CAPITAL AREA GROUND WATER CONSERVATION COMMISSION

BULLETIN NO. 3

A GEOHYDROLOGIC SURVEY OF THE "1,200-FOOT" SAND IN THE CAPITAL AREA GROUND WATER CONSERVATION DISTRICT

By

Charles G. Smith

Consulting Geologist

May 1979

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FOREWORD

This report on the "1,200-foot" sand is one of a series of studies financed by and accomplished under the direction of the Capital Area Ground Water Conservation Commission. The reports add to the knowledge of the ground-water resources in the District and will be useful to users and planners.

Although the chloride content in "1,200-foot" sand wells at the Greater Baton Rouge Port Commission's facilities in West Baton Rouge Parish has increased from a background level of about 5 milligrams per liter to about 100 milligrams per liter in recent years, the results of this study indicate that this is a localized instance. Although the study concludes that the "1,200-foot" sand is not in any immediate danger of salt-water contamination, the Board of Commissioners recommends that new wells to be screened in the "1,200-foot" sand should not be located near the fault, in order to minimize the possibility of movement of "salty water" across the fault in the District.

In order to assure that future users will have an adequate long-term supply of fresh water, the Board also recommends that:

1. The users in the District continue to develop plans to use surface water in lieu of ground water, where practicable.

2. The present quality-of-water monitoring network should be continued. Modifications should be made in the network, when and where necessary, based on an annual evaluation.

Mark E. Walton
Chairman

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Purpose and Background

The "1,200-foot" sand is one of the major aquifers of the Capital District.[1/] According to ground water pumpage reported to the Capital Area Ground Water Conservation Commission, average daily pumpage from this aquifer in the Capital District was 22 million gallons during 1978. With the exception of a few local areas, the "1,200-foot" sand is a distinct hydrologic unit present throughout the District and contains fresh water (Winner and others, 1968; Morgan, 1963) in most of the area north of the Baton Rouge fault.

Morgan (1963) discussed the "1,200-foot" sand in East and West Feliciana Parishes. Winner and others (1968) and Rollo (1969) reported most recently on the "1,200-foot" sand in Pointe Coupee and in parts of West and East Baton Rouge Parishes respectively. West of the Mississippi River, the latter two studies focused on the aquifers north of the Baton Rouge fault system. The Baton Rouge fault system is known to be a partial barrier dividing dominantly fresh water (less than 1,000 mg/l dissolved solids) aquifers north of the fault from dominantly salt water (greater than 1,000 mg/l dissolved solids) aquifers south of the fault.

Salt water occurs north of the Baton Rouge fault in the "600-foot", "1,000-foot", "1,500-foot", "2,000-foot", and "2,800-foot" sands (Rollo, 1969, p. 39; Smith, 1976, p. 3). The presence of salt water north of the fault is probably a result of (1) incomplete flushing of salt water from the aquifer before faulting occurred and/or (2) slow movement of salt water across the fault caused by a large head differential created at the fault since ground water pumping increased in the late 1940's. This possibility was realized for the "1,200-foot" sand when chloride levels began to rise in 1971 in two wells located at the Greater Baton Rouge Port Commission lock north of the Baton Rouge fault in West Baton Rouge Parish.

This study was undertaken to investigate the effects of the Baton Rouge fault on ground-water quality in the "1,200-foot" sand, especially in that area where the "1,200-foot" sand is the principal source of drinking water, i.e., the western parts of the District. This area is west of the area studied by Rollo (1969) and south of the area studied by Winner and others (1968). Thus, this study and report was oriented primarily to (1) mapping the relationship between the "1,200-foot" sand and the Baton Rouge fault system, (2) providing an up-dated evaluation of conditions in the "1,200-foot" sand, and (3) mapping and discussing potential areas of ground-water quality changes or degradation either due to natural variations in the aquifer or due to salt

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[1/] Capital District refers to the five parishes of the Capital Area Ground Water Conservation Commission; East and West Baton Rouge Parishes, East and West Feliciana Parishes and Pointe Coupee Parish.

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SUMMARY AND CONCLUSIONS

1. The Baton Rouge fault system is a zone of low permeability, which effectively divides the "1,200-foot" sand into a northern area of fresh water and a southern area of salt water. As a result of downward displacement along the fault, the "1,200-foot" sand on the north, in some places, is in contact with the "1,000-foot" sand on the south side of the fault.

2. A chloride increase was detected in wells WBR-36 and -37 in the "1,200-foot" sand north of the fault at the Greater Baton Rouge Port Commission (GBRPC) lock beginning in 1971. The chloride content has risen from the original level of 5 mg/l to 120 mg/l in the latest analyses (1979) in both wells. Although this is still fresh water, there is no evidence the current upward trend in chloride concentration will cease or reverse before the water exceeds a "reasonable maximum level" of 250 mg/l chlorides for drinking water (EPA, 1976, p. 206).

