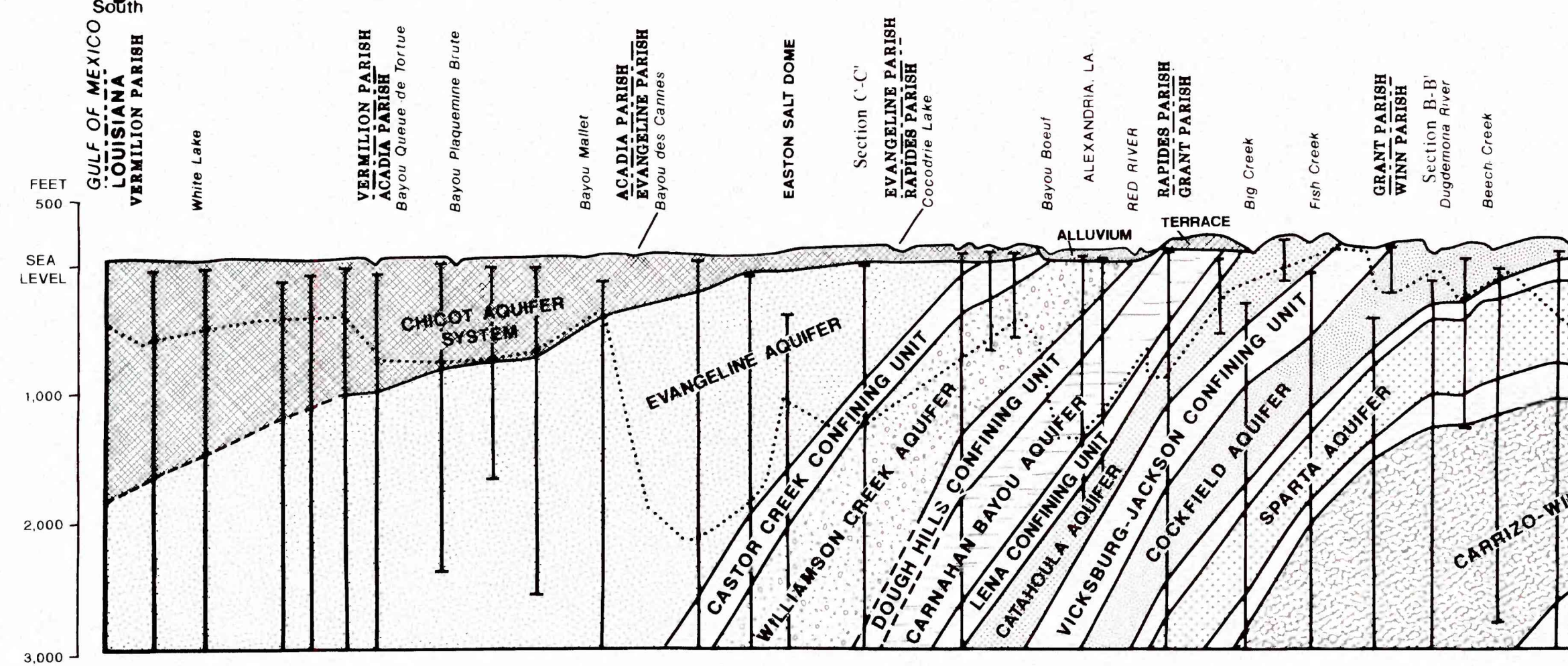
