CSRS | BUILDING STRONGER, SMARTER COMMUNITIES TOGETHER.

Exhibit L. Jamestown Business Park Potable Water Infrastructure Upgrade Letter & Map

LOUISIANA ECONOMIC DEVELOPMENT CERTIFIED SITE

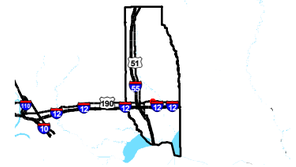
GREATER NEW ORLEANS INC
REGIONAL ECONOMIC DEVELOPMENT

Jamestown Business Park Potable Water Infrastructure Upgrade Letter & Map

P:\214094\GNO Certified Sites Program\Jamestown Business Park\CADGIS templates\GIS\Exhibit L Site Potable Water Infrastructure Map.mxd

Jamestown Business Park
Tangipahoa Parish, LA

GNO



LEGEND

Site Boundary (71.46 Ac.±)

Tangipahoa Water District Potable Water Infrastructure

- Existing 6-inch Potable Water Line
- Proposed 6-inch Potable Water Line
- Proposed 50,000 Gallon Elevated Storage Tank
- Proposed 50,000 GPD Water Well

Existing Roadway

- US Highway
- Local Roads

GREATER NEW ORLEANS INC
REGIONAL ECONOMIC DEVELOPMENT

Date:	10/1/2021
Project Number:	214094
Drawn By:	SEW
Checked By:	EEB

CSRS

General Notes:
1. No attempt has been made by CSRS, Inc. to verify site boundary, title, actual legal ownership, deed restrictions, servitudes, easements, or other burdens on the property, other than that furnished by the client or his representative.
2. Transportation data from 2013 TIGER datasets via U.S. Census Bureau at ftp://ftp2.census.gov/geo/tiger/TIGER2013.
3. 2015 aerial imagery from USDA-APFO National Agricultural Inventory Project (NAIP) and may not reflect current ground conditions.
4. Utility information from visual inspection and/or the individual utility operators. Exact field location has not been determined by survey. The lines shown are an approximate representation only and may have been offset for depiction purposes.

N

Scale 1:5,000

0 260 520 Feet

CSRS | BUILDING STRONGER, SMARTER COMMUNITIES TOGETHER.

October 1, 2021

Jamestown Business Park
Potable Water Infrastructure
Upgrade Letter & Map

Mr. Gary Silbert
GNO, Inc.
1100 Poydras Street, Suite 3475 New Orleans, LA 70163

Re. Jamestown Business Park
Water System Cost Estimate
CSRS Job No. 214094

Dear Mr. Silbert:

According to correspondence with local utility officials, the Jamestown Business Park on Gahn lane In Tangipahoa Parish, Louisiana does not have access to an existing potable water line to service the site. In order to provide adequate service, two options exist which include the construction of a service connection to tie into the existing Tangipahoa Water District main water line or the construction of a new groundwater well.

One option to provide potable water supply to the site is constructing a 6-inch water main extension along Gahn Lane to the existing Tangipahoa Water District 6-inch water main on U.S. Highway 190. The estimated cost to construct the approximate 524 linear feet extension and fire hydrant assembly is $40,000.

The second option includes constructing a well 600 feet below the ground surface capable of providing 50,000 GPD flow requirements, including storage tanks, pumps, and piping systems to provide fire protection. The source of well water is the Upper Ponchatoula Aquifer in the Chicot Equivalent Aquifer System, which generally has “soft” water. The estimated cost of this option is $805,000.

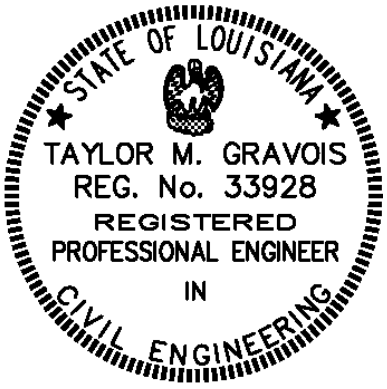
Please note this estimate does not include engineering, required rights of way, environmental impacts, or operation and maintenance costs. This cost estimate was prepared with the best information available at the time of certification. The actual costs can vary based on the availability of material, site conditions and labor availability. This plan can be executed within a reasonable timetable of 180 days or less based on preliminary engineering judgment.

Thank you for the opportunity to assist you in this project. Should you have any questions or require additional information, feel free to contact me.

Respectfully,

CSRS, Inc.

Taylor Gravois, PE, PLS



Jamestown Business Park
Potable Water Cost Estimate
Job No. 214094

Rough Order of Magnitude Cost Estimate Option 1					
Item No.	**Description**	**Unit**	**Est. Quantity**	**Unit Price**	**Extension**
1	6" C900 PVC Water Main	L.F.	524	$ 40.00	$ 20,960.00
2	Fire Hydrant Assembly (includes isolation valves)	Each	2	$ 4,500.00	$ 9,000.00
				Subtotal:	***$ 29,960.00***
				20% Contingency [1]:	***x 1.20***
				Rough Order of Magnitude (ROM):	**$ 40,000.00**

Rough Order of Magnitude Cost Estimate Option 2					
Item No.	**Description**	**Unit**	**Est. Quantity**	**Unit Price**	**Extension**
1	35 GPM (50,000 GPD) Water Well with Piping, Electrical, Controls and Pneumatic Tank	Each	1	$ 550,000.00	$ 550,000.00
2	50,000 gal Ground Storage Tank w/ Booster Pump, Rechlorination, Electrical & Controls	L.F.	1	$ 120,000.00	$ 120,000.00
				Subtotal:	***$ 670,000.00***
				20% Contingency [1]:	***x 1.20***
				Rough Order of Magnitude (ROM):	**$ 805,000.00**

Footnotes:

1.) Does not include costs for engineering, permitting, or general project management.
2.) This cost estimate was prepared with the best information available at the time of certification.
3.) Actual costs can vary based on availability of material, site conditions, and labor.
4.) Option 2 does not include iron and manganese treatment based on the USGS Water Resource Report for Tangipahoa Parish indicating the Chicot Equivalent Aquifer System is relatively soft water.

USGS
science for a changing world

DOTD
LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

Prepared in cooperation with the Louisiana Department of Transportation and Development

Water Resources of Tangipahoa Parish, Louisiana

Introduction

Information concerning the availability, use, and quality of water in Tangipahoa Parish, Louisiana (fig. 1), is critical for proper water-resource management. The purpose of this fact sheet is to present information that can be used by water managers, parish residents, and others for stewardship of this vital resource. Information on the availability, past and current use, use trends, and water quality from groundwater and surface-water sources in the parish is presented. Previously published reports (see References Cited section) and data stored in the U.S. Geological Survey's National Water Information System (http://waterdata.usgs.gov/nwis) are the primary sources of the information presented here.

In 2010, about 20.1 million gallons per day (Mgal/d) of water were withdrawn in Tangipahoa Parish, Louisiana, including 19.90 Mgal/d from groundwater sources and 0.18 Mgal/d from surface-water sources[1] (table 1). Withdrawals for public supply accounted for nearly 73 percent of the total water withdrawn in 2010 (table 2). Water withdrawals for other categories of use included industrial, rural domestic, livestock, general irrigation, and aquaculture. Water-use data collected at 5-year intervals from 1960 to 2010 indicated that total water withdrawals during the years 1960 and 2010 were similar at about 20 Mgal/d (fig. 2).

[1]Water-withdrawal data are based on estimated or reported site-specific data and aggregated data, which are distributed to sources. For a full description of water-use estimate methodology, see "Data Collection" in Sargent (2011). Tabulation of numbers across text and tables may result in different totals because of rounding; nonrounded numbers are used for calculation of totals.

