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

Water Resources
TECHNICAL REPORT NO. 24

GROUND-WATER RESOURCES OF THE GRAMERCY AREA, LOUISIANA

Prepared by
UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
In cooperation with
LOUISIANA DEPARTMENT OF TRANSPORTATION AND DEVELOPMENT
OFFICE OF PUBLIC WORKS
1980

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By

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U.S. Geological Survey

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

Multiply inch-pound units	By	To obtain metric units
foot (ft)	0.3048	meter (m)
foot per day (ft/d)	0.3048	meter per day (m/d)
foot squared per day (ft^2/d)	0.09290	meter squared per day (m^2/d)
gallon per day (gal/d)	0.003785	cubic meter per day (m^3/d)
gallon per day per foot [(gal/d)/ft]	0.01242	meter squared per day (m^2/d)
gallon per day per square foot [(gal/d)/ft^2]	0.04068	meter per day (m/d)
gallon per minute (gal/min)	0.06308	liter per second (L/s)
	5.450	cubic meter per day (m^3/d)
gallon per minute per foot [(gal/min)/ft]	0.2070	liter per second per meter [(L/s)/m]
mile (mi)	1.609	kilometer (km)
million gallons per day (Mgal/d)	3.785×10^6	liter per day (L/d)
	3.785	cubic meter 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.

GROUND-WATER RESOURCES OF THE GRAMERCY AREA, LOUISIANA

By Don C. Dial and Chabot Kilburn

ABSTRACT

Fresh ground water is available only in parts of the Gramercy area, primarily in three areally extensive aquifers that occur between depths of 200-700 feet. These are, in descending order, the Gramercy, Norco, and Gonzales-New Orleans aquifers. Shallow aquifers of more limited extent include point bars, the Mississippi River alluvial aquifer, and localized sands above the Gramercy aquifer. The shallow aquifers play an important role in hydraulically connecting the river and all aquifers above the Gonzales-New Orleans aquifer. The Gonzales-New Orleans aquifer is separated from the Norco aquifer by a thick clay layer that effectively isolates it from the shallower aquifers in the project area.

The Gramercy aquifer, generally 75-225 feet in thickness, is thin or missing in the northern part of the area. It is continuous from the vicinity of Convent to Reserve but contains freshwater only in part of this area. The Norco aquifer, 75-200 feet in thickness, contains freshwater in a relatively small area extending from Sorrento to Convent. The Gonzales-New Orleans aquifer, 200-300 feet in thickness, contains freshwater only in its upper part in the vicinity of Sorrento and in northeastern St. James Parish and northern St. John the Baptist Parish.

The freshwater in the Norco and Gonzales-New Orleans aquifers is soft to moderately hard and low in iron. The quality of water in the Gramercy aquifer is variable and ranges from very hard water with a high iron concentration to soft water with a low iron concentration. The shallow aquifers contain water that is generally very hard and high in iron concentration.

Water levels in wells in all except the Gonzales-New Orleans aquifer reflect hydraulic connection between the aquifers and the Mississippi River. Water levels in wells near the river range from slightly above land surface at high river stage to a maximum of about 20 feet below land surface at low river stage. The seasonal range in water levels is less in wells farther from the river.

Hydraulic conductivities of major aquifers range from 100 to 200 feet per day (750-1,900 gallons per day per square foot). Well yields of 1,000-3,000 gallons per minute are obtainable, depending on aquifer thickness.

Each of the aquifers has some potential for development in areas where freshwater is available. The potential for development of moderately saline water is virtually unlimited. Of particular interest are the areas where water suitable for public-supply use is available. The Gramercy aquifer, which contains hard to very hard water in much of the area, contains water of excellent quality in a small area near Belmont. The Norco aquifer contains water of good quality from Sorrento southward to Welcome. Locally, the Gonzales-New Orleans aquifer contains water of excellent quality. However, development of the Gonzales-New Orleans aquifer would require the use of scavenger wells or controlled pumping to prevent the upward movement of saltwater from the lower part of the aquifer.

INTRODUCTION

The area covered by this report is located along the Mississippi River, midway between Baton Rouge and New Orleans. It includes most of St. James Parish, the west half of St. John the Baptist Parish, and the southernmost part of Ascension Parish. (See fig. 1 and pl. 1.)

Until recently, the area's economy was based primarily on agriculture. However, during the past 15 to 20 years the area has been changing steadily as industries have built new plants along the Mississippi River. The trend toward more industrialization is expected to continue because of the attraction of the river for shipping, the availability of petroleum resources, and the availability of surface and ground water for various industrial uses.

Purpose and Scope

This report is one of a series of reports on ground-water conditions in the area adjacent to the Mississippi River between Baton Rouge and New Orleans, La. The objective of these reports is to make available to water users and planners the basic water facts needed to guide development of the ground-water resources.

The work was done as part of a cooperative program of water-resources investigations in Louisiana with the Louisiana Office of Public Works, Department of Transportation and Development, and the Louisiana Geological Survey, Department of Natural Resources.

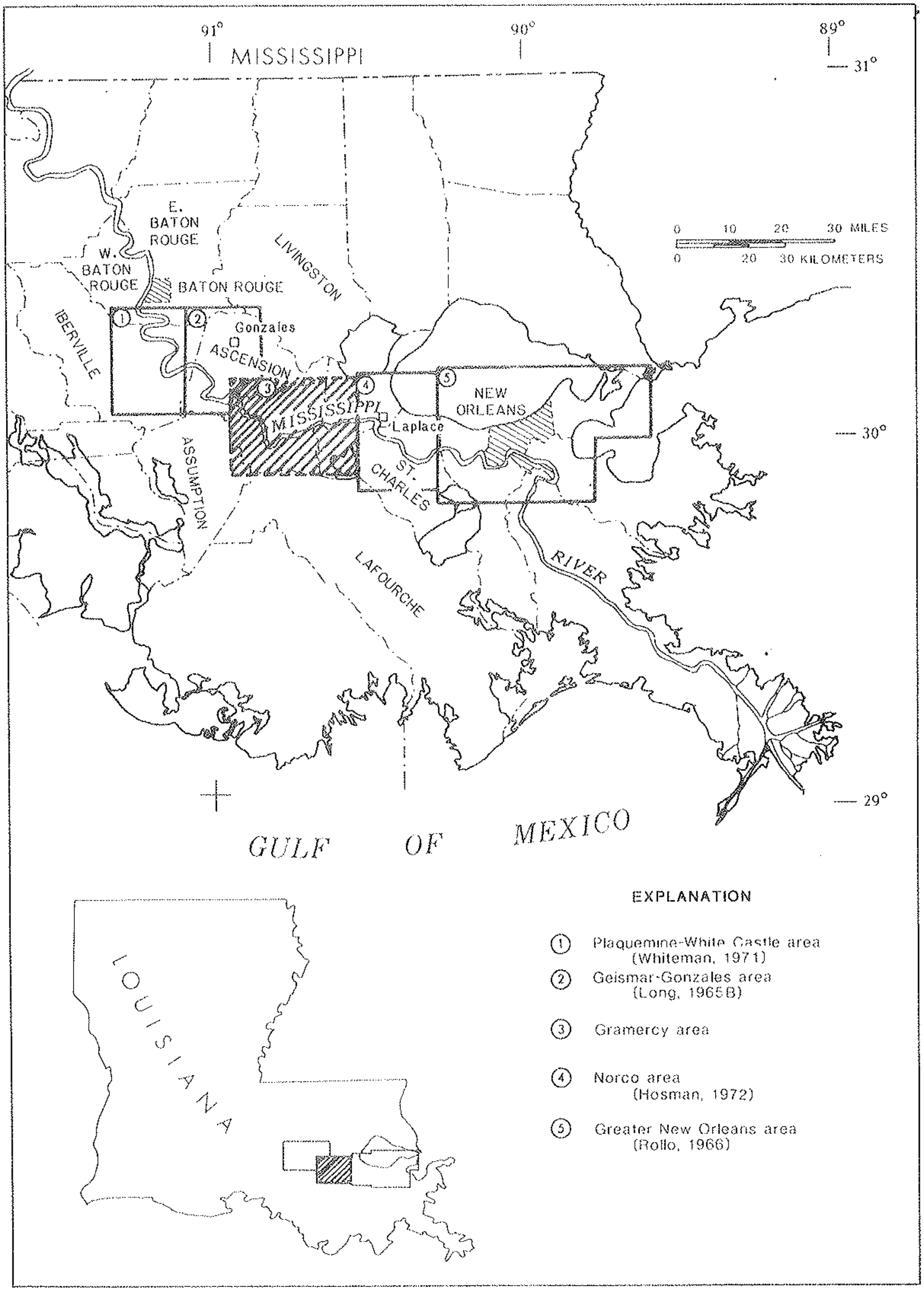


Figure 1.--Location of report area.

This study was planned to map in greater detail the aquifers that had previously been identified in the area between Baton Rouge and New Orleans. The report includes a description of (1) the areal and vertical extent of the freshwater-bearing sands and the relation between freshwater and saltwater in those sands, (2) the physical and hydraulic properties of the sands, (3) the chemical quality of the ground water and its suitability for various uses, and (4) ground-water pumping and its effect on the aquifers.

Previous Investigations

Cardwell and Rollo (1960) outlined the geologic conditions and the general availability and quality of ground water in the area along the Mississippi River between Baton Rouge and Laplace. In addition, much of the basic ground-water data used in this report were collected by Cardwell, Rollo, and Long (1963). Areal ground-water studies were made by Long (1965a) in the Geismar-Gonzales area, by Whiteman (1972) in the Plaquemine-White Castle area, and by Hosman (1972) in the Norco area. A summary report on ground-water conditions in Assumption Parish was made by Cardwell (1965).

The geology of sediments that include the aquifers underlying the Gramercy area has been studied and described in various degrees of detail by Fisk (1944, 1947, and 1952), Kolb (1962), Kolb and Van Lopik (1958), and Saucier (1963).

The Gramercy project was begun in 1965 but was delayed because the information that was needed to map the freshwater and saltwater zones in the aquifers was incomplete. A series of test wells drilled in 1968, 1974, 1975, and 1977 added sufficient information on the ground-water hydrology to permit the completion of the project.

Acknowledgments

The assistance and cooperation of the industries and owners of private wells who permitted collection of water samples and measurement of water levels in their wells is greatly appreciated. The authors wish to especially thank Kaiser Aluminum and Chemical Corp. for furnishing a key observation-well site. They also wish to thank Texaco, Inc.; Borden, Inc.; Rutherford Oil Co.; Marathon Oil Co.; Gravois Farms, Inc.; Sorrento Dome Land Corp.; and Mr. Norbert Roussel, Jr.; Mr. Sidney Wood; and Mr. Bill McClintock for permission to drill test wells on their property. The Louisiana Geological Survey and Office of Conservation, Department of Natural Resources, made available for study the electrical logs of oil and gas wells and test holes drilled in the Gramercy area.

Well-Numbering System

Water wells inventoried by the U.S. Geological Survey in Louisiana are identified by a prefix designating the parish in which the well is located and a number assigned sequentially in the order in which the well was inventoried. Thus, SJ-1 is the first well and SJ-100 is the hundredth well inventoried in St. James Parish. Locations of selected wells in the Gramercy area are shown on plate 1 (parish prefix omitted on maps). The descriptive data for these wells are given in table 2 in the back of the report.

GEOLOGIC SETTING

The sediments underlying the Gramercy area were laid down in a deltaic environment during Pleistocene and Holocene time. As the Mississippi River Delta extended seaward, sediments carried by the river were deposited and buried under a continuing supply of younger sediments. The accumulation of sediments was accompanied by compaction and subsidence as the weight of overlying material increased. Over a period of time the beds become a thick, wedge-shaped succession of gravels, sands, silts, and clays that dip gently southward as a result of initial stream gradients and a gradual downwarping.

Periods of continental glaciation, followed by periods of warmer climate, were accompanied by epochs of lower and then higher sea level. The changing sea level was, in turn, accompanied by seaward and then landward movement of the shoreline. The deltaic environment in which the sedimentary material was deposited was constantly changing, and in the past several thousand years the channels of the Mississippi River and its distributaries shifted back and forth across the coastal area. Seasonal flooding along the main stream and distributaries built the natural levees and created the interdistributary backswamp areas. Because of the varied and changing conditions of deposition, beds commonly thicken and thin laterally and may pinch out completely over short distances.

GEOHYDROLOGY AND FRESHWATER-SALTWATER RELATIONS

With the exception of the relatively young point bars along the present course of the Mississippi River, the aquifers in the Gramercy area probably contained salty water originally. The saturated sands become confined by overlying and underlying clay layers that were interbedded with the sands. The hydraulic head is higher in the updip (northerly) direction where the aquifers become progressively shallower. Eventually, they either crop out at the surface or connect hydraulically with shallow sands that are recharged directly by surface runoff.

Precipitation infiltrates through the surface of the ground and enters the shallow aquifers. The freshwater moves slowly downgradient in response to the head differences and flushes out the salty water ahead of it. The rate of flushing depends on the change in head per unit of distance and the physical characteristics of the aquifer. If the water being flushed from the aquifer passes through clay, the rate of movement is very slow. Conversely, if the aquifer is connected to an entrenched river channel, the rate of discharge is greater; and flushing is more rapid.

Flushing of aquifers in the Gramercy area has proceeded at different rates as evidenced by the shape and location of the freshwater-saltwater interfaces. If the flushing rate were uniform at all points, the freshwater-saltwater interface in each aquifer would describe a straight line perpendicular to the direction of ground-water flow.

Although the direct infiltration of precipitation is the main source of freshwater in the aquifers, the Mississippi River locally recharges the aquifers that are hydraulically connected to it. During abrupt rises in river level or prolonged periods of high river stage the altitude of the river is higher than the head in the adjacent aquifers, and the direction of ground-water flow is reversed from river to aquifer. However, records of water levels and river stages indicate that flow is toward the river most of the time. Flow from the river to aquifers may occur in the vicinity of pumping wells near the river where drawdown creates a hydraulic gradient toward the area of pumping.