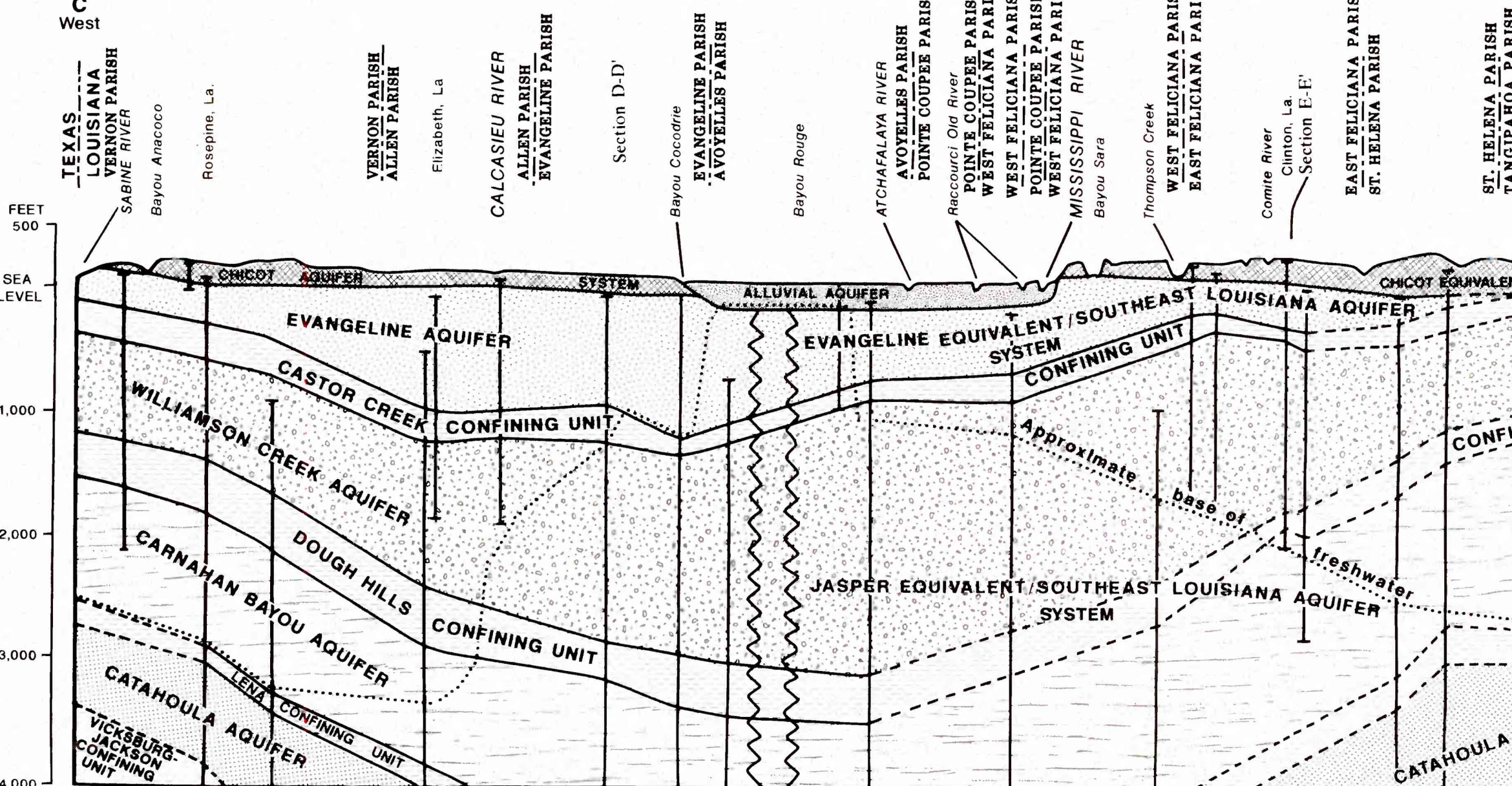
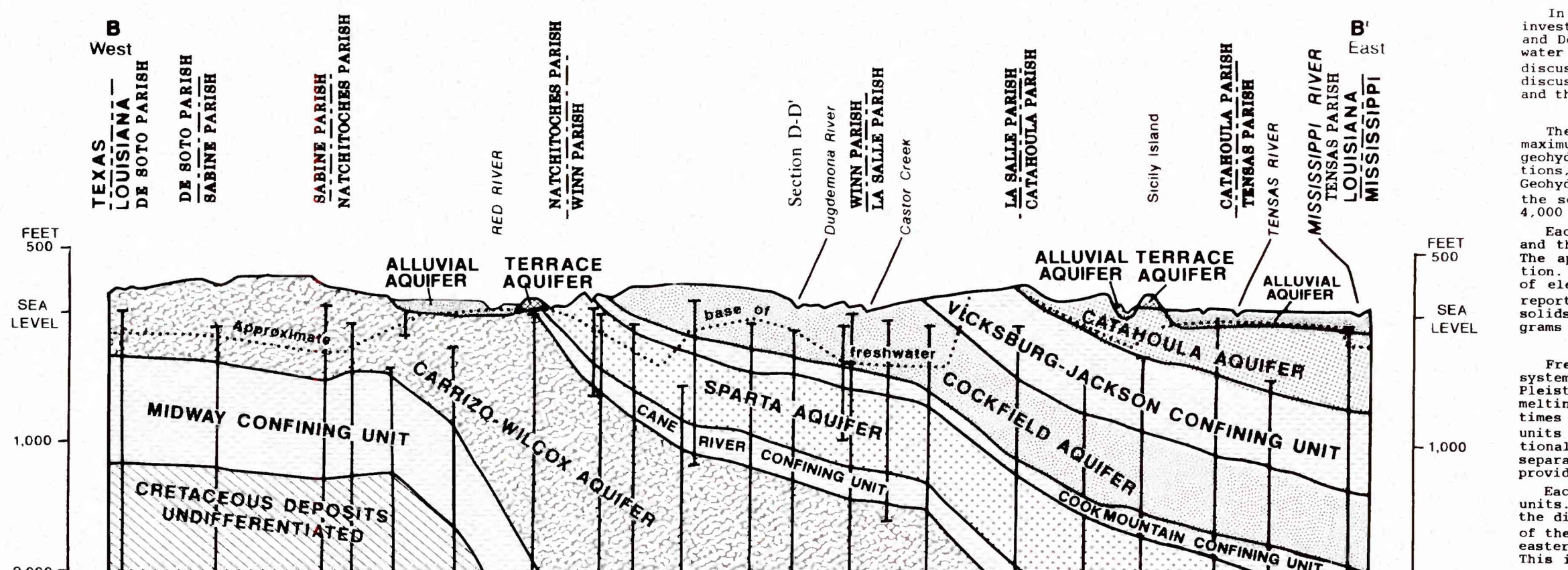
