

ALTITUDE OF THE BASE OF FRESH WATER IN COASTAL PLAIN AQUIFERS OF THE MISSISSIPPI EMBAYMENT

In determining the ground-water resources of a region one of the questions to be answered is: "How deep is the base of the fresh water?" The contour map shows the altitude of the base of fresh water in units of Cretaceous age and younger in the Mississippi embayment.

The Mississippi embayment comprises about 100,000 square miles in the Gulf Coastal Plain. (See index map.) Structurally the embayment is a syncline plunging gently to the south, and its axis roughly follows the present course of the Mississippi River. During the geologic past this region was occupied periodically by an arm of the sea, and marine and nonmarine sediments ranging in age from Jurassic to Quaternary have been deposited on the Paleozoic rocks, which form the basement complex. These sediments consist of gravel, silt, clay, lignite, marl, chalk, and limestone; and range in thickness from zero at the peripheral outcrop of Paleozoic rocks to several thousand feet at the axis of the embayment. Deposits of sand form regional aquifers or water-bearing units, most of which contain fresh water available for development and use.

Fresh water for this study is water containing less than 1,000 ppm (parts per million) of dissolved solids. The base of fresh water and the geologic unit containing the deepest fresh water were determined from electric logs of oil and gas test wells. The heavy dashed lines on the map are boundaries. Within a given boundary, the deepest fresh water is in the geologic unit shown, and contours are drawn on the base of the fresh water in that unit. Beyond the boundary for a particular unit, the unit contains no fresh water or the base of fresh water is in an older (lower) geologic unit. The accuracy of the boundaries was verified by chemical analyses of water from the geologic units where water wells are available for sampling.

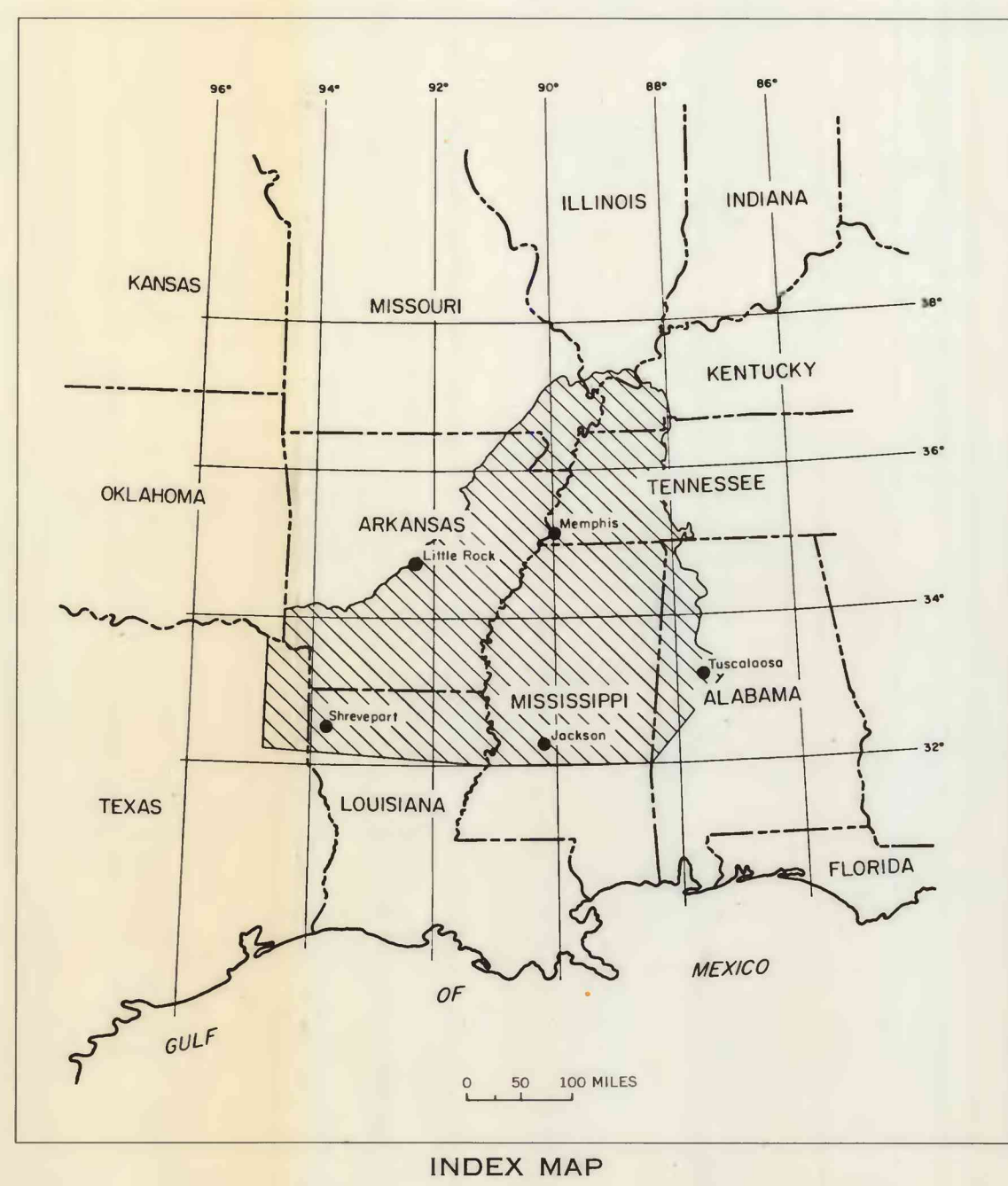
Rocks of Paleozoic age in the northern part of the embayment and near the periphery of the region contain fresh water in places, but the top of these rocks forms the subsurface boundary for this study. Above the Paleozoic rocks the unconsolidated units of Cretaceous age and younger contain fresh water. These units, in ascending order, are undifferentiated deposits of the Lower Cretaceous Series, Tuscaloosa Group or Formation, Eutaw and Tokio Formations, Coffee Sand, McNairy Sand (McNairy Sand Member of Ripley Formation in Tennessee and northern Mississippi), Nacatoch Sand, Wilcox Group or Formation, Meridian Sand Member of the Tallahatta Formation, Carrizo Sand, Sparta Sand, Cockfield Formation, and Quaternary terrace and alluvial deposits.