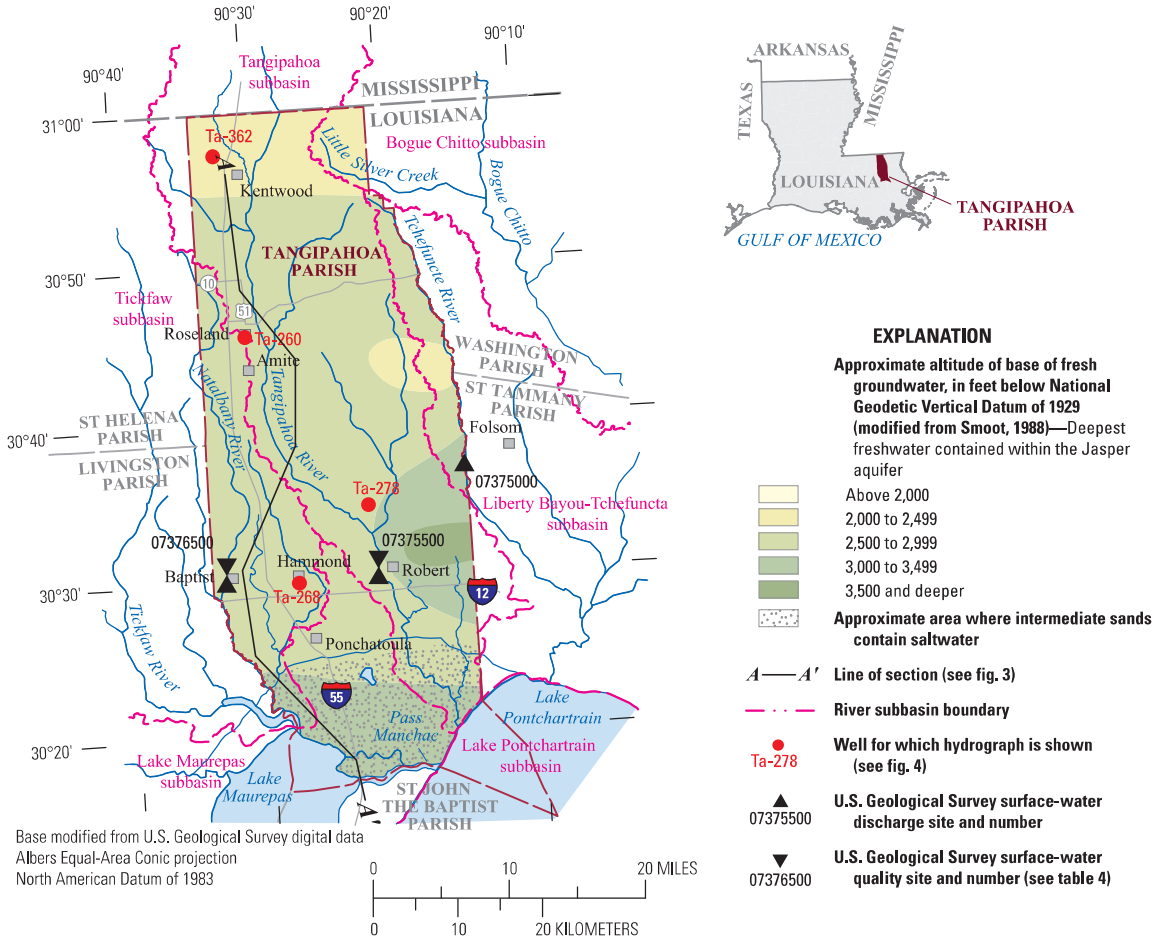


Figure 1. Location of study area, Tangipahoa Parish, Louisiana.

Table 1. Water withdrawals, in million gallons per day, by source in Tangipahoa Parish, Louisiana, 2010 (Sargent, 2011; B.P. Sargent, U.S. Geological Survey, written commun., 2015).

Aquifer system or surface-water body	Groundwater	Surface water
Chicot equivalent aquifer system	4.85	
Evangeline equivalent aquifer system	2.46	
Jasper equivalent aquifer system	12.59	
Miscellaneous streams		0.18
Total	**19.90**	**0.18**

Table 2. Water withdrawals, in million gallons per day, by use category in Tangipahoa Parish, Louisiana, 2010 (Sargent, 2011).

Use category	Groundwater	Surface water	Total
Public supply	14.59	0.00	14.59
Industrial	1.14	0.00	1.14
Rural domestic	3.66	0.00	3.66
Livestock	0.18	0.18	0.36
General irrigation	0.27	0.00	0.27
Aquaculture	0.08	0.00	0.08
Total	**19.90**	**0.18**	**20.08**

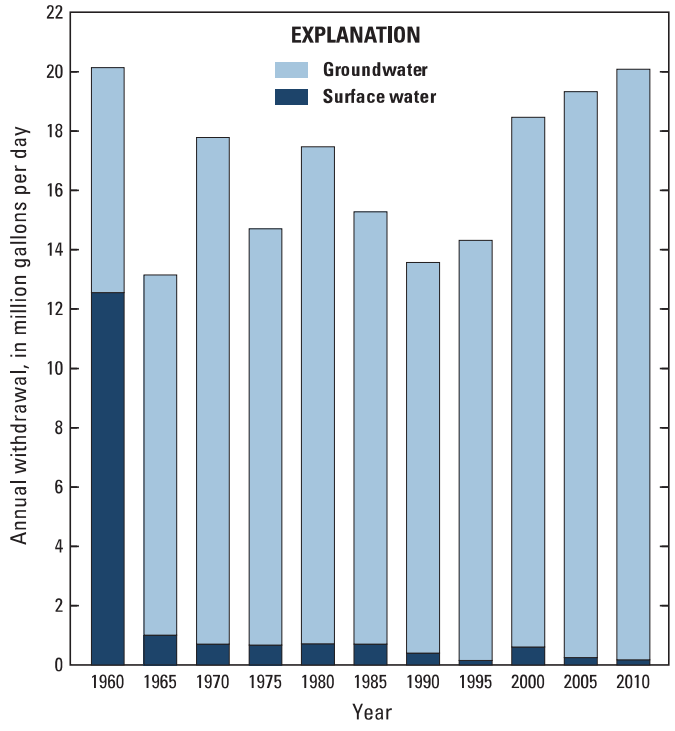


Figure 2. Water withdrawals in Tangipahoa Parish, Louisiana, 1960–2010 (Sargent, 2011).

Groundwater Resources

The primary freshwater-bearing aquifer systems in Tangipahoa Parish, from near surface to deepest, include the Chicot equivalent, Evangeline equivalent, and Jasper equivalent aquifer systems (fig. 3). The base of fresh groundwater (water with a chloride concentration of 250 milligrams per liter [mg/L] or less) generally ranges from greater than 2,000 to 3,500 feet (ft) below the National Geodetic Vertical Datum of 1929 (NGVD 29) in Tangipahoa Parish (fig. 1) (Smoot, 1988). Aquifers in the parish generally dip and thicken to the south. Recharge to the aquifers is primarily from infiltration of precipitation in the area extending from central Tangipahoa Parish northward to about 100 miles (mi) into Mississippi. Leakage from adjacent aquifers and seasonal input from rivers also provide for some recharge (Griffith, 2003). Discharge from the aquifers is by natural flow into rivers, leakage into underlying aquifers, and withdrawal from wells.

The Chicot Equivalent Aquifer System

The primary aquifers composing the Chicot equivalent aquifer system in Tangipahoa Parish are the Gonzales-New Orleans aquifer, Upland terrace aquifer, and the upper Ponchatoula aquifer. The Upland terrace aquifer is present at or near land surface in the northern half of the parish. The upper Ponchatoula aquifer is present in the southern half of the parish and may be considered a subsurface extension of the Upland terrace aquifer (fig. 3) (Nyman and Fayard, 1978). The altitude of the base of the Chicot equivalent aquifer system ranges from about 125 ft above NGVD 29 near the northern parish line to about 900 ft below NGVD 29 near the southern parish line (Griffith, 2003). Aquifers in the Chicot equivalent aquifer system typically range in thickness from 100 to 400 ft (Nyman and Fayard, 1978).

In 2009, water levels in the aquifer system ranged from about 250 ft above NGVD 29 near the northern parish line to about the NGVD 29 in the lowlands near the southern parish line. In the hilly northern part of the parish, the direction of groundwater flow in the Upland terrace aquifer is generally from hilltops towards major stream valleys. Regionally, the overall direction of flow in the Chicot equivalent aquifer system is to the south along the dip of the sediments (Tomaszewski, 2011). In Tangipahoa Parish, water-level changes within the Chicot equivalent aquifer system are primarily related to long- and short-term changes in precipitation. Water levels generally fluctuate during the year and declined about 5 ft between 1998 and 2012 at well Ta-362 (fig. 4).

State well-registration records indicated 7,877 active wells screened in the Chicot equivalent aquifer system in Tangipahoa Parish in 2015, including 7,042 domestic, 587 irrigation, 221 public supply, and 27 industrial. Depths of these wells ranged from 16 to 800 ft below land surface. Reported well yields ranged from 1 to 1,000 gallons per minute (gal/min) (Louisiana Department of Natural Resources, 2015). In 2010, groundwater withdrawals from the Chicot equivalent aquifer system in Tangipahoa Parish totaled about 4.85 Mgal/d, including 1.19 Mgal/d for public supply, 3.29 Mgal/d for rural-domestic use, 0.10 Mgal/d for livestock, 0.26 Mgal/d for general irrigation, and 0.02 Mgal/d for aquaculture (B.P. Sargent, U.S. Geological Survey, written commun., 2012).

