U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

Prepared in cooperation with the
CAPITAL AREA GROUND WATER CONSERVATION COMMISSION

SCIENTIFIC INVESTIGATIONS MAP 2865 (Sheet 1 of 2)
Tomaszewski, D.J., and Accardo, Darren, 2004, Louisiana Ground-Water Map No. 19: Potentiometric surface of the "2,400-foot" sand of the Baton Rouge area, Louisiana, May-June 2002

INTRODUCTION

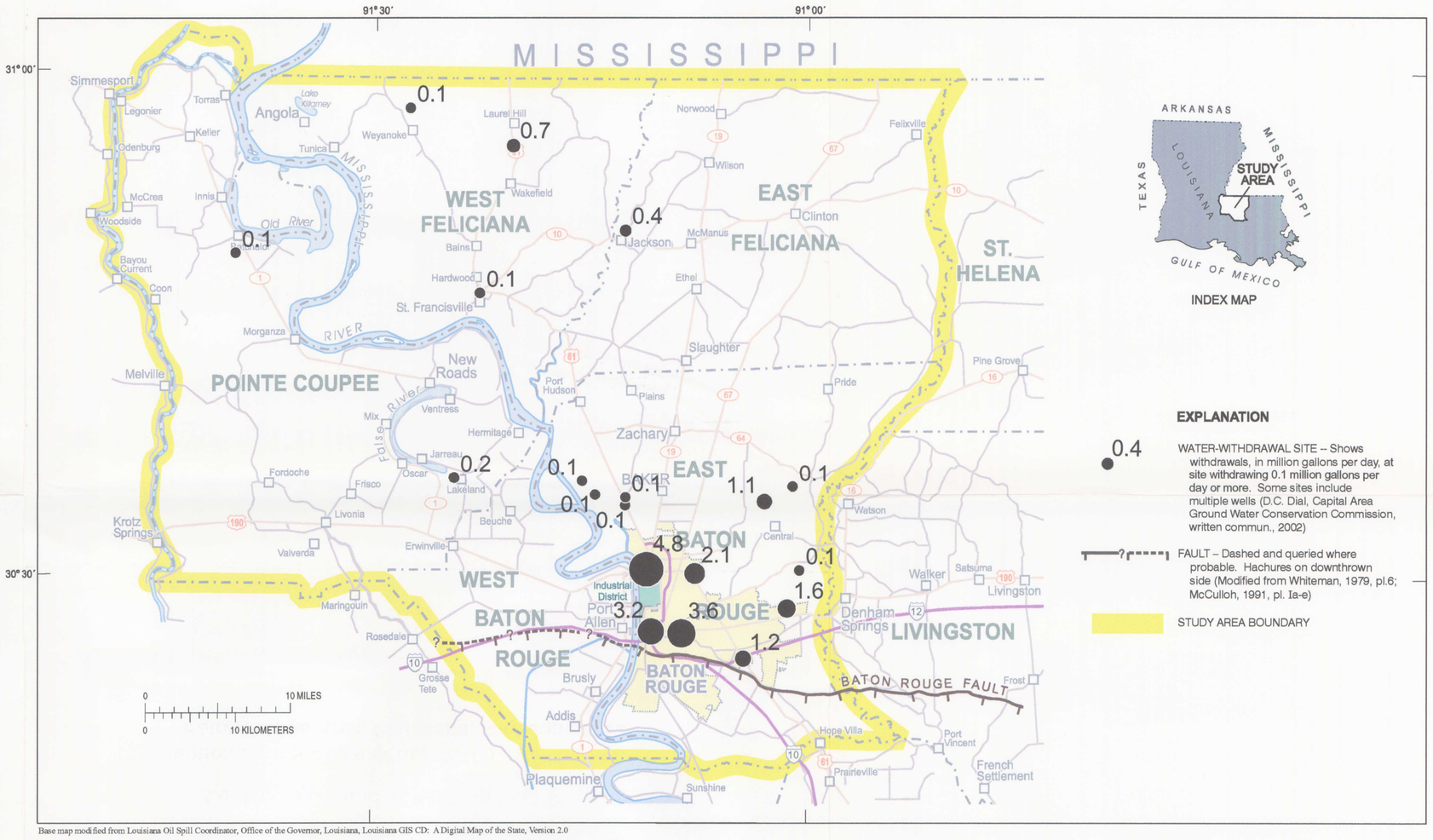
The "2,400-foot" sand (aquifer) is a major source of fresh ground water in the Baton Rouge area and surrounding parishes. In 2002, about 19.7 Mgal/d[1] was pumped from the "2,400-foot" sand in the five-parish study area (East and West Baton Rouge, Pointe Coupee, and East and West Feliciana Parishes, fig. 1). Most withdrawals in the study area (18 Mgal/d) were in East Baton Rouge Parish. Withdrawals from the "2,400-foot" sand in 2002 were used mostly for public supply (75 percent) and industry (25 percent).