In the southwestern part of Dallas County, Ark., parts of Ouachita County, Ark., and in the south-central part of Lafayette County, Ark., the base of the fresh water is in sand beds of the Cane River Formation. In these areas the base of fresh water is shown on the map as being in the overlying Sparta Sand because the areas are too small to be of regional importance.

In southern Arkansas, northwestern Louisiana, and northeastern Texas, other small areas exist where the base of fresh water is at a lower altitude than that shown on the map. Generally, the base of fresh water in these areas is in the lenticular sands of small areal extent; some of these areas may be associated with geologic structures.

If this map were to be used as a guide to determine the depth and the geologic unit that could be utilized for the disposal of highly mineralized water, the following facts should be considered: (1) the base of fresh water is not necessarily the top of the saline or highly mineralized water; (2) water containing more than 1,000 ppm is presently being used in some parts of the region and additional quantities may be utilized in these areas or other areas in the near future; and (3) local small areas in which the base of fresh water is at a lower altitude are not shown. Although these areas are not regionally important, they are locally important in the development of ground-water supplies.

The author thanks his colleagues for their assistance in the preparation of the map. Contours of the base of fresh water in the Sparta Sand south of the 34th parallel of latitude were generalized from an unpublished map prepared by J. Norman Payne, U.S. Geological Survey, Baton Rouge, La.



EXPLANATION

Contours on base of fresh water
Shows altitude of base of fresh water. Dashed where approximately located. Contour interval 200 feet with supplementary 100-foot contours (dotted); datum is mean sea level.

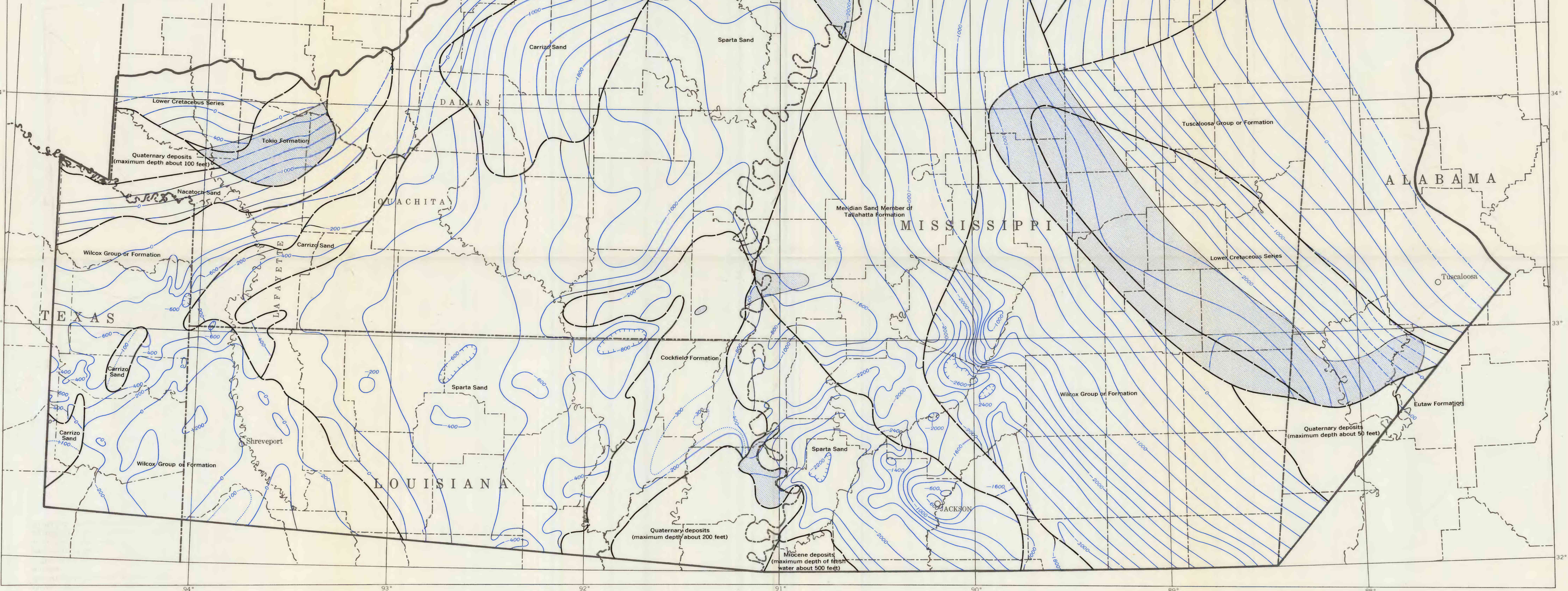
Boundary of area within which the indicated geologic unit contains the lowermost body of fresh water

Area where mineralized water overlies fresh water

Area where only mineralized water is available

Boundary of mineralized water areas

Boundary of report area



MAP SHOWING ALTITUDE OF THE BASE OF FRESH WATER IN COASTAL PLAIN AQUIFERS OF THE MISSISSIPPI EMBAYMENT

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