In ground-water studies in Louisiana, freshwater[1/] is generally defined as water having a chloride concentration of 250 mg/L (milligrams per liter) or less, and salty water as having a chloride concentration of more than 250 mg/L. In cross section the freshwater overlies the heavier salty water, which is in the form of a wedge beneath the interface (fig. 2). In the Gonzales-New Orleans aquifer in the Sorrento area, the transition zone between freshwater and salty water may be several miles. However, locally the transition zone is relatively narrow. Historical data are not available to determine regional movement of the interfaces. The pumping of wells near an interface may cause local movement or change in the slope of an interface.

The maximum depth to which freshwater occurs in the Gramercy area is shown by contours on plate 2.

DESCRIPTION OF AQUIFERS

The aquifers that contain freshwater in at least part of the area covered by this report are (in descending order) the shallow aquifers, the Gramercy aquifer, the Norco aquifer, and the Gonzales-New Orleans

1/Saline water has also been defined as that having more than 1,000 mg/L of dissolved solids (Winslow and others, 1968).

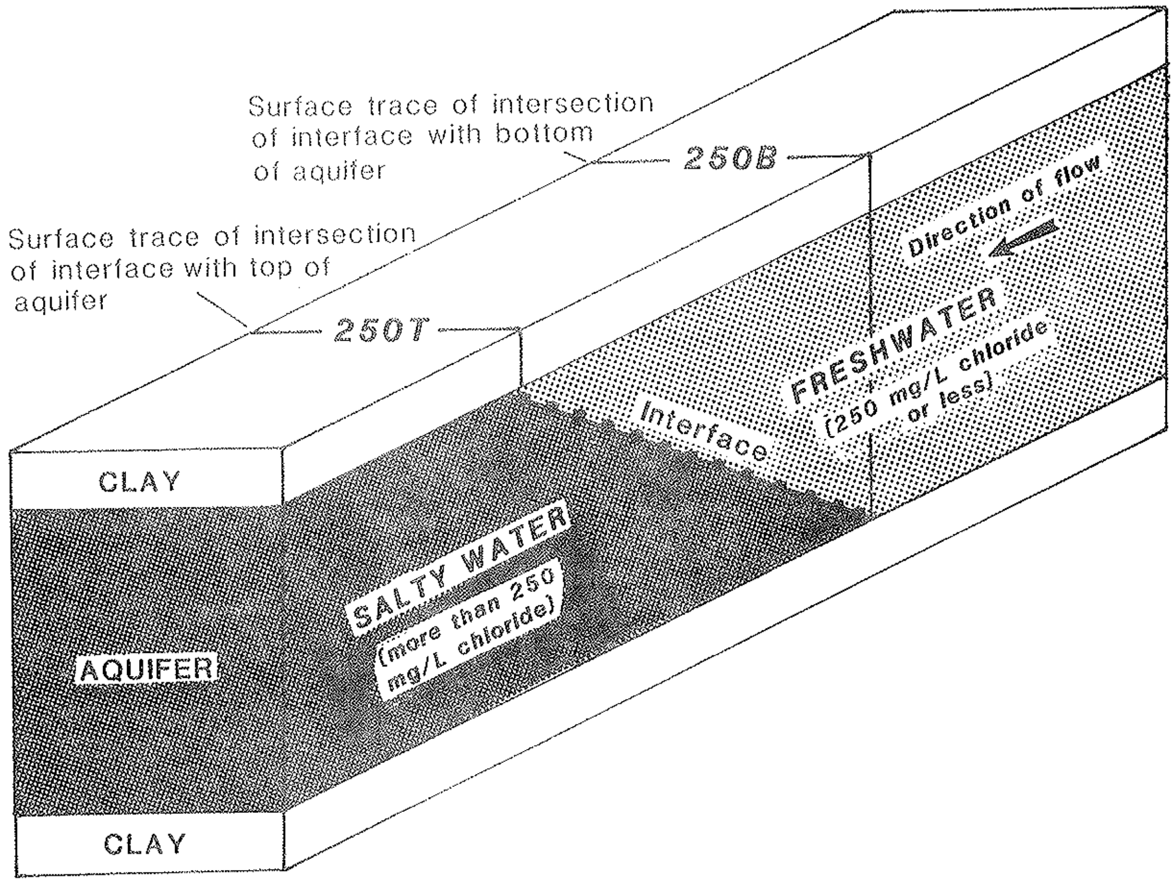


Figure 2.--Relation of freshwater and salty water in aquifers in the Gramercy area.

aquifer. The shallow aquifers include the point bars, the Mississippi River alluvial aquifer, and other local unnamed sands above the Gramercy aquifer. The Gramercy and Norco aquifers are similar lithologically and are distinguished mainly on the basis of stratigraphic position. In some areas they merge into a single aquifer. The Gonzales-New Orleans aquifer is more easily distinguished because of its uniform texture and the fact that, in the project area, it is separated from the Norco aquifer by a substantial thickness of clay. A diagrammatic section of the aquifers in the Gramercy area is shown in figure 3. More detailed geohydrologic sections are shown on plates 3 and 4, and a geohydrologic summary of each aquifer is given in table 1. The individual aquifers are discussed in detail in the following sections.

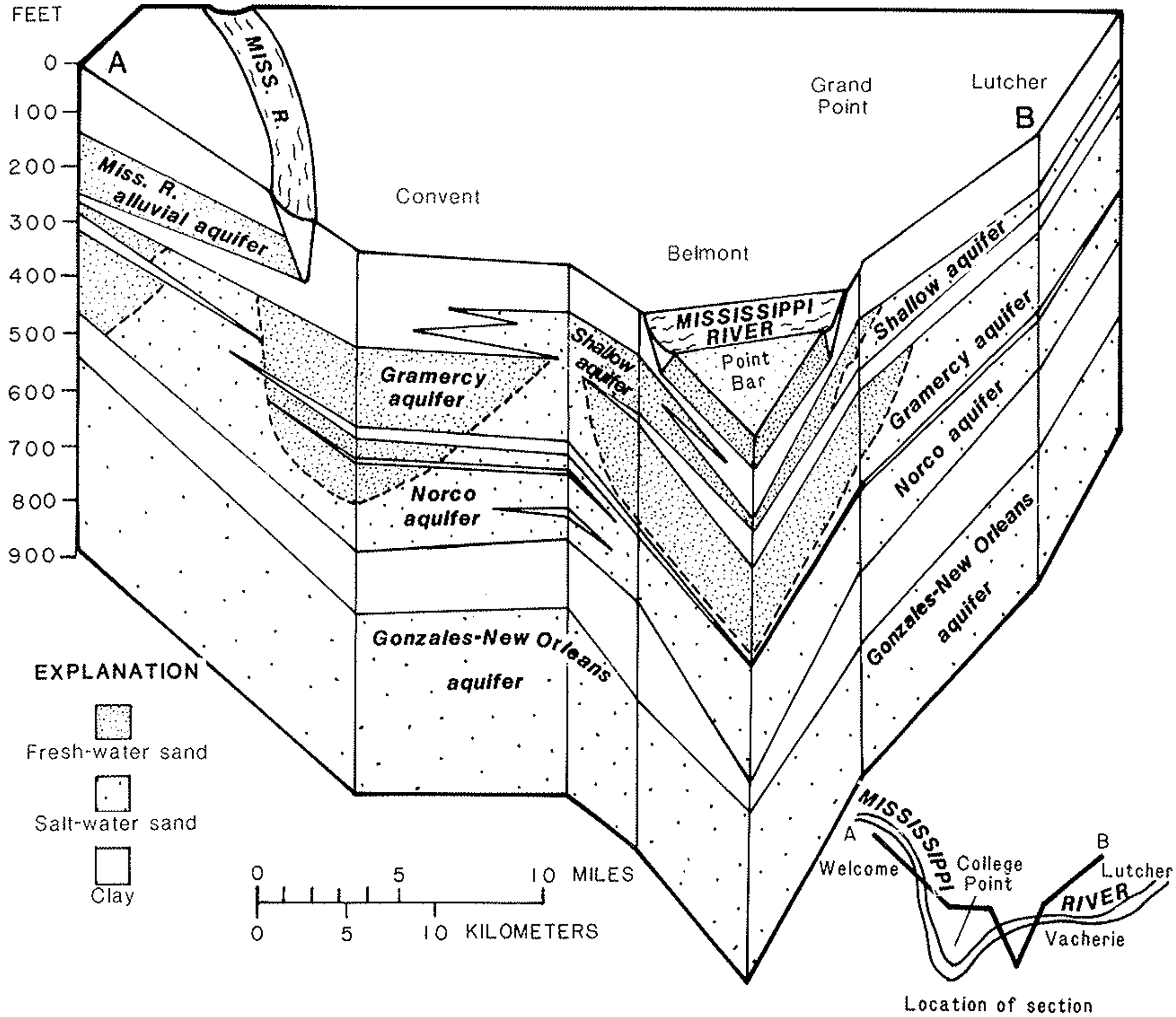


Figure 3.--Diagrammatic section showing the aquifer systems in the Gramercy area.

Shallow Aquifers

Point bars are composed of silt and fine sand that accumulate on the inside of river bends. The depths to which point bars extend below the surface are about the same as the depths reached by the river channel. Maximum depth reached in the Gramercy area is about 180 ft. The point bars have little significance as sources of ground water because the fine-grained material will not support large ground-water withdrawals. Although water from the point bars is fresh, the quality is generally poor because of high hardness[2/] and iron concentrations.

2/This report uses the hardness classification of Durfor and Becker (1964, p. 27) as follows: 0-60 mg/L, soft; 61-120 mg/L, moderately hard; 121-180 mg/L, hard; more than 180 mg/L, very hard.

Table 1.--Geohydrologic summary of aquifers

System	Series	Aquifer		Thickness (ft)	Description and remarks (depth to top, in feet)	Aquifer characteristics	Water quality
Quaternary	Holocene	Shallow aquifers	Point bars	Variable; maximum 150	Fine to very fine sand and silt. Bars accumulate on inside of river bends. (20-60)	Poor prospect for development because of low hydraulic conductivity.	Generally very high hardness and iron concentrations.
	Pleistocene		Mississippi River alluvial aquifer	60-120	Fine to medium sand at top; grading to coarse sand and gravel in lower part. (75-130)	Hydraulic conductivity estimated 200 ft/d or more in coarse sand and gravel.	Hardness ranges from 120 to 590 mg/L; iron concentration ranges from less than 1.0 mg/L away from river to 15 mg/L near river; pH ranges from 6.6 to 7.5.
			Shallow sands	50-100	Fine to medium sand. Units occur locally and pinch out in short distances. (45-130)	No aquifer test results. Hydraulic conductivity estimated 60-80 ft/d.	Hardness ranges from 160 to 580 mg/L; iron concentration ranges from 0.4 to 17 mg/L; pH ranges from 6.7 to 8.0.
		Gramercy		75-225	Fine sand at top; grades downward from medium to coarse sand, including some gravel. Pinches out in northern part of area. Discontinuous east of Reserve and Edgard. Converges with Norco aquifer in several areas and with the Mississippi River alluvial aquifer near west edge of report area. (175-240)	Hydraulic conductivity 100-250 ft/d.	Varies depending on location. In area near Belmont, water is soft, has low iron concentration, and pH is near 8.0. In other areas, hardness ranges from 100 to 490 mg/L; iron concentration ranges from less than 1 to 11 mg/L; pH ranges from 6.8 to 7.6.
		Norco		75-200	Fine sand at top; grades medium to coarse sand with depth, including some gravel. Continuous throughout the area. Converges with Gramercy aquifer in several areas. (200-450)	Hydraulic conductivity from one aquifer test 210 ft/d.	Hardness ranges from 40 to 350 mg/L in analyses of freshwater; iron concentration ranges from 0.2 to 1.3 mg/L in areas containing freshwater; pH ranges from 7.0 to 8.1.
		Gonzales-New Orleans		200-300	Mostly fine to medium sand of uniform texture. Continuous throughout the area. (400-700)	Hydraulic conductivity estimated 100-150 ft/d based on tests in Gonzales area.	Freshwater is soft and low in iron and manganese concentrations; pH averages about 8.0.

The Mississippi River alluvial aquifer is present mainly on the west side of the river upstream from St. James. The upper part of the aquifer generally consists of fine to medium sand, and the lower part coarse sand and gravel. The base of the aquifer reaches a maximum depth of about 250 ft below land surface in the report area. In Tps. 11 and 12 S., Rs. 15 and 16 E., the alluvial aquifer merges with the underlying Gramercy aquifer. The river channel probably eroded the upper part of the Gramercy aquifer and the overlying clay in this area, leaving the alluvial aquifer in connection with the lower part of the Gramercy aquifer. The alluvial aquifer is capable of yielding several thousand gallons per minute of water but is little used except for a few small wells drilled for livestock and domestic uses. Well SJ-179 (table 2), drilled for fire control use, has a reported yield of 500 gal/min. The aquifer contains freshwater in all except the southwest corner of the area (T. 13 S., R. 15 E.) where it contains salty water. The freshwater in the alluvial aquifer is hard and relatively high in iron concentration. (See analyses in tables 3 and 4.)

Shallow sands other than the point bars and alluvial aquifer occur locally above the Gramercy aquifer. These sands are not widespread and may pinch out abruptly in a short distance. One prominent shallow sand extends from the Belmont area at least as far as Gramercy. Another local sand is present in Tps. 10 and 11 S., R. 3 E. Like the alluvial aquifer, these sands are little used as water sources because of poor quality. However, they are capable of yielding substantial amounts of water. At Gramercy, where the thickness of the shallow sand is 50 to 60 ft, a reported yield of 485 gal/min was obtained. (See well SJ-148, table 2.) The shallow sands generally contain freshwater, but in the area of Grand Point and Gramercy they contain saline water. Freshwater in the shallow sands is high in iron concentration and has hardness values that range from hard to very hard.

The quality of freshwater in the point bars, Mississippi River alluvial aquifer, and shallow sands is generally inferior to the quality of freshwater in the Gramercy and Norco aquifers. Therefore, where the Gramercy and Norco aquifers contain freshwater, wells generally are completed in them instead of the shallow aquifers.

