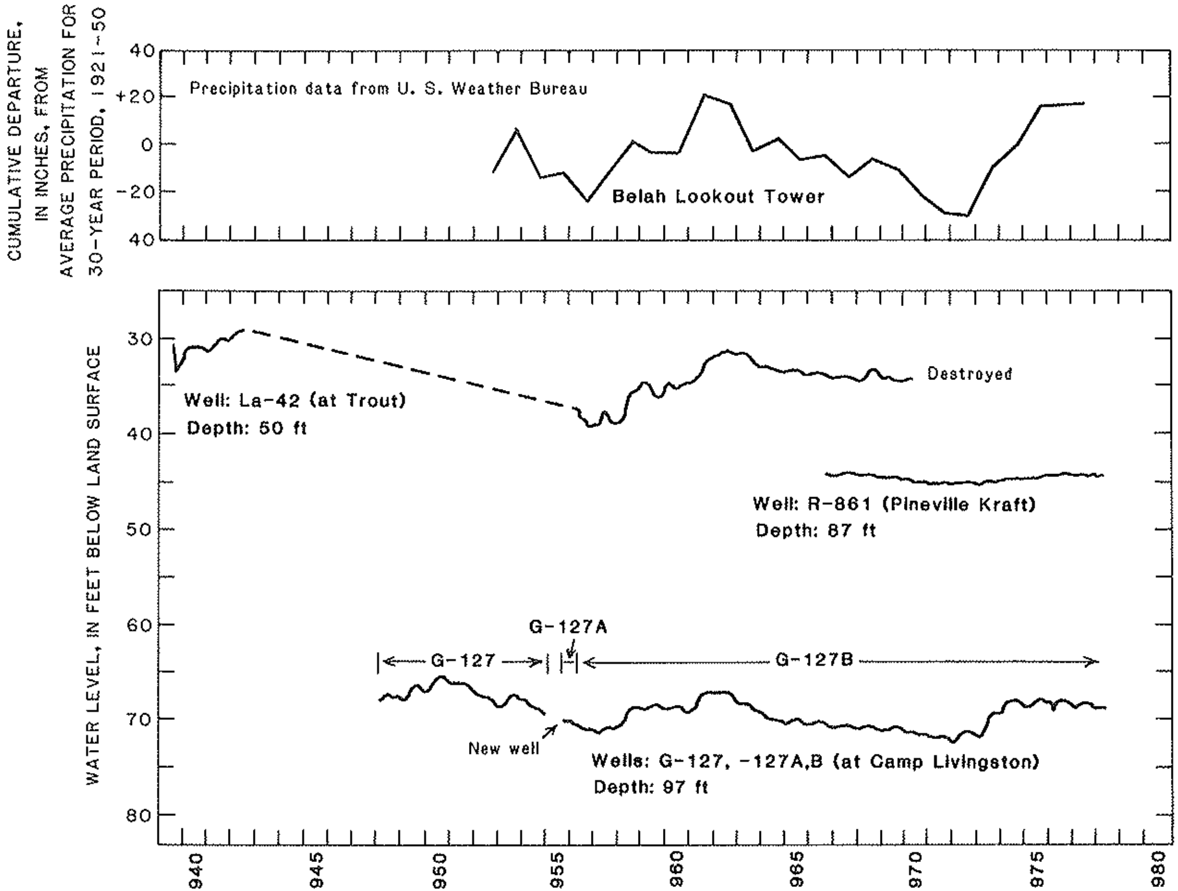

Figure 1.--Hydrographs of wells screened in the terrace aquifers and graph showing cumulative departure from average precipitation at Belah Lookout Tower.

(fig. 1, hydrographs of wells G-127, G-127A, G-127B, and La-42). In the southern part of the project area, erosion has been less; and the clay layer above the terrace aquifers is continuous (pl. 11B). As a result, infiltration is reduced. In this area, water-level fluctuations are smaller, averaging about 2 ft (fig. 1).

Relation of Water Levels to Stream and Lake Levels

In some valleys, as in the valleys of Dartigo Creek south of Verda and Devils Creek west of Nebo (pls. 2A and 2B), the base of the terrace aquifers is above the perennial streams and is separated from them by beds of Tertiary age. Thus, no direct hydraulic connection exists between the terrace aquifers and the streams. In other valleys, as the valley of Big Creek near Dry Prong, the base of the terrace aquifer is below the perennial stream; and the saturated sand of the aquifer is hydraulically connected to the stream. The stream acts as a base level for the water level of the aquifer, and water moving from the aquifer to the stream maintains a perennial flow. In the southern part of the project area the terrace aquifers are below and separated from the streams (for example, Wiggins Bayou north of Ruby, pl. 11B) by the upper clay-silt layer of the terrace deposits. Thus, the water level of the stream is not related to that of the terrace aquifer.

Water Movement

Infiltration.--Water enters the terrace aquifers mostly by infiltration from rainfall. The average annual rate of infiltration for the Big Creek drainage area upstream from the gaging station at Pollock was determined from the estimated base flow of Big Creek, which was interpreted from hydrographs. The annual rate of infiltration to the terrace aquifers ranges from about 0.3 to 0.7 ft/yr and averages about 0.5 ft/yr. This determination is based on the following assumptions: (1) the topographic divide of the Big Creek drainage area is nearly coextensive with the underlying ground-water divide in the terrace aquifer; (2) all runoff from the Big Creek drainage area, both overland and ground-water runoff (base flow), is measured at the gaging station; (3) the beds of Tertiary age that directly underlie the Williana-Bentley aquifer in the Big Creek drainage area are clay and essentially prevent exchange of water between the deeper sand beds and the terrace aquifer; and (4) the Williana-Bentley aquifer underlies the entire Big Creek drainage area.

Evapotranspiration.--A large amount of the precipitation in the project area is evaporated and transpired and does not enter the terrace aquifers. The average annual rate of evapotranspiration was determined for the Big Creek drainage area, using average rainfall and streamflow records. This determination is based on the same assumptions as the determination of the average rate of infiltration. The average annual evapotranspiration rate is about 40 in.

Direction and rate of movement.--Water in the terrace aquifers moves laterally toward and is discharged into streams that have eroded valleys into the aquifers. The direction of water movement in the terrace aquifers is down the slopes indicated by the contours showing the altitude of the potentiometric surface of the terrace aquifers (pls. 4A-4C). In the northern part of the project area the potentiometric surface generally has a relatively steep gradient of 10 to 40 ft/mi toward the streams. Ground-water movement is relatively fast, ranging from about 500 to 2,000 ft/yr, assuming that the effective porosity is 30 percent. In the southern part of the project area, where the terrace aquifers are not as extensively eroded, the intake point is farther from the point of discharge; and the potentiometric surface of the terrace aquifers has a relatively low gradient (3 ft/mi to less than 10 ft/mi). Ground-water movement in this area is much slower, ranging from about 200 to 500 ft/yr.

Clay beds between the terrace aquifers and the underlying aquifers retard the rate of movement between aquifers in most of the project area. However, locally, water in the terrace aquifers moves downward into underlying aquifers; and in some places, water in the underlying aquifers moves upward into the terrace aquifers. The direction of movement is from the aquifer with the higher water level to that with the lower water level. In the southwestern part of the project area the water level of the terrace aquifers is higher than that of the Tertiary aquifers. This is principally because the water level of the Tertiary aquifers has declined in response to pumping in the Alexandria-Pineville area. In most of the southwestern part of the project area, water levels of Tertiary sands originally were higher than those of the terrace aquifers. Water levels of the Tertiary aquifers are still higher than those of the Prairie aquifer in parts of northeastern Rapides Parish and in La Salle Parish north and northwest of Catahoula Lake. In the northern part of the project area, water levels of the terrace aquifer generally are higher than water levels of the Tertiary aquifers.

Quality of Water

Typical Ranges of Concentrations and Physical Properties

Generally, water in the terrace aquifers is fresh. Anomalously high concentrations of chloride and other constituents were detected in samples from single wells in parts of the project area. In other places, high concentrations of chloride and other constituents at several wells indicate a distribution of several square miles for the anomaly. The following discussions relate to areas of typical water quality. The anomalous areas are discussed later in the report.

In most of the project area, water in the terrace aquifers is soft and low in iron concentration (table 3). The water can be used for many industrial processes or for public supplies without treatment to reduce hardness or iron concentration.[2] Locally, some wells yield water that is hard and that has a high concentration of iron. For example, water from the terrace aquifers has a high hardness and iron concentration in the western part of the project area near St. Maurice, Montgomery, and Aloha and in the southern part near Kolin, Deville, and Effie. It is necessary to treat this water to make it satisfactory for public supply and some industrial uses. Before 1976 the Ward One Water Works (Avoyelles Parish) used water from wells screened in the Prairie aquifer and treated the water to lower hardness and iron concentration. The St. Maurice Water System has a treatment plant to lower the hardness and iron concentration of water from the Montgomery aquifer.

As the terrace aquifers are shallow, the water temperature is near the average annual air temperature, which is about 66°F in the area. Temperature of water in the terrace aquifers ranges from 66 to 69°F. The ranges of chemical properties and constituents reported in the following sections are based on data from about 280 analyses (tables 3 and 4).

Chloride.--The chloride concentration generally ranges from 1 to 140 mg/L (milligrams per liter). Water in the Williana-Bentley aquifer has the lowest chloride concentrations (1 to 20 mg/L). Chloride concentrations in water in the Montgomery aquifer range from about 10 to 140 mg/L. In the Prairie aquifer the range of chloride concentration is about 20 to 70 mg/L in southern La Salle Parish and about 40 to 140 mg/L in northwestern Avoyelles and northeastern Rapides Parishes. In water from well Av-323A the chloride concentration increased from 28 mg/L on February 4, 1971, to 56 mg/L on July 17, 1972. This may indicate pumping of well Av-323A has drawn water with a higher chloride concentration upward from the lower part of the Prairie aquifer.

Hardness.--In most of the project area, hardness of water in the terrace aquifers is 60 mg/L or less. Hardness of water in the Williana-Bentley aquifer ranges from about 4 to 60 mg/L; in the Montgomery aquifer, from about 15 to 120 mg/L; and in the Prairie aquifer in La Salle Parish, from about 16 to 60 mg/L. Typical hardnesses of water from the Prairie aquifer in northwestern Avoyelles and northeastern Rapides Parishes are higher than in most of the project area and range from about 40 to 350 mg/L. Water from well Av-323A increased in hardness from 76 to 130 mg/L between February 4, 1971, and July 17, 1972, (table 3). This increase appears due to water with a higher salinity and hardness drawn upward from the lower part of the Prairie aquifer by pumping of well Av-323A.

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[2] The U.S. Environmental Protection Agency (1976, p. 75) classifies hardness as follows: Water having a hardness of 0-75 mg/L is considered soft, 75-150 mg/L is moderately hard, 150-300 mg/L is hard, and more than 300 mg/L is very hard. In Louisiana, water that is hard or very hard and (or) that contains an iron concentration exceeding 0.3 mg/L generally is treated for public-supply use.

Iron.-In most of the project area the iron concentration of water in the terrace aquifers generally is 0.3 mg/L or less. Iron concentration of water in the Williana-Bentley aquifer ranges from 0.0 to 1.2 mg/L; in the Montgomery aquifer, from 0.0 to 2.3 mg/L; and in the Prairie aquifer, from 0.0 to 3.0 mg/L. In the southern part of the project area, about half of the wells screened in the Montgomery and Prairie aquifers yield water with an iron concentration greater than 0.3 mg/L.

pH.--The field pH of water from the terrace aquifers ranged from 4.0 to 7.1 and averaged 5.9. The low pH values probably are caused by concentrations of carbon dioxide gas dissolved in the water. Water having a low pH is corrosive. The corrosive water, which may have a low iron concentration in the aquifer, reacts with iron in the well casing or the water system. As a result, water in the distribution system may have a high iron concentration. For example, water from well G-25 (Pollock Water System) had an iron concentration of only 0.05 mg/L on September 29, 1959. However, water users experienced red stains on fixtures in houses. A sample collected at the city hall, June 8, 1962, had an iron concentration of 20 mg/L. Nearly all of the iron in water from the system results from reaction of the water with pipes in the system. Most of the public supplies that have wells screened in the terrace aquifers treat the water to raise the pH.

Dissolved solids.--Typically, the concentration of dissolved solids in water in the terrace aquifers ranges from about 25 to 700 mg/L. In most of the project area the concentration of dissolved solids is low (less than 100 mg/L), and concentrations are typically low where the terraces are dissected. In the dissected area the rate of leaching is rapid because erosion has thinned or removed the relatively impermeable clay layers above the aquifers and infiltration is more rapid. Valleys cut into the terrace aquifers provide nearby discharge. Thus, readily dissolved minerals have been leached from the terrace aquifers.

In the southern part of the project area in northeastern Rapides Parish south of Flagon Bayou and in northwestern Avoyelles Parish, the known concentration of dissolved solids ranges from about 40 to 600 mg/L. Where the dissolved-solids concentration is generally high, the terraces are not dissected. Thus, the rate of leaching is relatively slow, and all of the readily dissolved minerals have not been removed. Boundary clay beds and clay beds in the aquifer probably provide some of the dissolved solids.

Minor elements.--Results of analyses for minor elements in water from wells screened in the terrace aquifers are presented in table 4. Water samples were collected from three public-supply wells: well G-125, town of Colfax; well G-203, town of Pollock; and well La-77, town of Jena. Minor-element concentrations were low, except that water from well G-203 had a copper concentration of 300 µg/L (micrograms per liter). The copper probably came from solution of metal in the pump assembly.

Organic pesticides.--Samples were collected for analyses of organic pesticides from the same three wells that were sampled for minor elements. Samples for complete analyses (table 3) were collected on the same dates. The samples were analyzed for the 24 commonly used pesticides listed below:

Pesticides

Aldrin (total)
Chlordane (total)
DDD (total)
DDE (total)
DDT (total)
Diazinon (total)
Dieldrin (total)
Endrin (total)
Ethyl parathion (total)
Ethyl trithion (total)
Ethion (total)
Heptachlor epoxide (total)
Heptachlor (total)
Lindane (total)
Malathion (total)
Methyl parathion (total)
Methyl trithion (total)
Polychlorinated biphenyls (total)
Polychlorinated naphthalenes (total)
Silvex (total)
Toxaphene (total)
2,4-D (total)
2,4-DP (total)
2,4,5-T (total)

Concentrations of all constituents were below the threshold of detection except that water from well La-77 at Jena had a dieldrin concentration of 0.01 µg/L. This concentration is greater than the limit of 0.003 µg/L recommended by the U.S. Environmental Protection Agency (1976, p. 128).

Relation of water quality to depth in aquifers.--At two of three localities where water samples were collected from wells of different depth in the terrace aquifers, water from the deeper well had higher concentrations of chloride and hardness than water from the shallower well. The increase of concentrations with depth at wells Av-323A and Av-323B may indicate stratification of water in the aquifer. (See Marie, 1971, pl. 4.) The increase at wells R-1047 and R-1048 may indicate stratification or may indicate a gradual increase of concentrations with depth. Where the terrace aquifers are relatively thin and unbroken by clay beds, as in most of the project area, there may be little or no change of water quality with increased depth. (See following tabulation.)

Partial analyses of water from paired shallow and deep wells at three localities

Well number	Depth (ft)	Chloride (mg/L)	Hardness (mg/L)
R-1047[1]	24	10	35
R-1048[1]	147	70	350
Av-323A[2]	110	28	76
Av-323B[2]	140	92	190
G-370A[3]	35	10	12
G-370B[3]	65	3.4	6

[1] Thirteen miles southeast of Pineville.

[2] Nine miles east of Kolin.

[3] Two miles south of Williana.

Water-Quality Anomalies

In parts of the area, water in the terrace aquifers contains chloride concentrations of 250 mg/L or greater. Such concentrations are considered anomalously high in this report. Generally, water from the terrace aquifer that has an anomalously high chloride concentration has a hardness of 150 mg/L or greater and an iron concentration of 0.6 or greater. Most wells found to yield water with anomalous concentrations of chloride are screened in the Prairie aquifer in southern La Salle, northwestern Avoyelles, and northeastern Rapides Parishes.

Areal water-quality anomalies.--In two areas of several square miles each, wells screened in the Prairie aquifer yield water with anomalously high concentrations of chloride and other constituents. The northernmost area is in La Salle Parish north of Catahoula Lake; the other is in northeastern Rapides Parish south of Catahoula Lake (pl. 5). The concentration of chloride and other constituents is too high in these areas for the water to be satisfactory for public-supply or domestic purposes. However, at some sites within these areas the Prairie aquifer is used as a source of water for stock wells.