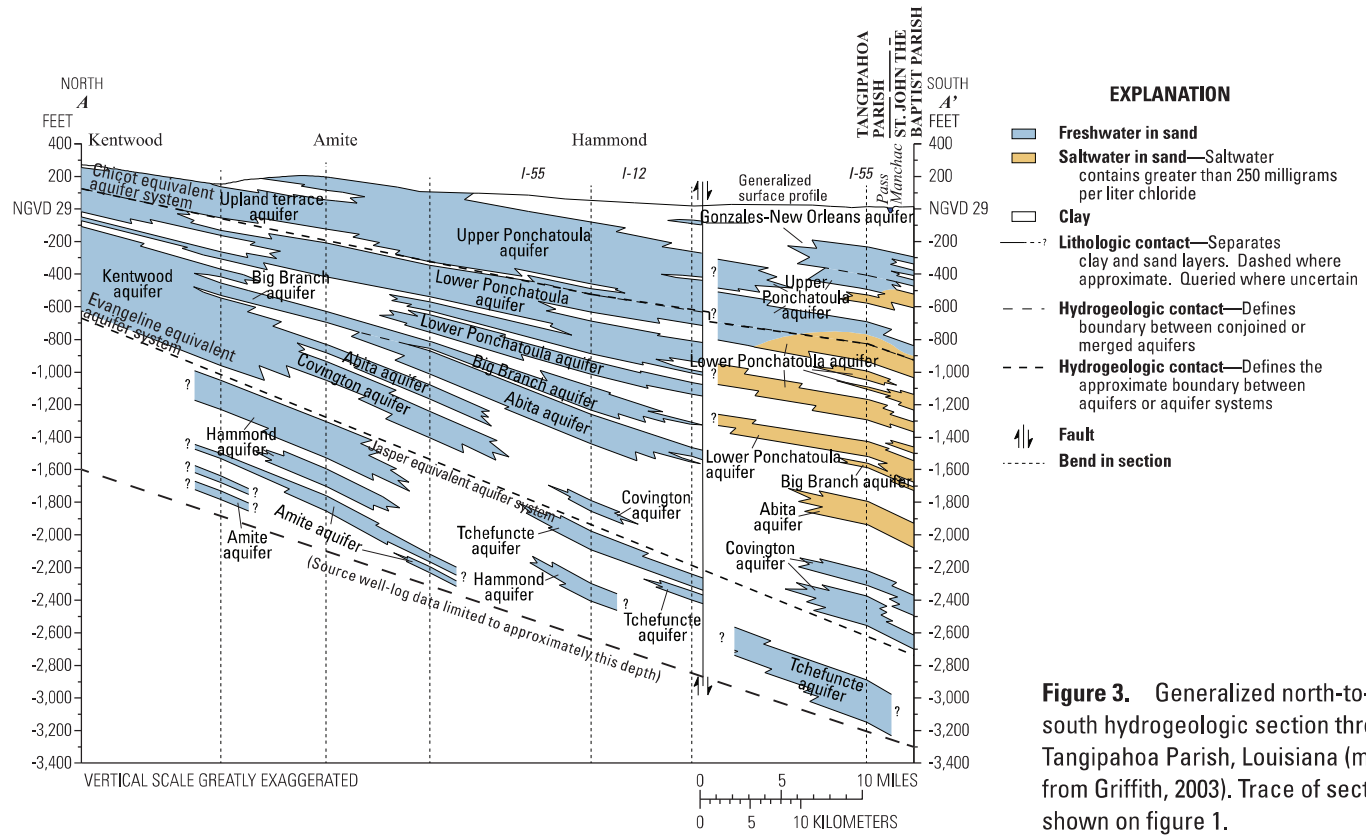


Figure 3. Generalized north-to-south hydrogeologic section through Tangipahoa Parish, Louisiana (modified from Griffith, 2003). Trace of section shown on figure 1.

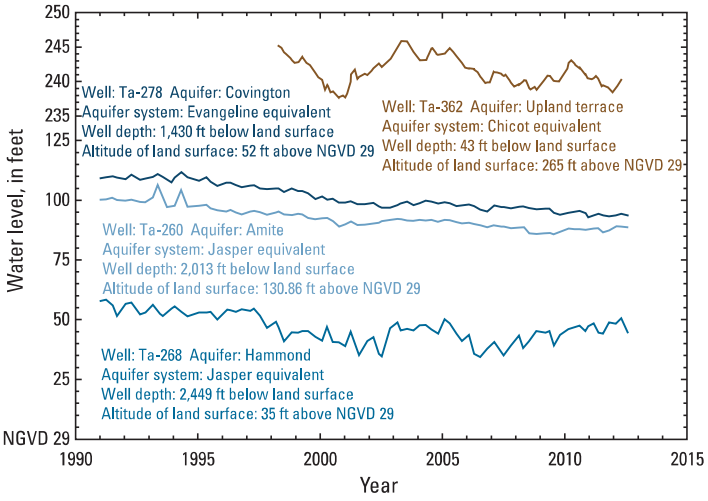


Figure 4. Water levels in wells Ta-362 screened in the Chicot equivalent aquifer system, Ta-278 screened in the Evangeline equivalent aquifer system, and wells Ta-260 and Ta-268 screened in the Jasper equivalent aquifer system in Tangipahoa Parish, Louisiana (see fig. 1 for well locations; U.S. Geological Survey, 2012a). Land surface and water levels are measured in feet (ft) relative to the National Geodetic Vertical Datum of 1929 (NGVD 29).

The Evangeline Equivalent Aquifer System

The aquifers composing the Evangeline equivalent aquifer system in Tangipahoa Parish are the lower Ponchatoula, Kentwood, Big Branch, Abita, and Covington aquifers (fig. 3). In Tangipahoa Parish, the altitude of the base of the Evangeline equivalent aquifer system ranges from about 600 ft below NGVD 29 near the northern parish line to greater than 2,700 ft below NGVD 29 near the southern parish line (fig. 3) (Griffith, 2003). Aquifers in the Evangeline equivalent aquifer system typically range in thickness from 50 to 500 ft (Nyman and Fayard, 1978).

In 2003, water levels in the Kentwood aquifer ranged from about 225 ft above NGVD 29 near the northern parish line to about 75 ft above NGVD 29 at Ponchatoula and indicated that groundwater flow was generally to the south in this aquifer (Prakken, 2004). Water levels declined about 15 ft between 1991 and 2012 at well Ta-278 (fig. 4), located northeast of Hammond (fig. 1) and screened in the Covington aquifer.

State well-registration records listed 101 active wells screened in the Evangeline equivalent aquifer system in Tangipahoa Parish in 2015, including 54 domestic, 24 public supply, 15 irrigation, and 8 industrial. Depths of these wells ranged from 155 to 2,040 ft below land surface. Reported well yields ranged from 6 to 1,500 gal/min (Louisiana Department of Natural Resources, 2015). In 2010, groundwater withdrawals from the Evangeline equivalent aquifer system in Tangipahoa Parish totaled about 2.47 Mgal/d, including 1.82 Mgal/d for public supply, 0.14 Mgal/d for industrial use, 0.37 Mgal/d for rural-domestic use, 0.07 Mgal/d for livestock, 0.01 Mgal/d for general irrigation, and 0.06 Mgal/d for aquaculture (B.P. Sargent, U.S. Geological Survey, written commun., 2012).

The Jasper Equivalent Aquifer System

The primary aquifers composing the Jasper equivalent aquifer system in Tangipahoa Parish are the Tchefuncte, Hammond, Amite, and Ramsay aquifers. The altitude of the top of the Jasper equivalent aquifer system ranges from about 700 ft below NGVD 29 near Kentwood to about 2,700 ft below NGVD 29 near the southern parish line (fig. 3) (Griffith, 2003). Aquifers in the Jasper equivalent aquifer system typically range in thickness from 100 to 250 ft (Nyman and Fayard, 1978).

Groundwater levels in the Hammond and Amite aquifers have declined since the 1950s because of groundwater withdrawals (Nyman and Fayard, 1978). Water levels in well Ta-268, located near Hammond and screened in the Hammond aquifer, declined about 7 ft from 1991 to 2012 (fig. 4). Water levels in well Ta-260, located in west-central Tangipahoa Parish at Roseland and screened in the Amite aquifer, declined about 10 ft from 1991 to 2012.

State well-registration records listed 83 active wells screened in the Jasper equivalent aquifer system in Tangipahoa Parish in 2015, including 54 public supply, 20 domestic, 6 irrigation, and 3 industrial. Depths of these wells ranged from 1,250 to 2,743 ft below land surface. Reported well yields ranged from 40 to 2,285 gal/min (Louisiana Department of Natural Resources, 2015). In 2010, groundwater withdrawals from the Jasper equivalent aquifer system in Tangipahoa Parish totaled about 12.59 Mgal/d, including 11.57 Mgal/d for public-supply use, 0.99 Mgal/d for industrial use, 0.01 Mgal/d for livestock, and 0.01 Mgal/d for general irrigation.

Groundwater Quality

Samples taken from freshwater wells in Tangipahoa Parish indicated that the Chicot, Evangeline, and Jasper aquifer systems have similar water quality, but some variation is present (table 3). Samples were found to be soft[2] with respect to hardness and generally did not exceed the U.S. Environmental Protection Agency's Secondary Maximum Contaminant Levels[3] (SMCLs) for dissolved solids and color. Median values for pH ranged from 7.0 to 7.9. Temperature increased with depth. Locally, concentrations of iron and manganese can greatly exceed the SMCLs. Hydrogen sulfide may be present locally in the Evangeline and Jasper equivalent aquifer systems (Nyman and Fayard, 1978).

Surface-Water Resources

Surface-water resources in Tangipahoa Parish are found within three regional drainage basins that comprise multiple subbasins (fig. 1). Most of the parish is in the Lake Maurepas Basin (Hydrologic Unit Code [HUC] 080702), with much smaller areas in the Lake Pontchartrain Basin (HUC 080902) and Pearl Basin (HUC 031800). All three basins eventually discharge into Lake Maurepas, Lake Pontchartrain, or the Gulf of Mexico (U.S. Geological Survey, 2015). In 2010, about 0.18 Mgal/d of surface water were withdrawn for livestock from streams in Tangipahoa Parish (table 2).

Lake Maurepas Basin

The Lake Maurepas Basin comprises the Tangipahoa (HUC 08070205), Tickfaw (HUC 08070203), and Lake Maurepas (HUC 08070204) subbasins (fig. 1). The Tangipahoa River (within the Tangipahoa subbasin) flows into the parish from Mississippi, is fed by small streams, and eventually flows into Lake Pontchartrain about 12 mi southeast of Ponchatoula. The average streamflow for the Tangipahoa River at Robert (site number 07375500) was 1,148 cubic feet per second (ft^3/s) for the period 1938–2009 from a drainage area of about 646 square miles (mi^2) (U.S. Geological Survey, 2009).

The Tickfaw subbasin within Tangipahoa Parish is primarily drained by the Natalbany River, which is fed by small streams and discharges into the Tickfaw River about 1.5 mi upstream from the mouth of the Tickfaw River on Lake Maurepas. The average streamflow for the Natalbany River at Baptist (site number 07376500) was 117 ft^3/s for the period 1943–2009 from a drainage area of about 79.5 mi^2 (U.S. Geological Survey, 2009).

Lake Maurepas and Pass Manchac are located in the Lake Maurepas subbasin. Lake Maurepas has a surface area of about 91 mi^2 and an average depth of about 7 ft and is connected to Lake Pontchartrain by way of Pass Manchac (Shampine, 1971).