Water levels in the shallow aquifers follow closely the stages of the Mississippi River (fig. 4, well SJB-144). Highest water levels may reach land surface or slightly above, depending on altitude of the land surface at the well site. Lowest water levels are about 15 to 20 ft below land surface in wells near the river and about 10 ft below the land surface in wells in backswamp areas. Although the shallow aquifers are used sparingly as water sources, they are significant because they connect hydraulically with the river as well as the underlying Gramercy and Norco aquifers. Thus the river, the shallow aquifers, and the Gramercy and Norco aquifers form a regional hydrologic system in which the ground water moves in response to head differences between individual aquifers and between the river and aquifers. Most of the time the river

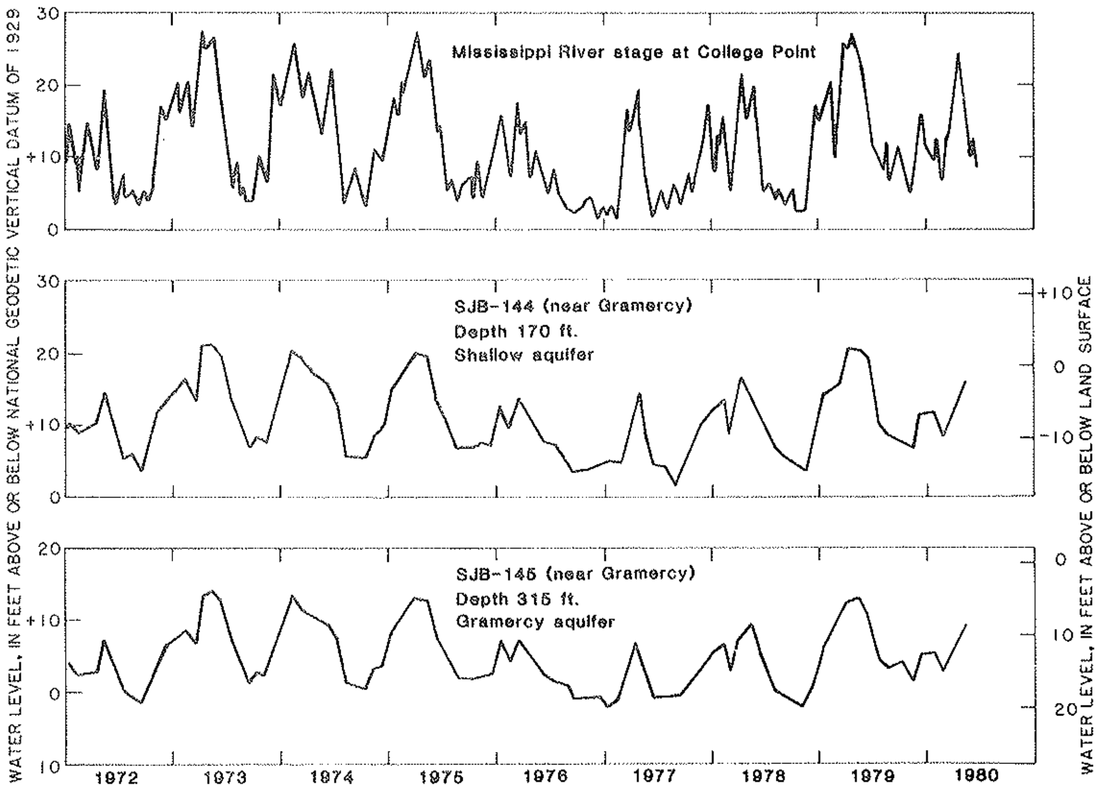


Figure 4.--Effects of Mississippi River stages on water levels in wells in the shallow and Gramercy aquifers.

is a gaining stream because the potentiometric head in the aquifers is higher than the river stage except during periods when the river is at a high stage. Where ground-water pumping has lowered ground-water levels, the hydraulic gradient is reversed; and water from the river recharges the aquifer.

Gramercy Aquifer

Extent, Thickness, and Lithology

The Gramercy aquifer is the most important source of fresh ground water in the area in terms of the size of the area where it contains freshwater (pl. 5). The aquifer is continuous over a broad area approximately parallel to the Mississippi River between Convent and Reserve. East of Reserve it becomes thin, divides into thin sands, or is absent entirely (Hosman, 1972, p. 19); and the same condition applies to the northern third of the area covered by this report. West of Convent the aquifer loses its identity as a separate geohydrologic unit as it merges with the underlying Norco aquifer and the overlying Mississippi River alluvial aquifer (fig. 3).

The top of the Gramercy aquifer is about 175 to 240 ft below land surface in most of the report area. Aquifer thickness ranges from 75 ft or less to more than 225 ft, increasing generally north to south (pl. 6).

Lithologic samples from test holes indicate that the Gramercy aquifer is composed mainly of fine to medium sand but may contain streaks of coarse sand and fine gravel. Grain size typically grades from fine sand at the top to coarse sand and gravel in the middle and lower parts of the aquifer.

Quality of the Water

Ground water in the Gramercy aquifer underlying most of the study area is slightly saline. The maximum chloride concentration (table 3) is 1,500 mg/L, but most analyses show less than 1,000 mg/L. Much of the area where freshwater is available is conveniently near the Mississippi River (pl. 5).

Freshwater from the Gramercy aquifer is variable in quality, depending on locality, but generally may be classified as a calcium magnesium bicarbonate type. The water is moderately hard (61-120 mg/L) to very hard (more than 180 mg/L) except in a small area near Belmont where the water is soft. The highest values of hardness occur in areas where the Gramercy aquifer is hydraulically connected with overlying point-bar deposits or shallow sands. The effect of point bars on water quality is shown by chemical analyses of water from two wells, SJ-81 and SJ-84, in T. 13 S., Rs. 16 and 17 E., which are both screened in the Gramercy aquifer. Water from well SJ-81, where the point bar is not present, has a hardness of 120 mg/L; but water from well SJ-84, where the point bar is convergent with the Gramercy aquifer, has a hardness of 390 mg/L. (See table 3 and pl. 1.)

Test drilling was conducted near Belmont in 1975 and 1977 to delineate the area where soft water was reported by Cardwell, Rollo, and Long (1963, table 5). Chemical analyses of water from several test wells and privately owned wells in the area confirmed that the water is soft (less than 30 mg/L), is low in iron concentration, and has a relatively high pH that ranges between 7.5 and 8.1. The area underlain by fresh, soft water is about 2.5 mi long by 0.5 mi wide and extends from Welham Plantation to the community of Bend (fig. 5). North and east of this area the Gramercy aquifer contains salty water, and south and west the aquifer contains hard water.

The geohydrologic conditions that caused the softening of water in the Belmont area are not clearly understood, but evidence obtained from chemical analysis indicates that the water is softened as it moves a relatively short distance through the aquifer from the river. At test well SJ-198A near the riverbank, ground water from the Gramercy aquifer is a calcium magnesium bicarbonate type with a hardness of 244 mg/L.

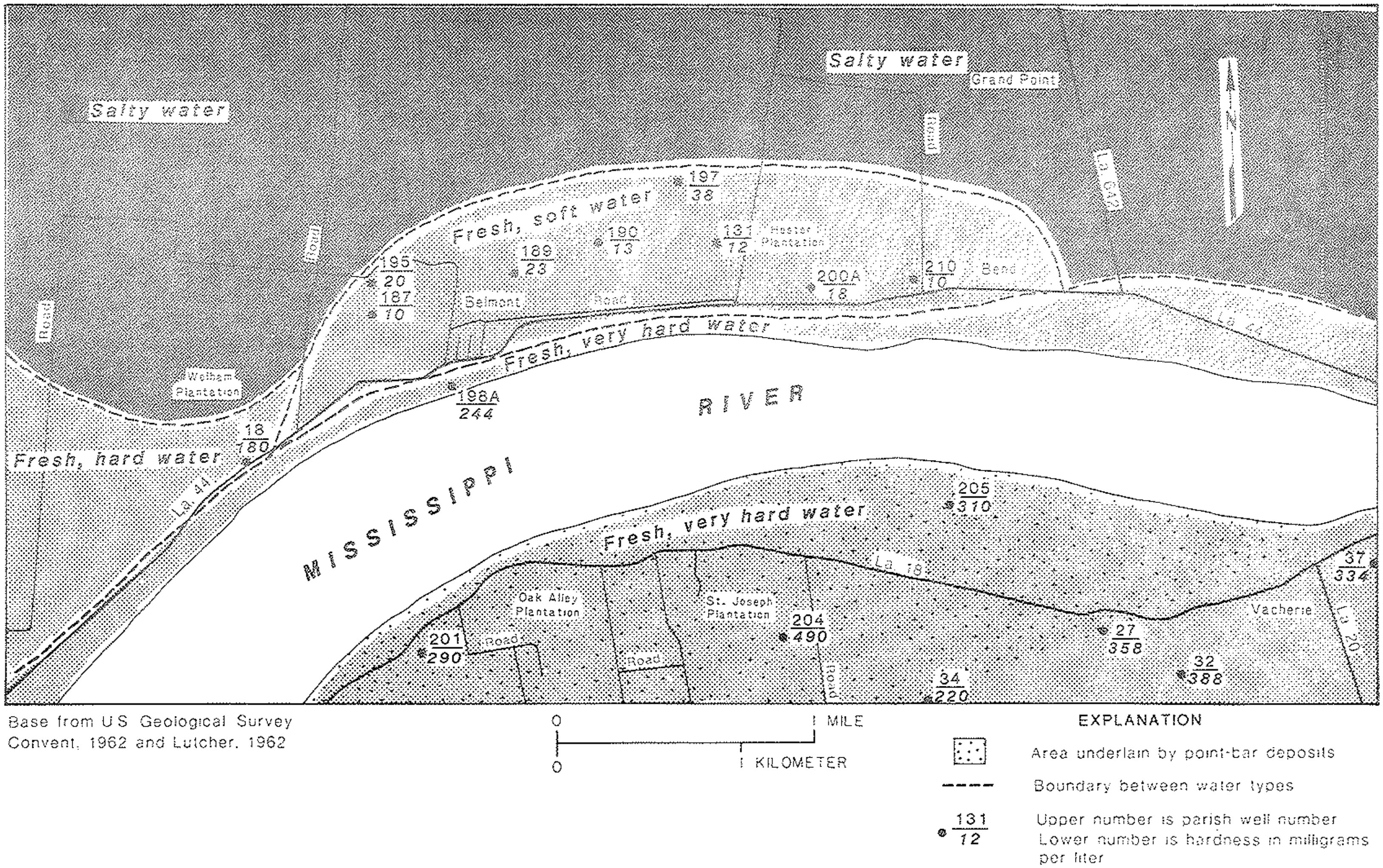


Figure 5.--Types of water in the Gramercy aquifer, Belmont area, St. James Parish.

However, 2,000 ft away at well SJ-187, the water has changed to a sodium bicarbonate type with a hardness of 10 mg/L. The effect of softening is also evident in the shallow aquifer at Belmont, as indicated by an analysis of water from well SJ-130, situated about 700 ft away from the river. Water from the shallow aquifer near the river (well SJ-198B) is very hard and chemically similar to that from the Gramercy aquifer (well SJ-198A). (See table 3.)

Aquifer Characteristics and Well Yields

Pumping tests to determine hydraulic characteristics of the Gramercy aquifer show that the hydraulic conductivity[3/] is about 100 ft/d, or 750 (gal/d)/ft^2, at Gramercy and about 250 ft/d, or 1,900 (gal/d)/ft^2, at St. James. The aquifer characteristics obtained from these tests are shown below:

Location	Wells		Transmissivity (ft^2/d)	Thickness (ft)	Coefficient of storage
	Pumped	Observed			
Gramercy---	SJB-136--	SJB-137--	9,000	90	0.0002
St. James--	SJ-5-----	SJ-6----- SJ-39----	30,000	120	.0006

The theoretical specific capacities of wells developed in material having these characteristics is approximately 30 and 80 (gal/min)/ft of drawdown, respectively, assuming that the wells are 100 percent efficient and that the entire thickness of the aquifer is screened. (See Meyer, 1963, p. 339.) Specific capacities reported for large wells in the Gramercy aquifer range from 24 to 54 (gal/min)/ft of drawdown.

Yields of large industrial wells range from a few hundred gallons per minute to over 3,000 gal/min. Although a few irrigation wells capable of yielding several hundred gallons per minute have been drilled, they are pumped only during rare drought periods. Many small-diameter wells for domestic and stock supplies are screened in the Gramercy aquifer in areas where it contains freshwater.

3/Hydraulic conductivity replaces the term "field coefficient of permeability," which is no longer in general use. In the text, units of hyd.aulic conductivity are followed by the older units of permeability. To convert hydraulic conductivity to field coefficient of permeability, multiply by 7.48. The same conversion rule applies to transmissivity, which replaces the term "transmissibility."

Withdrawals and Water Levels

In 1975, total pumpage from the Gramercy aquifer in St. James and St. John the Baptist Parishes averaged about 7.4 Mgal/d, of which about two-thirds (68 percent) was withdrawn in the Gramercy area. The remaining third (32 percent) was pumped at Reserve, Edgard, and St. James. Almost all of the pumpage from the Gramercy aquifer is for industrial use. Withdrawals for irrigation, domestic, and stock uses average only about 0.2 Mgal/d.

Typically, water levels in the Gramercy aquifer reach their seasonal high in the spring and low in the fall, coinciding with the seasonal high and low river stages (fig. 4, well SJB-145). In wells near the river, water levels may fluctuate seasonally from slightly above land surface to about 20 ft below land surface. Water levels in wells located near the backswamps range from several feet above to less than 10 ft below land surface, depending on the land-surface altitude and the season. The seasonal fluctuation in water levels decreases as the distance of the well from the river increases (fig. 6).