Chloride concentrations in these areas of anomalous water quality range from about 250 to 2,300 mg/L. In the northern area in the vicinity of Nebo, the chloride concentration of water in some wells in the Prairie aquifer has increased with time (table 3). For example, at well La-80, 1 1/2 mi south of Nebo, the chloride concentration increased from 76 mg/L in April 1959 to 300 mg/L in August 1967. In nearby well La-225 the chloride concentration was 1,600 mg/L in March 1974; however, by July 1975 the chloride concentration had decreased to 1,200 mg/L. This decrease may be due to dilution of water in the aquifer by recharge from above average rainfall, 1973-75. In the southern area the chloride concentration in water from well R-783 was about the same from April 1962 (1,500 mg/L) to March 1977 (1,400 mg/L).

Hardness of water in the Prairie aquifer in the high-chloride areas ranges from about 90 to 1,100 mg/L. Near Nebo, in the northern anomalous water-quality area, hardness of water in the Prairie aquifer increased from 1959 to 1967. Hardness of water from well La-80 increased from 72 mg/L in April 1959 to 190 mg/L in April 1967. Hardness of water from well La-225 was 160 mg/L in March 1974; however, the hardness had decreased to 140 mg/L by July 1975. As with the chloride decrease, the hardness decrease may be due to dilution of water in the aquifer by recharge from above average rainfall in 1973-75. In the southern areas the hardness of water from well R-783 changed little between April 1962 (650 mg/L) and March 1977 (660 mg/L).

In the two anomalous water-quality areas, known iron concentrations in water in the Prairie aquifer range from 0.14 to 35 mg/L. The concentration of dissolved solids ranges from 1,330 to 3,650 mg/L. The concentration of potassium ranges from about 10 to 20 mg/L, much higher than the potassium concentration in water from wells screened in the terrace aquifers outside of these areas. Field pH ranges from 4.6 to 5.5.

Water samples from a well in each of the two anomalous water-quality areas were analyzed for minor elements. Water from both wells had high concentrations of zinc, which may be from the casing. Water from well La-225, 1 1/2 mi south of Nebo, has relatively high concentrations of bromide and iodide. Water from well R-783, 6 mi northeast of Holloway, is high in concentrations of barium, bromide, and iodide (table 4). The high concentration of these constituents may indicate that water from deeper saltwater aquifers has entered the terrace aquifer. This may have been by contamination from oil-field brines or by natural discharge from underlying aquifers of Tertiary age. Available data on minor elements are inadequate to enable determination of the exact source.

Most of the northern anomalous water-quality area is in the vicinity of the Nebo-Hemphill oil and gas field (pl. 5). Wells in the Prairie aquifer near Nebo originally yielded freshwater. For example, water from well La-80 had a chloride concentration of only 76 mg/L in April 1959. Chloride concentration of water from nearby well La-225 was 1,300 mg/L in June 1977. About 1967, chloride and other constituents of the water increased, and the terrace wells were abandoned and replaced by deeper wells screened in freshwater sands of Tertiary age. Some well owners reported that their terrace aquifer wells were replaced at the expense of oil companies operating in the oil field. Aquifers of Tertiary age underlying the terrace aquifer in all of this area contain freshwater and are not a source of the high-chloride water in the Prairie aquifer; the high concentration of chloride and other constituents in the northern area are probably due to contamination by oil-production activity. The contaminating fluid may have entered the aquifer from saltwater evaporation pits or leaky saltwater disposal wells.

Most of the southern anomalous water-quality area is not in the oil fields (pl. 5), and some of the water having high concentrations of chloride and other constituents appears to be of natural origin. Owners of some wells screened in the Prairie aquifer report that their wells have yielded high-chloride water for 30 years or more. This would predate some of the oil-production activity. The water-level gradient indicates that the water in the southern area is moving toward the oil fields.

There are saltwater disposal wells and evaporation ponds in the oil fields in the southern anomalous water-quality area. Some of the terrace aquifer water with high concentrations of chloride and other constituents in the southern part of the area may be the result of contamination by saltwater produced as a byproduct of oil production.

Beneath part of the southern anomalous water-quality area, all aquifers of Tertiary age contain high-chloride water. Some of these aquifers are in contact with the terrace aquifer locally and could be a source of the high-chloride water in the Prairie aquifer. For example, well R-891, 2 1/2 mi east of Holloway, is screened in Tertiary sand and yields water having a chloride concentration of 2,200 mg/L. Water from well R-890, screened in Tertiary sand 1 mi east of well R-891, has a chloride concentration of 980 mg/L. The Tertiary aquifers in which these wells are screened are probably in contact with the terrace aquifer a short distance to the north of the well sites.

Interpretation of the electrical log of well R-893, in sec. 22, T. 5 N., R. 3 E., indicates that there is high-chloride water in the Tertiary sands between depths of 149 and 674 ft. Well R-870, 2 1/4 mi north-northwest of well R-893, is screened in one of the Tertiary sands that contain high-chloride water and yields water with a chloride concentration of 1,100 mg/L. The shallowest beds bearing high-chloride water at well R-893 are 38 ft below the Prairie aquifer. As the Tertiary beds dip southward about 60 ft/mi, the sands containing high-chloride water should be in contact with the terrace aquifer about one-half mile north of well R-893 (pl. 2C).

Because the water level of the Tertiary sands is higher than that of the terrace aquifer at places in the southern anomalous water-quality area, the potential exists for the saltwater to move from the Tertiary beds into the terrace aquifer. At well R-870 (pl. 2C) the water level of the Tertiary sand is 4 ft higher than that in the terrace aquifer. At well R-891 the water level of the Tertiary sand is about 14 ft higher than the water level of the terrace aquifer. As pumpage from Tertiary sands in the Alexandria area has reduced heads in the Tertiary aquifers, the difference in head probably was higher in the past than it is at present. Thus, discharge of water from the Tertiary sands to the terrace aquifer likely occurred at a higher rate in the past than at present.

<u>Single-well water-quality anomalies</u>.--Locally, in northeastern Rapides Parish, south and west of the southern anomalous water-quality area, wells screened in the Prairie Formation have yielded water with high-chloride concentrations. In 1938 the U.S. Geological Survey collected water samples from eight wells; the chloride concentration ranged from 240 to 2,300 mg/L, and hardness ranged from 130 to 2,400 mg/L. These wells, which no longer exist, were mostly less than 65 ft deep. In 1975 and 1976, collection of water samples from the sands in which these wells were completed was attempted. Test holes were drilled at or near the sites of six of the high-chloride wells. At four of the sites, no sand was found at the depth at which the high chloride was reported; thus, no water samples were collected. The Prairie aquifer was found below the horizon of the high-chloride wells. The former wells apparently were completed in sandy or silty beds above the Prairie aquifer. At the other test-hole sites, sand in the Prairie aquifer was found at the horizon from which the high-chloride water came.

Water samples were collected from the Prairie aquifer at or near the six test-hole sites either from test wells in the test holes or from nearby terrace wells. Water was fresh (chloride concentration ranged from 42 to 110 mg/L), and hardness was in the same range (92 to 310 mg/L) as water from other Prairie-aquifer wells in the area of the test-hole sites.

At the two sites where test holes were not drilled, water samples were collected from nearby wells screened in the Prairie aquifer. Water from these wells was fresh (chloride concentration ranged from 40 to 70 mg/L) and the hardness (62 to 150 mg/L) was in the same range as water from wells screened in the Prairie aquifer in the area. Thus, the high-chloride water that was noted in 1938 apparently has moved down the hydraulic gradient and out of the area. Although the origin of the high-chloride water is not known, it may have been caused by septic-tank effluent.

Pollution Potential

Rapid infiltration to the terrace aquifers makes these units very susceptible to contamination and pollution by soluble waste materials. Potential sources of contamination and pollution are public landfills, sewage oxidation ponds, industrial waste-disposal ponds, oil-field pits and wells for disposing of saltwater, and septic tanks. The northern anomalous water-quality area is an example of contamination by oil-field brines. The terrace aquifers may be contaminated readily in areas where the clay layers above the aquifers are breached--such as in stream valleys and gravel pits. In areas where the terrace aquifers are protected by clay layers, contamination is more easily retarded or prevented.

Near Riley Branch, three-fourths of a mile southwest of Eden, a water sample collected from a roadside seep that was flowing about 2 gal/min on March 5, 1973, had a chloride concentration of 6,600 mg/L and hardness of 940 mg/L. The seep is in the drainage area of the Trout Creek oil field, and saltwater disposal at the oil field could be a source of the saltwater in the seep. Because nearby wells screened in the terrace aquifers yield freshwater, the seep is probably from a permeable soil zone above the aquifer. The high-chloride concentration in the water of the roadside seep indicates the potential for contamination of the aquifer. Whether or not the water has infiltrated the terrace aquifer, the potential exists for downward movement into the aquifer.

Present and Potential Development

Present Development

In most of the project area the terrace aquifers have not been developed for large water supplies. Total pumpage from the aquifers by eight public-water-supply systems, which served a total of about 13,350 people in 1975, averages about 1 Mgal/d. One new water system, the Central Grant Water System, is being developed. In 1977, three wells were drilled to test the Williana-Bentley aquifer for this proposed water system. One system that formerly used water from the Prairie aquifer, the Ward One Water Works in Avoyelles Parish, now buys water from a water district in Rapides Parish. This reduced the population using water from the terrace aquifers by 1,100, and pumpage from the terrace by 0.10 Mgal/d. Table 1 summarizes average daily pumpage and population served in 1975.

Table 1.--Average public-supply pumpage from the terrace aquifers and population served, 1975

Name	Average daily pumpage (Mgal/d)	Population served
GRANT PARISH		
Colfax-------------------------	0.14	2,500[1/]
Dry Prong----------------------	.03	600
Montgomery---------------------	.06	1,700
Pollock------------------------	.03	600
West Grant Water Association---	.04[2/]	600[2/]
LA SALLE PARISH		
Belah-Fellowship Water System--	0.05	700
Jena---------------------------	.40	3,400
Water District 1 (Goodpine)----	.15	2,700
WINN PARISH		
St. Maurice Water System-------	0.05	550
Total---------------------	0.95	13,350

[1/] Most of the Colfax population served lives outside of the project area.

[2/] The West Grant Water Association uses three water wells. Two are screened in sands of Tertiary age, and one is screened in the Prairie aquifer. These pumpage and population-served figures are estimates for the Prairie aquifer.

The terrace aquifers yield an average of about 0.1 Mgal/d of water for water wells at gas pipeline compressor stations in the project area. The Farmland Industries Ammonia Plant, 2 mi northeast of Pollock, obtains drinking water for employees from the terrace aquifer.

Well G-380A, at the U.S. Forest Service Stuart Seed Orchard, is used to supply 0.2 Mgal/d of water for spraying the seed orchard and fire prevention.

Most of the domestic and stock wells in the project area are screened in the terrace aquifers; pumpage averages about 0.4 Mgal/d. Total pumpage from the terrace aquifers in the project area averages about 1.6 Mgal/d.

Potential Development

The terrace aquifers are a potential source for public supply and industrial water users in much of the project area. The saturated-sand thickness of the terrace aquifers is important to long-range plans for developing water supplies from the aquifers. During periods of deficient precipitation the water level of the terrace aquifers declines, and less saturated thickness is available than during periods of high precipitation. Water users should base long-range plans for development of the terrace aquifers on a saturated thickness adjusted for seasons or periods of low rainfall. Because of the variable saturated thickness, water users considering installing wells in the terrace aquifers should drill test holes to locate the more favorable localities.

Areas where data indicate that the saturated sand of the terrace aquifers is relatively thick (greater than the average thickness of 25 ft) include: La Salle Parish between the La Salle-Catahoula Parish border and a north-south line through Eden, including Jena, Trout, Fellowship, Nebo, and Whitehall; northeastern Rapides and northwestern Avoyelles Parishes south of Flagon Bayou; and Grant and Rapides Parishes at Camp Livingston (pl. 1). In Grant Parish the saturated sand is thick along Louisiana Highway 8 from the west edge of Pollock to Bentley and along U.S. Highway 167 from Bentley to about 4 mi north of Dry Prong. The saturated sand is also thick in Grant and Winn Parishes in the area north of Louisiana Highway 122 and west of Louisiana Highway 471.

At most localities in other parts of the project area, saturated sand in the terrace aquifer is less than 25 ft in thickness; however, test drilling might locate greater thicknesses.

Availability of Water at Selected Sites

The occurrence of the terrace aquifers is discussed in detail for selected areas of potential population or industrial growth. Items discussed for the terrace aquifers in each area include: geologic setting, water levels, saturated-sand thickness, suitability of water for public-supply use, present development, and potential development. Hydraulic characteristics of the terrace aquifers are discussed if data are available.

Bagdad-Rock Hill Area

Geologic setting.--The Williana-Bentley and Prairie aquifers occur in the Bagdad-Rock Hill area--the Williana-Bentley aquifer in most of the area and the Prairie aquifer in the southern part of the area along the northeast border of the Red River Valley (pl. 6A). In the southwestern part of the area the base of the Williana-Bentley aquifer is continuous with the base of the Prairie aquifer (pl. 6B). Near Rock Hill the base of the Williana-Bentley aquifer is about 70 ft higher than the base of the Prairie aquifer, and the aquifers are separated.

In most of the Bagdad-Rock Hill area, streams have cut into or through the Williana-Bentley aquifer; and large parts of the aquifer have been dewatered. In some places, streams have cut through the aquifer and exposed beds of Tertiary age on the valley walls.

Water levels and saturated-sand thickness.--The altitude of the water level in the Williana-Bentley aquifer slopes from 170 ft above NGVD in the northern part of the area, 5 1/2 mi north of Bagdad, to 85 ft above NGVD 1 1/4 mi south of Bagdad. Water levels in the Williana-Bentley aquifer range from 2 to 60 ft below land surface. In most of the area the aquifer is under water-table conditions. Although the saturated-sand thickness in the Williana-Bentley aquifer ranges from 4 to 45 ft in the Bagdad-Rock Hill area, it generally is less than 25 ft (pl. 6B). For example, the water level in the Prairie aquifer at well G-357, 1 mi south of Rock Hill, is 70 ft above NGVD, or 40 ft below land surface (July 1972). The saturated sand thickness is 17 ft.

Suitability of water.--Generally, water in the terrace aquifers in the Bagdad-Rock Hill area is suitable for public-supply use without treatment except for adjustment of pH. For example, well G-228 in the Colfax well field produces water having a pH of 4.2. Water from the Colfax well field is aerated to remove carbon dioxide gas. This treatment raises the pH and reduces corrosiveness. Well G-100, west of the Colfax well field, produces water with an iron concentration of 0.60 mg/L. Water from this well would need treatment to reduce the iron concentration to be satisfactory for public-supply use.

Development and potential.--The Williana-Bentley aquifer is the source of water for the town of Colfax, which is about 3 mi west of their well field in the Bagdad-Rock Hill area. Well yields at the Colfax well field range from 25 to 155 gal/min (table 2). The extent of the Williana-Bentley aquifer near the Colfax well field is being reduced by surface mining of the sand and gravel of the aquifer. Test drilling may reveal other areas of thick saturated sands in the Williana-Bentley aquifer near the Colfax well field. Except for the Colfax well field, water pumped from the terrace aquifers in the Bagdad-Rock Hill area is for domestic and stock uses. The number of domestic wells has declined since 1970 because the Zone Two Water System now supplies water to most of the area from wells in a Miocene aquifer. The thick (45 ft) saturated sand found at test well G-338A, at Bagdad, (pl. 6B) would be favorable for a water-supply well for the Zone Two Water System.

Potential for development of high-yield wells screened in the terrace aquifers at most sites in the Bagdad-Rock Hill area is poor. Saturated-sand intervals are thin, and the aquifers are dissected by streams, which reduces the areal extent of the aquifers. Although recharge is enhanced in places where erosion has removed part of the overlying clay-silt layer, nearby valleys increase natural discharge.

Thin sands of Miocene age that underlie most of the Bagdad-Rock Hill area are an additional source of water for domestic wells. Yields of about 20 gal/min can probably be obtained.

Bentley-Dry Prong-Pollock Area

Geologic setting.--The Williana-Bentley aquifer occurs in most of the Bentley-Dry Prong-Pollock area, and the Prairie aquifer occurs along Big Creek near Pollock. In parts of the north half of the area and in the southwest corner, streams have eroded the Williana-Bentley aquifer and exposed beds of Tertiary age (pl. 7). In other parts of the area the lower part of the saturated sand of the Williana-Bentley aquifer extends below the stream valleys.