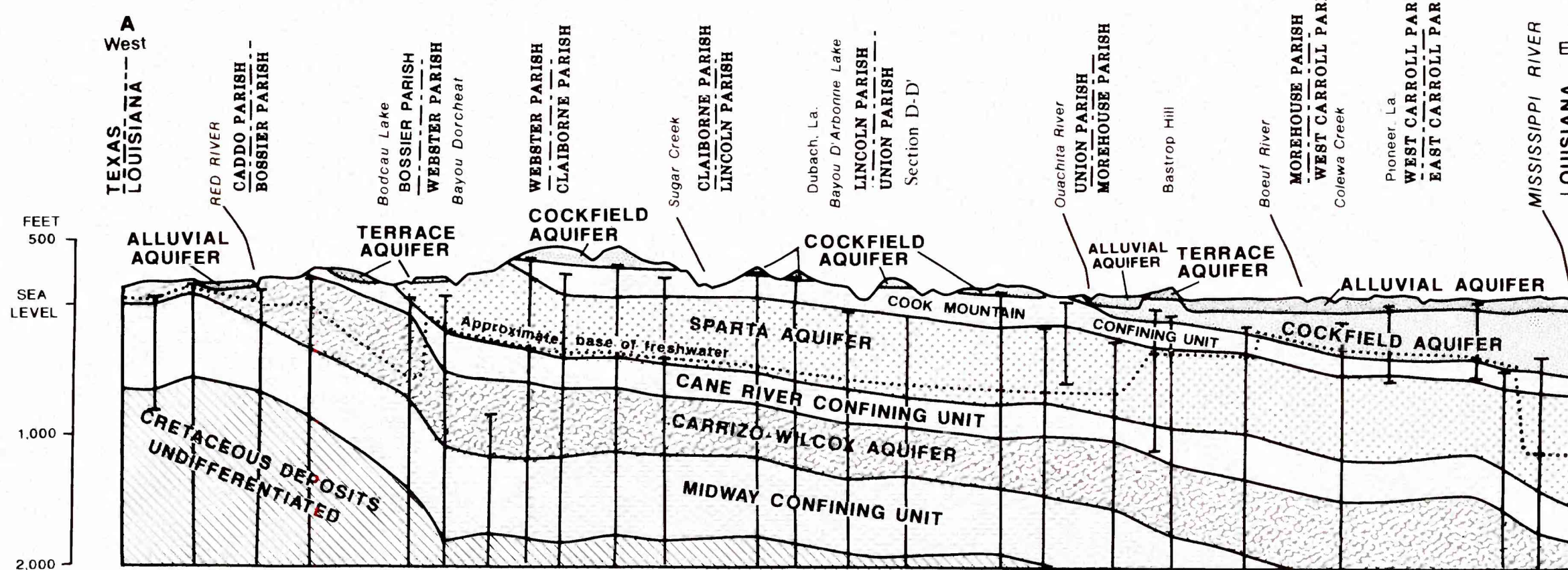