Three possible sources of the "salty" water are (1) a leak of brackish water through the casing from a shallower aquifer penetrated by the wells, (2) upward coning of salt water from the base of the aquifer, and (3) induced encroachment of salt water from aquifers south of the fault. Presently it is only possible to speculate which of these three conditions is the most likely. However, the most serious implications arise from the latter -- salt water encroachment. According to calculations by Rollo (p. 41) in 1969, which are still valid, the average rate of movement of water from the Port facility northward, toward the Baton Rouge industrial center, is about 300 feet per year. If this is correct, the leading edge of advancing salt water is not more than a few hundred feet north of wells WBR-36 and -37 presently. Thus, if brackish or salt water were crossing the fault here it would not reach the industrial area for several more decades, if ever. The theoretical groundwater flow rate is probably higher than the actual flow rate due to the fact that, locally the "1,200-foot" sand is a complex series of relatively thin sand layers, which may not be continuous much beyond the region of the apparent chloride increase. An evaluation of the estimated potentiometric contours with rates of pumping and head differential inferred that the permeability of the fault is no more than about 0.001 gallons per day/ft^2.

3. It is possible that salt water is moving across the fault into the "1,200-foot" sand at other places in the District. Rollo (1969, p. 30) noted the possibility at EB-781, which is an observation well at Acadian Thruway and the Baton Rouge fault. Here, the "1,000-foot" sand south of the fault, which yields water containing approximately 400 mg/l chloride, appears to be opposite the "1,200-foot" sand north of the fault. Water-level variations in an observation well (EB-782 A) completed in the "1,000-foot" sand south of the fault compared with those in EB-301, which is screened in the "1,200-foot" sand north of the fault, prove only a slight hydraulic connection exists between this aquifer and the "1,200-foot" sand to the north (see Figure 6). No evidence of salt water encroachment in this area exists in this aquifer. The nearest water quality monitoring well in the "1,200-foot" sand north of the fault in this area is EB-298, about a mile to the north at Government

Street. The water from this well has shown no significant change in chloride concentration since the first samples were collected in 1968.

4. The recent discovery of high iron concentrations (in excess of 0.3 mg/l) in water from a well (WBR-154) near Winterville in West Baton Rouge Parish, coupled with high iron concentrations in other wells in parts of West Baton Rouge and Pointe Coupee Parish, indicate water in the "1,200-foot" sand in the northeastern part of the Capital District (north of central West Baton Rouge Parish) may be undesirable without treatment, for certain uses.

RECOMMENDATIONS

The following recommendations are made recognizing that (1) except for increased use and the rise in chlorides at WBR-36 and -37, the current situation in the "1,200-foot" sand is not significantly different from that discussed by Rollo (1969) 10 years ago, and (2) water level and water quality monitoring programs along the Baton Rouge fault have been established and are being maintained by the U.S. Geological Survey in cooperation with the Louisiana Office of Public Works, the Louisiana Department of Transportation and Development, East Baton Rouge Parish, and the Capital Area Ground Water Conservation Commission.

1. Ground-water quality monitoring in the vicinity of wells WBR-36 and -37, and at other wells north of the fault in West Baton Rouge Parish, should continue. Water quality data from these wells is needed for evaluating salt-water encroachment, if any, in the Port Allen area.

2. Water quality monitor wells that might yield timely data at other locations along the Baton Rouge fault, particularly in East Baton Rouge Parish, should continue to be monitored.

3. In order to assure the greatest protection from salt water encroachment, future development of water supplies in the "1,200-foot" sand should be located as far as practical north of the Baton Rouge fault.

4. In the northeastern portion of the District, where the "1,200-foot" sand may contain more than 0.3 mg/l iron, exploratory drilling should be done, including collection and analysis of a water sample, before a final decision is made regarding installation of a supply well, if the intended water use requires low concentrations of iron.

GEOHYDROLOGY

The "1,200-Foot" Sand

The "1,200-foot" sand is an important ground water source in the Capital District. Table 1 shows the increasing production rates for this aquifer for the four years of record maintained by the Capital Area Ground Water Conservation Commission. Records are maintained for wells producing 50,000 gpd (gallons per day) or more. By far, the largest development of the aquifer is in the Baton Rouge industrial center. Taken together with public supply pumpage, only the "2,000-foot" and "2,800-foot" sands are more heavily pumped in East Baton Rouge Parish.

The "1,200-foot" sand is an important source of water in West Baton Rouge Parish where pumpage for public supply has more than doubled in four years, from 0.35 million gallons per day (mgd) in 1975 to 0.91 mgd in 1978. In Pointe Coupee Parish about 2.8 mgd is pumped from zone 1 aquifers (which includes the "1,200-foot" sand).

The "1,200-foot" sand is a persistent sand bed, mappable as a relatively continuous hydrologic unit throughout the area shown in the structural map in Figure 1. However, north of the area mapped, the aquifer rises in elevation, in some places is apparently connected to other aquifers and is not mappable as a single aquifer. Where Morgan (1963) in the Feliciana Parishes and Winner and others (1968) in Pointe Coupee Parish could not map the "1,200-foot" sand separately, they included it with other shallow sands in a hydrologic unit called zone 1.

Table 1. Ground water pumpage from the "1,200-foot" sand in mgd (millions of gallons per day).

	1975		1976		1977		1978	
	PS	IND	PS	IND	PS	IND	PS	IND
East Baton Rouge Parish	3.68	11.07	3.62	12.09	4.03	13.23	4.68	13.47
Pointe Coupee Parish	-	2.62	-	2.50	-	2.64	-	2.80
West Baton Rouge Parish	0.35	0.14	0.40	0.14	0.74	0.14	0.91	0.14
Total	17.80		18.75		20.78		22.00	

PS = Public Supply
IND = Industrial

Source: Capital Area Ground Water Conservation Commission