Water levels and saturated-sand thickness.--Water levels in the Williana-Bentley aquifer in the Bentley-Dry Prong-Pollock area are as high as 190 ft above NGVD along the west edge of the area. At Pollock, water levels are about 100 ft above NGVD. Water levels range from land surface, at springs near Pollock, to 80 ft below land surface. The aquifer is under water-table conditions in most of the area--saturated-sand thickness in the Williana-Bentley aquifer ranges from about 10 to 70 ft. The thinner occurrences are in the central part of the area, and thicker occurrences are in the western and southern parts (pl. 7A).

Hydraulic characteristics.--Hydraulic characteristics of the Williana-Bentley aquifer were determined from a pumping test at Dry Prong. Well G-384 was pumped at 250 gal/min for 24 hours, and drawdown and recovery measurements were made in well G-226. Transmissivity was 3,200 ft^2/d; hydraulic conductivity was 150 ft/d; and the storage coefficient was 0.0001, which is typical of confined conditions. Thin clay beds in the aquifer confine the water in the aquifer locally and account for the confined response at this locality in what is generally an unconfined aquifer in the Bentley-Dry Prong-Pollock area. No data are available for hydraulic characteristics of the Prairie aquifer.

Suitability of water.--Water from the Williana-Bentley aquifer in the Bentley-Dry Prong-Pollock area is generally suitable for public-supply use without treatment except for removal of carbon dioxide to increase the pH. Public-supply water systems at Dry Prong and Pollock treat the water to raise the pH.

Development and potential.--Dry Prong obtains most of its water from two wells, G-226 and G-384, screened in the Williana-Bentley aquifer. Pollock has two wells, G-25 and G-394, screened in the Williana-Bentley aquifer. Yields of these wells range from 25 to 250 gal/min. Specific capacity is 6.3 (gal/min)/ft of drawdown for well G-384 and 32.4 (gal/min)/ft of drawdown for well G-394. The Williana-Bentley aquifer also is a source of water for domestic wells in the Bentley-Dry Prong-Pollock area.

The Williana-Bentley aquifer is a potential source of water for additional wells for water-supply systems at some localities in the Bentley-Dry Prong-Pollock area because of the large saturated-sand thickness (pl. 7A) and the continuity of the saturated sand below the stream valleys. Localities where the saturated-sand thickness is favorable for water wells are near the Stuart Seed Orchard (saturated thickness as much as 75 ft in October 1938), near Bentley (saturated thickness as much as 42 ft in October 1971), and near Dry Prong (saturated thickness as much as 69 ft, 1966).

Sands of Miocene age that underlie most of the Bentley-Dry Prong-Pollock area are an additional source of water. Yields of wells screened in these sands probably would range from 5 to 120 gal/min.

Camp Beauregard-Camp Livingston Area

Geologic framework.--The Williana-Bentley aquifer occurs in most of the Camp Beauregard-Camp Livingston area. The Montgomery and Prairie aquifers occur in the southern part (pl. 8A). Streams have dissected the Williana-Bentley aquifer, and in the eastern part of the area they have cut through the aquifer exposing beds of Tertiary age.

Water levels and saturated-sand thickness.--The altitude of the water level in the Williana-Bentley aquifer ranges from about 160 ft above NGVD in the central part of the Camp Beauregard-Camp Livingston area to about 100 ft in the northern part of the area and to about 120 ft near Flagon Bayou in the southern part. Water levels range from about 20 to 70 ft below ground level. The aquifer is unconfined in most of the area. The greatest saturated-sand thickness is about 75 ft (1974) at well G-360 in the northwestern part of "old" Camp Livingston (pl. 8B).

Suitablity of water.--Water in the Williana-Bentley aquifer in the central part of the Camp Beauregard-Camp Livingston area is soft and the iron concentration is variable. Water from well R-994 (sec. 5, T. 5 N., R. 1 E.) has an iron concentration of only 0.12 mg/L, satisfactory for public-supply use without treatment. Water from wells R-380 (sec. 9, T. 5 N., R. 1 E.) and G-359 (sec. 33, T. 6 N., R. 1 E.) has iron concentrations of 0.50 and 0.72 mg/L, respectively. Water from these sites would require treatment to be satisfactory for public-supply use. In the southwest corner of the Camp Beauregard-Camp Livingston area, water from well R-274 has a hardness of 210 mg/L.

Development and potential.--During World War II the terrace aquifers were a source of water for some wells at Camp Livingston, which is now abandoned. Well G-192 had a specific capacity of 50 (gal/min)/ft of drawdown while pumping 400 gal/min when tested in 1942. Now these aquifers are a source of water only for domestic and stock wells in the Camp Beauregard-Camp Livingston area. The northwestern part of "old" Camp Livingston would be a favorable area for developing water wells because the thickness of saturated sand is as great as 75 ft (1974).

Large amounts of water are also available from sands of Miocene age in the Camp Beauregard-Camp Livingston area. Yields for wells that supplied water for Camp Livingston were as much as 400 gal/min.

Hargis-Montgomery Area

Geologic setting.--The Montgomery aquifer occurs in the western part of the Hargis-Montgomery area west of Nantachie Creek. The Williana-Bentley aquifer occurs east of Nantachie Creek (pl. 9A). The Prairie aquifer occurs along the Nantachie valley and Red River Valley. Streams have cut through the Williana-Bentley aquifer exposing beds of Tertiary age along the valley walls (pl. 9B).

Water levels and saturated-sand thickness.--In the Williana-Bentley aquifer, water levels are higher in altitude than those in the Montgomery aquifer and range from about 180 to 210 ft above NGVD. Water levels in the Williana-Bentley aquifer range from 20 to 35 ft below land surface, and the aquifer generally is unconfined. Saturated-sand thickness ranges from 9 to 45 ft.

Water levels in the Montgomery aquifer range in altitude from about 100 to 130 ft above NGVD, or 6 to 40 ft below land surface. The Montgomery aquifer is confined at Montgomery and at other wells as shown on plate 9A. Saturated-sand thickness in the Montgomery aquifer ranges from 13 to 85 ft.

Suitability of water.--Water in the Montgomery and Williana-Bentley aquifers has a hardness range of about 5 to 400 mg/L and a range in iron concentration of 0.03 to 2.3 mg/L. Thus, in some parts of the area, treatment for high-iron concentrations and hardness may be necessary for public-supply use. The range of field pH values is 5.4 to 7.1, so the water may be corrosive. At Montgomery where the pH is 5.5-5.7, the water is treated with soda-ash to raise the pH value.

Development and potential.--The Montgomery aquifer is the source of water for the town of Montgomery, where seven wells were in use in 1976. Yields ranged from 30 to 90 gal/min, and specific capacities of the wells were about 1 to 2 (gal/min)/ft of drawdown. The Montgomery and Williana-Bentley aquifers are also a source of water for domestic and stock wells in the Hargis-Montgomery area.

Near Hargis the potential for development of the Williana-Bentley aquifer is small; saturated thickness is less than 20 ft, and the areal extent of the aquifer has been reduced by erosion (pl. 9A). At well G-304 (about 1 1/2 mi east of Hargis) the saturated thickness is 35 ft, but the extent of the aquifer is small. At test well W-151, screened in the Montgomery aquifer 3 1/2 mi north-northwest of the town of Montgomery, the saturated thickness is 85 ft (February 1974). This locality would be favorable for a well.

Only saltwater sands or thin freshwater sands of Eocene age occur beneath the southern two-thirds of the Hargis-Montgomery area. Freshwater sands of Eocene age are as much as 100 ft thick in the northern one-third of the area.

Jena-Trout Area

Geologic setting.--The Williana-Bentley aquifer occurs in most of the Jena-Trout area; the Prairie aquifer occurs in the southeast and northwest corners (pl. 10A), underlying about 2 mi^2 of the area. The Williana-Bentley aquifer is separated from the Prairie aquifer by outcrops of Tertiary beds in part of the area (pl. 10B). Elsewhere, the degree of connection between the Williana-Bentley and Prairie aquifers is not known. In the vicinity of Jena and Trout the saturated sand of the Williana-Bentley aquifer extends beneath the streams (pl. 10B); but in the southeastern and northern parts of the area, streams have cut through the Williana-Bentley aquifer, exposing beds of Tertiary age (pl. 10A). The streams are not incised into the Prairie aquifers.

Water levels and saturated-sand thickness.--The water level in the Williana-Bentley aquifer ranges approximately from 160 to 120 ft above NGVD and from 10 to 80 ft below ground level. Regionally, the water level slopes to the south (pl. 4B). The Williana-Bentley aquifer is unconfined in the Jena-Trout area--the saturated-sand thickness is as great as 80 ft about 1 mi southwest of Jena (pl. 10A). More than 40 ft of saturated sand occurs in a belt trending northeastward through Jena.

Three test wells were installed in the Prairie aquifer at a site in sec. 8, T. 7 N., R. 4 E. to compare water levels in the lower (well La-215), middle (well La-218), and upper (well La-217) parts of the aquifer. The results are summarized in the following tabulation:

Well no.	Well depth (ft below land surface)	Water level (ft below land surface)	Date	Altitude of water level (ft above NGVD)
La-215-----	88	51.95	2-21-73	33
La-217-----	60	49.33	2-21-73	36
La-218-----	74	51.80	2-22-73	33

Saturated-sand thickness at the site of the three wells is 37 ft.

On February 22, 1973, when well La-215 (lower part of the aquifer) was installed, this part of the aquifer was unconfined. All later water-level measurements in this well and all water-level measurements in wells La-217 and La-218 were above the top of the aquifer, which indicates confined conditions. The rise in water levels was in response to long-term excess of precipitation (fig. 1).

Hydraulic characteristics.--The hydraulic characteristics of the Williana-Bentley aquifer were determined by three aquifer tests in the Jena-Trout area. In one test at Jena, well La-151 was pumped at 270 gal/min for 15 days, and water-level drawdown was measured in four nearby observation wells. Water-level recovery measurements were made for 14 days. The transmissivity of the terrace aquifer was 10,700 ft^2/d, and the hydraulic conductivity was 270 ft/d. The storage coefficient was 0.18, which is indicative of unconfined conditions. The specific yield, computed volumetrically, was 0.23.

In another test at Jena, drawdown and recovery were measured in well La-128, which was pumped at 273 gal/min for 2 days. Transmissivity was 13,000 ft^2/d, and hydraulic conductivity was 230 ft/d. Near Trout, drawdown in well La-42 caused by increasing the yield of a nearby well by 60 gal/min was measured for 17 days. Transmissivity was 4,300 ft^2/d, hydraulic conductivity was 250 ft/d, and the storage coefficient was 0.1.

Suitability of water.--Water in the Williana-Bentley aquifer is soft and has low concentrations of chloride and iron. The pH range is 4.9 to 6.0. Water with values in this range may be corrosive, but the public supplies in the area use the water without treatment. Water in the Prairie aquifer is soft and low in chloride concentration, but the iron concentration at well La-215 is 0.68 mg/L.

Development and potential.--The Williana-Bentley aquifer is the only or major source of supply for three public supplies in the Jena-Trout area: the town of Jena, Water Works District No. 1, and the Belah-Fellowship Water System. The town of Jena has eight wells, five screened in the Williana-Bentley aquifer, one (La-127) screened in the Williana-Bentley aquifer and a sand of Tertiary age, and two (La-78 and La-79) that may be screened in the Williana-Bentley aquifer or may be screened partly or entirely in sand of Tertiary age. Yields of these wells range from 50 to 273 gal/min, and specific capacities range from 4 to 48 (gal/min)/ft of drawdown (table 2).

Water Works District No. 1 has four wells screened in the Williana-Bentley aquifer. Yields range from 90 to 225 gal/min, and specific capacities range from 17 to 25 (gal/min)/ft of drawdown. The Belah-Fellowship Water System has one well, La-230, screened in the Williana-Bentley aquifer. The specific capacity was 10.8 (gal/min)/ft of drawdown while pumping 200 gal/min for 24 hours.

The Williana-Bentley aquifer is a potential source for additional public-supply wells or industrial wells southwest of Jena where the saturated sand thickness is 40 ft or more (pl. 10B). A distance of about 1 mi between wells would minimize well interference. If transmissivity were 10,000 ft^2/d and the storage coefficient were 0.2, pumping a well continuously at 200 gal/min for 1 year would cause less than 0.5 ft of drawdown at a distance of 1 mi.

Freshwater sands of Miocene age that occur beneath most of the Jena-Trout area are an additional source of water. Sands range from 10 to 60 ft in thickness.

Kolin-Libuse Area

Geologic setting.--The Williana-Bentley aquifer occurs in most of the western part of the Kolin-Libuse area, and the Prairie aquifer occurs in a stream valley near the west edge of the area. The Montgomery and Prairie aquifers occur in the central and eastern parts. The Williana-Bentley aquifer has been dissected by streams, some of which have cut through the aquifer and exposed Tertiary beds in the northwestern part of the area (pl. 11). In the northern part of the area the base of the Williana-Bentley aquifer is higher than the Montgomery aquifer, and the Williana-Bentley and Montgomery aquifers have little or no hydraulic connection (pl. 11B). In the southern part of the area the base of the Williana-Bentley aquifer and the base of the Montgomery aquifer are at the same altitude, and the aquifers are connected.

Water levels and saturated-sand thickness.--The water level of the Williana-Bentley aquifer ranges in altitude from about 150 to 80 ft above NGVD and slopes toward Flagon Bayou to the north and toward tributaries of the Red River to the southwest (pl. 4C). At well R-448 where the Williana-Bentley aquifer is not confined the water level is 20 ft below land surface (February 1974), and the saturated-sand thickness is 46 ft.

The water level of the Montgomery and Prairie aquifers, which are in hydraulic connection in the central and eastern parts of the area, ranges from 95 to 45 ft above NGVD and slopes to the east and southeast. These levels range from 16 to 60 ft below land surface. The Montgomery and Prairie aquifers are confined in the southeastern part of the Kolin-Libuse area (pl. 11). In the central and northern parts of the Kolin-Libuse area the Montgomery aquifer is an unconfined aquifer; no water-level data are available for the Prairie aquifer. The saturated-sand thickness ranges from 29 to 76 ft in the central part of the Kolin-Libuse area. Generally, it is thicker than 40 ft (pl. 11A).

Suitability of water.--In the southern part of the Kolin-Libuse area the hardness of water in the Montgomery and Prairie aquifers ranges from 220 to 350 mg/L and would require treatment to be satisfactory for public-supply use. Treatment for iron removal would also be required in a narrow belt across the central part of the Kolin-Libuse area south of Kolin, where the iron concentration ranges from 0.5 to 2.3 mg/L. In other parts of the Kolin-Libuse area, water from the terrace aquifers is satisfactory for public-supply use without treatment.

Development and potential.--The terrace aquifers are used mostly as a source of water for domestic wells in the Kolin-Libuse area. Well R-605 is on standby use for fire protection at the Texas Gas Transmission Company's compressor station.

In the central and eastern parts of the Kolin-Libuse area the Montgomery and Prairie aquifers have a large potential because of the extent and thickness of the saturated sand. In the central part of the area, seven test wells were drilled to test the Montgomery aquifer. Yields of these wells were as high as 193 gal/min, and specific capacities were as high as 26 (gal/min)/ft of drawdown. Transmissivity and hydraulic conductivity were estimated by the method described by Meyer (1963) from the specific capacity of some of these wells, assuming that they were completely developed and that the storage coefficient is 0.02. Transmissivity of the Montgomery aquifer in the test-well area is estimated to be as high as 11,000 ft^2/d, and hydraulic conductivity as high as 240 ft/d. These test wells had screen lengths of 21 ft or less. Saturated-sand thicknesses ranged from 29 to 76 ft and averaged 57 ft (1966). Because of partial penetration of the saturated sand by the screen, specific capacities were lower than would be possible from fully screened wells. Thus, the estimated transmissivity probably is low. Specific capacities as high as 50 (gal/min)/ft of drawdown after 1 day of pumping could be obtained from properly constructed and developed wells screened in a sand with transmissivity of 11,000 ft^2/d.