Estimates of total withdrawals from all aquifers of Quaternary and Tertiary age in most of East Baton Rouge Parish and part of West Baton Rouge Parish (fig. 2) were about 2 Mgal/d in 1900 and about 12 Mgal/d in 1936 (Meyer and Turcan, 1955, p. 53). Rapid industrial growth in the Baton Rouge area began about 1936, and by 1953, about 65 Mgal/d were withdrawn from all aquifers in most of East Baton Rouge Parish and part of West Baton Rouge Parish for industry and public supply (Meyer and Turcan, 1955, p. 53). Withdrawal data for the "2,400-foot" sand (fig. 3) indicate withdrawals were about 10 Mgal/d or less during the period 1950-60 and increased from about 13 Mgal/d (1990) to about 20 Mgal/d (2002). As withdrawals have increased in the "2,400-foot" sand, water levels have declined.

System	Series	Stratigraphic unit		Aquifer or confining unit[1]
Quaternary	Holocene	Mississippi River and other alluvial deposits		Mississippi River alluvial aquifer
	?			
	Pleistocene	Unnamed Pleistocene deposits		Shallow sands
			Upland terrace aquifer	"400-foot" sand
				"600-foot" sand
Tertiary	Pliocene	Fleming Formation	Blounts Creek Member	"800-foot" sand
				"1,000-foot" sand
	?			"1,200-foot" sand
	Miocene			"1,500-foot" sand
				"1,700-foot" sand
			Castor Creek Member	Unnamed confining unit
			Williamson Creek Member	"2,000-foot" sand
			Dough Hills Member	"2,400-foot" sand
			Carnahan Bayou Member	"2,800-foot" sand
			Lena Member	Unnamed confining unit
	?	Catahoula Formation		Catahoula aquifer
	Oligocene			

[1]Clay units separating aquifers in the Baton Rouge area are discontinuous and unnamed.

Figure 2. Hydrogeologic units in the Baton Rouge area, Louisiana (modified from Stuart and others, 1994, fig. 5; Lovelace and Lovelace, 1995, fig. 1).



Base map modified from Louisiana Oil Spill Coordinator, Office of the Governor, Louisiana, Louisiana GIS CD: A Digital Map of the State, Version 2.0

Figure 1. Location of the study area and water withdrawal sites in the "2,400-foot" sand of the Baton Rouge area, Louisiana, 2002.

In addition to concerns about water-level declines in the "2,400-foot" sand, recent increases in chloride concentrations at well EB-804B indicate the possibility of saltwater[2] encroachment north of the fault (fig. 4). Withdrawals have increased near well EB-804B, and chloride concentrations at the well increased from 10 mg/L (prior to 1994) to about 100 mg/L (2001).

Additional knowledge about ground-water flow and effects of withdrawals on the "2,400-foot" sand of the Baton Rouge area is needed to assess ground-water development potential and to protect the resource. To meet this need, the U.S. Geological Survey (USGS), in cooperation with the Capital Area Ground Water Conservation Commission (CAGWCC), began a study in 2001 to measure and document the current (2002) water levels in wells screened in the "2,400-foot" sand, construct a potentiometric-surface (water-level) map, and evaluate changes in the potentiometric surface. This report documents the results and findings of this study.

The authors gratefully acknowledge the assistance and cooperation of numerous public water suppliers, industrial facilities, and private well owners that allowed site access and collection of water-level data. Don C. Dial, Director, Capital Area Ground Water Conservation Commission, assisted with technical support and provided withdrawal data for the study.

GENERAL HYDROGEOLOGY

The "2,400-foot" sand and other aquifers in the Baton Rouge area (fig. 2) extend throughout the study area, adjacent parishes, and into southwestern Mississippi. Most of the aquifers, which are named according to their approximate depth below land surface in the industrial district, are composed of very fine to coarse sand and may contain gravel. The correlation between aquifers in the Baton Rouge area and regional stratigraphy is shown in figure 2.

The Baton Rouge fault, which has been described as a leaky barrier to ground-water flow (Whiteman, 1979, p. 10), historically has impeded freshwater flushing of saltwater south of the fault and presently impedes saltwater encroachment northward into freshwater areas. Along the Baton Rouge fault, vertical displacement has caused limited hydraulic connection of the "2,400-foot" sand north of the fault with the "2,000-foot" sand south of the fault (Torak and Whiteman, 1982, p. 15). In the Baton Rouge area, the "2,400-foot" sand contains freshwater north of the Baton Rouge fault. South of the fault, the "2,400-foot" sand and overlying and underlying aquifers contain mostly saltwater.

Precipitation enters the aquifer as recharge in the outcrop area, located in southwestern Mississippi, and moves downdip toward coastal areas in Louisiana (Morgan, 1963, pl. 1). Prior to large withdrawals, ground-water flow was from north to south in the study area (Rollo, 1969, p. 8). The southward flow of freshwater was impeded at the fault, and ground water moved upward through overlying clays and sands to discharge at land surface as seeps and springs (Rollo, 1969, p. 9). Small amounts of freshwater from the "2,400-foot" sand (north of the fault) leaked across the fault to create local freshwater areas in the "2,000-foot" sand south of the fault.