Lake Pontchartrain and Pearl Basins

The Lake Pontchartrain Basin comprises the Liberty Bayou-Tchefuncta (HUC 08090201) and Lake Pontchartrain (08090202) subbasins in Tangipahoa Parish (fig. 1). The Tchefuncte River begins near the Tangipahoa-Washington Parish border and eventually flows into St. Tammany Parish and then Lake Pontchartrain. The average streamflow for the Tchefuncte River near Folsom (site number 07375000) was 158 ft^3/s for the period 1943–2009 from a drainage area of about 103 mi^2 (U.S. Geological Survey, 2009). Lake Pontchartrain is a shallow estuarine bay of the Gulf of Mexico and has a surface area of about 621 mi^2 and an average depth of about 11 ft (Shampine, 1971).

The Pearl Basin is composed of only the Bogue Chitto subbasin (HUC 0318005) in Tangipahoa Parish. This subbasin contains Little Silver Creek which drains out of Tangipahoa Parish and into the Bogue Chitto in Washington Parish.

Surface-Water Quality

Surface-water quality varies greatly in Tangipahoa Parish. Streams in the Tangipahoa and Liberty Bayou-Tchefuncta subbasins have good connection to the shallow aquifers, resulting in substantial groundwater influence on the quality of the surface water in these two basins. The Natalbany River and its tributaries are poorly connected to the shallow aquifers and are less affected by groundwater interaction (Fayard and Nyman, 1976). The majority of the parish is drained by freshwater streams that ultimately discharge into Lake Maurepas and Lake Pontchartrain. In both lakes, salinity varies substantially because of the influx of freshwater from streams and saline water from the Gulf of Mexico (Shampine, 1971). Saltwater intrusion may occur during droughts or storm events in the lower reaches of the streams that discharge into these lakes.

Water samples analyzed during the period 1968–99 from the Tangipahoa River at Robert and during the period 1943–69 from the Natalbany River at Baptist were found to be soft with respect to hardness and did not exceed SMCLs for concentrations of chloride and sulfate (table 4). Dissolved-oxygen concentrations in samples from the Tangipahoa River were generally greater than 5 mg/L, which is considered the minimum value for a

[2]Hardness ranges, expressed as milligrams per liter of calcium carbonate, are as follows: 0–60, soft; 61–120, moderately hard; 121–180, hard; greater than 180, very hard (Hem, 1985).

[3]The SMCLs are nonenforceable Federal guidelines regarding cosmetic effects (such as tooth or skin discoloration), aesthetic effects (such as taste, odor, or color), or technical effects (such as damage to water equipment or reduced effectiveness of treatment for other contaminants) of drinking water. SMCLs were established as guidelines by the U.S. Environmental Protection Agency (2016).

Table 3. Summary of selected water-quality characteristics for freshwater in the Chicot, Evangeline, and Jasper equivalent aquifer systems in Tangipahoa Parish, Louisiana (U.S. Geological Survey, 2012b).

[Values are in milligrams per liter, except as noted. °C, degrees Celsius; PCU, platinum cobalt unit; µS/cm, microsiemen per centimeter; SU, standard unit; $CaCO_3$, calcium carbonate; µg/L, microgram per liter; <, less than; SMCL, Secondary Maximum Contaminant Level established by the U.S. Environmental Protection Agency (2016); NA, not applicable]

	Temperature (°C)	Color, (PCU)	Specific conductance, field (µS/cm at 25 °C)	pH, field (SU)	Hardness (as $CaCO_3$)	Chloride, filtered (as Cl)	Iron, filtered (µg/L as Fe)	Manganese, filtered (µg/L as Mn)	Dissolved solids, filtered
Chicot equivalent aquifer system, 1939–2001 (31 wells)									
Median	21.0	2	179	7.0	11	4.0	50	40	152
10th percentile	20.0	0	31	5.0	3	2.2	<10	<3	41
90th percentile	24.0	20	278	8.3	25	15	690	110	198
Number of samples	27	16	25	28	30	31	21	21	22
Percentage of samples that do not exceed SMCLs	NA	81	NA	57	NA	100	67	62	100
Evangeline equivalent aquifer system, 1939–2005 (36 wells)									
Median	24.2	2	198	7.2	15	3.0	120	70	160
10th percentile	21.0	0	84	6.2	7	2.0	30	<20	67
90th percentile	29.4	13	300	8.8	26	4.5	1,500	320	187
Number of samples	28	20	27	22	29	36	18	17	22
Percentage of samples that do not exceed SMCLs	NA	90	NA	59	NA	100	67	35	100
Jasper equivalent aquifer system, 1939–2005 (55 wells)									
Median	30.5	10	264	7.9	4	3.1	120	30	196
10th percentile	26.3	0	147	6.8	1	2.3	20	<20	161
90th percentile	34.0	30	428	9.1	9	6.1	1,100	140	265
Number of samples	37	36	46	43	45	55	31	19	35
Percentage of samples that do not exceed SMCLs	NA	72	NA	67	NA	100	68	63	97
SMCLs									
	NA	15	NA	6.5–8.5	NA	250	300	50	500

diverse population of fresh, warmwater biota, including sport fish (Louisiana Department of Environmental Quality, 2008). The median value for pH in samples from the Tangipahoa River was 6.5 standard units and from the Natalbany River was 6.2 standard units. Turbidity may be more of a concern in the Natalbany River because of its path cutting through numerous clay deposits (Fayard and Nyman, 1976).

References Cited

Fayard, L.D., and Nyman, D.J., 1976, Surface-water resources of the Tangipahoa, Tchefuncta, and Natalbany River Basins, southeastern Louisiana: Louisiana Department of Public Works Water Resources Technical Report no. 11, 49 p.

Griffith, J.M., 2003, Hydrogeologic framework of southeastern Louisiana: Louisiana Department of Transportation and Development Water Resources Technical Report no. 72, 21 p., 18 pls.

Hem, J.D., 1985, Study and interpretation of the chemical characteristics of natural water (3d ed.): U.S. Geological Survey Water-Supply Paper 2254, 264 p., accessed February 20, 2013, at http://pubs.er.usgs.gov/publication/wsp2254.

Louisiana Department of Environmental Quality, 2008, Environmental Regulatory Code, Title 33, Part IX, Subpart 1: Baton Rouge, Louisiana Department of Environmental Quality, accessed June 9, 2009, at http:www.deq.louisiana.gov/portal/tabid/1674/Default.aspx.

Louisiana Department of Natural Resources, 2015, Strategic Online Natural Resources Information System (SONRIS): Louisiana Department of Natural Resources database, accessed May 18, 2015, at http://sonris.com/.

Nyman, D.J., and Fayard, L.D., 1978, Ground-water resources of Tangipahoa and St. Tammany Parishes, southeastern Louisiana: Louisiana Department of Transportation and Development, Office of Public Works Water Resources Technical Report no. 15, 76 p.

Prakken, L.B., 2004, Louisiana ground-water map no. 17—Generalized potentiometric surface of the Kentwood aquifer system and the "1,500-foot" and "1,700-foot" sands of the Baton Rouge area in southeastern Louisiana, March–April 2003: U.S. Geological Survey Scientific Investigations Map 2862, 2 sheets, accessed February 24, 2012, at http://pubs.er.usgs.gov/publication/sim2862.

Sargent, B.P., 2011, Water use in Louisiana, 2010: Louisiana Department of Transportation and Development Water Resources Special Report no. 17, 135 p.

Shampine, W.J., 1971, Chemical, biological, and physical data for the major lakes and reservoirs in Louisiana: Louisiana Department of Public Works Basic Records Report no. 5, 98 p.

Smoot, C.W., 1988, Louisiana hydrologic atlas map no. 3—Altitude of the base of freshwater in Louisiana: U.S. Geological Survey Water-Resources Investigations Report 86–4314, 1 sheet, accessed November 2, 2011, at http://pubs.er.usgs.gov/publication/wri864314.

Table 4. Summary of selected water-quality characteristics for the Tangipahoa and Natalbany Rivers in Tangipahoa Parish, Louisiana (U.S. Geological Survey, 2012b).

[Values are in milligrams per liter, except as noted. µS/cm, microsiemen per centimeter; °C, degrees Celsius; SU, standard unit; $CaCO_3$, calcium carbonate; µg/L, microgram per liter; SMCL, Secondary Maximum Contaminant Level established by the U.S. Environmental Protection Agency (2016); NA, not applicable; PCU, platinum cobalt units]

	Specific conductance, field (µS/cm at 25 °C)	Oxygen, dissolved	pH, field (SU)	Hardness (as $CaCO_3$)	Calcium, filtered (as Ca)	Magnesium, filtered (as Mg)	Sodium, filtered (as Na)	Chloride, filtered (as Cl)	Sulfate, filtered (as SO_4)	Iron, filtered (µg/L as Fe)
Tangipahoa River at Robert, 1968–99[1]										
Median	49	8.6	6.5	10	2.3	1.0	4.9	5.9	2.2	220
10th percentile	45	7.1	6.1	8	2.0	0.6	3.7	4.5	1.1	130
90th percentile	57	10.3	7.0	12	2.8	1.2	5.8	7.4	4.5	350
Number of samples	130	114	128	130	131	130	128	128	128	75
Percentage of samples that do not exceed SMCLs	NA	NA	52	NA	NA	NA	NA	100	100	79
SMCLs										
	NA	NA	6.5–8.5	NA	NA	NA	NA	250	250	300
Natalbany River at Baptist, 1943–69[2]										
	Specific conductance, field (µS/cm at 25 °C)	Color (PCU)	pH, field (SU)	Hardness (as $CaCO_3$)	Calcium, filtered (as Ca)	Magnesium, filtered (as Mg)	Sodium, filtered (as Na)	Chloride, filtered as Cl)	Sulfate, filtered (as SO_4)	Dissolved solids, filtered
Median	72	20	6.2	16	3.5	1.4	8	7.9	6.4	63
10th percentile	67	5	5.8	13.0	3.1	1.3	6.7	5.0	4.1	54.2
90th percentile	92	54	6.7	18.0	4.2	1.9	10.8	9.2	9.0	82.0
Number of samples	17	19	19	19	17	17	17	21	19	15
Percentage of samples that do not exceed SMCLs	NA	42	NA	NA	NA	NA	NA	100	100	100
SMCLs										
	NA	15	6.5–8.5	NA	NA	NA	NA	250	250	500

[1]Site number 07375500.