The rate of infiltration of water to the terrace aquifers in the Kolin-Libuse area is probably lower than it is at Big Creek near Pollock because the clay-silt layer between the aquifer and land surface is thicker and is much less dissected than at Big Creek. If the infiltration rate of the Montgomery and Prairie aquifers in the Kolin-Libuse area is as low as 1 in/yr, it would sustain a continuous yield of about 33 $(gal/min)/mi^2$. A continuous supply of about 2.3 Mgal/d could be developed from the Prairie and Montgomery aquifers in an area of about 48 mi^2 in the central and eastern parts of the Kolin-Libuse area. Water in storage would maintain the yield in dry years. If the infiltration rate were 3 in/yr of water, the sustained yield would be about 100 $(gal/min)/mi^2$; and a supply of about 7 Mgal/d could be developed. Although well capacities greatly exceeding recharge rate are possible, development should be based on recharge rate rather than well capacity.

Large amounts of water are available from thick sands of Miocene age that underlie the northern and central parts of the Kolin-Libuse area. Yields of wells are as much as 750 gal/min. There are no data for Miocene sands beneath the southern part of the area.

Verda-New Verda Area

Geologic setting.--The Williana-Bentley aquifer occurs in most of the northern part of the Verda-New Verda area (pl. 12A). In the north-central part of the area the Williana Formation is separated from the Bentley Formation (pl. 12B); in other parts of the area the Williana and Bentley Formations are continuous. The Montgomery aquifer occurs in the northeastern, central, and southern parts of the area; and the Prairie aquifer occurs along Dartigo Creek, Iatt Lake, and the Red River. Streams have cut through these aquifers exposing the underlying beds of Tertiary age in the Verda-New Verda area, especially in the northern part. In parts of the area the terrace aquifers are separated from each other by streams and outcrops of beds of Tertiary age; in other parts, the degree of separation is not known.

Water levels and saturated-sand thickness.--In the Williana-Bentley aquifer the altitude of the water level ranges from approximately 240 to 160 ft above NGVD. Water levels are 18 to 63 ft below land surface. The Williana-Bentley is not confined in the Verda-New Verda area--saturated-sand thickness ranges from 6 to 28 ft.

In the Montgomery aquifer the altitude of the water level ranges from 114 to 150 ft above NGVD, and levels range from 16 to 36 ft below land surface. The Montgomery is an unconfined aquifer at well G-299, in the central part of the Verda-New Verda area, but is a confined aquifer at well G-298, about 1 1/2 mi south of well G-299. Saturated-sand thickness in the Montgomery aquifer is 20 ft at well G-299 (September 1971), 4 mi north-northwest of Aloha, and 12 ft at well G-298 (September 1971), 1 1/2 mi south of well G-299 (pl. 12A).

For the Prairie aquifer the altitude of the water level ranges from approximately 60 to 100 ft above NGVD. Water levels range from 7 to 30 ft below land surface. The Prairie aquifer is a confined aquifer in the Verda-New Verda area. Saturated-sand thickness in the Prairie aquifer ranges from 10 to 36 ft.

Suitability of water.--The few chemical analyses available indicate that water from the terrace aquifers in most of the area would be suitable for public-supply use without treatment. Water from the Prairie aquifer near the Red River and Iatt Lake would not be satisfactory for public-supply use without treatment for reduction of hardness. For example, water from well G-347, at Aloha, near the Red River, had 710 mg/L hardness; and water from well G-369, on the Iatt Lake shore, had 210 mg/L hardness. Well G-369 also had a chloride concentration of 430 mg/L; water from this well would not be suitable for a public supply.

Development and potential.--The terrace aquifers are a source of water for domestic and stock wells in the Verda-New Verda area. Since 1973, the West Grant Water Association has been supplying water to many residents in the area, so domestic wells screened in the terrace aquifer probably are not used as much now as they were before 1973. Three miles east of Aloha the West Grant Water Association has one well, G-382 (yield, 150 gal/min), screened in the Prairie aquifer.

The saturated-sand thickness is 6 to 22 ft in most of the Verda-New Verda area. The extent of the aquifer is small because of dissection by stream erosion. Therefore, most wells probably will yield 30 gal/min or less. Additional test drilling might locate a greater thickness of saturated sand having the potential for greater yield.

In most of the Verda-New Verda area the clay of the Jackson and Vicksburg Groups, which does not yield water to wells, underlies the terrace aquifers. Yields of 200 gal/min can be obtained from sands of Eocene age beneath the Jackson and Vicksburg clay in the northern part of the area. Sands of Miocene age above the Jackson and Vicksburg are a potential source of water in the southern part of the Verda-New Verda area.

SUMMARY AND CONCLUSIONS

In part of central Louisiana the terrace aquifers are a potential source of ground water for public-supply and industrial uses. The aquifers have not been utilized at some localities because the average saturated thickness is only 25 ft, which has caused concern over the capability of the aquifers to supply adequate water for future needs, and because of concern over pollution potential. However, at many sites the unit is thick enough, is protected from pollution by overlying clay beds, and will yield enough water to be considered a good source.

Most recharge to the terrace aquifers is from infiltration of water from precipitation. Of the average annual precipitation of 54 in., about 39 in. is consumed by evapotranspiration, and about 9 in. is overland runoff. Thus, only about 6 in. of water infiltrates the aquifer in the central part of the project area. This quantity would sustain a continuous yield of about 200 (gal/min)/mi^2 to wells. In the southern part of the project area the average annual rate of infiltration probably is lower. A rate as low as 1 in/yr of water would sustain a continuous yield of 33 (gal/min)/mi^2. The amounts available to wells would be reduced by the amount of water that moves laterally and discharges into streams that have eroded valleys into the aquifers. Development of wells would "capture" some of this water but would result in a reduced flow of some of the streams.

Hydraulic conductivity of the terrace aquifers determined from pumping tests ranges from 150 to 270 ft/d and averages 220 ft/d. Transmissivity ranges from 3,200 to 13,000 ft^2/d and averages about 8,200 ft^2/d. The coefficient of storage ranges from 0.0001 to 0.18. The terrace aquifers are water-table aquifers in most of the project area. Yields of wells screened in the terrace aquifers have been reported to be as high as 400 gal/min, and specific capacities as high as 50 (gal/min)/ft of drawdown. Higher yields could be pumped for short periods of time. At wells where the specific capacity is 50 (gal/min)/ft of drawdown the yield would be 750 gal/min with 15 ft of drawdown. Limitations on continuous sustained yields are available recharge, areal extent of the aquifers, available drawdown, and well interference. Sustained yields would be about 200 (gal/min)/mi^2. A well that develops a pumping cone with more than 1-mi^2 surface area could have a sustained yield of more than 200 gal/min. If a well's pumping cone had an areal extent of several square miles, the well could have a sustained yield in the range of 800 to 1,000 gal/min in some parts of the project area.

Hydrographs show that the principal water-level fluctuations are seasonal. In addition, long-term water-level trends correspond to changes in the amount of water in storage in response to long periods of greater than average or lower than average rainfall. Water levels in the terrace aquifers are higher than water levels of underlying aquifers of Tertiary age in the southwestern part of the project area because pumping at Alexandria and Pineville has lowered the water level of the aquifers of

Tertiary age. Water levels of the Prairie aquifer are lower than those of the Tertiary aquifers in parts of northeastern Rapides Parish and in La Salle Parish north and northwest of Catahoula Lake. In the northern part of the project area, water levels of the terrace aquifers are generally higher than those of the Tertiary aquifers.

In most of the area, water from the terrace aquifers is low in dissolved solids and is satisfactory for public-supply use without treatment except for an adjustment of pH, which is generally low. Although potential for pollution exists, little pollution now occurs as the area is mostly woodland. In parts of the project area, water in the terrace aquifers has anomalously high concentrations of chloride and other constituents. The source of the high concentrations of chloride probably is leaky oil-field waste-water evaporation ponds and disposal wells in some areas and discharge from underlying saline-water aquifers in other areas.

Saturated sand of the terrace aquifers is thicker than 25 ft at most localities in central and west-central La Salle Parish and near Camp Livingston in Grant and Rapides Parishes. The saturated sand also is thick in Grant Parish near Pollock, Bentley, and Dry Prong; in Grant and Winn Parishes north and northeast of Montgomery; and in the southern part of the project area. In other parts of the project area the saturated sand of the terrace aquifers is thin at most localities. Variable thickness of saturated sand and gravel make test drilling desirable in all areas.

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HYDROLOGIC DATA

Tables 2-4

Table 2.--Records of selected water wells screened in the terrace aquifers, central Louisiana

Owner: LOPW, Louisiana Office of Public Works, Department of Transportation and Development.
Aquifer: Qp, Prairie aquifer; Qm, Montgomery aquifer; Qwb, Williana-Bentley aquifer; Tu, sand of Tertiary age (undifferentiated).

Remarks: Data available--D, driller's or geologist's log; E, electrical log; MA, mechanical analysis; S, sand samples. Data in this report--C, complete chemical analysis; P, partial chemical analysis; SC, chemical analysis for selected organic constituents and (or) selected minor constituents.

Well No.	Location			Owner	Year drilled	Depth (ft)	Casing diameter (in.)	Screen			Water level		Specific-capacity data					Aquifer	Remarks
	Sec.	T.	R.					Diameter (in.)	Length (ft)	Opening (in.)	Feet below land surface datum	Date	Yield (gal/min)	Drawdown (ft)	Specific capacity [(gal/min)/ft of drawdown]	Hours pumped	Date		
AVOYELLES PARISH																			
Av-125	9	2 N.	3 E.	United Gas Pipe Line Co	1963	152	10- 6	6	20	0.025	49	2- -63	133	18	7.4	--	2- -63	Qp	C.
302	29	4 N.	3 E.	LOPW	1968	105	4	4	12	-----	49.4	2- 7-68	43	35.2	1.2	4	3- 7-68	Qp	C,D,E.
303	34	4 N.	3 E.	do	1968	120	4	4	7 5	.014 .012	55.8	3-18-68	43	13.3	3.3	3	3-18-68	Qp	C,D,E.
322	35	4 N.	3 E.	Ward One Water Works	1971	90	4	--	10	-----	27	1- 6-71	50	----	----	--	1- 6-71	Qp	C,E,MA,S.
323A	29	4 N.	3 E.	do	1971	110	6	--	20	-----	----	--------	70	----	----	--	2- -71	Qp	P.
323B	29	4 N.	3 E.	do	1971	140	4	--	10	-----	----	--------	-----	----	----	--	--------	Qp	P.
GRANT PARISH																			
G-25	6	6 N.	1 E.	Town of Pollock	1936	52	12	--	--	-----	33.8	8-30-62	25	----	----	--	8-30-62	Qwb	C.
97A	22	6 N.	1 W.	U.S. Army	1942	74	4	2	10	-----	----	--------	12	----	----	--	--------	Qwb	P.
103	12	6 N.	3 W.	Town of Colfax	1944	48	3	2	10	-----	43.6	8-14-44	-----	----	----	--	--------	Qwb	D,E.
104	2	6 N.	3 W.	do	1944	39	6	2	10	-----	20.6	8-24-44	-----	----	----	--	--------	Qwb	D.
120	2	6 N.	3 W.	do	1947	69	-----	--	--	-----	----	--------	125	----	----	--	4- -47	Qwb	P.
123	2	6 N.	3 W.	do	1945	69	8	--	--	-----	30	1947	125 75	---- ----	---- ----	-- --	9-29-59 8-10-72	Qwb	C,P.
125	2	6 N.	3 W.	do	1949	72	8	6	--	-----	30	1949	100	----	----	--	1959	Qwb	P,SC.
127	32	6 N.	1 E.	U.S. Army	1941	127	12	--	--	-----	67.8	2- 8-48	-----	----	----	--	--------	Qwb	D.
142	16	8 N.	5 W.	Town of Montgomery	1956	67	8	8	27	0.016	17.5	8-16-56	53	47.9	1.1	1	9-13-56	Qm,Tu	C.
182	12	7 N.	1 W.	Trunkline Gas Co	----	88	4	--	--	-----	----	--------	-----	----	----	--	--------	Qwb	P.
190	34	6 N.	1 E.	U.S. Army	1942	70	4	--	--	-----	35	1-23-42	-----	----	----	--	--------	Qwb	D.
191	33	6 N.	1 E.	do	1942	85	4	--	--	-----	----	--------	-----	----	----	--	--------	Qwb	D.
192	33	6 N.	1 E.	do	1942	119	12- 8	8	67	-----	59.3	2- 3-42	401	8	50	72	1- -42	Qwb	D.
203	6	6 N.	1 E.	Town of Pollock	1963	43	8	6	10	.040	26.9	4-29-63	105	9.6	10.9	1	4-29-63	Qwb	C,SC,D,MA,S.
206	16	8 N.	5 W.	Town of Montgomery	1962	52	14- 6	6	15	-----	17.7	9-21-71	40	----	----	--	10-17-71	Qm	C,P.
207	16	8 N.	5 W.	do	1962	44	14- 6	6	5 10	.012 .014	.7 7.3	1962 9-21-71	70	33	2.1	24	1962	Qm	C.
226	24	7 N.	2 W.	Village of Dry Prong	1966	120	8- 4	4	20	-----	18.2	5-28-73	220	----	----	--	--------	Qwb	C.
227	16	8 N.	5 W.	Town of Montgomery	1965	60	10- 6	6	30	-----	5.9	9-21-71	35	----	----	--	10-17-71	Qm	C.
228	2	6 N.	3 W.	Town of Colfax	1964	53	10	10	20	.065	15.4 4.9	8-10-72 5-19-75	-----	----	----	--	--------	Qwb	P; screen, 23-33 and 43-53 ft.

296---	16	8 N.	5 W.	Town of Montgomery	1968	68	12- 6	6	30	-----	9.2	10-27-71	-----	----	----	--	--------	Qm	
342---	29	7 N.	1 E.	Farmland Industries, Inc	1975	49	10	10	10	.030	22	10-14-75	100	6.5	15.4	24	10-15-75	Qwb	C,D,E.
376A--	22	6 N.	1 W.	Town of Pollock	1975	71	-----	--	10	-----	34	4- -75	-----	----	----	--	--------	Qwb	C.
382---	2	6 N.	3 W.	Town of Colfax	1975	68	8	--	21	-----	20.3	5-23-75	90	----	----	--	5-23-75	Qwb	
383---	2	6 N.	3 W.	do	1975	70	8	--	20	-----	16.3	5-23-75	126	----	----	--	5-23-75	Qwb	
384---	24	7 N.	2 W.	Village of Dry Prong	1974	110	10- 8	8	20	.020	14.0	5-27-73	250	39.5	6.3	24	5-28-73	Qwb	C,E.
388A--	29	6 N.	2 W.	LOPW	1975	88	4	2	10	.010	23.3	7-22-75	17	8.7	2.0	3	7-22-75	Qwb	C,D,E,MA,S.
389---	16	8 N.	5 W.	Town of Montgomery	----	45	4	4	--	-----	----	--------	-----	----	----	--	--------	Qm	
390---	16	8 N.	5 W.	do	----	45	4	4	--	-----	----	--------	-----	----	----	--	--------	Qm	
391---	16	8 N.	5 W.	do	1978	45	4	4	--	-----	----	--------	-----	----	----	--	--------	Qm	
392---	13	7 N.	4 W.	West Grant Water Association	1973	45	6	6	10	.018	7	10- 4-73	150	----	----	--	5-19-76	Qp	C.
394---	6	6 N.	1 E.	Town of Pollock	1976	43	10	10	10	.030	26.9	1-13-75	100	3.1	32.4	6	1-13-75	Qwb	C.
397---	17	7 N.	2 W.	LOPW	1977	150	4- 2	2	10 10	.012 .010	42.4	5-24-77	28	10.0	2.8	3	5-24-77	Qwb	C,P,D,E,MA,S.
398---	4	7 N.	2 W.	do	1977	104	4	2	10 10	.010 .012	19.0	6- 2-77	30	11.4	2.6	4	6- 2-77	Qwb	C,P,D,E,MA,S.
399---	7	7 N.	2 W.	do	1977	79	4	4	10	.018	60.0	6-10-77	3	----	----	--	6-10-77	Qwb	C,P,D,E.