The effect of pumping from the Gramercy aquifer is shown by the configuration of the potentiometric surface in the Gramercy area (pl. 7). At low river stage the head difference between the river and the water level in well SJB-145 is almost 3 ft (fig. 4), causing the direc-

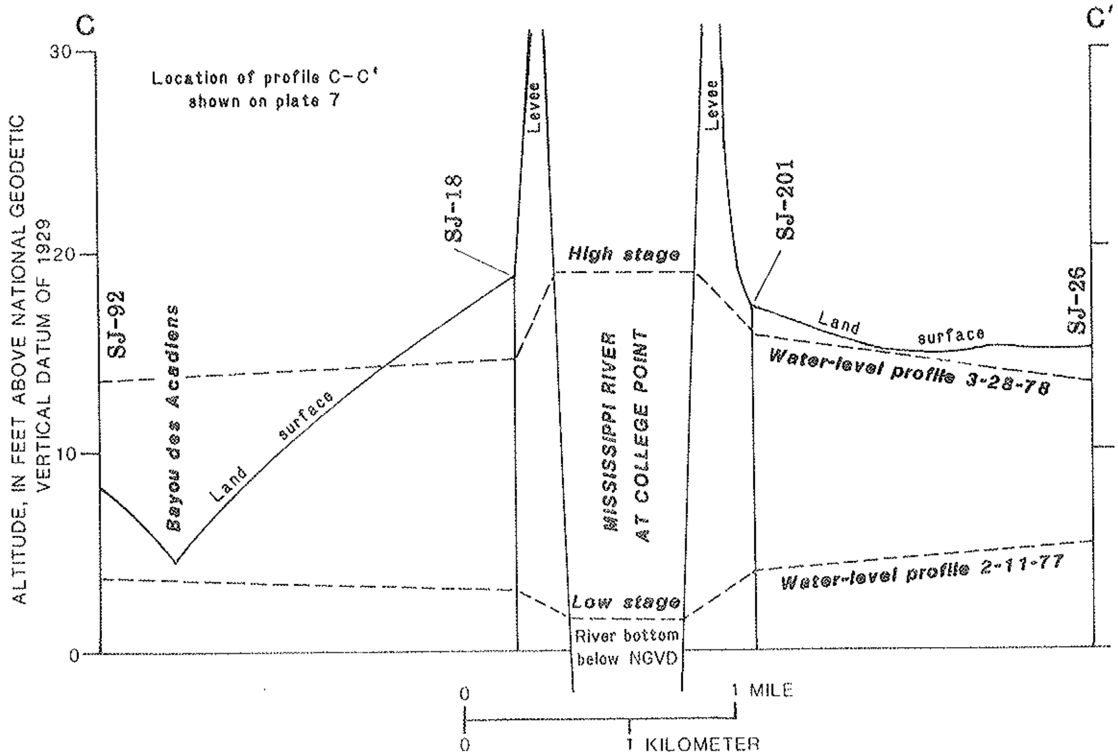


Figure 6.--Profiles of water levels in wells in the Gramercy aquifer at high and low river stages.

tion of ground-water flow to be opposite the natural flow direction at low river stage. The cone of depression created by the pumping center affects ground-water movement only within a few miles of Gramercy. The normal direction of ground-water flow at low river stage is toward the river, as can be inferred from the water-level contours upstream from Belmont. Water-level measurements taken at high river stage (March 1978) indicate a head difference of 8 ft between the river stage and the water level in well SJB-145. Thus, the recharge effect of the river is more pronounced at high stage because the hydraulic gradient toward the pumping cone is steeper.

Development Potential

Of the three major aquifers in the Gramercy area, the Gramercy aquifer has the best potential for future development. Future industrial expansion will occur along the Mississippi River, where the Gramercy aquifer contains freshwater in a large part of the area. In areas where the aquifer contains salty water, the water is generally less saline than that in the Norco and Gonzales-New Orleans aquifers. This water of low salinity may be usable in applications where freshwater is not essential.

In the area of Belmont, where the Gramercy aquifer contains soft water (fig. 5), there is some potential for development of a public water supply. The area of soft water occupies about 0.7 mi^2, and the aquifer has an average thickness of 125 ft. The main problem associated with developing this resource is encroachment, induced by pumping, of water of poorer quality from adjoining areas. Heavy withdrawal from the relatively small area would probably cause encroachment of salty water from the north and east; fresh but very hard water would be drawn in from the south and west. The effect would be a gradual blending of the good water with the poorer quality water and an overall deterioration of water quality.

If development of a public water supply for the Belmont area is considered, some control measures would be needed to delay the encroachment of poorer quality water. The best arrangement of wells would be to place them near the center of the zone of soft water and to use maximum spacing in an east-west direction parallel to the river. The wells should be pumped in a manner that would minimize drawdown by pumping at low constant rates and pumping alternately between wells in the well field. Long sustained pumping would increase the drawdown, which affects the rate of movement of water toward the well. The well field should also include monitor wells between the production wells and the hard or saline water. These would give an early indication of increasing hardness or salinity in the well field and would be helpful in planning strategy to lessen the effect of encroachment.

Another possibility for developing the ground-water supply would be to mix ground water with treated water from the Mississippi River. The proper blend of soft ground water and hard river water would lessen or eliminate the need for treating the river water for hardness. A treatment facility already exists about 1 mi upriver from the west edge of the soft-water area and could be utilized for treating and blending the waters. An added advantage of using ground water as an alternative source is the possibility of temporary contamination of river water by accidental spills of hazardous materials. In such cases, ground water could be used solely until the danger of contamination is past.

Although the Gramercy aquifer contains salty water in much of the area, in many industrial uses, moderately saline water or a blend of freshwater and salty water can be tolerated. For years the Kaiser Aluminum and Chemical Corp. plant near Gramercy has controlled saltwater encroachment by the careful selection of well sites. Wells that are pumped near the river induce recharge from the river, and wells farthest from the river intercept the salty water as it enters the well field from the north and east. Well locations and highest and lowest chloride concentrations at each site are shown in figure 7. (See also tables 2 and 3.)

Norco Aquifer

Extent, Thickness, and Lithology

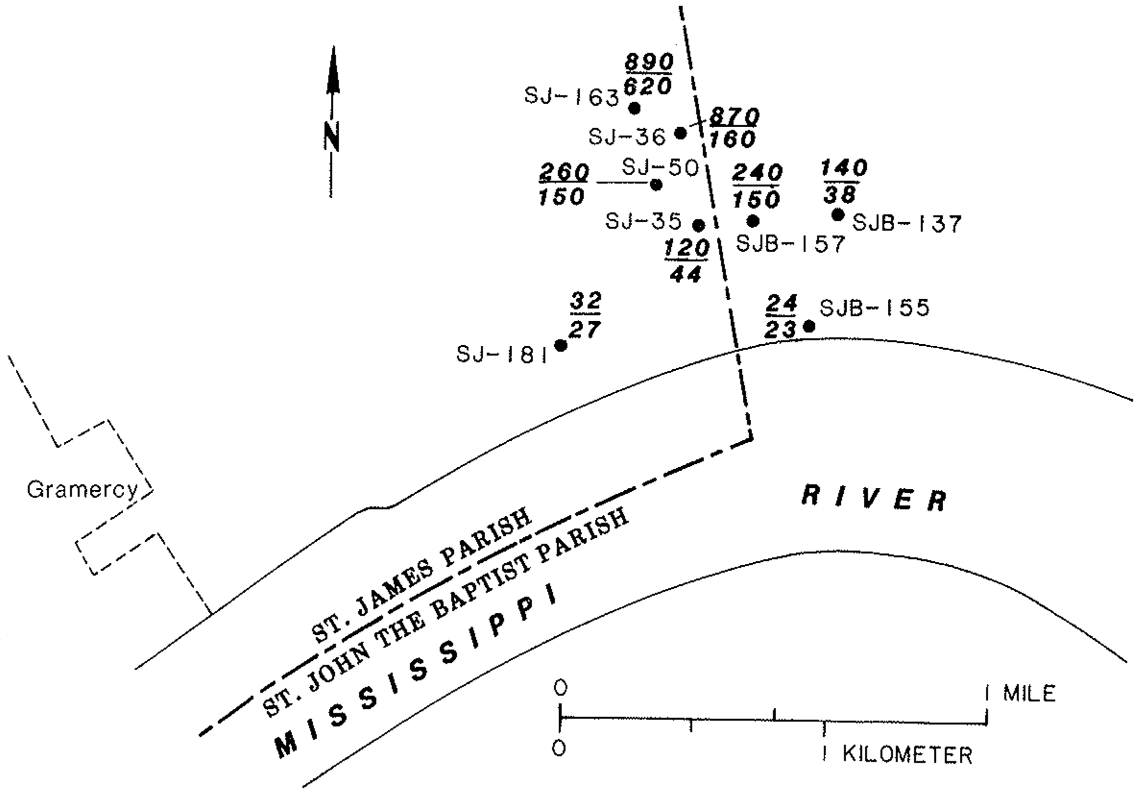
The Norco aquifer is present throughout the Gramercy area but is little used as an aquifer because it contains salty water in most of the area. Areas where freshwater is available are shown on plate 8. A narrow lobe of freshwater extends southward from Sorrento to Convent. Freshwater also occurs in two small areas east of Reserve and Lac Des Allemands that are part of a much larger body of freshwater extending northeastward toward Laplace and Norco (Hosman, 1972, pl. 1B).

The thickness of the Norco aquifer ranges from 75 to 200 ft in the Gramercy area (pl. 9). The aquifer is thickest in the vicinity of Vacherie, and thinnest southeast of Sorrento and near Gramercy. In areas where the Norco aquifer converges with the Gramercy aquifer, only the approximate thickness of the Norco aquifer is shown on plate 9.

The aquifer is lithologically similar to the Gramercy aquifer. The upper part of the aquifer consists of fine sand, with medium to coarse sand occurring in the lower part. Fine gravel may also be present in the lower part of the aquifer, generally occurring in thin layers a few feet thick.

Quality of the Water

The Norco aquifer contains salty water in most of the Gramercy area. However, the water is only moderately saline with known chloride concentrations ranging from about 400 to 1,600 mg/L. Although not suitable for public-supply purposes, the water may be suitable for some industrial applications.



Well no.	Depth (feet)	Screened interval	Period of record
SJ-35	245	205-245	1958-74
SJ-36	245	205-245	1957-71
SJ-50	245	208-248	1958-67
SJ-163	264	208-264	1963-79
SJ-181	269	207-269	1974-79
SJB-137	287	207-287	1963-71
SJB-155	260	210-260	1969-79
SJB-157	288	208-288	1970-79

EXPLANATION

● SJ-35 Well location and number

870 / 160 — Highest chloride concentration / Lowest chloride concentration (in milligrams per liter)

(See analyses in tables 3 and 4)

Figure 7.--Ranges in chloride concentrations in Kaiser well field, Gramercy, La.

In the area where the Norco aquifer contains freshwater (pl. 8), the water quality is good. Hardness is typically 80 to 90 mg/L; and at the site of test well SJ-208, near Welcome, hardness is only 40 mg/L. The combined values of iron and manganese usually fall below 0.5 mg/L, and pH is generally 7.5 to 8.0. The water could be used for many purposes with little or no treatment.

Aquifer Characteristics and Well Yields

Aquifer-test data are available for one test that was conducted at the Helvetia Sugar Cooperative near Central. The transmissivity obtained from the test is 21,000 ft^2/d, or 160,000 (gal/d)/ft; hydraulic conductivity is 210 ft/d, or 1,600 $(gal/d)/ft^2$; and the storage coefficient is approximately $5x10^{-4}$. These results are comparable to those reported in the Norco area (Hosman, 1972, p. 39). Transmissivity probably is greater than that shown by the aquifer test at Helvetia in areas where the aquifer has a greater thickness. The thickness at the test site is about 100 ft.

In the Gramercy area the largest well yield reported from the Norco aquifer is 1,230 gal/min, and the highest reported specific capacity is 28 (gal/min)/ft of drawdown. The theoretical maximum specific capacity of a well screened in an aquifer having the characteristics described at Helvetia is about 60 (gal/min)/ft of drawdown (Meyer, 1963, p. 339). The difference between the theoretical and the actual specific capacity can be attributed to such factors as partial penetration of the aquifer by the well screen, head losses at the screen entrance, and friction losses in the well casing. Under actual operating conditions, pumping wells seldom achieve 100-percent efficiency; but many wells in the Baton Rouge-New Orleans area have an efficiency of about 70 percent. Therefore, a specific capacity of about 40 (gal/min)/ft of drawdown might be reasonably attainable from a well that is constructed to obtain maximum specific capacity.

Withdrawals and Water Levels

The average pumpage from the Norco aquifer was 1.2 Mgal/d in 1975. Most pumpage is for industrial use, but small amounts are pumped for domestic and livestock uses. The potential for much greater industrial pumpage is available for applications where water with low salinity can be tolerated.

Water levels in the Norco aquifer are affected by the stage of the Mississippi River in the same manner as levels in the shallow and Gramercy aquifers. (See figs. 4 and 8.) A comparison of hydrographs of wells SJ-41 and SJB-53 (fig. 8) shows that in the eastern part of the Gramercy area, water levels are a few feet lower than in the western part because of the effect of pumping at Norco (Hosman, 1972, pl. 6). The present rate

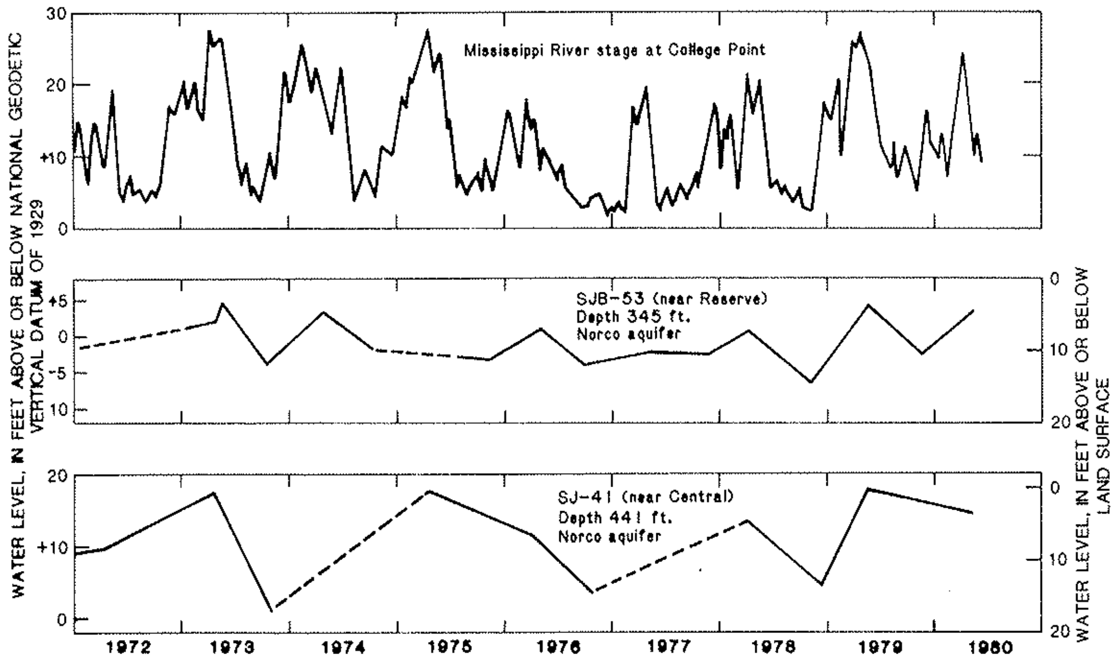


Figure 8.--Water levels in wells in the Norco aquifer and Mississippi River stages at College Point.

of pumping from the Gramercy aquifer has little effect on water levels in the Norco aquifer. Heavy and sustained pumping from the overlying Gramercy aquifer might possibly induce drawdown in the Norco aquifer in areas of convergence; but sustained pumping from the Gramercy aquifer occurs only in the vicinity of Gramercy, where the two aquifers are separated by a clay layer.