LOUISIANA HYDROLOGIC ATLAS MAP NO. 4:
GEOHYDROLOGIC SECTIONS OF LOUISIANA

By Charles W. Smoot
1989



INTRODUCTION

In 1984, the U.S. Geological Survey began a cooperative investigation with the Louisiana Department of Transportation and Development to refine knowledge of the base of fresh ground water in Louisiana. This is the third report of a series that discusses fresh ground water in Louisiana. The two other reports discuss the areal extent of freshwater in aquifers (Smoot, 1986) and the altitude of the base of freshwater (Smoot, 1988).

Purpose and Scope

The purpose of this report is to show the variability of maximum depth of fresh ground water in Louisiana, by use of five geohydrologic cross sections. Of the five geohydrologic sections, three are oriented west to east and two north to south. Geohydrologic data from 152 electric logs were used to construct the sections. The base of these sections ranges from 2,000 to 4,000 feet below sea level.

Each section shows all the aquifers that contain freshwater and the confining units present along the line of the section. The approximate base of freshwater is also shown on each section. The base of freshwater was determined from interpretation of electric logs of test holes and oil and gas wells. In this report, freshwater is defined as water containing dissolved solids concentrations equal to or less than 1,000 mg/L (milligrams per liter).

GEOHYDROLOGY

Freshwater in Louisiana occurs in 14 aquifers or aquifer systems ranging in age from Quaternary to Tertiary. Aquifers of Pleistocene age were deposited during periods of glacial melting. Most of the Tertiary aquifers were deposited during times of emergence as seas withdrew, and most of the confining units were deposited in advancing seas. The alternating depositional environments left most of the aquifers in Louisiana separated by calcareous marine deposits. These marine deposits provide most of the basis for geological differentiation.

Each section shows the approximate dip of the geohydrologic units. None of the sections is oriented along the dip. Within the western part of the State the general dip is to the southeast, and within the eastern part of the State the general dip is to the southwest. This is because the beds dip toward the axis of the Mississippi structural trough.

structural trough which coincides approximately with the present course of the Mississippi River (Hollister, 1960, p. 11). A section in northern Louisiana, from Union Parish to Tensas Parish, drawn along the dip (Whiteman and Martin, 1984), shows that the beds are almost flat lying across the Monroe uplift. Southeast of the Monroe uplift the dip increases to approximately 35 ft/mi (feet per mile). Table 1 describes the geohydrology of aquifers or aquifer systems and confining units.