LA SALLE PARISH

La-42---	9	8 N.	3 E.	Louisiana Delta Hardwood Co	1910	51	10	--	--	-----	30.9	7-21-39	-----	----	----	--	--------	Qwb	
66A--	10	8 N.	3 E.	Town of Jena	1945	105	6	--	10	-----	----	--------	-----	----	----	--	--------	Qwb	C,D,E.
67---	2	8 N.	3 E.	do	1945	95	6	2	10	-----	----	--------	-----	----	----	--	--------	Qwb	D,MA,S.
68A--	11	8 N.	3 E.	do	1945	114	6	2	10	-----	----	--------	-----	----	----	--	--------	Qwb	P,D.
76---	37	8 N.	3 E.	do	1948	109	8	8	20	-----	----	--------	-----	----	----	--	--------	Qwb	P.
77---	13	8 N.	3 E.	do	1948	98	8	8	20	-----	51.8	7- 8-69	110	----	----	--	10-12-72	Qwb	C,P.
79---	37	8 N.	3 E.	do	1953	129	8	8	20	-----	15.7	2-11-60	200	----	----	--	10-12-72	Qwb,Tu	C.
127--	37	8 N.	3 E.	do	1965	119	10- 6	6	31	0.020	36	10- -65	203 225	7 ----	29 ----	-- --	10- -65 10-12-72	Qwb,Tu	C,P,D,E.
128--	12	8 N.	3 E.	do	1965	100	10- 6	6	31	.020	39.7 39.2	7- 7-65 7-29-69	273	7.3	37	24	7-30-69	Qwb	C,D.
129--	15	8 N.	3 E.	La Salle Parish Water Works District No. 1.	1964	136	10- 6	6	60	.020	53	4- -64	224	13	17	24	4- -64	Qwb	C,D.
130--	10	8 N.	3 E.	do	1964	143	10- 6	6	60	.020	62	4- -64	225	9	25	24	4- -64	Qwb	P,D.
131--	9	8 N.	3 E.	do	1964	80	10- 6	6	22	.020	45	5- -64	-----	----	----	--	--------	Qwb	D.
140--	37	8 N.	3 E.	LOPW	1969	---	-----	--	--	-----	----	--------	-----	----	----	--	--------	------	D.
141--	37	8 N.	3 E.	do	1969	---	-----	--	--	-----	----	--------	-----	----	----	--	--------	------	D.
142--	2	8 N.	3 E.	do	1969	87	2	2	10	.012	47.9	7-14-69	12	----	----	4	7-14-69	Qwb	C,D,MA,S.
143--	12	8 N.	3 E.	do	1969	81	2	2	10	.012	51.0	7-16-69	8	----	----	8	7-16-69	Qwb	C,D,MA,S.
144--	37	8 N.	3 E.	do	1969	68	2	2	10	.012	37.5	7-18-69	7	----	----	3	7-18-69	Qwb	C,D,MA,S.
151--	2	8 N.	3 E.	Town of Jena	1969	82	10- 6	6	10	.060	46.7	11- 4-69	270	15.1	17.9	24	6- 4-70	Qwb	C,P,D.
152--	12	8 N.	3 E.	do	1969	86	10- 6	6	10	.060	51.4	11- 4-69	200	10.8	18.5	12	9-17-69	Qwb	C,D.
180--	31	8 N.	3 E.	LOPW	1971	94	4	4	10	.014	54.6	12- 1-71	30	5.8	5.2	2	12- 1-71	Qwb	C,D,E,MA,S.
230--	31	8 N.	3 E.	Belah-Fellowship Water System, Inc	1975	96	-----	8	14	.020	50.6	3-24-75	201	18.6	10.8	24	3-24-75	Qwb	C,D.
240--	9	8 N.	3 E.	La Salle Parish Water Works District No. 1.	1971	90	-----	8	--	-----	----	--------	70	----	----	--	--------	Qwb	

RAPIDES PARISH

R-605---	31	4 N.	1 E.	Texas Gas Transmission Co	1956	107	8	8	20 20	0.016 .018	59.7	2-29-56	375	30	12	--	2-23-56	Qm	
766---	2	5 N.	2 E.	Columbia Gulf Transmission Co	1956	80	6	4	24	-----	----	--------	-----	----	----	--	--------	Qp	C.
861---	42	4 N.	1 E.	Bodcaw Co	1966	87	6	6	11	.012	43.1	5-21-66	94	4	24	7	5-23-66	Qm	C,D,E.

WINN PARISH

W-108A--	18	9 N.	5 W.	LOPW	1968	118	4	3	10	0.010	20.6	7-26-68	38	8.4	4.5	2	7-26-68	Qm	C,D,E,MA,S.
169---	18	9 N.	5 W.	Saint Maurice Water System	1969	128	5	3	10	.020	28	1- -69	50	4	12.5	24	1- -69	Qm	D.
170---	18	9 N.	5 W.	do	1978	130	5- 2½	2	15	.012	30	2- -78	95	15	6.3	2	2- -78		

Table 3.—Chemical analyses of water from selected wells screened in

[Analyses were by the U.S. Geological Survey except as indicated by the following footnotes: 1/By Louisiana Division of Health; 2/by
for the aquifers are as follows (comparable map symbols in parentheses): Alluvial aquifers, undifferentiated--112ALVL (Qal); up-
(Qb); Williana aquifer--112WLLN (Qw); Tertiary System aquifers--120TRTR (Tu). */Well also screened in Tertiary System aquifer]

LOCAL IDENT-I-FIER				GEO-LOGIC UNIT	DATE OF SAMPLE	DEPTH OF WELL, TOTAL (FEET)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	COLOR (PLAT-INUM COBALT UNITS)	HARD-NESS (MG/L AS CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)
							AVOYELLES PARISH							
AV- 125	2N	3E	9	112PRIR	66-06-23	152	984	7.4	--	5	300	74	27	100
AV- 151	3N	3E	11	112PRIR	65-11-30	79	--	--	--	--	--	--	--	--
AV- 189	3N	3E	33	112PRIR	53-10-28 1/	200	--	7.0	--	23	200	--	--	--
					66-06-23	200	750	--	--	--	240	--	--	--
					67-06-02	200	--	--	--	--	--	--	--	--
AV- 220	3N	3E	16	112PRIR	66-06-23	190	1120	--	--	--	310	--	--	--
AV- 222	4N	3E	35	112PRIR	66-06-23	90	130	--	--	--	40	--	--	--
AV- 223	3N	3E	5	112PRIR	66-06-24	104	914	7.4	--	0	260	60	26	100
AV- 224	3N	3E	9	112PRIR	66-06-23	140	900	--	--	--	250	--	--	--
AV- 302	4N	3E	29	112PRIR	68-03-07	105	253	6.4	21.0	5	55	13	5.5	28
AV- 303	4N	3E	34	112PRIR	68-03-18	120	868	6.3	20.5	5	220	59	16	110
AV- 304	3N	3E	38	112PRIR	68-03-18	140	537	7.1	--	5	230	66	15	27
AV- 305	3N	3E	68	112PRIR	68-03-01	129	--	--	--	--	290	--	--	--
AV- 322	4N	3E	35	112PRIR	71-01-06 2/	90	462	6.9	--	--	130	31	13	55
AV- 323A	4N	3E	29	112PRIR	71-02-04	110	--	--	--	--	76	--	--	--
					71-08-12	110	--	--	--	--	100	--	--	--
					71-08-19	110	--	--	--	--	110	--	--	--
					71-12-22	110	--	6.9	--	--	120	--	--	--
					72-07-17	110	--	--	20.5	--	130	--	--	--
AV- 323B	4N	3E	29	112PRIR	71-01-21	140	--	--	--	--	190	--	--	--
AV- 365	4N	2E	35	112PRIR	76-04-26	97	839	8.3	--	5	200	45	22	110
							GRANT PARISH							
G- 25	6N	1E	6	112BNTL	39-07-06	52	--	--	--	--	12	--	--	--
					39-09-19	52	--	--	--	--	7	1.6	.8	3.6
					50-07-19	52	38	7.0	20.5	--	7	1.0	1.2	--
					59-09-29	52	36	5.6	20.5	20	6	1.8	.4	1.6
G- 29	8N	2W	22	112WLLN	39-09-18	35	--	--	--	--	6	1.2	.7	2.1
G- 45	6N	1W	20	112BNTL	39-09-18	39	--	--	--	--	11	2.8	.9	7.9
G- 97A	6N	1W	22	112BNTL	42-08-22	74	--	--	--	--	20	--	--	--
G- 100	6N	3W	3	112BNTL	44-06-06	22	--	7.4	19.5	--	69	--	--	--
G- 101	6N	3W	3	112BNTL	44-06-06	25	--	7.7	--	--	51	--	--	--
G- 102	6N	3W	11	112BNTL	44-06-07	24	--	5.8	--	--	170	--	--	--
G- 106	6N	3W	2	112BNTL	44-08-22	38	--	5.7	20.5	--	22	--	--	--
G- 109	6N	3W	3	112BNTL	44-09-12	27	--	6.4	--	--	18	--	--	--
G- 120	6N	3W	2	112BNTL	47-08-18	69	--	5.7	--	--	20	--	--	--
G- 123	6N	3W	2	112BNTL	47-08-06 1/	69	--	5.7	--	--	20	--	--	--
					59-09-29	69	32	5.5	19.5	20	5	1.4	.4	1.8
					68-07-26	69	30	6.7	--	5	4	1.0	.4	4.4
					72-08-10	69	--	6.5	--	--	2	--	--	--
G- 124	6N	3W	2	112BNTL	48-05-03	75	--	5.5	--	--	14	--	--	--
G- 125	6N	3W	2	112BNTL	72-08-10	72	--	6.9	--	--	4	--	--	--
					75-05-19	72	33	7.0	21.5	0	4	1.1	.3	2.4
G- 127B	6N	1E	32	112WLLN	72-03-27	97	--	--	--	--	6	--	--	--
G- 134	6N	2W	32	112BNTL	58-03-17	72	--	--	20.0	--	50	--	--	--
					58-10-09	72	--	--	21.0	--	20	--	--	--
G- 142	8N	5W	16	112MGMR*/	59-09-30	67	236	6.7	20.0	80	29	7.0	2.8	42
G- 203	6N	1E	6	112BNTL	63-05-10	43	48	5.9	--	5	9	2.1	.9	3.7
					63-05-22	43	--	5.3	--	0	11	--	--	--
					75-05-01	43	50	4.7	20.0	5	10	1.9	1.3	3.8
					75-06-23	43	--	4.9	--	--	--	--	--	--
G- 205	7N	4W	9	112PRIR	63-11-08	20	2020	7.3	22.0	15	940	190	110	130
G- 206	8N	5W	16	112MGMR	62-07-00 1/	52	--	5.9	20.0	5	24	--	--	--
					71-09-21	52	--	--	--	--	38	--	--	--
G- 207	8N	5W	16	112MGMR	62-07-00 1/	44	--	6.1	20.0	8	24	--	--	--
					71-09-21	44	--	--	--	--	38	--	--	--
G- 226	7N	2W	24	112WLLN	68-03-28	120	100	7.2	21.0	5	19	4.0	2.2	15
					70-08-12	120	--	--	--	--	10	--	--	--
G- 227	8N	5W	16	112MGMR	68-07-09	60	374	7.1	--	15	69	14	8.3	42
					71-09-21	60	--	--	--	--	68	--	--	--
					71-10-08	60	--	5.7	--	--	--	--	--	--
G- 228	6N	3W	2	112BNTL	72-08-10	53	--	4.2	--	--	10	--	--	--
					75-05-19	53	27	--	19.5	5	5	1.2	.6	2.3
G- 262	6N	1W	1	112BNTL	70-01-21	65	--	--	--	--	6	--	--	--
G- 263	7N	1E	31	112ALVL	70-11-04	19	--	--	--	--	40	--	--	--
G- 273	7N	2W	13	112WLLN	70-07-01	89	--	--	--	--	6	--	--	--
					70-08-12	89	48	6.5	--	5	7	1.7	.7	7.3
G- 278	7N	1E	31	112ALVL	70-11-14	11	--	--	--	--	28	--	--	--

the terrace aquifers, alluvium, and sands of Tertiary age, central Louisiana

Curtis Laboratories; 3/by Betz Laboratories; 4/by Edna Wood Laboratories; 5/by Production Profits. Geologic unit (aquifer).--Symbols
land terrace deposits--112UPTC (Qu); Prairie aquifer--112PRIR (Qp); Montgomery aquifer--112MGMR (Qm); Bentley aquifer--112BNTL

SODIUM PERCENT	POTASSIUM, DISSOLVED (MG/L AS K)	BICARBONATE (MG/L AS HCO3)	CARBONATE (MG/L AS CO3)	SULFATE DISSOLVED (MG/L AS SO4)	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	NITROGEN, NITRATE TOTAL (MG/L AS NO3)	NITROGEN, NITRATE DISSOLVED (MG/L AS NO3)	IRON, TOTAL RECOVERABLE (UG/L AS FE)	IRON, DISSOLVED (UG/L AS FE)	MANGANESE, DISSOLVED (UG/L AS MN)
AVOYELLES PARISH--Continued													
43	2.8	442	0	49	74	.0	36	585	--	.10	--	70	--
--	--	--	--	--	48	--	--	--	--	--	--	--	--
--	--	--	--	--	120	--	--	--	--	--	1200	--	--
--	--	--	--	--	62	--	--	--	--	--	--	--	--
--	--	--	--	1.8	--	--	--	--	--	--	--	--	--
--	--	--	--	--	140	--	--	--	--	--	--	--	--
--	--	--	--	--	12	--	--	--	--	--	--	--	--
46	2.6	414	0	.6	88	.1	28	510	--	.70	--	60	--
--	--	--	--	--	110	--	--	--	--	--	--	--	--
52	.8	82	0	9.0	31	.2	49	177	--	.20	--	580	--
53	.5	364	0	.2	100	.2	31	496	--	.00	--	740	--
21	.7	319	0	.0	19	.2	39	324	--	.00	--	1600	--
--	--	--	--	--	68	--	--	--	--	--	--	--	--
--	--	215	0	.0	50	.1	10	269	.10	--	--	3000	500
--	--	--	--	--	28	--	--	--	--	--	--	200	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	54	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	56	--	--	--	--	--	--	--	--
--	--	--	--	--	92	--	--	--	--	--	--	--	--
.54	3.9	412	0	.0	72	.3	27	483	.24	--	--	60	140
GRANT PARISH--Continued													
--	--	18	--	1.0	3.0	.0	--	--	--	.50	--	--	--
--	1.2	10	0	1.0	4.1	.2	18	37	--	.93	460	--	--
--	--	11	0	.0	5.0	--	19	43	--	1.8	--	--	--
--	.4	8	0	.6	.6	.1	18	30	--	2.1	50	--	--
41	.6	6	0	1.3	2.6	.1	9.7	23	--	1.8	1200	--	--
60	.7	14	0	1.5	11	.2	33	65	--	.33	170	--	--
--	--	39	--	1.0	4.0	--	--	--	--	--	--	--	--
--	--	70	--	2.0	16	--	--	--	--	--	600	--	--
--	--	5	--	3.0	13	--	--	--	--	--	50	--	--
--	--	8	--	2.0	81	--	--	--	--	--	0	--	--
--	--	13	--	2.0	5.0	--	--	--	--	.20	200	--	--
--	--	15	--	6.0	6.0	--	--	--	--	.50	450	--	--
--	--	--	--	--	9.0	--	--	--	--	--	100	--	--
--	--	--	--	--	9.0	--	--	--	--	--	100	--	--
40	.6	6	0	.8	1.9	.1	14	26	--	1.5	140	--	--
64	.9	12	0	.2	4.4	.0	13	32	--	1.2	--	40	--
--	--	--	--	--	8.0	--	--	--	--	--	--	90	--
--	--	9	0	--	3.8	--	--	--	--	--	0	--	--
--	--	--	--	--	8.0	--	--	--	--	--	--	50	--
52	.6	4	0	1.3	3.0	.1	14	25	.20	--	--	0	0
--	--	--	--	--	16	--	--	--	--	--	--	--	--
--	--	--	--	--	12	--	--	--	--	--	--	--	--
--	--	--	--	--	8.0	--	--	--	--	--	--	--	--
75	1.1	116	0	.4	17	.3	37	167	--	.30	4100	--	--
42	1.8	10	0	6.6	3.2	.0	12	36	--	.40	70	--	--
--	--	7	0	--	10	.0	--	--	--	--	0	--	--
40	1.7	11	0	4.8	3.1	.0	17	43	.78	--	--	120	30
--	--	--	--	--	--	--	--	--	3.4	--	--	--	--
23	1.8	592	0	420	200	.5	15	1360	--	.10	150	--	--
--	--	18	0	--	40	.0	--	--	--	--	30	--	--
--	--	--	--	--	50	--	--	--	--	--	--	150	--
--	--	26	0	--	--	.0	--	--	--	--	50	--	--
--	--	--	--	--	56	--	--	--	--	--	--	100	--
62	1.0	44	0	2.0	9.3	.1	33	89	--	.10	--	20	--
--	--	--	--	--	30	--	--	--	--	--	--	70	--
56	2.7	40	0	22	70	.0	30	218	--	8.9	--	160	--
--	--	--	--	--	72	--	--	--	--	--	--	50	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	--	--	--	--	6.0	--	--	--	--	--	--	50	--
43	1.0	10	--	1.3	3.7	.1	15	31	--	--	--	20	50
--	--	--	--	--	12	--	--	--	--	--	--	--	--
--	--	--	--	--	12	--	--	--	--	--	--	--	--
--	--	--	--	--	20	--	--	--	--	--	--	20	--
--	.7	25	0	.0	3.0	.0	44	70	.10	--	--	50	10
--	--	--	--	--	10	--	--	--	--	--	--	--	--