Large ground-water withdrawals from the "2,400-foot" sand (fig. 1) north of the fault have altered the distribution of hydraulic head such that water no longer discharges at land surface near the fault. Much of the ground water moving southward from the recharge area is now intercepted at withdrawal sites (fig.1). Large withdrawals from the "2,400-foot" sand north of the fault have reduced hydraulic head in the aquifer and can induce vertical leakage of water into the sand from overlying and underlying clays and aquifers. Large withdrawals also may cause encroachment of saltwater from south of the fault into freshwater areas north of the fault.

WATER-LEVEL DATA

Water levels at wells EB-322 and WBR-100B (figs. 4 and 5), screened in the "2,400-foot" sand, show the effects of long-term withdrawals in the Baton Rouge area. Both wells are located near large withdrawal sites. As withdrawals have increased in the "2,400-foot" sand, water levels in wells EB-322 and WBR-100B have declined (fig. 3). Water levels were about 70 ft above land surface at well EB-322 in central East Baton Rouge Parish in 1942. Total water-level decline at well EB-322 has been about 160 ft (1942-2003).

The hydrograph for well EB-322 shows that as withdrawals increase, water levels decline, and during periods of decreased water withdrawals, water levels remain stable (no decline) or recover. Water levels declined about 3.7 ft/yr at well EB-322 during the approximate period of 1942-82. Water levels recovered slightly during 1982-89 when withdrawals declined. Water levels were generally stable during 1990-95. Water levels declined about 2.8 ft/yr from 1996 to 2001 in response to increased withdrawals from the "2,400-foot" sand. Similar water-level trends can be noted at well WBR-100B although rates of decline and recoveries vary. Seasonal fluctuations in water levels at wells EB-322 and WBR-100B are a result of seasonal demand for water.

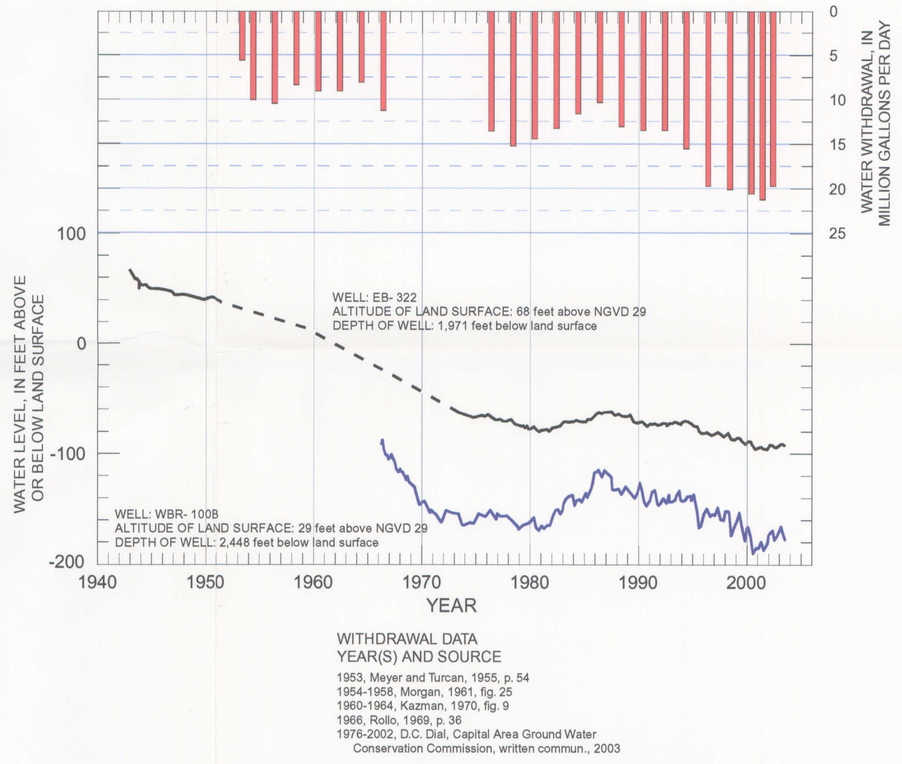


Figure 3. Water withdrawal from the "2,400-foot" sand and water levels in wells EB-322 and WBR-100B in the Baton Rouge area, Louisiana.

[1]Water-use data for 2002 are modified from records provided by the Capital Area Ground Water Conservation Commission to the USGS.

[2]Saltwater in this report is defined as water that contains chloride at concentrations of more than 250 mg/L. Concentrations of chloride greater than 250 mg/L exceed the Secondary Maximum Contaminant Level (SMCL) for drinking water (U.S. Environmental Protection Agency, 1977, 1992). SMCL's are established for contaminants that can adversely affect the aesthetic quality of drinking water. At high concentrations or values, health implications as well as aesthetic degradation also may exist. SMCL's are not federally enforceable, but are intended as guidelines for the states.

Louisiana Ground-Water Map No. 19:

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2004

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