[2]Site number 07376500.

Tomaszewski, D.J., 2011, Water-level surface in the Chicot equivalent aquifer system in southeastern Louisiana, 2009: U.S. Geological Survey Scientific Investigations Map 3173, 2 pls., accessed February 24, 2012, at http://pubs.usgs.gov/sim/3173/.

U.S. Environmental Protection Agency, 2016, Secondary Drinking Water Standards: Guidance for Nuisance Chemicals, accessed April 13, 2016, https://www.epa.gov/dwstandardsregulations/secondary-drinking-water-standards-guidance-nuisance-chemicals.

U.S. Geological Survey, 2009, Annual water-data reports: Accessed July 30, 2010, at http://wdr.water.usgs.gov/.

U.S. Geological Survey, 2012a, Groundwater levels for Louisiana: National Water Information System Web Interface, accessed October 23, 2012, at http://nwis.waterdata.usgs.gov/la/nwis/gwlevels.

U.S. Geological Survey, 2012b, Water quality samples for Louisiana: National Water Information System Web Interface, accessed August 20, 2012, at http://nwis.waterdata.usgs.gov/la/nwis/qwdata/.

U.S. Geological Survey, 2015, Science in your watershed: Locate your watershed, accessed May 4, 2015, at http://water.usgs.gov/wsc/map_index.html.

This fact sheet was published by the U.S. Geological Survey in cooperation with the Louisiana Department of Transportation and Development (DOTD).
Thanks are given to Zahir "Bo" Bolourchi, Director, Water Resources Programs, Louisiana DOTD, who contributed to the content of the fact sheet.

By Vincent E. White and Lawrence B. Prakken

For additional information, contact:

Director, USGS Lower Mississippi-Gulf Water Science Center
3535 S. Sherwood Forest Blvd., Suite 120
Baton Rouge, LA 70816
E-mail: gs-w-lmg_center_director@usgs.gov
Fax: (225) 298–5490
Telephone: (225) 298–5481
Home Page: http://la.water.usgs.gov

ISSN 2327-6916 (print) ISSN 2327-6932 (online) http://dx.doi.org/10.3133/fs20163049

USGS
science for a changing world

DOTD
LOUISIANA DEPARTMENT OF TRANSPORTATION & DEVELOPMENT

Prepared in cooperation with the Louisiana Department of Transportation and Development

Water Resources of Tangipahoa Parish, Louisiana

Introduction

Information concerning the availability, use, and quality of water in Tangipahoa Parish, Louisiana (fig. 1), is critical for proper water-resource management. The purpose of this fact sheet is to present information that can be used by water managers, parish residents, and others for stewardship of this vital resource. Information on the availability, past and current use, use trends, and water quality from groundwater and surface-water sources in the parish is presented. Previously published reports (see References Cited section) and data stored in the U.S. Geological Survey's National Water Information System (http://waterdata.usgs.gov/nwis) are the primary sources of the information presented here.

In 2010, about 20.1 million gallons per day (Mgal/d) of water were withdrawn in Tangipahoa Parish, Louisiana, including 19.90 Mgal/d from groundwater sources and 0.18 Mgal/d from surface-water sources[1] (table 1). Withdrawals for public supply accounted for nearly 73 percent of the total water withdrawn in 2010 (table 2). Water withdrawals for other categories of use included industrial, rural domestic, livestock, general irrigation, and aquaculture. Water-use data collected at 5-year intervals from 1960 to 2010 indicated that total water withdrawals during the years 1960 and 2010 were similar at about 20 Mgal/d (fig. 2).

[1]Water-withdrawal data are based on estimated or reported site-specific data and aggregated data, which are distributed to sources. For a full description of water-use estimate methodology, see "Data Collection" in Sargent (2011). Tabulation of numbers across text and tables may result in different totals because of rounding; nonrounded numbers are used for calculation of totals.

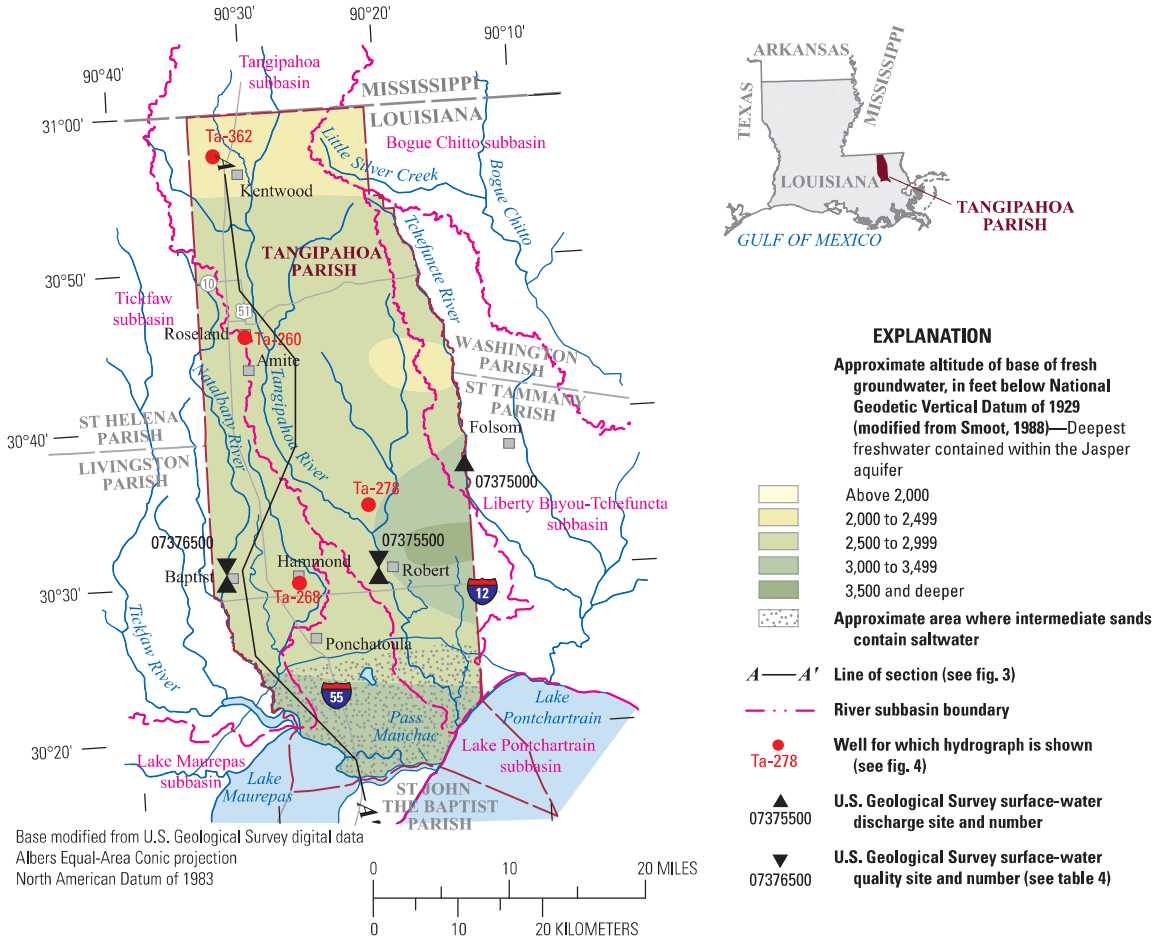


Figure 1. Location of study area, Tangipahoa Parish, Louisiana.

Table 1. Water withdrawals, in million gallons per day, by source in Tangipahoa Parish, Louisiana, 2010 (Sargent, 2011; B.P. Sargent, U.S. Geological Survey, written commun., 2015).

Aquifer system or surface-water body	Groundwater	Surface water
Chicot equivalent aquifer system	4.85	
Evangeline equivalent aquifer system	2.46	
Jasper equivalent aquifer system	12.59	
Miscellaneous streams		0.18
Total	**19.90**	**0.18**

Table 2. Water withdrawals, in million gallons per day, by use category in Tangipahoa Parish, Louisiana, 2010 (Sargent, 2011).