Table 3.--Chemical analyses of water from selected wells screened in the ter–

LOCAL IDENT-I-FIER				GEO-LOGIC UNIT	DATE OF SAMPLE	DEPTH OF WELL, TOTAL (FEET)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	COLOR (PLAT-INUM COBALT UNITS)	HARD-NESS (MG/L AS CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)
GRANT PARISH--Continued														
G- 292	8N	5W	22	112MGMR	71-07-09	55	--	--	--	--	30	--	--	--
G- 302	8N	5W	15	112MGMR	71-09-28	63	153	7.0	--	5	18	3.6	2.2	23
G- 304	8N	4W	5	112WLLN	71-10-04	65	32	6.0	--	0	6	20	.2	3.9
G- 305	8N	4W	4	112WLLN	71-10-04	40	96	7.1	--	5	36	12	1.5	2.4
G- 308	8N	5W	15	112MGMR	71-10-12	65	--	--	--	--	14	--	--	--
					71-10-27	65	146	7.3	--	40	15	4.0	1.2	30
G- 314	7N	2W	2	112WLLN	71-10-20	99	29	7.0	--	0	6	2.0	.2	4.3
G- 316	7N	2W	4	112BNTL	71-10-21	98	36	6.6	--	0	6	2.0	.2	4.5
G- 317	6N	2W	11	112BNTL	71-10-22	60	--	--	--	--	14	--	--	--
G- 319	8N	5W	12	112BNTL	71-10-15	46	--	--	--	--	8	--	--	--
					71-10-27	46	64	--	--	0	16	3.9	1.5	5.0
G- 320	8N	4W	21	112BNTL	71-10-15	45	--	--	--	--	8	--	--	--
					71-10-27	45	32	5.7	--	0	5	1.4	.4	2.5
G- 321	7N	4W	12	112MGMR	71-09-24	47	--	--	--	--	82	--	--	--
					71-10-27	47	414	5.2	--	0	80	19	7.9	44
					72-04-05	47	--	--	--	--	--	--	--	--
G- 322	6N	2W	11	112BNTL	71-11-05	70	46	6.1	--	0	8	2.4	.5	5.2
G- 324	6N	1W	10	112WLLN	71-11-11	96	--	--	--	--	10	--	--	--
G- 325	7N	1W	5	112WLLN	71-11-11	50	26	6.3	--	5	6	1.8	.4	2.5
G- 327	7N	1W	24	112BNTL	71-11-12	67	30	5.9	--	25	6	1.4	.6	3.0
G- 328	7N	1E	27	112BNTL	71-11-15	82	--	--	--	--	6	--	--	--
					72-03-28	82	29	6.8	--	10	5	1.8	.1	3.5
G- 334	8N	2W	22	112WLLN	72-04-03	37	90	6.0	--	0	19	5.0	1.6	7.6
G- 335	8N	2W	35	112WLLN	72-04-04	95	22	6.1	--	0	6	1.8	.4	1.2
G- 342	7N	1E	29	112BNTL	75-10-00 2/	49	45	5.7	--	--	8	2.3	.5	9.4
G- 347	7N	4W	15	112PRIR	72-10-16	63	--	--	--	--	710	--	--	--
					75-05-22	63	1270	6.5	--	7	610	130	69	64
					76-07-16	63	1330	6.7	--	15	600	140	52	70
G- 350	6N	2W	27	112BNTL	62-07-06	75	--	--	--	--	20	--	--	--
G- 352	5N	2W	1	112BNTL	72-07-07	71	--	--	--	--	44	--	--	--
G- 353	6N	2W	34	112BNTL	72-07-07	41	29	6.1	--	5	5	1.8	.1	3.5
G- 355	6N	2W	34	112BNTL	72-07-12	30	--	--	--	--	10	--	--	--
G- 356	6N	2W	26	112BNTL	72-07-12	58	--	--	--	--	10	--	--	--
G- 359	6N	1E	33	112WLLN	72-09-13	88	43	6.5	--	15	6	2.2	.1	6.0
G- 362	7N	2W	25	112WLLN	72-04-18	75	--	4.8	--	--	14	--	--	--
					72-10-24	75	64	4.8	--	0	7	1.4	.9	6.9
G- 363	6N	1W	6	112WLLN	72-10-24	100	39	5.9	--	0	6	1.4	.6	4.5
G- 368	6N	2W	4	112BNTL	74-02-23	42	36	6.7	--	0	6	2.0	.2	3.9
G- 369	7N	3W	15	112PRIR	74-02-23	45	--	--	--	--	210	--	--	--
G- 370A	8N	2W	27	112WLLN	74-03-05	35	--	--	--	--	12	--	--	--
G- 370B	8N	2W	27	112WLLN	74-03-05	65	28	6.7	--	5	6	1.5	.6	3.3
G- 371	7N	2W	27	112WLLN	74-03-06	61	--	--	--	--	20	--	--	--
G- 374	6N	1W	8	112BNTL	74-02-23	88	--	5.9	--	--	20	--	--	--
G- 376A	6N	1W	22	112BNTL	75-04-00 3/	71	80	6.8	--	--	22	10	12	7.4
G- 380A	6N	1W	15	112WLLN	72-02-25 2/	140	87	5.4	--	2	15	4.4	1.0	16
G- 384	7N	2W	24	112WLLN	73-10-30 2/	110	104	5.8	--	2	18	4.7	1.4	21
G- 388A	6N	2W	29	112BNTL	75-07-22	88	38	5.7	19.5	0	3	1.0	.1	5.3
G- 392	7N	4W	13	112PRIR	73-10-09	45	--	6.0	--	0	12	2.4	1.5	21
					73-10-12 2/	45	98	5.9	--	2	5	1.2	.4	25
G- 394	6N	1E	6	112BNTL	75-11-19 2/	43	48	5.4	--	2	7	2.0	.5	8.7
G- 397	7N	2W	17	112BNTL	77-05-24	150	87	5.9	20.0	0	18	6.0	.7	8.5
G- 398	7N	2W	4	112BNTL	77-06-02	104	37	5.5	19.0	5	8	2.5	.3	3.0
G- 399	7N	2W	7	112BNTL	77-06-10	79	34	4.6	--	5	5	1.0	.6	2.6
G- 403	7N	1W	35	112BNTL	78-06-08	36	28	4.0	19.5	1	10	2.5	.8	2.2
LA SALLE PARISH														
LA- 28	7N	2E	9	112PRIR	39-07-20	80	--	--	--	--	120	--	--	--
LA- 66A	8N	3E	10	112WLLN	45-05-00	105	--	--	--	--	38	2.3	7.9	--
LA- 68A	8N	3E	11	112WLLN	45-05-00	114	--	7.5	--	--	48	--	--	--
LA- 73	7N	3E	39	112PRIR	59-04-30	40	1010	--	--	--	240	--	--	--
					68-03-26	40	--	--	--	--	330	--	--	--
LA- 76	6N	3E	37	112WLLN	59-04-29	109	--	--	--	--	22	--	--	--
LA- 77	8N	3E	13	112WLLN	72-10-12	98	--	--	--	--	16	--	--	--
					75-06-02	98	87	5.6	20.5	0	14	4.1	1.0	11
LA- 79	8N	3E	37	112WLLN 4/	72-10-12	129	63	5.1	19.0	0	10	3.0	.6	9.1
LA- 80	7N	3E	40	112PRIR	59-04-29	76	--	--	--	--	72	--	--	--
					67-04-27	76	--	--	--	--	190	--	--	--
					67-08-15	76	--	--	--	--	--	--	--	--
LA- 81	8N	4E	42	112PRIR	59-04-29	78	--	--	--	--	58	--	--	--
LA- 84	8N	2E	34	112BNTL	59-04-30	66	--	--	--	--	60	--	--	--
LA- 116	8N	3E	29	112WLLN	67-04-27	100	--	--	--	--	10	--	--	--

GRANT PARISH--Continued

SODIUM PERCENT	POTASSIUM, DISSOLVED (MG/L AS K)	BICARBONATE (MG/L AS HCO3)	CARBONATE (MG/L AS CO3)	SULFATE DISSOLVED (MG/L AS SO4)	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	NITROGEN, NITRATE TOTAL (MG/L AS NO3)	NITROGEN, NITRATE DISSOLVED (MG/L AS NO3)	IRON, TOTAL RECOVERABLE (UG/L AS FE)	IRON, DISSOLVED (UG/L AS FE)	MANGANESE, DISSOLVED (UG/L AS MN)
--	--	--	--	--	36	--	--	--	--	--	--	--	--
--	.7	28	0	.0	31	.1	38	113	.00	--	--	310	60
--	.6	14	0	.4	2.8	.2	19	38	2.3	--	--	90	20
--	.8	44	0	.2	2.9	.3	11	57	3.6	--	--	30	40
--	--	--	--	--	28	--	--	--	--	--	--	590	--
80	.8	44	0	18	21	.1	15	112	.00	--	--	930	50
--	.8	12	0	4.2	2.2	.0	22	42	.00	--	--	20	10
--	1.6	22	0	.0	1.4	.0	28	49	.00	--	--	90	10
--	--	--	--	--	16	--	--	--	--	--	--	--	--
--	--	--	--	--	20	--	--	--	--	--	--	80	--
--	.4	11	0	.0	8.8	.0	15	48	8.9	--	--	100	10
--	--	--	--	--	18	--	--	--	--	--	--	250	--
--	1.6	10	0	.2	2.9	.0	11	25	.00	--	--	180	20
--	--	--	--	--	48	--	--	--	--	--	--	50	--
--	4.2	9	0	.2	46	.0	28	281	130	--	--	60	30
--	--	--	--	--	--	--	--	--	120	--	--	--	--
--	2.2	20	0	.2	3.2	.0	27	52	1.6	--	--	20	10
--	--	--	--	--	12	--	--	--	--	--	--	90	--
--	2.0	14	0	.6	2.1	.0	21	38	.10	--	--	290	30
42	2.3	14	0	.2	1.7	.0	20	37	.50	--	--	590	50
--	--	--	--	--	16	--	--	--	--	--	--	--	--
--	1.2	12	0	1.0	2.2	.0	19	35	.00	--	--	560	20
--	2.7	18	0	12	6.3	.1	9.9	56	2.2	--	--	130	20
--	1.9	8	0	.2	2.6	.0	15	27	.00	--	--	180	40
--	--	22	0	.0	7.0	.1	7.4	37	.10	--	--	20	20
--	--	--	--	--	90	--	--	--	--	--	--	--	--
19	2.2	741	0	37	51	.6	28	765	.40	--	--	10000	890
21	2.8	732	0	42	61	.4	31	767	7.2	--	--	10000	890
--	--	--	--	--	8.0	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	--	--
--	.8	12	0	.0	3.4	.0	14	30	.00	--	--	110	10
--	--	--	--	--	6.0	--	--	--	--	--	--	--	--
--	--	--	--	--	8.0	--	--	--	--	--	--	--	--
--	.9	18	0	.2	5.3	.0	28	52	.10	--	--	720	210
--	--	--	--	--	8.0	--	--	--	--	--	--	30	--
62	1.6	26	0	1.4	3.6	.0	28	57	.10	--	--	130	0
56	1.4	17	0	.0	2.4	.0	28	46	.10	--	--	20	0
52	1.5	13	0	.2	2.2	.0	15	35	3.7	--	--	60	25
--	--	--	--	--	430	--	--	--	--	--	--	--	--
--	--	--	--	--	10	--	--	--	--	--	--	--	--
53	.1	1	0	.0	3.4	.0	13	28	.94	--	--	680	25
--	--	--	--	--	28	--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--	--	--	--	--	150	--
18	.1	21	0	<5.0	7.0	.1	54	--	<1.0	--	--	1900	<100
--	--	45	0	.0	10	.0	15	69	.40	--	--	50	20
--	--	54	0	.0	14	.0	16	84	.04	--	--	50	20
72	1.2	11	0	.0	5.0	.0	22	40	.00	--	--	60	20
--	--	51	0	1.0	15	.2	41	108	--	--	--	300	0
--	--	34	0	1.6	20	.1	16	81	.10	--	--	100	20
--	--	16	0	4.3	6.0	.1	8.4	38	.10	--	--	20	20
48	1.8	36	0	6.0	3.2	.0	22	66	.00	--	--	30	0
41	1.5	12	0	.0	3.2	.0	18	35	.27	--	--	40	12
45	1.6	11	0	.8	3.4	.3	15	30	.07	--	--	80	10
30	1.1	8	--	2.8	3.1	.1	14	33	--	--	--	0	0

LA SALLE PARISH--Continued

SODIUM PERCENT	POTASSIUM, DISSOLVED (MG/L AS K)	BICARBONATE (MG/L AS HCO3)	CARBONATE (MG/L AS CO3)	SULFATE DISSOLVED (MG/L AS SO4)	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	NITROGEN, NITRATE TOTAL (MG/L AS NO3)	NITROGEN, NITRATE DISSOLVED (MG/L AS NO3)	IRON, TOTAL RECOVERABLE (UG/L AS FE)	IRON, DISSOLVED (UG/L AS FE)	MANGANESE, DISSOLVED (UG/L AS MN)
--	--	22	0	45	100	.0	--	--	--	--	--	--	--
--	--	48	0	11	9.0	--	--	--	--	2.5	--	--	--
--	--	74	--	10	18	--	--	--	--	--	--	--	--
--	--	--	--	--	280	--	--	--	--	--	--	--	--
--	--	--	--	--	510	--	--	--	--	--	--	--	--
--	--	--	--	--	16	--	--	--	--	--	--	--	--
--	--	--	--	--	10	--	--	--	--	--	--	--	--
60	1.2	24	0	.1	9.7	.1	36	81	5.8	--	--	10	0
--	1.2	26	0	2.2	4.7	.1	34	68	.40	--	--	100	0
--	--	--	--	--	76	--	--	--	--	--	--	--	--
--	--	--	--	--	240	--	--	--	--	--	--	--	--
--	--	--	--	--	300	--	--	--	--	--	--	--	--
--	--	--	--	--	28	--	--	--	--	--	--	--	--
--	--	--	--	--	32	--	--	--	--	--	--	--	--
--	--	--	--	--	12	.0	--	--	--	--	--	--	--

