UNITED STATES DEPARTMENT OF THE INTERIOR
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WATER RESOURCES INVESTIGATIONS
REPORT 84-4364

Figure 1 - Schematic diagram of regional hydrogeologic units and selected rock-stratigraphic units in the Southeastern U.S. Coastal Plain

EXPLANATION

Outcrop of rocks comprising aquifer unit A4

Updip limit of rocks comprising aquifer unit A4

—100— Potentiometric contour - shows altitude of potentiometric surface. Contour interval 25, 50, and 100 feet. Dashed where approximately located. Depressions in surface indicated by hachures. Datum is National Geodetic Vertical Datum of 1929

SCALE 1:2,000,000

0 10 20 30 40 50 100 MILES

0 10 20 30 40 50 100 KILOMETERS

INTRODUCTION

The U.S. Geological Survey is studying the regional ground-water flow system in the Cretaceous and Tertiary sand aquifers in the southeastern Coastal Plain of the United States. Parts of the states of Mississippi, Alabama, Georgia, and South Carolina are included in the study. Analysis of the regional distribution of permeable clastic rocks in this area (Renken, 1984) suggests that in general the aquifer system can be divided into three aquifer units separated by confining units of highly variable permeability. A fourth aquifer unit that consists in places of limestone equivalent to the Floridan aquifer system (Miller, 1984) and in other places of surfical sand mapped by Renken (1984) overlies much of the system. This fourth aquifer unit is a source of recharge to and discharge from the sand aquifer system but is not being considered in detail in this study. To avoid nomenclature and correlation problems from state to state, the aquifer and confining bed units of the system have been given alpha-numeric labels. A schematic classification of rock stratigraphic and regional hydrologic units for the Southeastern Coastal Plain aquifer system is shown in figure 1 (Renken, 1984). Aquifer unit A4, consisting of Upper and Lower Cretaceous sands, is the lower-most group of aquifers in the regional sand aquifer system. The major stratigraphic units within A4 include Lower Cretaceous throughout the region and Coffee Sand, Eutaw Formation, McShan Formation, and Tuscaloosa Group in Mississippi; Eutaw Formation, and Tuscaloosa Group in Alabama; Tuscaloosa and Atkinson Formations in Georgia; and Cape Fear Formation in South Carolina (Renken, 1984). The outcrop of aquifer unit A4 is shaded on the map. Aquifer unit A4 does not crop out in eastern Georgia or South Carolina; but its estimated updip limit is shown on the map.

The purpose of this map is to show the estimated predevelopment potentiometric surface of aquifer unit A4 in the Southeastern Coastal Plain aquifer system. The term 'predevelopment' is a nebulous reference because the water-level measurements used to draw water level contours range from the early 1900's to the 1980's. In all areas the earliest available water-level measurements were used; modern measurements were used only in those areas where there does not appear to be significant head decline due to man-induced stress. Because the water-level measurements were made at different times, the potentiometric map is not expected to show precise water levels at specific sites for a specific time--its purpose is to show the approximate water-level surface as it probably existed prior to development. On the map, contours stop at the updip boundries of outcrop areas. However, in the real system, contours extend in a continuous way into the next lowest unit.

No previous regional predevelopment potentiometric surface maps have been prepared for any units within the Southeastern Coastal Plain aquifer system.

SOURCE OF DATA

This map is a compilation of data from state ground-water studies and from the files of the U.S. Geological Survey offices in Jackson, Miss., Tuscaloosa, Ala., Doraville, Ga., and Columbus, S.C.

In Mississippi the data were compiled from Stephenson and others (1928) and from office files. Alabama data came from Johnston (1933) and Carlston (1944), from office files, and from county reports prepared by Newton and others (1965), Scott (1960, 1962, and 1964), Scott and others (1967), Scott and Lines (1972), Knowles and others (1960), Davis (1980), Davis and others (1975 and 1980), Newton and others (1971), Lines (1975), Causey and others (1978), Reed and others (1972), and Scott and others (1981). Georgia data came from Stephenson and Veatch (1915) and from office files. South Carolina data came from reports prepared by Hayes (1979), Park (1984), and Zack (1977), and from office files.

GROUND-WATER MOVEMENT

In general, potentiometric highs result from recharge and lows result from discharge, with this discharge being most typically to rivers. Contour lines that curve upstream as they cross a river valley indicate aquifer discharge to the river. Two notable examples of this convex upstream curvature occur across the Black Warrior River Valley in Tuscaloosa County, Ala., and across the Alabama River Valley in Macon, Elmore and Montgomery Counties, Ala. Stream-aquifer interaction generally occurs in the outcrop;downdip of the outcrop where the unit is buried under younger sediments stream-aquifer interaction is minimal. An exception to this downdip stream-aquifereffect occurs in Marion County, South Carolina, where the A4 aquifer apparently discharges to the Pee Dee River even though aquifer unit A4 does not crop out in South Carolina.

Water enters aquifer unit A4 as percolation from the precipitation in the outcrop area and flows either downgradient to streams or downdip to deeply buried areas and ultimately to areas of upward leakage. In Mississippi, the direction of flow is from the outcrop southwest then southeast to the Tombigbee River. In Alabama, the direction of flow is to the rivers in the outcrop and south toward the Gulf of Mexico. In Georgia, movement of water is from the outcrop to the Chattahoochee River. Where aquifer unit A4 does not outcrop, movement of water is down-gradient. In West Georgia, water flows from the updip limit of A4 southwest toward Alabama and the Gulf of Mexico; in East Georgia water flows from the updip limit southeast toward South Carolina and the Atlantic Ocean. In South Carolina, water moves east-northwest parallel to the coast, toward North Carolina and the Pee Dee River.

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BASE FROM U.S. GEOLOGICAL SURVEY DIGITAL
LINE GRAPHS FROM 1:2,000,000 SCALE MAPS

APPROXIMATE POTENTIOMETRIC SURFACE FOR THE AQUIFER UNIT A4, SOUTHEASTERN COASTAL PLAIN AQUIFER SYSTEM OF THE UNITED STATES, PRIOR TO DEVELOPMENT

By
V. A. Stricker, Walter R. Aucott, Robert E. Faye, John S. Williams, and Micheal J. Mallory

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