Use category	Groundwater	Surface water	Total
Public supply	14.59	0.00	14.59
Industrial	1.14	0.00	1.14
Rural domestic	3.66	0.00	3.66
Livestock	0.18	0.18	0.36
General irrigation	0.27	0.00	0.27
Aquaculture	0.08	0.00	0.08
Total	**19.90**	**0.18**	**20.08**

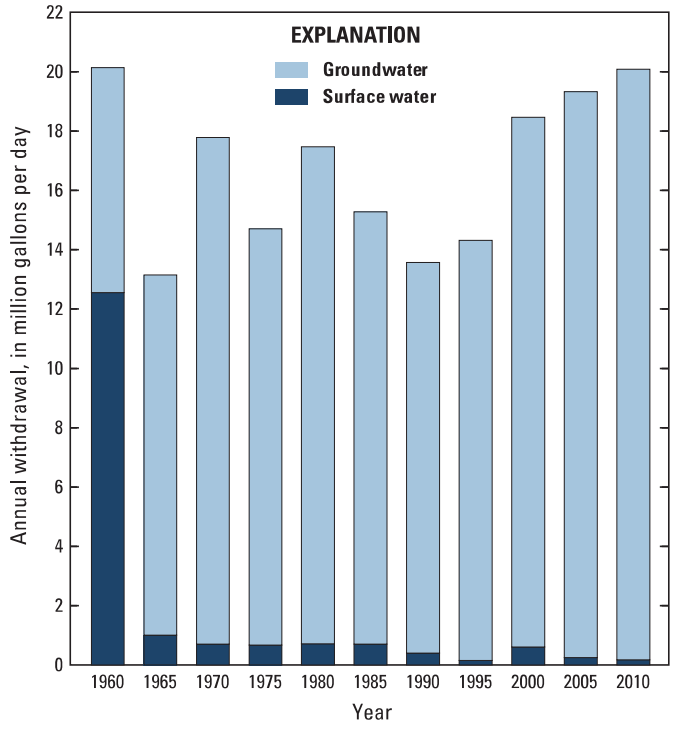


Figure 2. Water withdrawals in Tangipahoa Parish, Louisiana, 1960–2010 (Sargent, 2011).

Groundwater Resources

The primary freshwater-bearing aquifer systems in Tangipahoa Parish, from near surface to deepest, include the Chicot equivalent, Evangeline equivalent, and Jasper equivalent aquifer systems (fig. 3). The base of fresh groundwater (water with a chloride concentration of 250 milligrams per liter [mg/L] or less) generally ranges from greater than 2,000 to 3,500 feet (ft) below the National Geodetic Vertical Datum of 1929 (NGVD 29) in Tangipahoa Parish (fig. 1) (Smoot, 1988). Aquifers in the parish generally dip and thicken to the south. Recharge to the aquifers is primarily from infiltration of precipitation in the area extending from central Tangipahoa Parish northward to about 100 miles (mi) into Mississippi. Leakage from adjacent aquifers and seasonal input from rivers also provide for some recharge (Griffith, 2003). Discharge from the aquifers is by natural flow into rivers, leakage into underlying aquifers, and withdrawal from wells.

The Chicot Equivalent Aquifer System

The primary aquifers composing the Chicot equivalent aquifer system in Tangipahoa Parish are the Gonzales-New Orleans aquifer, Upland terrace aquifer, and the upper Ponchatoula aquifer. The Upland terrace aquifer is present at or near land surface in the northern half of the parish. The upper Ponchatoula aquifer is present in the southern half of the parish and may be considered a subsurface extension of the Upland terrace aquifer (fig. 3) (Nyman and Fayard, 1978). The altitude of the base of the Chicot equivalent aquifer system ranges from about 125 ft above NGVD 29 near the northern parish line to about 900 ft below NGVD 29 near the southern parish line (Griffith, 2003). Aquifers in the Chicot equivalent aquifer system typically range in thickness from 100 to 400 ft (Nyman and Fayard, 1978).

In 2009, water levels in the aquifer system ranged from about 250 ft above NGVD 29 near the northern parish line to about the NGVD 29 in the lowlands near the southern parish line. In the hilly northern part of the parish, the direction of groundwater flow in the Upland terrace aquifer is generally from hilltops towards major stream valleys. Regionally, the overall direction of flow in the Chicot equivalent aquifer system is to the south along the dip of the sediments (Tomaszewski, 2011). In Tangipahoa Parish, water-level changes within the Chicot equivalent aquifer system are primarily related to long- and short-term changes in precipitation. Water levels generally fluctuate during the year and declined about 5 ft between 1998 and 2012 at well Ta-362 (fig. 4).

State well-registration records indicated 7,877 active wells screened in the Chicot equivalent aquifer system in Tangipahoa Parish in 2015, including 7,042 domestic, 587 irrigation, 221 public supply, and 27 industrial. Depths of these wells ranged from 16 to 800 ft below land surface. Reported well yields ranged from 1 to 1,000 gallons per minute (gal/min) (Louisiana Department of Natural Resources, 2015). In 2010, groundwater withdrawals from the Chicot equivalent aquifer system in Tangipahoa Parish totaled about 4.85 Mgal/d, including 1.19 Mgal/d for public supply, 3.29 Mgal/d for rural-domestic use, 0.10 Mgal/d for livestock, 0.26 Mgal/d for general irrigation, and 0.02 Mgal/d for aquaculture (B.P. Sargent, U.S. Geological Survey, written commun., 2012).

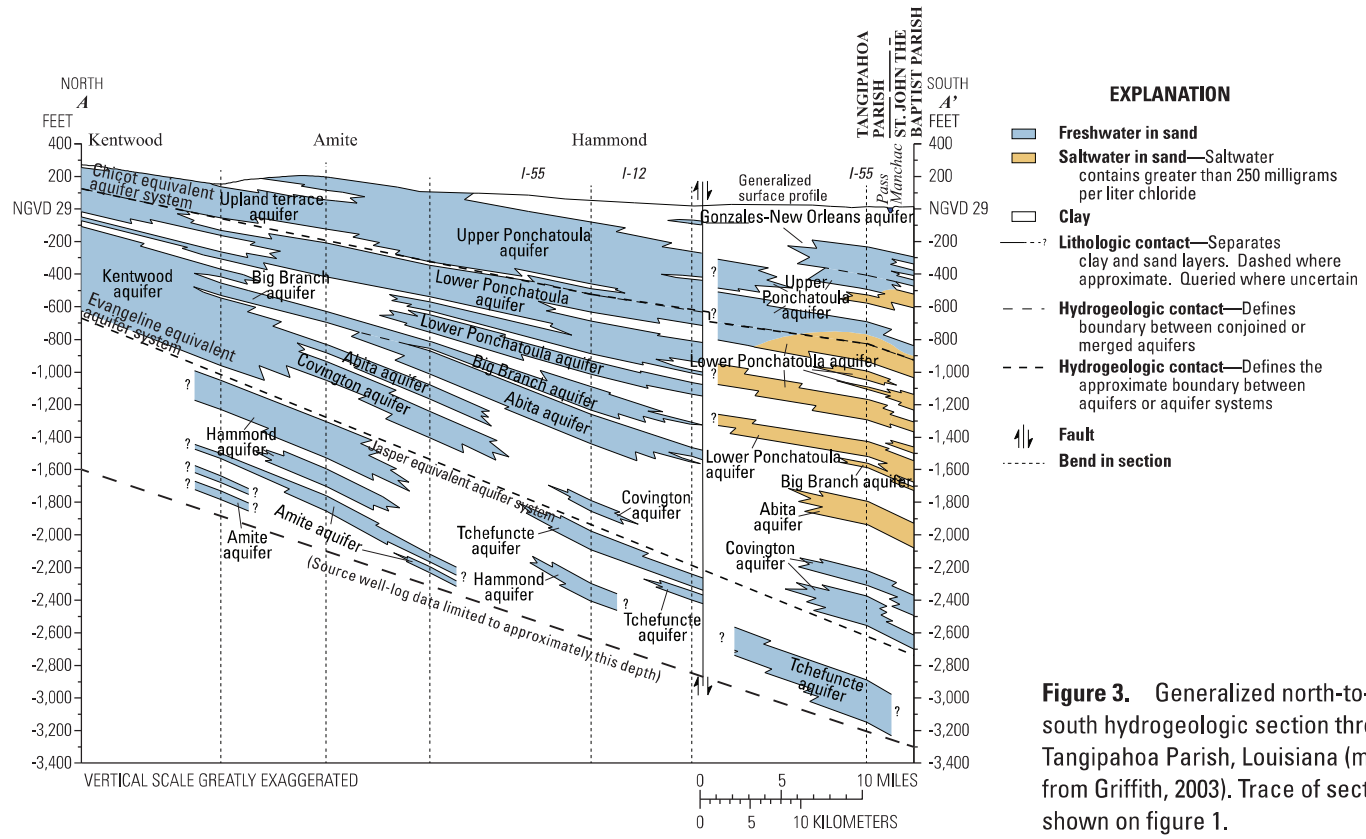


Figure 3. Generalized north-to-south hydrogeologic section through Tangipahoa Parish, Louisiana (modified from Griffith, 2003). Trace of section shown on figure 1.

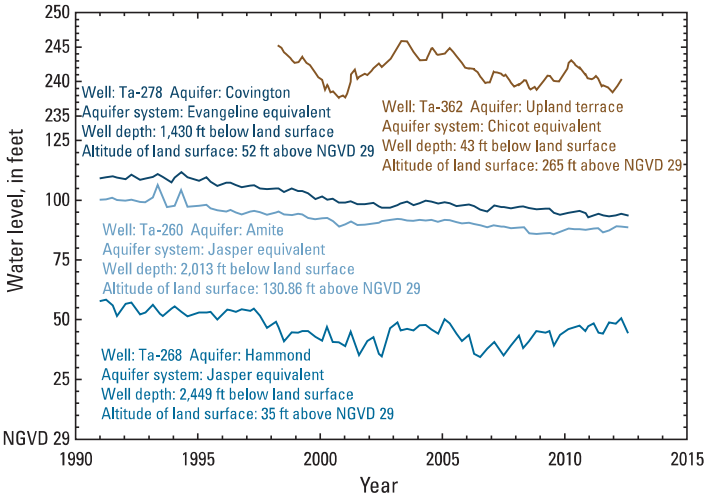


Figure 4. Water levels in wells Ta-362 screened in the Chicot equivalent aquifer system, Ta-278 screened in the Evangeline equivalent aquifer system, and wells Ta-260 and Ta-268 screened in the Jasper equivalent aquifer system in Tangipahoa Parish, Louisiana (see fig. 1 for well locations; U.S. Geological Survey, 2012a). Land surface and water levels are measured in feet (ft) relative to the National Geodetic Vertical Datum of 1929 (NGVD 29).