Development Potential

The Norco aquifer has the potential for extensive development near Sorrento, where it contains freshwater throughout and has a thickness of approximately 100 ft (pl. 9). A test well (An-258B) at Sorrento shows water of generally good quality, with iron and hardness concentrations of 0.22 and 84 mg/L, respectively. South of Sorrento the water quality is similar to that in the Sorrento area (tables 3 and 4; wells SJ-41, SJ-108, and SJ-193).

A continuation of the lobe of freshwater in the Norco aquifer occurs on the west (south) side of the Mississippi River near Welcome (pl. 8). Test wells drilled near Welcome confirm that the water is similar in quality to that on the east (north) side. At the site of test well SJ-208 the water is soft, but at the site of test well SJ-211, 0.5 mi to the west, the water is hard (table 4).

The water of good quality in the Norco aquifer near Welcome, though limited areally, is significant because of its potential usability as a public-supply source. It is the only source of relatively soft water on the west side of the Mississippi River in the report area. However, before the aquifer is considered for possible development, additional test drilling is needed to determine the extent of the zone containing freshwater and to determine the quality of this water between Welcome and Convent. As the water of good quality is in an area where the Gramercy and Norco aquifers converge, the possibility that pumping may cause migration of water of poorer quality toward pumping wells should be considered.

Gonzales-New Orleans Aquifer

Extent, Thickness, and Lithology

The Gonzales-New Orleans aquifer is a continuous geohydrologic unit extending from eastern Iberville Parish to the eastern part of Orleans Parish. The aquifer was formerly called the Gonzales aquifer by Long (1965b) in the Geismar-Gonzales area, and the "700-foot" sand by Eddards, Kister, and Scarcia (1956, p. 32) and Rollo (1966, p. 22) in the New Orleans area. West of the Mississippi River in Iberville Parish the aquifer merges with shallower sands and is not distinguishable as a separate unit (Whiteman, 1972, pl. 2).

The thickness of the Gonzales-New Orleans aquifer ranges from about 200 to 300 ft in the Gramercy area. The minimum thickness is in the northern and northeastern parts of the area, and the maximum thickness lies to the south and west of Vacherie (pl. 10).

The sand in the Gonzales-New Orleans aquifer is fine to medium and is more uniform than the sand in the Norco and Gramercy aquifers. Gravel is found only rarely in the aquifer.

Quality of the Water

The water in the Gonzales-New Orleans aquifer is moderately saline in most of the area of study. The upper part of the aquifer contains freshwater in the vicinity of Sorrento and in an area extending southwestward from Lake Maurepas (pl. 10). Chemical analyses of water from test wells screened in the aquifer (An-258A, at Sorrento, and SJ-183, along Interstate Highway 10 east of Blind River) show that the water in those areas is soft and generally of good quality (table 4). The combined concentration of iron and manganese at both sites is less than 0.3 mg/L, and pH is 7.8 to 8.0. The characteristic yellow color associated with water in the Gonzales-New Orleans aquifer in the New Orleans area is not present in the Gramercy area.

Aquifer Characteristics and Well Yields

The Gonzales-New Orleans aquifer is not used in the Gramercy area, and aquifer-test results are not available. However, in the adjoining Gonzales area the hydraulic conductivity is about 120 ft/d, or 900 (gal/d)/ft^2, and the transmissivity is about 32,000 ft^2/d, or 240,000 (gal/d)/ft, (Long, 1965b, p. 13). At Norco the hydraulic conductivity is 90 ft/d, or 680 (gal/d)/ft^2, and the average transmissivity (from two aquifer tests) is about 20,000 ft^2/d, or 150,000 (gal/d)/ft, (Hosman, 1972, p. 49-50). The results at Norco compare favorably with results obtained in the New Orleans area (Rollo, 1966, p. 65). In the Sorrento area the aquifer characteristics should be comparable to those in the Gonzales area because the physical characteristics of the aquifer are about the same in the two areas.

Withdrawals and Water Levels

Pumpage from the Gonzales-New Orleans aquifer is negligible because it contains salty water in all of the industrialized area along the Mississippi River. Several small-diameter wells for household and commercial uses are screened in the aquifer near Sorrento where the upper part of the aquifer contains freshwater. The total pumpage from these wells is estimated to be less than 10,000 gal/d (1978).

Water levels in wells near Sorrento and at Gonzales, just outside the report area (fig. 1), range from slightly above to a few feet below land surface. (See well An-2, fig. 9.) The aquifer in those areas shows little or no effect from pumping. It is affected by the stages of

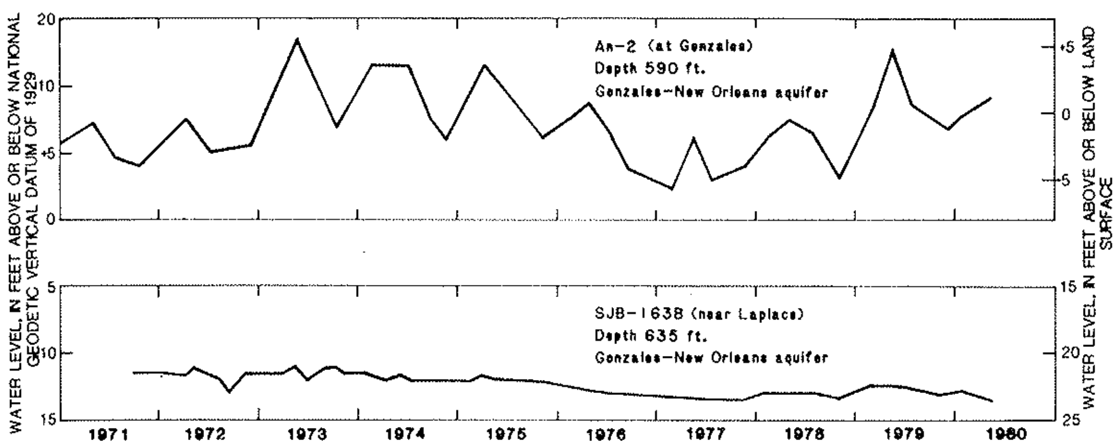


Figure 9.--Water levels in wells in the Gonzales-New Orleans aquifer.

the Mississippi River, as shown by the seasonal fluctuations in the hydrograph, because of hydraulic connection with the shallow aquifers and the river northwest of the report area (Long, 1965b, pl. 1). On the other hand, water levels in well SJB-163B at Laplace, just east of the Gramercy area, are 20-25 ft below land surface and show the effect of pumping in the New Orleans area. A comparison of water levels in the two wells shows that water levels in the Laplace area average about 15 ft lower than at Gonzales. Water levels in well SJB-163B do not fluctuate with river stage, which indicates that the hydraulic connection between river and aquifer in the eastern part of the area is poor. At Laplace, as in most of the Gramercy area, a thick clay separates the Gonzales-New Orleans aquifer from the shallower aquifers.

Development Potential

Development of the Gonzales-New Orleans aquifer in the areas where it contains freshwater runs the risk of inducing the upward movement of saltwater from the lower part of the aquifer. Consequently, development for other than small domestic supplies is dependent on a system that can withdraw the freshwater while minimizing the upward movement of salty water or that can separate freshwater and salty water and dispose of the salty water.

The principles involved in operating a scavenger well were tested in a well in the Gonzales-New Orleans aquifer at Gonzales. This test and the principles of the scavenger well have been described by Long (1965a). The conditions favorable for operating a scavenger well are present in the Sorrento area and are similar to those at Gonzales. The upper part of the aquifer contains freshwater that overlies the denser salty water at the base. Two wells, one screened in the upper part and one in the lower part of the aquifer, are pumped simultaneously, with the upper well drawing off the freshwater and the lower well the salty water. Operation of the freshwater well by itself would be unsuccessful as it would cause upward migration of salty water toward the well screen because of the drawdown caused by pumping. The principle of the scavenger well is illustrated in figure 10.

The main disadvantages of the scavenger-well operation are the expense of installing additional wells to intercept the salty water and the problem of disposing of the salty water. A possible disposal method is to inject the salty water into a deeper saltwater-bearing aquifer than that from which it was taken.

Although the scavenger-well operation is technically feasible, the economic feasibility of such a system would have to be weighed against other possibilities. For example, if the alternative source of supply is surface water and extensive treatment is needed, the cost of a scavenger-well operation that delivers treatment-free ground water may be economically competitive when compared with water-treatment costs over a period of several years.

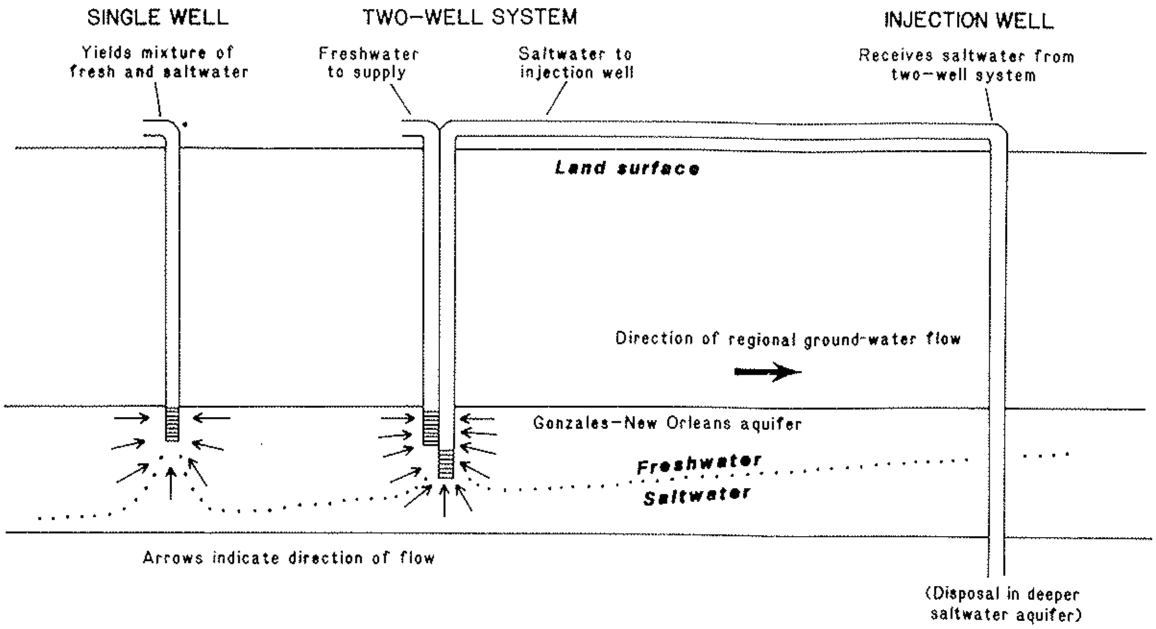


Figure 10.--Operation of a scavenger well to recover freshwater overlying saltwater.

SUMMARY AND CONCLUSIONS

The Mississippi River, the shallow aquifers, and the Gramercy and Norco aquifers are part of a single interconnected hydrologic system. The shallow aquifers not only afford direct connection to the river in many cases, but in some places they are hydraulically connected to the deeper aquifers. Thus the constantly changing head differences created by river stages cause changing flow patterns in the aquifer system. Under natural conditions the river in the Gramercy area receives water discharged from the aquifers except during high river stages when the aquifers are recharged by the river. However, drawdown created by pumping from wells has the effect of reversing the natural flow, and the river constantly recharges the aquifer.

The shallow aquifers consist of point bars, the Mississippi River alluvial aquifer, and local sands occurring above the Gramercy aquifer. Point bars have little significance as far as development is concerned because of low yields and poor water quality. The Mississippi River alluvial aquifer has some potential for development on the west side of the river between St. James and the west margin of the report area. Water from the alluvial aquifer is hard and contains excessive amounts of iron, but it may be suitable for many industrial or agricultural uses. A shallow aquifer above the Gramercy aquifer occurs locally between Belmont and Gramercy. It has some potential for use, especially where the underlying Gramercy aquifer contains salty water. However, water from this aquifer is very hard and high in iron concentration.

Three major aquifers--the Gramercy, Norco, and Gonzales-New Orleans--contain freshwater in at least a part of the Gramercy area. A large part of the area, however, contains no fresh ground water. Fortunately, much of this area is uninhabited backswamps away from the Mississippi River. The Gramercy and Norco aquifers are probably best suited for future development because much of the areas where they contain freshwater are adjacent to the Mississippi River. The Gonzales-New Orleans aquifer contains no freshwater in areas immediately adjacent to the river. Water of good quality is available in the Gramercy, Norco, and Gonzales-New Orleans aquifers in local areas. The Gramercy aquifer near Belmont and the Norco aquifer between Sorrento and Central contain water of suitable quality for public-supply use. The usable quantities are limited, however, and should be developed in a manner that minimizes the threat of saltwater encroachment. The Gonzales-New Orleans aquifer has water of excellent quality in the Sorrento area and in an area southwest of Lake Maurepas extending at least as far as Interstate Highway 10. Heavy development in either of these areas would require the use of scavenger wells to control the upward movement of saltwater from the lower part of the aquifer.