Section A-A' extends across northern Louisiana. Five aquifers, the alluvial, terrace, Cockfield, Sparta, and Carrizo-Wilcox aquifers, contain freshwater along parts of this section. The base of freshwater along this section ranges from more than 100 feet above to about 1,100 feet below sea level. The easternward dip of the beds within the freshwater zone along this section is approximately 8 ft/mi.

Section B-B' extends across north-central Louisiana. Six aquifers, the alluvial, terrace, Catahoula, Cockfield, Sparta, and Carrizo-Wilcox aquifers, contain freshwater along parts of this section. The base of freshwater along this section ranges from no freshwater to approximately 400 feet below sea level. Along the western one-third of section B-B', across the Sabine uplift, the freshwater-bearing units dip to the east approximately 8 ft/mi. This dip increases to nearly 30 ft/mi along the eastern one-third of this section.

Section C-C' extends across south-central and northern southeastern Louisiana. Five aquifers, the alluvial, Chicot, Evangeline, Williamson Creek, and Carnahan Bayou aquifers, and their equivalents in the southeastern part of the State contain freshwater within the southeastern part of the State. East of the Mississippi River valley the aquifer names of Chicot, Evangeline, Williamson Creek, Carnahan Bayou, and Catahoula aquifers have not been accepted. Therefore, the equivalents of the Chicot, Evangeline, and Catahoula aquifers are referred to, in this report, as the Chicot equivalent/southeast Louisiana aquifer system, the Evangeline equivalent/southeast Louisiana aquifer system, and the Williamson Creek, and Carnahan Bayou aquifers are combined and referred to as the Jasper equivalent/southeast Louisiana aquifer system. Because of limited stratigraphic data within the southeastern part of the State, most of the aquifer contacts are approximate. Where the aquifer contacts are not certain, they are shown as dashed lines. The base of freshwater along this section ranges from approximately 150 feet below to approximately 3,300 feet below sea level. Along section C-C', the beds dip approximately 25 ft/mi from both directions toward the axis of the Mississippi structural trough.

Section D-D' extends from Arkansas to the Gulf of Mexico through central Louisiana. All the freshwater aquifers in Louisiana are shown on this section. Each of these aquifers, except the Carrizo-Wilcox, contains freshwater along parts of

this section. Also shown is a unit of undifferentiated Cretaceous deposits, which is not considered to be a freshwater aquifer in Louisiana. The base of freshwater ranges from 100 feet above to 2,200 feet below sea level. Within the northern one-third of the State, the dip of the freshwater units along this north-south oriented section is approximately 3 ft/mi. Beneath Winn Parish the dip of the units increases to almost 80 ft/mi. In the southern part of the State the dip of the Chicot aquifer system is approximately 20 ft/mi.

Section E-E' transectes the southeastern part of the State from Mississippi to the Gulf of Mexico. Three aquifer systems, the Chicot equivalent/southeast Louisiana, Evangeline equivalent/southeast Louisiana, and Jasper equivalent/southeast Louisiana, contain freshwater along parts of this section. The base of freshwater along this section is more than 3,100 feet below sea level. However, no fresh ground water is available beneath southern Terrebonne Parish. The dip of the beds along this section is nearly 40 ft/mi.

SUMMARY

The maximum depth of fresh ground water in Louisiana is variable. Freshwater is contained in 14 aquifer or aquifer systems; however, the areal extent of freshwater in each of the aquifers is limited. The base of freshwater shown on these sections ranges from 100 feet above sea level to more than 3,300 feet below sea level. Within the western part of the State the general dip of geohydrologic units is to the southeast, and within the eastern part of the State the general dip is to the southwest.

SELECTED REFERENCES

Louisiana Geological Survey, 1984. Geologic map of Louisiana: scale, 1:500,000.