Table 3.--Chemical analyses of water from selected wells screened in the ter-

LOCAL IDENT- I- FIER				GEO- LOGIC UNIT	DATE OF SAMPLE	DEPTH OF WELL, TOTAL (FEET)	SPE- CIFIC CON- DUCT- ANCE (MICRO- MHOS)	PH (UNITS)	TEMPER- ATURE (DEG C)	COLOR (PLAT- INUM COBALT UNITS)	HARD- NESS (MG/L AS CACO3)	CALCIUM DIS- SOLVED (MG/L AS CA)	MAGNE- SIUM, DIS- SOLVED (MG/L AS MG)	SODIUM, DIS- SOLVED (MG/L AS NA)
LA SALLE PARISH--Continued														
LA- 118	8N	3E	31	112WLLN	67-04-22	83	--	--	--	--	8	--	--	--
LA- 127	8N	3E	37	112WLLN[3/]	67-12-11	119	--	5.8	20.0	--	8	--	--	--
					72-10-12	119	62	5.1	20.0	0	10	2.5	.9	8.0
LA- 128	8N	3E	12	112WLLN	68-01-08	100	58	5.7	19.0	5	9	3.0	.4	7.5
					72-10-12	100	--	4.8	19.5	--	10	--	--	--
LA- 129	8N	3E	15	112WLLN	67-12-13	136	180	7.3	19.0	5	32	8.0	2.9	24
					78-08-08	136	180	6.0	20.5	0	30	8.8	1.9	24
LA- 130	8N	3E	10	112WLLN	68-02-27	143	--	--	--	--	12	--	--	--
					78-08-08	143	93	6.4	20.0	0	16	4.9	.9	11
LA- 142	8N	3E	2	112WLLN	69-07-14	87	60	--	--	10	10	2.9	.7	7.6
LA- 143	8N	3E	12	112WLLN	69-07-16	81	62	7.0	--	15	12	4.5	.2	7.8
LA- 144	8N	3E	37	112WLLN	69-07-18	68	122	--	--	5	24	6.9	1.7	14
LA- 151	8N	3E	2	112WLLN	70-06-18	82	73	6.2	19.0	0	14	4.0	1.0	9.5
					72-10-12	82	--	5.0	--	--	12	--	--	--
LA- 152	8N	3E	12	112WLLN	72-10-12	86	68	4.7	19.5	0	10	2.7	.8	9.0
LA- 180	8N	3E	31	112WLLN	71-12-01	94	62	6.4	--	0	10	3.9	.1	7.0
LA- 181	8N	3E	31	112WLLN	71-12-01	80	85	5.7	17.0	5	18	6.2	.6	10
LA- 182	8N	3E	29	112WLLN	71-12-01	110	57	6.5	--	5	9	2.8	.5	7.6
LA- 186	8N	2E	26	112BNTL	72-04-17	60	762	5.5	--	0	160	36	16	74
LA- 188	8N	3E	18	112BNTL	72-04-11	68	78	6.0	--	0	13	3.0	1.3	8.2
LA- 191	8N	2E	15	112BNTL	72-04-25	34	--	--	--	--	6	--	--	--
LA- 192	8N	3E	7	112BNTL	72-04-25	64	--	--	--	--	10	--	--	--
					72-04-26	64	42	6.8	--	10	5	1.7	.2	6.8
LA- 194	8N	4E	7	112WLLN	72-04-27	94	83	6.8	--	20	17	5.0	1.1	12
LA- 195	9N	4E	32	112WLLN	72-05-09	83	123	7.0	--	0	25	6.5	2.1	12
LA- 196	9N	4E	28	112WLLN	72-04-28	98	47	6.7	--	5	5	1.7	.2	7.2
LA- 197	9N	4E	27	112WLLN	72-05-10	82	273	6.9	--	5	60	16	4.9	31
LA- 199	8N	4E	2	112WLLN	72-05-10	105	37	6.7	--	5	6	1.9	.3	4.4
LA- 200	8N	4E	20	112WLLN	72-05-19	80	56	6.0	--	0	14	5.2	.3	3.6
					72-05-25	80	--	--	--	--	10	--	--	--
LA- 201	8N	2E	15	112BNTL	72-05-19	32	--	--	--	--	14	--	--	--
					72-05-25	32	56	5.9	--	0	12	4.2	.4	3.2
LA- 202	8N	3E	39	112WLLN	72-08-22	127	102	6.9	--	0	18	6.4	.5	14
LA- 204	8N	3E	32	112WLLN	72-08-29	116	36	6.4	--	0	6	2.5	.0	3.5
LA- 205	8N	3E	31	112BNTL	72-08-29	92	43	6.8	--	0	6	1.7	.4	5.0
LA- 206	8N	4E	8	112WLLN	72-08-03	127	33	6.6	--	0	11	3.0	.9	7.0
LA- 207	8N	4E	4	112WLLN	72-08-04	109	48	6.9	--	15	8	3.0	.1	5.5
LA- 210	8N	3E	30	112BNTL	72-08-30	103	61	6.4	--	0	8	3.2	.0	8.5
LA- 211	8N	4E	18	112WLLN	72-10-10	50	62	6.1	--	5	10	2.5	.9	8.8
LA- 213	8N	3E	38	112WLLN	72-10-11	97	71	6.0	--	5	12	3.0	1.1	9.2
					73-02-23	97	77	6.6	--	0	21	4.4	2.4	9.4
LA- 214	8N	4E	42	112PRIR	72-11-07	83	--	--	--	--	30	--	--	--
LA- 215	7N	4E	8	112PRIR	72-11-10	88	243	7.0	--	0	42	10	4.1	33
LA- 216	6N	3E	6	112PRIR	72-11-09	97	--	--	--	--	24	--	--	--
					72-11-10	97	--	--	--	--	16	--	--	--
					73-02-21	97	121	6.5	--	5	28	6.0	3.2	17
LA- 224	7N	3E	13	112UPTC	74-03-08	74	2590	6.8	--	5	560	130	58	260
LA- 225	7N	3E	22	112PRIR	74-03-09	42	--	--	--	--	160	--	--	--
					75-07-16	42	4030	5.5	--	0	140	38	9.7	720
					76-11-17	42	4450	--	--	0	170	37	19	720
					77-01-05	42	4190	4.6	--	0	160	34	18	750
					77-06-30	42	4070	4.8	--	5	170	40	17	740
					78-04-04	42	4310	5.0	--	0	170	36	18	740
LA- 226	7N	3E	40	112PRIR	74-03-11	95	6770	6.8	--	0	860	210	82	1100
LA- 228	7N	3E	40	112PRIR	67-04-13	110	--	--	--	--	92	--	--	--
LA- 229	7N	3E	15	112WLLN	69-07-18	70	--	--	--	--	4	--	--	--
					69-12-17	70	--	--	--	--	4	--	--	--
					71-02-01	70	--	--	--	--	8	--	--	--
LA- 230	8N	3E	31	112WLLN	75-08-18[4/]	96	46	5.5	--	2	7	2.0	.5	--
LA- 231	6N	3E	11	112PRIR	67-04-13	74	--	--	--	--	970	--	--	--
LA- 232	6N	3E	11	112PRIR	67-04-13	64	--	--	--	--	490	--	--	--
LA- 233	8N	3E	21	112WLLN	67-04-26	90	--	--	--	--	8	--	--	--
LA- 234	7N	4E	8	112PRIR	67-04-13	90	--	--	--	--	76	--	--	--
					75-06-28	90	--	5.5	--	--	56	--	--	--
LA- 235	7N	2E	36	112PRIR	67-04-27	60	--	--	--	--	60	--	--	--
LA- 236	6N	3E	7	112PRIR	67-04-27	75	--	--	--	--	36	--	--	--
LA- 237	6N	2E	10	112PRIR	67-04-27	38	--	--	--	--	8	--	--	--
LA- 238	8N	2E	26	112UPTC	75-06-28	60	39	5.6	--	5	5	1.0	.7	3.2
LA- 239	8N	2E	26	112BNTL	75-06-28	60	--	--	--	--	4	--	--	--
LA- 243	7N	2E	36	112PRIR	75-06-28	43	--	--	--	--	56	--	--	--
LA- 244	7N	3E	41	112PRIR	76-11-17	79	--	--	--	--	870	--	--	--
LA- 245	7N	3E	41	112PRIR	71-02-01	75	--	--	--	--	180	--	--	--

race aquifers, alluvium, and sands of Tertiary age, central Louisiana--Continued

LA SALLE PARISH--Continued

SODIUM PERCENT	POTASSIUM, DISSOLVED (MG/L AS K)	BICARBONATE (MG/L AS HCO3)	CARBONATE (MG/L AS CO3)	SULFATE DISSOLVED (MG/L AS SO4)	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	NITROGEN, NITRATE TOTAL (MG/L AS NO3)	NITROGEN, NITRATE DISSOLVED (MG/L AS NO3)	IRON, TOTAL RECOVERABLE (UG/L AS FE)	IRON, DISSOLVED (UG/L AS FE)	MANGANESE, DISSOLVED (UG/L AS MN)
--	--	--	--	--	10	--	--	--	--	--	--	--	--
--	--	--	--	--	18	--	--	--	--	--	--	--	--
--	1.2	22	0	1.6	4.9	.0	34	65	1.3	--	--	110	30
--	.6	25	0	.2	3.8	.0	37	65	--	.10	--	20	--
--	--	--	--	--	10	--	--	--	--	--	--	--	--
61	.8	61	0	6.2	21	.1	46	139	--	.10	--	30	--
62	1.5	58	0	5.2	22	.1	50	143	.63	--	--	50	20
--	--	--	--	--	12	--	--	--	--	--	--	--	--
58	1.1	29	0	4.6	8.0	.1	44	90	1.9	--	--	30	20
--	.7	31	0	2.6	2.0	.0	39	70	.00	--	--	40	30
--	.8	28	0	.2	3.7	.0	30	63	1.4	--	--	40	30
--	1.0	37	0	14	8.1	.1	37	101	.00	--	--	70	40
--	.9	30	0	2.0	5.8	.1	41	79	.10	--	--	80	20
--	--	--	--	--	8.0	--	--	--	--	--	--	--	--
--	1.3	20	0	1.0	6.3	.0	32	66	2.5	--	--	40	0
--	1.2	30	0	.0	1.2	.1	34	63	.10	--	--	120	30
--	1.5	32	0	.2	11	.0	32	78	.00	--	--	70	10
--	1.4	33	0	.0	.0	.0	38	66	.00	--	--	80	20
--	8.8	8	0	.0	220	.1	15	388	13	--	--	270	100
--	1.9	12	0	.0	7.4	.0	23	64	13	--	--	100	50
--	--	--	--	--	14	--	--	--	--	--	--	--	--
--	--	--	--	--	10	--	--	--	--	--	--	--	--
--	1.0	22	0	1.8	3.1	.0	36	62	.00	--	--	240	40
--	1.2	45	0	1.0	4.0	.0	47	93	.10	--	--	210	50
--	1.6	34	0	.0	18	.0	38	95	.10	--	--	780	30
--	1.1	24	0	.2	3.9	.0	34	60	.10	--	--	230	80
--	1.9	56	0	22	44	.1	39	187	.00	--	--	280	0
57	1.0	16	0	.2	2.7	.0	27	46	.10	--	--	790	30
--	1.0	23	0	.0	3.1	.1	25	50	.70	--	--	80	0
--	--	--	--	--	16	--	--	--	--	--	--	--	--
--	--	--	--	--	20	--	--	--	--	--	--	--	--
--	2.5	19	0	.0	3.4	.1	14	40	3.4	--	--	100	10
--	1.1	49	0	2.2	6.4	.1	46	101	.00	--	--	80	20
--	1.1	13	0	1.6	3.6	.0	20	38	.20	--	--	150	120
--	1.1	16	0	1.4	3.4	.1	25	47	.80	--	--	20	20
--	1.0	29	0	.8	3.2	.0	25	55	.00	--	--	120	10
--	1.5	24	0	.6	2.2	.0	30	55	.10	--	--	740	90
--	1.3	26	0	2.4	5.0	.1	34	68	.00	--	--	30	30
--	1.1	29	0	.0	4.0	.0	37	68	.20	--	--	60	0
--	1.3	26	0	1.6	4.9	.0	30	66	1.9	--	--	--	270
48	1.0	34	0	.6	7.9	.0	35	79	1.7	--	--	130	--
--	--	--	--	--	30	--	--	--	--	--	--	--	--
62	1.3	79	0	12	28	.1	48	176	.10	--	--	680	70
--	--	--	--	--	18	--	--	--	--	--	--	--	--
--	--	--	--	--	16	--	--	--	--	--	--	350	--
55	1.6	45	0	5.2	18	.0	39	112	.10	--	--	190	5
49	13	12	0	14	810	.1	39	1330	.32	--	--	260	75
--	--	--	--	--	1600	--	--	--	--	--	--	--	--
91	10	0	0	3.2	1200	.1	21	2030	.51	--	--	25000	3700
89	13	0	0	3.2	1200	.1	21	2060	.32	--	--	1600	4900
90	11	4	0	4.2	1300	.0	21	2170	.12	--	--	27000	5000
89	21	6	0	4.2	1300	.1	21	2190	6.7	--	--	33000	4800
91	.6	0	0	2.0	1300	.0	21	2160	1.3	--	--	35000	5100
73	19	21	0	19	2200	.1	33	3650	.58	--	--	140	30
--	--	--	--	--	370	--	--	--	--	--	--	--	--
--	--	--	--	--	22	--	--	--	--	--	--	--	--
--	--	--	--	--	16	--	--	--	--	--	--	--	--
--	--	--	--	--	22	--	--	--	--	--	--	--	--
--	--	23	0	2.0	7.0	<.1	31	--	.80	--	--	<50	90
--	--	--	--	--	950	--	--	--	--	--	--	--	--
--	--	--	--	--	740	--	--	--	--	--	--	--	--
--	--	--	--	--	10	--	--	--	--	--	--	--	--
--	--	--	--	--	88	--	--	--	--	--	--	--	--
--	--	--	--	--	48	--	--	--	--	--	--	--	--
--	--	--	--	--	66	--	--	--	--	--	--	--	--
--	--	--	--	--	30	--	--	--	--	--	--	--	--
--	--	--	--	--	16	--	--	--	--	--	--	--	--
47	1.9	6	0	.2	4.1	.2	15	34	5.1	--	--	40	10
--	--	--	--	--	6.0	--	--	--	--	--	--	--	--
--	--	--	--	--	60	--	--	--	--	--	--	--	--
--	--	--	--	--	2300	--	--	--	--	--	--	--	--
--	--	--	--	--	570	--	--	--	--	--	--	--	--