Total ground-water pumpage from all aquifers in the area studied was about 9 Mgal/d in 1975. The potential for much greater pumpage is available, but the occurrence of salty water in the aquifers in much of the area is detrimental to their development in applications where freshwater is needed.

Water levels in all aquifers fluctuate in response to changing Mississippi River stages. The Gonzales-New Orleans aquifer is not affected by the river in the eastern part of the area. No long-term declines have been observed from water-level records, and none are anticipated. Heavy pumping from the Gramercy aquifer at Gramercy has caused some lowering of water levels locally. However, the amount of drawdown is lessened by induced recharge from the river, with which the aquifer is in good hydraulic connection.

A possible source of water for public-supply use was revealed by test drilling near Welcome. In this area the Norco aquifer contains freshwater of good quality in a small area along the river road. Additional test drilling is needed, however, to determine the areal extent of the freshwater. The area where the aquifer contains freshwater is in a narrow zone of 1 mi or less in width that changes abruptly from freshwater to salty water.

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HYDROLOGIC DATA

Tables 2-4

TABLE 2.—RECORDS OF SELECTED WATER WELLS

(USE OF WATER: H, DOMESTIC; F, FIRE CONTROL; N, INDUSTRIAL; I, IRRIGATION; U, UNUSED)

LOCAL NUMBER	LATITUDE AND LONGITUDE DEGREES-MINUTES-SECONDS	OWNER	DEPTH OF WELL (FEET)	DEPTH TO FIRST OPENING (FEET)	DATE COMPLETED	USE OF WATER	WATER LEVEL (FEET)	DATE WATER LEVEL MEASURED	CASING DIAMETER (INCHES)	DISCHARGE (GALLONS PER MINUTE)	DRAWDOWN (FEET)	PUMP INTAKE SETTING (FEET)
					SHALLOW AQUIFERS							
AN- 200A	30 08 57 N 090 55 30 W	LA PUBLIC WORKS	226	216	06/16/1961	U	4.46	06/19/1961	4	75	--	45
AN- 200B	30 08 57 N 090 55 30 W	LA PUBLIC WORKS	134	124	06/19/1961	U	--	--	2.5	20	--	--
SJ- 148	30 02 57 N 090 41 00 W	COLONIAL SUGARS	160	130	03/29/1962	N	2.35+	04/10/1962	10	485	49	70
SJ- 161	30 05 55 N 090 54 25 W	ALTEX READY MIX	104	84	06/03/1962	N	9.50	06/22/1962	6	--	--	40
SJ- 165	30 00 27 N 090 50 24 W	F FALGOUST, JR	212	142	06/19/1963	I	11.00	06/19/1963	12	2300	--	70
SJ- 177	30 02 37 N 090 40 59 W	LA PUBLIC WORKS	136	126	10/18/1968	U	15.75	10/21/1968	4	21	7	--
SJ- 178	30 02 37 N 090 41 11 W	LA PUBLIC WORKS	136	126	10/24/1968	U	14.75	10/28/1968	4	50	53	--
SJ- 179	30 04 58 N 090 55 02 W	GULF OIL CORP	180	120	07/14/1967	F	--	--	10	510	--	60
SJ- 182	30 02 49 N 090 41 09 W	LA PUBLIC WORKS	140	135	09/ /1974	U	7.30	12/09/1974	2	15	--	--
SJ- 184A	30 07 58 N 090 43 41 W	LA PUBLIC WORKS	170	155	10/23/1974	U	10.88	10/25/1974	4	50	6	--
SJ- 198B	30 00 56 N 090 46 45 W	U S GEOL SURVEY	188	181	12/09/1975	U	15.86	12/08/1975	2	25	--	--
SJ- 200B	30 01 15 N 090 45 31 W	U S GEOL SURVEY	159	152	12/22/1975	U	3.95	01/05/1976	2	19	--	--
					GRAMERCY AQUIFER							
AN- 284	30 07 52 N 090 53 28 W	U S GEOL SURVEY	218	208	10/18/1977	U	4.45	10/18/1977	4	30	13	--
SJ- 4	29 59 38 N 090 50 45 W	ST JAMES SUGAR	341	300	08/10/1946	N	--	--	8	--	--	--
SJ- 5	29 59 38 N 090 50 45 W	ST JAMES SUGAR	345	245	09/20/1946	N	2.96	05/07/1957	18	2178	27	--
SJ- 6	29 59 40 N 090 50 50 W	ST JAMES SUGAR	338	258	08/10/1946	N	1.55	05/07/1957	18	2259	--	--
SJ- 7	29 59 41 N 090 50 45 W	ST JAMES SUGAR	348	268	09/30/1952	N	2.10	05/07/1957	18	1747	--	--
SJ- 35	30 03 26 N 090 39 50 W	KAISER ALUMINUM	245	205	05/02/1957	N	--	--	8	370	--	50
SJ- 36	30 03 41 N 090 39 53 W	KAISER ALUMINUM	245	205	04/23/1957	N	5.00	04/22/1957	8	670	--	50
SJ- 50	30 03 34 N 090 39 57 W	KAISER ALUMINUM	248	208	10/08/1958	N	11.00	10/08/1958	8	500	--	80
SJ- 59	30 02 57 N 090 41 00 W	COLONIAL SUGARS	380	238	06/09/1959	N	14.70	07/01/1959	18	2500	26	100
SJ- 120	30 05 16 N 090 52 02 W	TRANSCON GAS	216	196	10/20/1961	U	--	--	4	50	--	--
SJ- 163	30 03 43 N 090 39 59 W	KAISER ALUMINUM	265	208	07/10/1962	N	16.82	07/10/1962	12	602	19	90
SJ- 166	30 00 47 N 090 50 37 W	NELSON FALGOUST	244	180	07/19/1963	I	12.00	07/19/1963	12	--	--	70
SJ- 167	30 01 40 N 090 50 37 W	C WAGUESPACK	297	229	07/08/1963	I	13.00	07/08/1963	12	--	--	70
SJ- 170	30 06 22 N 090 53 43 W	TEXACO INC	250	220	07/ /1965	N	4.00	07/ /1965	6	--	--	110
SJ- 172	29 59 38 N 090 50 30 W	ST JAMES SUGAR	342	232	1963	N	13.92	01/24/1964	30	3260	100	145
SJ- 173	29 59 38 N 090 50 50 W	ST JAMES SUGAR	342	282	12/ /1963	N	12.00	12/ /1963	8	--	--	100
SJ- 174	30 02 23 N 090 41 55 W	LUTCHER ICE CO	265	235	05/15/1965	N	10.00	05/15/1965	8	--	--	80
SJ- 181	30 03 12 N 090 40 07 W	KAISER ALUMINUM	269	207	03/30/1971	N	12.30	03/30/1971	12	363	8	150
SJ- 186	30 04 33 N 090 40 37 W	U S GEOL SURVEY	230	220	11/29/1974	U	3.98	12/09/1974	2	--	--	--
SJ- 194	30 01 17 N 090 47 20 W	U S GEOL SURVEY	259	252	09/22/1975	U	5.50	09/24/1975	2	20	--	--
SJ- 195A	30 01 15 N 090 47 02 W	U S GEOL SURVEY	329	322	10/13/1975	U	4.56	10/13/1975	2	33	--	--
SJ- 195B	30 01 15 N 090 47 02 W	U S GEOL SURVEY	262	255	10/ /1975	U	4.80	10/15/1975	2	21	--	--
SJ- 196	30 01 23 N 090 49 15 W	U S GEOL SURVEY	278	271	10/31/1975	U	3.75	11/08/1975	2	20	--	--
SJ- 197	30 01 34 N 090 45 59 W	U S GEOL SURVEY	300	293	11/24/1975	U	3.62	11/24/1975	2	35	--	--
SJ- 198A	30 00 56 N 090 46 45 W	U S GEOL SURVEY	358	351	12/05/1975	U	16.63	12/05/1975	2	23	--	--
SJ- 199	30 04 22 N 090 41 24 W	U S GEOL SURVEY	255	248	12/16/1975	U	4.62	12/15/1975	2	30	--	--
SJ- 200A	30 01 15 N 090 45 31 W	U S GEOL SURVEY	335	328	12/19/1975	U	5.89	12/23/1975	2	22	--	--
SJ- 207	30 00 49 N 090 51 30 W	SHELL PIPELINE	301	251	03/15/1977	F	4.45	03/09/1977	12	703	14	100
SJ- 210	30 01 16 N 090 45 10 W	U S GEOL SURVEY	345	335	11/22/1977	U	4.81	11/22/1977	4	21	44	--
SJ- 211B	30 03 19 N 090 53 02 W	U S GEOL SURVEY	259	249	12/16/1977	U	2.52	12/16/1977	4	20	--	--

SJB- 27	30 02 17 N	090 34 15 W	CAIRE & GRAUGNARD	302	260	10/10/1949	N	16.58	09/16/1960	12	620	--	80
SJB- 136	30 03 30 N	090 39 41 W	KAISER ALUMINUM	287	205	05/ /1962	N	7.00	05/09/1962	12	1000	35	80
SJB- 137	30 03 30 N	090 39 30 W	KAISER ALUMINUM	287	207	1962	N	16.65	08/30/1962	12	--	--	80
SJB- 148	30 03 22 N	090 39 31 W	KAISER ALUMINUM	274	194	11/04/1964	N	23.80	11/04/1964	12	--	--	140
SJB- 155	30 03 16 N	090 39 32 W	KAISER ALUMINUM	260	210	12/30/1968	N	--	--	16	--	--	170
SJB- 157	30 03 29 N	090 39 40 W	KAISER ALUMINUM	288	208	09/30/1970	N	27.60	09/30/1970	12	1000	38	160
SJB- 168	30 04 27 N	090 39 46 W	U S GEOL SURVEY	220	210	12/17/1975	U	5.04	12/17/1975	2	30	--	--
SJB- 169	30 02 14 N	090 34 21 W	CAIRE & GRAUGNARD	316	256	04/26/1976	N	13.00	05/13/1976	12	805	24	100

NORCO AQUIFER

AN- 60	30 09 55 N	090 49 12 W	F O ROSHKO	321	--	1954	U	1.40	02/04/1957	4	--	--	--
AN- 91	30 10 30 N	090 47 15 W	EXXON CO USA	326	234	07/26/1957	N	--	--	12	1000	--	--
AN- 211	30 08 31 N	090 47 29 W	SHELL OIL CO	278	248	10/ /1961	H	--	--	4	--	--	--
AN- 2588	30 11 10 N	090 51 26 W	LA PUBLIC WORKS	270	260	09/28/1972	U	2.14	09/28/1972	4	23	13	--
SJ- 10	30 03 04 N	090 40 50 W	SUGAR CANE WAX	340	240	06/ /1952	N	15.74	07/29/1962	12	1000	--	70
SJ- 14	30 02 57 N	090 40 59 W	COLONIAL SUGARS	350	310	1913	N	16.50	01/19/1959	8	500	--	--
SJ- 41	30 04 49 N	090 52 02 W	HELVETIA SUGAR	441	399	06/08/1948	N	9.00	06/08/1948	8	411	15	70
SJ- 121	30 05 16 N	090 52 02 W	TRANSCON GAS	440	409	11/09/1961	N	8.50	11/10/1961	8	205	19	--
SJ- 171	30 06 21 N	090 53 48 W	TEXACO INC	425	325	08/20/1965	N	12.00	08/ /1965	10	--	--	60
SJ- 180	30 04 42 N	090 52 04 W	HELVETIA SUGAR	444	384	09/19/1973	--	12.20	09/19/1973	12	--	--	100
SJ- 184B	30 07 58 N	090 43 41 W	LA PUBLIC WORKS	285	270	10/23/1974	U	1.62	10/31/1974	4	25	20	--
SJ- 193	30 07 18 N	090 52 00 W	U S GEOL SURVEY	408	401	09/30/1975	U	0.33+	09/30/1975	2	30	--	--
SJ- 208	30 03 28 N	090 52 26 W	U S GEOL SURVEY	451	441	10/31/1977	U	12.78	10/31/1977	4	30	15	--
SJ- 211A	30 03 19 N	090 53 02 W	U S GEOL SURVEY	387	377	12/12/1977	U	5.78	12/12/1977	4	20	17	--
SJB- 164	30 03 31 N	090 34 03 W	GODCHAUX SUGAR	397	270	07/ /1969	N	30.00	12/27/1971	16	--	--	140

GONZALES-NEW ORLEANS AQUIFER

AN- 258A	30 11 10 N	090 51 26 W	LA PUBLIC WORKS	470	460	09/22/1972	U	0.53+	09/22/1972	2	20	--	--
SJ- 183	30 07 19 N	090 40 53 W	LA PUBLIC WORKS	575	565	10/04/1974	U	0.15+	10/10/1974	4	25	21	--
SJ- 185	30 07 16 N	090 40 22 W	LA PUBLIC WORKS	600	585	11/15/1974	U	0.20	11/15/1974	4	23	23	--

EXPLANATION OF HEADINGS FOR TABLES 3 AND 4

Local identifier.--First part is the parish well number, explained on p. 5; second part is location with respect to township, range, and section, respectively.

Abbreviations: mg/L is concentration in milligrams per liter;
μg/L is concentration in micrograms per liter.