Hollister, J.R., 1960. Ground water in Louisiana: Louisiana Department of Conservation and Louisiana Department of Public Works Water Resources Bulletin 1, 84 p.

Ryal, G.N., 1982. Regional geohydrology of the northern Louisiana, salt-dome basin, part 1, conceptual model and data needs. U.S. Geological Survey Open-File Report 82-45, 23 p.

Smoot, C.W., 1986. Louisiana hydrologic atlas map no. 2: Areal extent of freshwater in major aquifers of Louisiana: U.S. Geological Survey Water-Resources Investigations Report 86-4150, map (1 sheet).

Varvaro, G.G., 1957. Geology of Evangeline and St. Landry Parishes, Louisiana: Louisiana Department of Conservation Geological Bulletin 31, 295 p.

Whiteman, C.D., Jr., and Martin, Angel, Jr., 1984. Geohydrologic sections, northern Louisiana: U.S. Geological Survey Water-Resources Investigations Report 84-4211, map (1 sheet).

Table 1.—Stratigraphic and geohydrologic units and description

Period	Epoch	Stratigraphic unit	Geohydrologic unit		Geologic description
			Northern and south-central Louisiana	Southeastern Louisiana	
Quaternary	Pleistocene	Red River alluvial deposits	Northern and south-central Louisiana Red River alluvial aquifer	Mississippi River alluvial aquifer	Coarse sand, graveliferous at base grading upward to sand, silt, and clay.
		Mississippi River alluvial deposits	Mississippi River alluvial aquifer	Chicot equivalent/southeast Louisiana aquifer system	Coarse sand, graveliferous at base grading upward to sand, silt, and clay (dip part of deposit); fine to coarse sand with clay interbeds (down dip part of deposit).
Pliocene	Fleming Formation	Blounts Creek Member	Blounts Creek aquifer	Evangeline aquifer	Fine to medium sand with clay interbeds.
		Castor Creek Member	Castor Creek aquifer	Castor Creek aquifer	Clay, calcareous, fossiliferous, with thin sand interbeds.
Miocene	Jasper Formation	Williamson Creek Member	Williamson Creek aquifer	Williamson Creek aquifer	Fine to coarse sand, locally may be graveliferous, with clay interbeds.
		Dough Hills Member	Dough Hills aquifer	Jasper equivalent/southeast Louisiana aquifer system	Clay, calcareous, with thin sand interbeds.
Tertiary	Oligocene	Lena Member	Lena aquifer	Lena aquifer	Fine to coarse sand with clay interbeds.
		Catahoula Formation	Catahoula aquifer	Catahoula equivalent/southeast Louisiana aquifer system	Mostly clay, calcareous.
Eocene	Claborn Group	Vicksburg Group	Vicksburg confining unit	Vicksburg confining unit	Fine to medium sand with clay interbeds.
		Jackson Group	Jackson confining unit	Jackson confining unit	Mostly clay, calcareous, fossiliferous.
Paleocene	Midway Group	Cockfield Formation	Cockfield aquifer	Cockfield aquifer	Fine to medium lignitic sand and carbonaceous clay.
		Cook Mountain Formation	Cook Mountain confining unit	Cook Mountain confining unit	Clay, partly sandy, glauconitic, fossiliferous.
Paleocene	Midway Group	Sparta Formation	Sparta aquifer	Sparta aquifer	Fine to medium sand with clay interbeds; lignitic.
		Cane River Formation	Cane River aquifer	Cane River aquifer	Mostly clay, glauconitic, fossiliferous; some marl.
Paleocene	Midway Group	Carrizo-Wilcox Formation	Carrizo-Wilcox aquifer	Carrizo-Wilcox aquifer	Interbedded sand, clay, and silt; lignitic, locally upper part may contain fine to medium sand.
		Midway Group	Midway confining unit	Midway confining unit	Marine clay with thin calcareous basal unit.