Table 3.--Chemical analyses of water from selected wells screened in the ter-

LOCAL IDENT-I-FIER				GEO-LOGIC UNIT	DATE OF SAMPLE	DEPTH OF WELL, TOTAL (FEET)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	COLOR (PLAT-INUM COBALT UNITS)	HARD-NESS (MG/L AS CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)
LA SALLE PARISH—Continued														
LA- 245	7N	3E	41	112PRIR	76-11-18	75	--	--	--	--	240	--	--	--
LA- 246	7N	3E	40	112PRIR	71-02-01	60	--	--	--	--	220	--	--	--
					76-11-17	60	--	--	--	--	480	--	--	--
LA- 248	7N	3E	41	112PRIR	71-02-01	80	--	--	--	--	1100	--	--	--
RAPIDES PARISH														
R- 153	4N	2E	10	112PRIR	38-00-00	35	--	--	--	--	200	--	--	--
R- 154	4N	3E	16	112PRIR	38-10-22	40	--	--	--	--	130	--	--	--
R- 159	4N	2E	12	112PRIR	38-00-00	40	--	--	--	--	130	--	--	--
R- 160	5N	2E	29	112PRIR	38-10-23	50	--	--	--	--	130	--	--	--
R- 179	5N	3E	10	112PRIR	38-10-22	64	--	--	--	--	130	--	--	--
R- 268	5N	1W	28	112PRIR	38-08-17	38	--	--	--	--	55	--	--	--
R- 269	5N	1W	15	112BNTL	38-08-17	38	--	--	--	--	20	--	--	--
R- 270	5N	1W	14	112BNTL	38-10-20	48	--	--	--	--	160	--	--	--
R- 271	5N	1W	14	112BNTL	38-08-17	40	--	--	--	--	30	--	--	--
R- 274	5N	1W	36	112BNTL	38-10-21	62	--	--	--	--	210	--	--	--
R- 276	5N	1E	36	112BNTL	38-08-17	60	--	--	--	--	25	--	--	--
R- 280	5N	2E	40	112PRIR	38-09-12	82	--	--	--	--	160	--	--	--
R- 282	5N	3E	26	112PRIR	38-09-12	125	--	--	--	--	390	--	--	--
R- 283	4N	3E	2	112PRIR	38-09-12	78	--	--	--	--	1800	--	--	--
R- 287	5N	3E	38	112PRIR	38-09-12	70	--	--	--	--	210	--	--	--
R- 290	3N	2E	10	112PRIR	38-10-25	34	--	--	--	0	2400	580	230	620
R- 295	3N	2E	27	112PRIR	38-08-19	65	--	--	--	--	250	--	--	--
R- 309	4N	2E	27	112PRIR	38-10-21	96	--	--	--	--	40	--	--	--
R- 311	4N	2E	29	112PRIR	38-10-21	40	--	--	--	--	160	--	--	--
R- 380	5N	1E	9	112WLLN	41-11-26	54	--	--	--	--	21	1.2	.7	5.2
R- 448	4N	1E	14	112BNTL	74-02-23	62	37	6.0	--	0	10	3.0	.6	2.0
R- 605	4N	1E	31	112MGMR	56-02-28	107	--	--	20.5	--	--	--	--	--
R- 766	5N	2E	2	112PRIR	68-07-12	80	626	8.0	--	5	160	36	16	76
R- 779	4N	3E	4	112PRIR	62-04-06	110	745	7.4	--	5	150	38	13	100
R- 780	5N	2E	40	112PRIR	62-04-06	86	380	7.5	--	30	100	26	9.4	34
R- 782	4N	2E	41	112MGMR	62-04-06	111	215	6.9	--	15	32	8.1	2.9	25
R- 783	5N	3E	5	112PRIR	62-04-06	96	--	--	--	--	650	--	--	--
					68-07-12	96	5150	7.6	20.0	5	650	170	53	830
					77-03-09	96	4940	6.7	--	5	660	150	68	770
R- 856A	4N	1E	30	112MGMR	66-03-29[5]	103	92	--	--	--	26	6.2	2.6	12
R- 857	4N	2E	40	112MGMR	66-04-09[5]	80	151	--	--	--	31	8.1	2.6	22
R- 858	4N	1E	28	112MGMR	66-04-01[5]	90	77	--	--	--	19	4.6	1.9	9.2
R- 861	4N	1E	42	112MGMR	66-05-23[5]	87	322	--	--	5	41	9.9	3.9	43
R- 862	4N	2E	41	112MGMR	66-05-18	99	127	--	--	5	29	7.0	2.7	39
R- 864	3N	1E	1	112MGMR	66-04-14[5]	98	168	--	--	--	29	6.9	2.8	27
R- 865	3N	1E	2	112MGMR	66-04-20[5]	64	113	--	--	--	11	3.0	.8	18
R- 994	5N	1E	5	112WLLN	72-09-14	62	41	6.5	--	15	7	2.2	.4	5.0
R- 997	5N	1E	3	112WLLN	72-09-15	37	--	--	--	--	6	--	--	--
R- 998	5N	1E	4	112WLLN	72-09-15	56	--	--	--	--	8	--	--	--
R-1047	3N	2E	22	112PRIR	74-03-14	24	--	5.3	--	--	35	--	--	--
R-1048	3N	2E	22	112PRIR	74-03-14	147	--	--	--	--	350	--	--	--
R-1086	4N	3E	2	112PRIR	75-06-07	101	--	--	--	--	92	--	--	--
R-1088	5N	2E	28	112PRIR	75-06-14	65	--	--	--	--	92	--	--	--
R-1094	5N	3E	10	112PRIR	75-01-12	90	--	--	--	--	710	--	--	--
					76-09-08	90	--	--	--	--	740	--	--	--
R-1104	4N	2E	12	112PRIR	76-04-19	81	588	7.6	--	5	180	43	17	45
R-1105	5N	3E	36	112PRIR	76-04-19	98	548	8.1	--	0	130	30	12	69
R-1106	3N	2E	9	112MGMR	76-04-21	114	697	8.1	--	10	220	58	19	58
R-1107	5N	3E	19	120TRTR	76-05-04	87	--	--	--	--	420	--	--	--
R-1108A	5N	3E	17	112PRIR	76-04-27	67	--	--	--	--	570	--	--	--
R-1108B	5N	3E	17	112PRIR	76-04-27	117	4860	8.3	--	15	300	82	24	980
R-1109	5N	3E	19	120TRTR	76-04-27	88	4570	8.0	--	0	390	100	33	830
R-1110	3N	2E	27	112PRIR	76-05-05	151	842	8.3	--	5	310	74	31	68
R-1114	4N	3E	10	112PRIR	75-04-23	100	--	--	--	--	170	--	--	--
					76-09-08	100	--	--	--	--	160	--	--	--
R-1115	5N	3E	40	112PRIR	75-04-23	100	--	--	--	--	200	--	--	--
					76-09-08	100	--	--	--	--	200	--	--	--
R-1116	5N	3E	40	112PRIR	75-04-23	100	--	--	--	--	120	--	--	--
					76-09-08	100	--	--	--	--	120	--	--	--
R-1117	5N	3E	29	112PRIR	75-05-07	105	--	--	--	--	360	--	--	--
					76-09-08	105	--	--	--	--	390	--	--	--
R-1118	5N	3E	2	112PRIR	75-05-07	96	--	--	--	--	450	--	--	--
					76-09-08	96	--	--	--	--	520	--	--	--
R-1119	5N	3E	41	112PRIR	75-05-12	105	--	--	--	--	62	--	--	--
					76-09-08	105	--	--	--	--	64	--	--	--

race aquifers, alluvium, and sands of Tertiary age, central Louisiana--Continued

SODIUM PERCENT	POTASSIUM, DISSOLVED (MG/L AS K)	BICARBONATE (MG/L AS HCO3)	CARBONATE (MG/L AS CO3)	SULFATE DISSOLVED (MG/L AS SO4)	CHLORIDE, DISSOLVED (MG/L AS CL)	FLUORIDE, DISSOLVED (MG/L AS F)	SILICA, DISSOLVED (MG/L AS SIO2)	SOLIDS, SUM OF CONSTITUENTS, DISSOLVED (MG/L)	NITROGEN, NITRATE TOTAL (MG/L AS NO3)	NITROGEN, NITRATE DISSOLVED (MG/L AS NO3)	IRON, TOTAL RECOVERABLE (UG/L AS FE)	IRON, DISSOLVED (UG/L AS FE)	MANGANESE, DISSOLVED (UG/L AS MN)
					LA SALLE PARISH--Continued								
--	--	--	--	--	740	--	--	--	--	--	--	--	--
--	--	--	--	--	240	--	--	--	--	--	--	--	--
--	--	--	--	--	940	--	--	--	--	--	--	--	--
--	--	--	--	--	2200	--	--	--	--	--	--	--	--
					RAPIDES PARISH--Continued								
--	--	--	--	--	50	--	--	--	--	--	--	--	--
--	--	--	--	--	1200	--	--	--	--	--	--	--	--
--	--	--	--	--	440	--	--	--	--	--	--	--	--
--	--	--	--	--	240	--	--	--	--	--	--	--	--
--	--	--	--	--	400	--	--	--	--	--	--	--	--
--	--	--	--	--	14	--	--	--	--	--	--	--	--
--	--	--	--	--	34	--	--	--	--	--	--	--	--
--	--	128	--	4.0	200	.1	--	--	--	--	--	--	--
--	--	--	--	--	40	--	--	--	--	--	--	--	--
--	--	566	--	66	250	.4	--	--	--	--	--	--	--
--	--	--	--	--	<4.0	--	--	--	--	--	--	--	--
--	--	270	--	1.0	15	--	--	--	--	--	--	--	--
--	--	222	--	26	400	.0	--	--	--	--	--	--	--
--	--	472	--	30	1700	.0	--	--	--	--	--	--	--
--	--	306	--	1.0	78	.0	--	--	--	--	--	--	--
36	7.6	517	0	20	2300	.1	24	4070	--	1.0	470	--	--
--	--	--	--	--	260	--	--	--	--	--	--	--	--
--	--	--	--	--	22	--	--	--	--	--	--	--	--
--	--	--	--	--	260	--	--	--	--	--	--	--	--
59	1.6	24	0	1.0	6.0	.2	20	49	--	.00	500	--	--
27	1.5	14	0	.0	3.0	.1	23	41	.62	--	--	80	60
--	--	--	--	--	--	--	--	--	--	--	--	--	--
51	1.7	276	0	12	58	.2	30	366	--	.20	--	190	--
59	2.4	279	0	.4	97	.2	24	413	--	.10	580	--	--
41	1.0	159	0	.2	29	.2	29	207	--	.10	830	--	--
62	1.1	59	0	.4	29	.0	37	132	--	.10	950	--	--
--	--	--	--	--	1500	--	--	--	--	--	--	--	--
73	9.4	439	0	3.2	1500	.2	24	2790	--	--	--	4400	--
71	17	512	0	5.6	1400	.0	27	2690	.00	--	--	4700	250
--	--	46	0	1.2	11	--	47	103	--	--	--	--	--
--	--	61	0	3.3	18	--	48	132	--	--	--	--	--
--	--	38	0	.0	7.4	--	38	80	--	--	--	--	--
--	--	68	0	.0	56	--	48	194	--	--	--	--	--
--	--	62	0	7.4	40	--	55	182	--	--	--	--	--
--	--	53	0	2.1	31	--	44	140	--	--	--	--	--
--	--	28	0	1.2	20	--	30	87	--	--	--	--	--
--	.8	16	0	.6	3.7	.0	22	43	.10	--	--	120	30
--	--	--	--	--	8.0	--	--	--	--	--	--	--	--
--	--	--	--	--	6.0	--	--	--	--	--	--	--	--
--	--	--	--	--	10	--	--	--	--	--	--	--	--
--	--	--	--	--	70	--	--	--	--	--	--	--	--
--	--	--	--	--	52	--	--	--	--	--	--	--	--
--	--	--	--	--	42	--	--	--	--	--	--	--	--
--	--	--	--	--	2100	--	--	--	--	--	--	--	--
--	--	--	--	--	2200	--	--	--	--	--	--	--	--
35	1.8	178	0	1.8	96	.3	35	328	.26	--	--	1200	310
54	2.4	228	0	9.8	65	.4	32	333	.12	--	--	890	320
36	2.6	232	0	1.2	110	.4	16	379	.25	--	--	0	190
--	--	--	--	--	1200	--	--	--	--	--	--	--	--
--	--	--	--	--	800	--	--	--	--	--	--	--	--
87	13	436	0	6.4	1400	.5	34	2760	.50	--	--	840	290
82	10	647	0	4.2	1200	.4	27	2520	.17	--	--	780	240
32	3.0	442	0	8.4	54	.4	27	484	.24	--	--	290	220
--	--	--	--	--	90	--	--	--	--	--	--	--	--
--	--	--	--	--	78	--	--	--	--	--	--	--	--
--	--	--	--	--	200	--	--	--	--	--	--	--	--
--	--	--	--	--	210	--	--	--	--	--	--	--	--
--	--	--	--	--	96	--	--	--	--	--	--	--	--
--	--	--	--	--	98	--	--	--	--	--	--	--	--
--	--	--	--	--	520	--	--	--	--	--	--	--	--
--	--	--	--	--	530	--	--	--	--	--	--	--	--
--	--	--	--	--	720	--	--	--	--	--	--	--	--
--	--	--	--	--	750	--	--	--	--	--	--	--	--
--	--	--	--	--	42	--	--	--	--	--	--	--	--
--	--	--	--	--	40	--	--	--	--	--	--	--	--

Table 3.--Chemical analyses of water from selected wells screened in the ter-

	LOCAL IDENT-I-FIER	GEO-LOGIC UNIT	DATE OF SAMPLE	DEPTH OF WELL, TOTAL (FEET)	SPE-CIFIC CON-DUCT-ANCE (MICRO-MHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	COLOR (PLAT-INUM COBALT UNITS)	HARD-NESS (MG/L AS CACO3)	CALCIUM DIS-SOLVED (MG/L AS CA)	MAGNE-SIUM, DIS-SOLVED (MG/L AS MG)	SODIUM, DIS-SOLVED (MG/L AS NA)
RAPIDES PARISH--Continued												
R-1120	5N 3E 32	112PRIR	75-05-12	75	--	--	--	--	420	--	--	--
			76-09-08	75	--	--	--	--	490	--	--	--
R-1121	5N 3E 22	112PRIR	75-05-07	90	--	--	--	--	440	--	--	--
			76-09-08	90	--	--	--	--	500	--	--	--
R-1122	3N 2E 11	112PRIR	75-05-22	120	--	--	--	--	150	--	--	--
R-1123	4N 3E 16	112PRIR	75-04-23	85	--	--	--	--	130	--	--	--
R-1129	5N 3E 29	112PRIR	75-04-23	85	--	--	--	--	360	--	--	--
R-1130	5N 3E 28	112PRIR	75-05-08	110	--	--	--	--	620	--	--	--
R-1131	5N 2E 14	112PRIR	75-05-12	91	--	--	--	--	150	--	--	--
WINN PARISH												
W- 108A	9N 5W 18	112MGMR	68-07-26	118	335	7.1	20.0	15	100	24	9.7	33
W- 148	9N 4W 30	112WLLN	72-04-05	63	31	6.0	--	5	4	1.2	.2	4.5
W- 151	9N 5W 31	112MGMR	74-02-26	117	400	6.4	--	0	120	24	13	22
W- 152	9N 5W 17	112MGMR	74-02-26	86	--	--	--	--	400	--	--	--
W- 155	9N 5W 24	112WLLN	74-03-04	65	53	5.7	--	5	10	3.4	.4	5.0

race aquifers, alluvium, and sands of Tertiary age, central Louisiana--Continued

SODIUM PERCENT	POTAS- SIUM, DIS- SOLVED (MG/L AS K)	BICAR- BONATE (MG/L AS HCO3)	CAR- BONATE (MG/L AS CO3)	SULFATE DIS- SOLVED (MG/L AS SO4)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	FLUO- RIDE, DIS- SOLVED (MG/L AS F)	SILICA, DIS- SOLVED (MG/L AS SIO2)	SOLIDS, SUM OF CONSTI- TUENTS, DIS- SOLVED (MG/L)	NITRO- GEN, NITRATE TOTAL (MG/L AS NO3)	NITRO- GEN, NITRATE DIS- SOLVED (MG/L AS NO3)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)	MANGA- NESE, DIS- SOLVED (UG/L AS MN)
RAPIDES PARISH--Continued													
--	--	--	--	--	670	--	--	--	--	--	--	--	--
--	--	--	--	--	690	--	--	--	--	--	--	--	--
--	--	--	--	--	1200	--	--	--	--	--	--	--	--
--	--	--	--	--	920	--	--	--	--	--	--	--	--
--	--	--	--	--	110	--	--	--	--	--	--	--	--
--	--	--	--	--	70	--	--	--	--	--	--	--	--
--	--	--	--	--	440	--	--	--	--	--	--	--	--
--	--	--	--	--	930	--	--	--	--	--	--	--	--
--	--	--	--	--	90	--	--	--	--	--	--	--	--
WINN PARISH--Continued													
--	.6	176	0	.2	16	.1	33	204	--	.20	--	2300	--
--	1.2	12	0	.0	2.5	.0	19	35	.00	--	--	400	20
29	2.0	31	0	4.7	97	.1	44	223	1.1	--	--	80	55
--	--	--	--	--	120	--	--	--	--	--	--	--	--
47	1.5	10	0	1.8	7.8	.1	24	51	2.1	--	--	90	25

Table 4.--Analyses of water from wells in the terrace aquifer for selected minor constituents

[See table 3 for analyses for major constituents]

Well number	Date of collection	Aluminum, dissolved (as Al)	Arsenic, dissolved (as As)	Barium, total recoverable (as Ba)	Boron, dissolved (as B)	Cadmium, dissolved (as Cd)	Chromium, dissolved (as Cr)	Chromium, hexavalent, dissolved (as Cr)	Cobalt, dissolved (as Co)	Copper, dissolved (as Cu)	Lead, dissolved (as Pb)	Lithium, dissolved (as Li)	Mercury, dissolved (as Hg)	Mercury, total recoverable (as Hg)	Molybdenum, dissolved (as Mo)	Nickel, dissolved (as Ni)	Selenium, dissolved (as Se)	Silver, dissolved (as Ag)	Zinc, dissolved (as Zn)	Bromide, dissolved (as Br)	Carbon, organic, total (as C)	Iodide, dissolved (as I)	Nitrogen, nitrite, total (as NO_2)	Nitrogen, nitrite, dissolved (as N)	Nitrogen, nitrite plus nitrate, dissolved (as N)	Phosphorus, total (as P)
		Micrograms per liter																		Milligrams per liter						
G-125--	5-19-75	0	1	-----	0	0	--	0	--	10	18	--	---	0.1	--	--	--	5	2	---	3.8	----	3.03	0.01	0.05	----
G-203--	5- 1-75	30	0	-----	0	0	--	0	--	300	27	--	---	---	--	--	--	0	10	---	3.4	----	.00	.00	.78	----
G-203--	6-23-75	--	--	-----	--	--	--	--	--	---	--	--	---	---	--	--	--	--	-----	---	---	----	.03	.01	.77	0.00
La-77--	6- 2-75	0	1	-----	10	0	--	0	--	9	0	--	0.0	.0	--	--	--	0	4	---	.3	----	.00	.00	1.3	----
La-225-	11-17-76	--	--	-----	--	--	--	--	--	---	--	--	---	---	--	--	--	--	-----	4.2	---	0.15	----	----	----	----
La-225-	1- 5-77	--	1	-----	--	5	6	0	--	20	5	--	.0	---	--	--	1	0	2,500	---	---	----	----	----	----	----
R-783--	3- 9-77	0	1	1,000	--	7	0	--	0	2	0	60	.0	---	2	0	0	0	320	3.2	---	.38	----	----	----	----