TEMPERATURE CONVERSION TABLE

Degree Celsius (°C)	Degree Fahrenheit (°F)
19.0	66
19.5	67
20.0	68
20.5	69
21.0	70
21.5	71
22.0	72
22.5	72
23.0	73
23.5	74

TABLE 3.--PARTIAL CHEMICAL ANALYSES OF WATER FROM SELECTED WELLS

	LOCAL IDENT- I- FIER	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)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)
				SHALLOW AQUIFERS							
AN- 191	10S 3E 7	61-04-21	180	1030	--	--	--	180	200	--	--
SJ- 11	11S 15E 58	67-03-23	185	530	7.2	20.5	--	220	17	--	2400
SJ- 44	11S 15E 40	60-07-21	185	1790	--	20.5	--	450	360	--	--
SJ- 67	12S 16E 49	61-06-09	135	796	--	--	--	260	77	--	--
SJ- 68	11S 3E 63	60-12-01	87	1490	--	20.0	--	380	310	--	--
SJ- 78	12S 16E 51	67-03-24	174	655	7.9	20.0	--	230	45	--	1300
SJ- 85	12S 15E 25	61-04-11	178	770	--	--	--	260	50	--	--
SJ- 138	11S 4E 57	52-07-08	65	--	7.2	--	12	580	70	100	--
SJ- 144	11S 3E 22	62-03-29	171	747	7.2	20.0	--	190	34	--	--
SJ- 153	12S 15E 38	62-05-09	187	2630	--	20.0	30	130	650	--	--
SJ- 161	11S 3E 20	62-06-26	104	--	--	--	--	280	4.5	--	--
SJ- 176	11S 5E 190	67-02-17	114	1230	--	--	--	290	54	--	--
SJ- 178	11S 5E 51	68-10-28	136	--	--	--	--	460	66	--	--
SJ- 202	12S 16E 31	76-03-17	220	388	7.2	--	--	170	20	--	1900
SJB- 77	12S 19E 102	32-08-19	185	--	--	--	34	260	88	14000	--
SJB- 78B	12S 19E 101	61-04-12	81	5420	--	21.0	--	1400	1600	--	--
SJB- 81	12S 19E 13	45-06-19	70	11200	7.1	--	34	280	2100	800	--
SJB- 108	12S 19E 100	61-08-25	135	772	--	--	--	310	20	--	--
SJB- 124	11S 6E 15	35-08-05	170	--	--	--	7	300	320	1600	--
SJB- 125	11S 6E 10	38-08-23	165	--	7.0	--	250	160	7.0	19000	--
SJB- 127	11S 6E 10	45-12-20	175	--	7.1	--	78	220	4.1	10000	--
SJB- 139	11S 6E 27	62-06-15	150	1160	--	--	--	210	210	--	--
SJB- 152	11S 5E 44	67-02-16	134	1010	--	--	--	340	88	--	--
SJB- 153	11S 5E 190	67-02-16	134	1760	--	--	--	400	310	--	--
				GRAMERCY AQUIFER							
SJ- 5	12S 16E 9	60-10-20	345	820	--	21.0	--	160	49	--	--
SJ- 8	12S 16E 23	67-03-24	207	1120	7.2	--	--	590	8.8	--	15000
SJ- 18	12S 4E 40	67-03-23	285	1010	7.9	18.0	10	110	77	--	270
		78-03-28	285	997	--	--	--	180	44	--	--
		79-05-01	285	1000	--	--	--	200	41	--	--
SJ- 20	11S 5E 6	60-05-04	176	4220	--	--	--	380	1200	--	--
SJ- 21	12S 5E 24	61-04-11	245	2290	--	--	--	250	560	--	--
SJ- 24	12S 16E 8	61-06-18	281	644	--	21.0	--	180	47	--	--
		79-05-01	281	705	6.9	21.0	--	200	100	--	--
SJ- 26	12S 17E 11	61-04-12	249	594	--	20.5	--	240	20	--	--
		77-03-30	249	1450	7.1	21.5	--	360	200	--	--
SJ- 27	12S 17E 17	60-02-24	250	883	--	--	--	380	30	--	--
SJ- 32	12S 17E 17	60-04-27	309	762	--	--	--	390	16	--	--
SJ- 33	13S 17E 51	60-04-14	280	748	--	--	--	370	16	--	--
SJ- 37	12S 17E 20	59-01-19	280	986	6.6	20.0	--	330	38	1100	--
SJ- 81	13S 16E 39	75-06-12	275	657	7.6	21.0	--	120	16	--	2900
SJ- 82	13S 16E 39	60-04-27	253	1150	--	--	--	190	140	--	--
SJ- 84	12S 17E 1	75-06-12	285	1010	7.3	--	--	390	25	--	--
SJ- 90	12S 16E 8	60-04-14	235	721	--	--	--	190	62	--	--
SJ- 91	13S 16E 45	60-04-14	260	741	--	--	--	190	65	--	--
SJ- 92	12S 4E 10	76-03-04	250	461	--	20.0	--	130	27	--	420
SJ- 94	13S 17E 11	62-04-10	285	1470	--	21.0	--	150	260	--	--
SJ- 95	11S 15E 44	60-12-09	273	1310	--	20.5	--	130	230	2300	--
SJ- 97	11S 15E 51	60-09-15	285	1170	--	23.0	--	110	110	--	--
SJ- 99	11S 4E 7	51-08-06	236	--	7.4	--	54	300	38	1300	--
SJ- 100	11S 4E 9	60-09-21	338	3010	--	--	--	340	850	--	--
SJ- 103	11S 4E 21	60-09-21	315	714	--	--	--	--	16	--	--
SJ- 110	12S 4E 29	49-09-20	298	--	7.3	--	23	420	80	3500	--
SJ- 112	12S 16E 14	61-02-10	243	728	--	--	--	280	26	--	--
SJ- 116	11S 5E 85	61-11-08	265	2040	--	--	--	200	500	--	--
SJ- 118	11S 5E 85	61-11-08	260	1800	--	20.5	--	200	440	--	--
SJ- 119	11S 5E 85	61-06-29	240	1750	--	--	--	200	430	--	--
SJ- 120	11S 3E 38	61-10-20	216	817	--	--	--	220	47	--	--
SJ- 122	11S 5E 85	77-04-27	196	1750	--	20.5	--	210	340	--	--
SJ- 123	11S 5E 85	62-04-10	174	1640	--	20.0	--	190	360	--	--
SJ- 129	12S 4E 42	75-02-18	304	2930	--	20.5	--	250	730	--	--
SJ- 131	12S 4E 50	62-02-01	265	644	--	--	--	28	38	--	--
		75-04-04	265	458	7.9	21.0	--	12	15	--	60
SJ- 132	12S 5E 21	49-02-22	283	2390	7.7	--	7	130	590	1100	--
SJ- 133	12S 5E 6	53-09-16	275	--	7.8	--	23	360	42	5000	--
SJ- 134	12S 5E 18	50-09-27	303	--	7.6	--	17	200	600	1400	--
SJ- 135	12S 5E 15	62-02-08	270	663	--	--	--	290	14	--	--
SJ- 139	11S 4E 57	45-06-11	242	3680	7.4	--	23	190	940	3400	--
SJ- 140	11S 4E 77	62-02-08	210	5130	--	--	--	370	1500	--	--
SJ- 141	12S 5E 28	50-07-18	272	2890	7.9	--	40	160	800	1000	--

TABLE 3.--PARTIAL CHEMICAL ANALYSES OF WATER FROM SELECTED WELLS--Continued

GRAMERCY AQUIFER--Continued

LOCAL IDENT- I- FIER	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)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)
SJ- 142 11S 5E 20	46-09-03	225	--	7.5	--	17	110	490	2000	--
SJ- 143 11S 5E 4	48-09-21	294	--	7.6	--	23	130	730	2500	--
SJ- 154 12S 16E 83	62-05-15	238	751	--	20.0	--	250	38	--	--
SJ- 155 12S 16E 59	62-05-15	250	742	--	20.5	--	270	22	--	--
SJ- 156 13S 16E 5	67-03-24	250	926	7.6	20.5	--	270	43	--	1300
SJ- 172 12S 16E 9	66-11-03	342	805	--	21.0	--	270	68	--	180
SJ- 173 12S 16E 9	76-03-17	342	969	7.2	--	--	320	76	--	--
	78-12-18	342	1220	--	--	--	420	140	--	--
SJ- 174 11S 5E 31	65-05-18	265	--	7.5	--	15	160	710	--	1000
	66-09-26	265	3560	--	--	--	190	1000	--	580
SJ- 181 11S 5E 190	74-10-09	269	490	7.3	--	--	210	32	--	--
	79-05-01	269	481	7.3	--	--	170	27	--	--
SJ- 187 12S 4E 43	75-04-11	270	590	8.0	21.0	40	10	26	--	110
SJ- 188 12S 4E 8	75-04-11	216	1040	7.6	20.0	--	190	91	--	2300
SJ- 190 12S 4E 48	75-05-05	267	495	8.1	20.5	25	13	8.4	--	80
SJ- 191 12S 5E 46	75-05-22	235	2370	7.4	21.0	--	280	590	--	750
SJ- 201 12S 17E 6	76-03-09	280	931	7.2	21.0	--	290	70	--	2100
SJ- 204 12S 17E 12	76-04-30	325	900	7.3	21.0	--	490	17	--	0
SJ- 205 12S 17E 14	77-03-23	248	723	7.0	20.0	--	310	10	--	4300
SJB- 18 11S 6E 26	61-03-14	281	2310	--	21.5	--	370	610	--	--
SJB- 19 11S 6E 73	62-03-30	241	2220	8.1	20.5	--	200	570	2200	--
SJB- 20 11S 6E 73	62-03-30	241	1690	--	20.5	--	140	380	--	--
SJB- 21 11S 6E 73	62-03-30	241	2190	--	20.5	--	190	590	--	--
SJB- 45 12S 18E 15	60-11-09	252	1670	--	--	--	250	320	--	--
SJB- 52 11S 6E 10	60-01-04	273	1660	--	--	--	240	370	--	--
SJB- 70 13S 18E 35	60-04-13	234	1660	--	22.0	--	290	360	--	--
SJB- 73 12S 18E 17	60-09-16	280	1550	--	22.0	--	150	260	--	--
SJB- 78A 12S 19E 101	32-08-19	258	--	--	--	12	220	240	--	--
SJB- 105 12S 18E 20	48-03-30	285	--	7.7	--	37	190	48	800	--
SJB- 113 12S 18E 12	46-09-16	268	--	7.4	--	34	450	120	3500	--
SJB- 114 12S 18E 11	61-07-28	239	1560	--	21.0	--	160	410	--	--
SJB- 115 12S 18E 9	45-08-22	264	1920	7.4	--	30	300	26	1200	--
SJB- 121 11S 6E 11	46-02-02	235	--	7.9	--	34	190	280	1500	--
SJB- 122 11S 6E 14	52-01-29	220	--	7.9	--	12	270	430	1100	--
SJB- 123 11S 6E 17	46-05-01	246	--	7.4	--	34	260	240	2000	--
SJB- 129 11S 6E 9	57-08-22	271	2220	7.6	--	25	220	580	800	--
SJB- 130 11S 6E 6	52-04-16	260	2320	7.9	--	23	220	590	600	--
SJB- 137 11S 5E 44	71-10-29	287	522	--	--	--	140	38	--	--
SJB- 155 11S 5E 44	74-10-09	260	444	7.4	--	--	220	24	--	--
	79-05-01	260	431	7.0	--	--	160	23	--	--
SJB- 157 11S 5E 190	74-10-09	288	1100	7.3	--	--	190	190	--	--
	79-05-01	288	989	7.4	--	--	170	150	--	--

NORCO AQUIFER

LOCAL IDENT- I- FIER	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)	CHLO- RIDE, DIS- SOLVED (MG/L AS CL)	IRON, TOTAL RECOV- ERABLE (UG/L AS FE)	IRON, DIS- SOLVED (UG/L AS FE)
AN- 14 10S 4E 21	60-11-15	250	1910	--	--	--	80	500	--	--
AN- 44 10S 4E 15	62-05-09	289	2180	--	22.0	--	180	580	--	--
AN- 60 10S 4E 21	60-04-06	321	3130	--	22.0	--	130	900	--	--
AN- 72 10S 3E 7	60-11-15	304	1470	--	--	--	96	360	--	--
AN- 80 10S 3E 7	58-12-18	315	--	--	20.0	--	92	410	--	--
AN- 85 10S 3E 26	58-12-18	280	--	7.0	21.0	--	66	25	--	--
AN- 87 10S 3E 9	60-11-16	360	1460	--	--	--	--	360	--	--
AN- 90 10S 4E 15	58-08-28	210	--	--	--	--	94	150	--	--
	61-10-12	210	1170	--	23.0	--	180	140	--	--
AN- 91 10S 4E 15	61-04-14	326	5730	--	--	--	260	1700	--	--
AN- 119 10S 3E 9	58-12-18	338	--	7.0	21.0	--	68	220	--	--
AN- 190 10S 3E 9	61-04-21	347	1730	--	--	--	80	430	--	--
AN- 194 10S 3E 7	61-04-21	397	3270	--	21.0	--	99	900	520	--
AN- 211 10S 4E 27	61-11-02	278	5660	--	--	--	180	1700	--	--
AN- 288 10S 3E 26	78-02-14	330	494	7.7	--	--	44	64	--	210
SJ- 10 11S 5E 41	54-01-18	340	2290	7.3	21.0	10	200	590	1100	--
	60-05-04	340	2350	--	--	--	190	600	--	--
SJ- 14 11S 5E 38	58-12-21	350	2710	7.0	21.0	--	180	770	--	--
	60-10-12	350	2090	--	--	--	180	500	--	--
SJ- 41 11S 3E 38	59-05-15	441	864	7.8	21.0	30	82	120	300	--
	78-12-18	441	918	--	--	--	78	160	--	--
SJ- 70 11S 4E 10	75-03-13	413	3780	--	--	--	250	1100	--	--
SJ- 79 12S 16E 69	60-10-18	380	684	--	--	--	330	7.7	8800	--
SJ- 101 11S 4E 19	50-01-30	431	--	7.2	--	7	380	1700	200	--
SJ- 102 11S 4E 20	60-09-21	350	1020	--	--	--	350	48	--	--