The Evangeline Equivalent Aquifer System

The aquifers composing the Evangeline equivalent aquifer system in Tangipahoa Parish are the lower Ponchatoula, Kentwood, Big Branch, Abita, and Covington aquifers (fig. 3). In Tangipahoa Parish, the altitude of the base of the Evangeline equivalent aquifer system ranges from about 600 ft below NGVD 29 near the northern parish line to greater than 2,700 ft below NGVD 29 near the southern parish line (fig. 3) (Griffith, 2003). Aquifers in the Evangeline equivalent aquifer system typically range in thickness from 50 to 500 ft (Nyman and Fayard, 1978).

In 2003, water levels in the Kentwood aquifer ranged from about 225 ft above NGVD 29 near the northern parish line to about 75 ft above NGVD 29 at Ponchatoula and indicated that groundwater flow was generally to the south in this aquifer (Prakken, 2004). Water levels declined about 15 ft between 1991 and 2012 at well Ta-278 (fig. 4), located northeast of Hammond (fig. 1) and screened in the Covington aquifer.

State well-registration records listed 101 active wells screened in the Evangeline equivalent aquifer system in Tangipahoa Parish in 2015, including 54 domestic, 24 public supply, 15 irrigation, and 8 industrial. Depths of these wells ranged from 155 to 2,040 ft below land surface. Reported well yields ranged from 6 to 1,500 gal/min (Louisiana Department of Natural Resources, 2015). In 2010, groundwater withdrawals from the Evangeline equivalent aquifer system in Tangipahoa Parish totaled about 2.47 Mgal/d, including 1.82 Mgal/d for public supply, 0.14 Mgal/d for industrial use, 0.37 Mgal/d for rural-domestic use, 0.07 Mgal/d for livestock, 0.01 Mgal/d for general irrigation, and 0.06 Mgal/d for aquaculture (B.P. Sargent, U.S. Geological Survey, written commun., 2012).

The Jasper Equivalent Aquifer System

The primary aquifers composing the Jasper equivalent aquifer system in Tangipahoa Parish are the Tchefuncte, Hammond, Amite, and Ramsay aquifers. The altitude of the top of the Jasper equivalent aquifer system ranges from about 700 ft below NGVD 29 near Kentwood to about 2,700 ft below NGVD 29 near the southern parish line (fig. 3) (Griffith, 2003). Aquifers in the Jasper equivalent aquifer system typically range in thickness from 100 to 250 ft (Nyman and Fayard, 1978).

Groundwater levels in the Hammond and Amite aquifers have declined since the 1950s because of groundwater withdrawals (Nyman and Fayard, 1978). Water levels in well Ta-268, located near Hammond and screened in the Hammond aquifer, declined about 7 ft from 1991 to 2012 (fig. 4). Water levels in well Ta-260, located in west-central Tangipahoa Parish at Roseland and screened in the Amite aquifer, declined about 10 ft from 1991 to 2012.

State well-registration records listed 83 active wells screened in the Jasper equivalent aquifer system in Tangipahoa Parish in 2015, including 54 public supply, 20 domestic, 6 irrigation, and 3 industrial. Depths of these wells ranged from 1,250 to 2,743 ft below land surface. Reported well yields ranged from 40 to 2,285 gal/min (Louisiana Department of Natural Resources, 2015). In 2010, groundwater withdrawals from the Jasper equivalent aquifer system in Tangipahoa Parish totaled about 12.59 Mgal/d, including 11.57 Mgal/d for public-supply use, 0.99 Mgal/d for industrial use, 0.01 Mgal/d for livestock, and 0.01 Mgal/d for general irrigation.

Groundwater Quality

Samples taken from freshwater wells in Tangipahoa Parish indicated that the Chicot, Evangeline, and Jasper aquifer systems have similar water quality, but some variation is present (table 3). Samples were found to be soft[2] with respect to hardness and generally did not exceed the U.S. Environmental Protection Agency's Secondary Maximum Contaminant Levels[3] (SMCLs) for dissolved solids and color. Median values for pH ranged from 7.0 to 7.9. Temperature increased with depth. Locally, concentrations of iron and manganese can greatly exceed the SMCLs. Hydrogen sulfide may be present locally in the Evangeline and Jasper equivalent aquifer systems (Nyman and Fayard, 1978).

Surface-Water Resources

Surface-water resources in Tangipahoa Parish are found within three regional drainage basins that comprise multiple subbasins (fig. 1). Most of the parish is in the Lake Maurepas Basin (Hydrologic Unit Code [HUC] 080702), with much smaller areas in the Lake Pontchartrain Basin (HUC 080902) and Pearl Basin (HUC 031800). All three basins eventually discharge into Lake Maurepas, Lake Pontchartrain, or the Gulf of Mexico (U.S. Geological Survey, 2015). In 2010, about 0.18 Mgal/d of surface water were withdrawn for livestock from streams in Tangipahoa Parish (table 2).

Lake Maurepas Basin

The Lake Maurepas Basin comprises the Tangipahoa (HUC 08070205), Tickfaw (HUC 08070203), and Lake Maurepas (HUC 08070204) subbasins (fig. 1). The Tangipahoa River (within the Tangipahoa subbasin) flows into the parish from Mississippi, is fed by small streams, and eventually flows into Lake Pontchartrain about 12 mi southeast of Ponchatoula. The average streamflow for the Tangipahoa River at Robert (site number 07375500) was 1,148 cubic feet per second (ft^3/s) for the period 1938–2009 from a drainage area of about 646 square miles (mi^2) (U.S. Geological Survey, 2009).

The Tickfaw subbasin within Tangipahoa Parish is primarily drained by the Natalbany River, which is fed by small streams and discharges into the Tickfaw River about 1.5 mi upstream from the mouth of the Tickfaw River on Lake Maurepas. The average streamflow for the Natalbany River at Baptist (site number 07376500) was 117 ft^3/s for the period 1943–2009 from a drainage area of about 79.5 mi^2 (U.S. Geological Survey, 2009).

Lake Maurepas and Pass Manchac are located in the Lake Maurepas subbasin. Lake Maurepas has a surface area of about 91 mi^2 and an average depth of about 7 ft and is connected to Lake Pontchartrain by way of Pass Manchac (Shampine, 1971).

Lake Pontchartrain and Pearl Basins

The Lake Pontchartrain Basin comprises the Liberty Bayou-Tchefuncta (HUC 08090201) and Lake Pontchartrain (08090202) subbasins in Tangipahoa Parish (fig. 1). The Tchefuncte River begins near the Tangipahoa-Washington Parish border and eventually flows into St. Tammany Parish and then Lake Pontchartrain. The average streamflow for the Tchefuncte River near Folsom (site number 07375000) was 158 ft^3/s for the period 1943–2009 from a drainage area of about 103 mi^2 (U.S. Geological Survey, 2009). Lake Pontchartrain is a shallow estuarine bay of the Gulf of Mexico and has a surface area of about 621 mi^2 and an average depth of about 11 ft (Shampine, 1971).

The Pearl Basin is composed of only the Bogue Chitto subbasin (HUC 0318005) in Tangipahoa Parish. This subbasin contains Little Silver Creek which drains out of Tangipahoa Parish and into the Bogue Chitto in Washington Parish.

Surface-Water Quality

Surface-water quality varies greatly in Tangipahoa Parish. Streams in the Tangipahoa and Liberty Bayou-Tchefuncta subbasins have good connection to the shallow aquifers, resulting in substantial groundwater influence on the quality of the surface water in these two basins. The Natalbany River and its tributaries are poorly connected to the shallow aquifers and are less affected by groundwater interaction (Fayard and Nyman, 1976). The majority of the parish is drained by freshwater streams that ultimately discharge into Lake Maurepas and Lake Pontchartrain. In both lakes, salinity varies substantially because of the influx of freshwater from streams and saline water from the Gulf of Mexico (Shampine, 1971). Saltwater intrusion may occur during droughts or storm events in the lower reaches of the streams that discharge into these lakes.

Water samples analyzed during the period 1968–99 from the Tangipahoa River at Robert and during the period 1943–69 from the Natalbany River at Baptist were found to be soft with respect to hardness and did not exceed SMCLs for concentrations of chloride and sulfate (table 4). Dissolved-oxygen concentrations in samples from the Tangipahoa River were generally greater than 5 mg/L, which is considered the minimum value for a

[2]Hardness ranges, expressed as milligrams per liter of calcium carbonate, are as follows: 0–60, soft; 61–120, moderately hard; 121–180, hard; greater than 180, very hard (Hem, 1985).

[3]The SMCLs are nonenforceable Federal guidelines regarding cosmetic effects (such as tooth or skin discoloration), aesthetic effects (such as taste, odor, or color), or technical effects (such as damage to water equipment or reduced effectiveness of treatment for other contaminants) of drinking water. SMCLs were established as guidelines by the U.S. Environmental Protection Agency (2016).

Table 3. Summary of selected water-quality characteristics for freshwater in the Chicot, Evangeline, and Jasper equivalent aquifer systems in Tangipahoa Parish, Louisiana (U.S. Geological Survey, 2012b).

[Values are in milligrams per liter, except as noted. °C, degrees Celsius; PCU, platinum cobalt unit; µS/cm, microsiemen per centimeter; SU, standard unit; $CaCO_3$, calcium carbonate; µg/L, microgram per liter; <, less than; SMCL, Secondary Maximum Contaminant Level established by the U.S. Environmental Protection Agency (2016); NA, not applicable]

	Temperature (°C)	Color, (PCU)	Specific conductance, field (µS/cm at 25 °C)	pH, field (SU)	Hardness (as $CaCO_3$)	Chloride, filtered (as Cl)	Iron, filtered (µg/L as Fe)	Manganese, filtered (µg/L as Mn)	Dissolved solids, filtered
Chicot equivalent aquifer system, 1939–2001 (31 wells)									
Median	21.0	2	179	7.0	11	4.0	50	40	152
10th percentile	20.0	0	31	5.0	3	2.2	<10	<3	41
90th percentile	24.0	20	278	8.3	25	15	690	110	198
Number of samples	27	16	25	28	30	31	21	21	22
Percentage of samples that do not exceed SMCLs	NA	81	NA	57	NA	100	67	62	100
Evangeline equivalent aquifer system, 1939–2005 (36 wells)									
Median	24.2	2	198	7.2	15	3.0	120	70	160
10th percentile	21.0	0	84	6.2	7	2.0	30	<20	67
90th percentile	29.4	13	300	8.8	26	4.5	1,500	320	187
Number of samples	28	20	27	22	29	36	18	17	22
Percentage of samples that do not exceed SMCLs	NA	90	NA	59	NA	100	67	35	100
Jasper equivalent aquifer system, 1939–2005 (55 wells)									
Median	30.5	10	264	7.9	4	3.1	120	30	196
10th percentile	26.3	0	147	6.8	1	2.3	20	<20	161
90th percentile	34.0	30	428	9.1	9	6.1	1,100	140	265
Number of samples	37	36	46	43	45	55	31	19	35
Percentage of samples that do not exceed SMCLs	NA	72	NA	67	NA	100	68	63	97
SMCLs									
	NA	15	NA	6.5–8.5	NA	250	300	50	500

diverse population of fresh, warmwater biota, including sport fish (Louisiana Department of Environmental Quality, 2008). The median value for pH in samples from the Tangipahoa River was 6.5 standard units and from the Natalbany River was 6.2 standard units. Turbidity may be more of a concern in the Natalbany River because of its path cutting through numerous clay deposits (Fayard and Nyman, 1976).

References Cited

Fayard, L.D., and Nyman, D.J., 1976, Surface-water resources of the Tangipahoa, Tchefuncta, and Natalbany River Basins, southeastern Louisiana: Louisiana Department of Public Works Water Resources Technical Report no. 11, 49 p.

Griffith, J.M., 2003, Hydrogeologic framework of southeastern Louisiana: Louisiana Department of Transportation and Development Water Resources Technical Report no. 72, 21 p., 18 pls.

Hem, J.D., 1985, Study and interpretation of the chemical characteristics of natural water (3d ed.): U.S. Geological Survey Water-Supply Paper 2254, 264 p., accessed February 20, 2013, at http://pubs.er.usgs.gov/publication/wsp2254.

Louisiana Department of Environmental Quality, 2008, Environmental Regulatory Code, Title 33, Part IX, Subpart 1: Baton Rouge, Louisiana Department of Environmental Quality, accessed June 9, 2009, at http:www.deq.louisiana.gov/portal/tabid/1674/Default.aspx.

Louisiana Department of Natural Resources, 2015, Strategic Online Natural Resources Information System (SONRIS): Louisiana Department of Natural Resources database, accessed May 18, 2015, at http://sonris.com/.

Nyman, D.J., and Fayard, L.D., 1978, Ground-water resources of Tangipahoa and St. Tammany Parishes, southeastern Louisiana: Louisiana Department of Transportation and Development, Office of Public Works Water Resources Technical Report no. 15, 76 p.

Prakken, L.B., 2004, Louisiana ground-water map no. 17—Generalized potentiometric surface of the Kentwood aquifer system and the "1,500-foot" and "1,700-foot" sands of the Baton Rouge area in southeastern Louisiana, March–April 2003: U.S. Geological Survey Scientific Investigations Map 2862, 2 sheets, accessed February 24, 2012, at http://pubs.er.usgs.gov/publication/sim2862.

Sargent, B.P., 2011, Water use in Louisiana, 2010: Louisiana Department of Transportation and Development Water Resources Special Report no. 17, 135 p.

Shampine, W.J., 1971, Chemical, biological, and physical data for the major lakes and reservoirs in Louisiana: Louisiana Department of Public Works Basic Records Report no. 5, 98 p.

Smoot, C.W., 1988, Louisiana hydrologic atlas map no. 3—Altitude of the base of freshwater in Louisiana: U.S. Geological Survey Water-Resources Investigations Report 86–4314, 1 sheet, accessed November 2, 2011, at http://pubs.er.usgs.gov/publication/wri864314.

Table 4. Summary of selected water-quality characteristics for the Tangipahoa and Natalbany Rivers in Tangipahoa Parish, Louisiana (U.S. Geological Survey, 2012b).

[Values are in milligrams per liter, except as noted. µS/cm, microsiemen per centimeter; °C, degrees Celsius; SU, standard unit; $CaCO_3$, calcium carbonate; µg/L, microgram per liter; SMCL, Secondary Maximum Contaminant Level established by the U.S. Environmental Protection Agency (2016); NA, not applicable; PCU, platinum cobalt units]

	Specific conductance, field (µS/cm at 25 °C)	Oxygen, dissolved	pH, field (SU)	Hardness (as $CaCO_3$)	Calcium, filtered (as Ca)	Magnesium, filtered (as Mg)	Sodium, filtered (as Na)	Chloride, filtered (as Cl)	Sulfate, filtered (as SO_4)	Iron, filtered (µg/L as Fe)
Tangipahoa River at Robert, 1968–99[1]										
Median	49	8.6	6.5	10	2.3	1.0	4.9	5.9	2.2	220
10th percentile	45	7.1	6.1	8	2.0	0.6	3.7	4.5	1.1	130
90th percentile	57	10.3	7.0	12	2.8	1.2	5.8	7.4	4.5	350
Number of samples	130	114	128	130	131	130	128	128	128	75
Percentage of samples that do not exceed SMCLs	NA	NA	52	NA	NA	NA	NA	100	100	79
SMCLs										
	NA	NA	6.5–8.5	NA	NA	NA	NA	250	250	300
Natalbany River at Baptist, 1943–69[2]										
	Specific conductance, field (µS/cm at 25 °C)	Color (PCU)	pH, field (SU)	Hardness (as $CaCO_3$)	Calcium, filtered (as Ca)	Magnesium, filtered (as Mg)	Sodium, filtered (as Na)	Chloride, filtered as Cl)	Sulfate, filtered (as SO_4)	Dissolved solids, filtered
Median	72	20	6.2	16	3.5	1.4	8	7.9	6.4	63
10th percentile	67	5	5.8	13.0	3.1	1.3	6.7	5.0	4.1	54.2
90th percentile	92	54	6.7	18.0	4.2	1.9	10.8	9.2	9.0	82.0
Number of samples	17	19	19	19	17	17	17	21	19	15
Percentage of samples that do not exceed SMCLs	NA	42	NA	NA	NA	NA	NA	100	100	100
SMCLs										
	NA	15	6.5–8.5	NA	NA	NA	NA	250	250	500

[1]Site number 07375500.

[2]Site number 07376500.

Tomaszewski, D.J., 2011, Water-level surface in the Chicot equivalent aquifer system in southeastern Louisiana, 2009: U.S. Geological Survey Scientific Investigations Map 3173, 2 pls., accessed February 24, 2012, at http://pubs.usgs.gov/sim/3173/.

U.S. Environmental Protection Agency, 2016, Secondary Drinking Water Standards: Guidance for Nuisance Chemicals, accessed April 13, 2016, https://www.epa.gov/dwstandardsregulations/secondary-drinking-water-standards-guidance-nuisance-chemicals.

U.S. Geological Survey, 2009, Annual water-data reports: Accessed July 30, 2010, at http://wdr.water.usgs.gov/.

U.S. Geological Survey, 2012a, Groundwater levels for Louisiana: National Water Information System Web Interface, accessed October 23, 2012, at http://nwis.waterdata.usgs.gov/la/nwis/gwlevels.

U.S. Geological Survey, 2012b, Water quality samples for Louisiana: National Water Information System Web Interface, accessed August 20, 2012, at http://nwis.waterdata.usgs.gov/la/nwis/qwdata/.

U.S. Geological Survey, 2015, Science in your watershed: Locate your watershed, accessed May 4, 2015, at http://water.usgs.gov/wsc/map_index.html.

This fact sheet was published by the U.S. Geological Survey in cooperation with the Louisiana Department of Transportation and Development (DOTD).
Thanks are given to Zahir "Bo" Bolourchi, Director, Water Resources Programs, Louisiana DOTD, who contributed to the content of the fact sheet.

By Vincent E. White and Lawrence B. Prakken

For additional information, contact:

Director, USGS Lower Mississippi-Gulf Water Science Center
3535 S. Sherwood Forest Blvd., Suite 120
Baton Rouge, LA 70816
E-mail: gs-w-lmg_center_director@usgs.gov
Fax: (225) 298–5490
Telephone: (225) 298–5481
Home Page: http://la.water.usgs.gov

ISSN 2327-6916 (print) ISSN 2327-6932 (online) http://dx.doi.org/10.3133/fs20163049