TABLE 3.--PARTIAL CHEMICAL ANALYSES OF WATER FROM SELECTED WELLS--Continued

LOCAL IDENT-I-FIER				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)	CHLO-RIDE, DIS-SOLVED (MG/L AS CL)	IRON, TOTAL RECOV-ERABLE (UG/L AS FE)	IRON, DIS-SOLVED (UG/L AS FE)
						NORCO AQUIFER--Continued							
SJ- 105	11S	3E	27	49-01-17	410	--	7.9	--	19	140	770	400	--
SJ- 106	11S	3E	32	49-02-22	420	--	7.9	--	12	79	460	200	--
SJ- 107	11S	3E	35	62-01-31	420	1140	--	21.0	--	81	230	--	--
SJ- 108	11S	3E	43	60-12-01	430	870	--	--	--	72	100	--	--
				76-03-24	430	901	7.7	--	--	76	100	--	360
SJ- 121	11S	3E	38	66-09-26	440	931	--	--	--	90	150	--	750
SJ- 125	11S	3E	48	62-02-01	420	1970	--	20.5	--	120	480	--	--
SJ- 126	11S	4E	5	75-02-18	425	2840	--	21.0	--	130	750	--	--
SJ- 128	12S	4E	24	62-02-01	450	1760	--	21.0	--	390	370	--	--
SJ- 136	11S	5E	1	46-05-06	380	4240	7.5	--	0	250	720	850	--
SJ- 145	11S	3E	22	62-03-29	395	2120	8.1	21.0	--	91	570	310	--
SJ- 146	11S	3E	39	62-03-29	377	1500	--	21.0	--	220	340	--	--
SJ- 147	11S	3E	52	62-03-29	374	977	8.1	20.5	--	110	190	380	--
SJ- 171	11S	3E	16	75-04-23	425	2570	7.8	21.0	--	140	720	--	670
SJB- 13	11S	6E	10	27-08-09	320	4460	--	--	12	14	390	--	--
SJB- 50	11S	6E	11	62-03-30	348	2350	--	20.5	--	520	650	5700	--
SJB- 53	11S	6E	32	57-04-16	345	--	7.4	--	15	240	680	4100	--
SJB- 59	12S	19E	102	49-06-27	327	--	7.5	--	48	170	510	1200	--
SJB- 74	12S	18E	9	56-09-18	382	--	7.2	--	5	290	510	700	--
SJB- 76	12S	18E	14	49-06-27	350	--	7.5	--	27	120	710	3200	--
SJB- 79	12S	19E	16	49-06-27	350	--	7.6	--	15	130	350	800	--
SJB- 80	12S	19E	2	60-11-09	360	1430	--	--	30	120	200	--	--
SJB- 83	12S	19E	11	46-10-22	357	--	7.6	--	45	330	170	700	--
SJB- 98	11S	7E	90	39-01-09	360	--	--	--	12	490	130	1000	--
SJB- 99	11S	6E	44	46-11-19	361	--	7.7	--	55	190	260	2500	--
SJB- 103	11S	6E	19	61-03-10	395	2550	--	--	--	240	730	--	--
SJB- 107	12S	19E	16	31-10-24	342	--	--	--	42	200	170	--	--
SJB- 112	12S	19E	17	49-06-27	350	2220	7.5	--	40	160	590	800	--
SJB- 116	11S	6E	32	61-06-28	420	2430	--	--	--	170	620	--	--
SJB- 126	11S	6E	10	27-08-09	380	2700	--	--	7	18	320	--	--

TABLE 4.--COMPLETE CHEMICAL ANALYSES

LOCAL IDENT-I-FIER	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)
SHALLOW AQUIFERS										
AN- 200A 10S 3E 7	61-06-19	226	2610	7.3	20.5	5	430	110	40	360
AN- 200B 10S 3E 7	61-06-19	134	959	7.3	20.5	5	210	50	21	120
SJ- 60 12S 15E 38	67-01-12	185	1450	7.5	20.0	5	120	32	9.7	280
SJ- 130 12S 4E 75	67-03-23	84	582	8.0	21.0	10	47	12	4.1	120
SJ- 148 11S 5E 38	66-09-26	160	1770	6.8	--	10	580	110	75	160
SJ- 177 11S 5E 4	68-10-21	136	853	6.7	20.5	20	400	100	36	16
SJ- 182 11S 5E 3	74-11-26	140	1030	6.7	21.0	40	450	95	52	45
SJ- 184A 10S 5E 37	74-10-25	170	1250	7.2	20.0	20	240	59	24	180
SJ- 198B 12S 4E 46	75-12-08	188	882	7.6	20.0	10	240	67	17	64
SJ- 200B 12S 4E 50	76-01-05	159	1090	7.4	20.0	5	120	31	9.4	200
SJB- 33 11S 6E 10	59-03-06	137	2680	7.2	--	40	480	100	53	390
SJB- 144 12S 18E 18	62-08-17	170	879	7.1	21.0	10	440	43	80	24
GRAMERCY AQUIFER										
AN- 153 11S 3E 1	67-03-23	285	1110	8.0	20.5	40	100	32	6.0	240
AN- 284 10S 3E 9	77-10-18	218	937	7.5	21.0	0	250	61	24	100
SJ- 2 12S 5E 17	56-09-26	280	1580	7.6	22.0	15	170	43	16	260
SJ- 4 12S 16E 9	57-06-26	341	1110	7.3	21.0	5	330	81	32	100
SJ- 30 13S 17E 50	57-04-02	283	717	7.3	22.0	0	180	42	18	96
SJ- 34 12S 17E 14	67-01-12	284	660	7.4	20.5	5	220	51	23	54
SJ- 35 11S 5E 190	66-04-14	245	611	8.2	--	10	150	35	15	75
SJ- 36 11S 5E 190	67-01-16	245	2300	7.4	21.0	20	100	29	7.7	460
SJ- 40 11S 3E 38	67-04-04	246	1320	7.8	21.0	20	490	130	42	110
SJ- 50 11S 5E 190	67-01-16	248	1070	7.4	21.0	20	140	36	12	180
SJ- 98 12S 17E 41	60-09-30	300	2050	7.3	22.0	20	240	72	15	370
SJ- 104 12S 4E 11	67-04-04	301	409	7.4	20.0	20	210	53	18	10
SJ- 163 11S 5E 190	66-04-14	265	2990	7.7	--	15	140	34	13	570
SJ- 170 11S 3E 16	66-10-27	250	1430	6.9	20.5	5	200	50	19	240
SJ- 186 11S 5E 43	74-12-11	230	1320	6.9	19.5	5	290	62	32	200
SJ- 189 12S 4E 76	75-05-22	270	679	7.9	21.0	20	23	6.0	2.0	150
SJ- 194 12S 4E 40	75-09-24	259	1720	7.8	20.5	20	68	18	5.6	360
SJ- 195A 12S 4E 43	75-10-13	329	1630	7.6	21.0	10	110	28	8.8	330
SJ- 195B 12S 4E 43	75-10-15	262	761	7.9	21.0	55	20	8.0	.0	170
SJ- 196 12S 4E 8	75-11-08	278	503	7.7	21.0	2	140	38	9.7	59
SJ- 197 12S 4E 49	75-11-24	300	1120	8.1	21.0	--	38	13	1.3	260
SJ- 198A 12S 4E 46	75-12-05	358	813	7.4	21.0	10	240	62	22	110
SJ- 199 11S 5E 43	75-12-15	255	1750	7.4	20.5	5	210	49	21	280
SJ- 200A 12S 4E 50	75-12-22	335	995	7.8	21.5	110	18	4.5	1.6	220
SJ- 207 12S 16E 13	77-03-30	301	818	7.2	--	5	360	96	29	42
SJ- 210 12S 4E 53	77-11-22	345	534	7.9	22.0	5	10	3.9	.1	120
SJ- 211B 12S 16E 63	77-12-16	259	403	7.2	20.0	0	160	46	12	17

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)	IRON, TOTAL RECOVERABLE (UG/L AS FE)	IRON, DISSOLVED (UG/L AS FE)	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)	MANGANESE, DISSOLVED (UG/L AS MN)
SHALLOW AQUIFERS												
3.5	243	0	1.6	730	.2	17	1390	.00	1600	--	100	--
2.2	281	0	.6	180	.2	17	538	.00	520	--	10	--
2.2	436	0	.2	260	.2	22	816	.10	--	290	--	--
1.1	297	0	5.6	43	.4	28	359	.00	--	30	--	--
22	786	0	.2	240	.0	28	1020	.00	--	540	--	--
4.4	523	0	.2	13	.1	54	482	.00	--	17000	--	--
11	626	0	1.6	38	.1	29	581	.16	--	1400	--	180
6.0	604	0	2.0	110	.2	21	700	.04	--	410	--	140
2.1	417	0	10	14	.2	28	408	.31	--	700	--	300
2.4	426	0	1.2	150	.2	23	631	2.8	--	450	--	140
25	678	0	1.4	580	.2	25	1520	.10	1600	--	100	--
4.4	558	0	2.2	13	.1	42	486	.50	16000	--	0	--
GRAMERCY AQUIFER												
--	690	0	.2	43	.1	--	--	--	--	430	--	--
2.8	344	0	2.8	130	.2	13	503	.60	--	910	--	170
4.1	372	0	.2	320	.1	30	866	.20	1400	--	100	--
4.6	467	0	.0	130	.1	32	617	.20	2500	--	0	--
3.8	423	0	.0	36	.1	30	436	.50	890	--	10	--
3.5	314	0	.2	65	.1	26	378	.20	--	410	--	--
1.4	233	0	30	60	.2	23	357	2.1	--	800	--	--
2.9	338	0	.0	580	.4	26	1280	1.4	--	350	--	--
--	710	0	.2	110	.4	--	--	--	--	280	--	--
2.2	376	0	10	160	.3	28	613	.10	--	720	--	--
5.5	500	0	.4	440	.4	25	1170	.20	600	--	20	--
1.2	263	0	.0	6.7	.2	24	243	.00	--	11000	--	--
3.1	272	0	.6	820	.3	26	1600	.70	--	360	--	--
2.8	505	0	1.0	210	.1	33	801	.40	--	290	--	--
5.8	676	0	2.0	110	.1	27	772	.24	--	400	--	220
1.0	325	0	.2	56	.6	23	399	.13	--	200	--	10
4.5	436	0	1.0	340	.5	26	971	.26	--	180	--	40
4.5	408	0	2.6	330	.5	25	931	.02	--	430	--	60
2.4	364	0	1.6	60	.9	25	447	.24	--	160	--	20
2.0	275	0	.2	24	.1	27	297	2.4	--	390	--	70
2.2	467	0	26	140	.8	22	695	.06	--	140	--	20
2.2	554	0	.0	13	.2	25	504	.23	--	970	--	210
4.4	320	0	.0	400	.4	26	940	.06	--	840	--	120
1.1	415	0	.0	120	.1	24	576	.74	--	270	--	0
4.7	529	0	.0	20	.1	37	490	.32	--	2600	--	420
1.2	295	0	9.2	18	.2	22	320	.48	--	100	--	50
1.5	161	0	50	18	.1	17	241	.00	--	660	--	280

TABLE 4.--COMPLETE CHEMICAL ANALYSES

LOCAL IDENT- I- FIER	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)
GRAMERCY AQUIFER--Continued										
SJB- 24 11S 6E 67	57-03-08	242	2430	7.5	--	5	300	76	27	380
SJB- 27 12S 19E 101	57-03-08	302	1730	7.3	21.0	5	260	64	24	270
SJB- 38 12S 18E 12	59-01-29	194	1420	6.8	20.0	70	330	64	42	180
SJB- 136 11S 5E 190	67-01-16	287	1290	7.5	19.5	15	160	43	14	210
SJB- 145 12S 18E 18	62-08-17	320	1730	7.9	21.0	5	290	6.4	67	280
SJB- 148 11S 5E 44	66-04-14	274	478	7.2	--	10	180	45	17	29
SJB- 168 11S 5E 190	75-12-17	220	1870	7.5	20.5	5	320	77	31	280
NORCO AQUIFER										
AN- 258B 10S 3E 24	72-09-28	270	590	7.4	21.0	15	85	22	7.3	100
SJ- 42 12S 16E 71	67-01-12	528	1340	7.3	20.0	5	280	55	36	180
SJ- 69 11S 4E 11	60-03-23	407	5520	7.6	21.0	10	280	70	26	1100
SJ- 184B 10S 5E 37	74-10-31	285	1390	7.3	21.0	10	110	28	9.7	230
SJ- 193 11S 3E 7	75-09-30	408	1180	7.6	21.5	0	120	30	9.7	200
SJ- 208 12S 16E 31	77-10-31	451	1130	7.7	22.0	20	40	10	3.6	240
SJ- 211A 12S 16E 63	77-12-12	387	447	7.4	21.0	0	100	26	9.5	64
SJB- 31 12S 19E 18	57-04-02	375	1520	7.5	21.0	5	230	53	23	250
SJB- 143 12S 18E 18	62-08-09	415	2880	7.8	21.5	10	140	28	18	550
GONZALES-NEW ORLEANS AQUIFER										
AN- 258A 10S 3E 24	72-09-22	470	375	8.1	23.0	0	18	6.4	.5	80
SJ- 183 11S 5E 43	74-10-10	575	790	7.8	23.0	20	10	3.0	.6	170
SJ- 185 11S 5E 43	74-11-15	600	1200	7.7	23.0	20	18	4.0	1.9	240

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)	IRON, TOTAL RECOVERABLE (UG/L AS FE)	IRON, DISSOLVED (UG/L AS FE)	MANGANESE, TOTAL RECOVERABLE (UG/L AS MN)	MANGANESE, DISSOLVED (UG/L AS MN)
GRAMERCY AQUIFER--Continued												
4.4	281	0	2.2	640	.2	30	1300	1.2	1100	--	100	--
4.7	400	0	.0	370	.3	32	963	.20	1800	--	10	--
5.0	420	0	1.6	260	.2	25	795	16	6300	--	10	--
2.4	290	0	19	260	.3	27	726	.10	--	680	--	--
3.2	630	0	1.2	260	.2	19	957	.30	690	--	20	--
1.4	200	0	42	29	.2	23	286	.20	--	1100	--	--
3.8	331	0	24	440	.1	28	1050	.09	--	1000	--	260
NORCO AQUIFER												
2.1	361	0	1.2	14	.0	24	349	.10	--	220	--	80
2.5	487	0	.2	210	.1	25	743	.10	--	1300	--	--
4.3	275	0	12	1700	.6	24	3030	.10	750	--	40	--
4.2	247	0	.4	320	.3	22	737	.00	--	340	--	130
5.0	232	0	12	260	.2	26	657	.16	--	360	--	100
2.9	404	0	12	160	.2	24	654	.80	--	270	--	42
1.7	291	0	2.8	10	.0	27	284	.10	--	320	--	110
5.6	506	0	.0	260	.1	33	878	3.0	1800	--	200	--
3.8	238	0	1.4	800	.3	21	1540	.20	510	--	20	--
GONZALES-NEW ORLEANS AQUIFER												
1.0	171	0	4.6	34	.2	35	246	.40	--	150	--	100
1.8	222	4	.4	130	.5	25	444	.04	--	30	--	20
2.6	234	3	6.0	250	.6	23	647	.16	--	60	--	0