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Hydrogeologic Investigation and Establishment of a Permanent Multi-Observational Well Network in Aiken, Allendale, and Barnwell Counties, South Carolina

Eight-Year Interim Report (1986-1994)

By

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ABSTRACT

Continuous core and downhole geophysical data from seven well-cluster sites delineate the lithostratigraphic and hydrostratigraphic units peripheral to the Savannah River Site (SRS) in west-central South Carolina. Thirteen lithostratigraphic and nine hydrostratigraphic units are identified. Data collected from the ongoing study include 146 paleontologic and palynologic age dates, 100 x-ray diffraction analyses of clay and bulk mineralogy, 442 sieve analyses, 6,040 ft (feet) of detailed core description, mineral composition, and porosity determined from thin-section analyses, and continuos water level data.

Sediments range in age from Upper Cretaceous (Coniacian) to Holocene and are mostly of marine origin. The Cretaceous section is 350 to 1,000 ft thick and consists of unconsolidated siliciclastic sediments with minor amounts of carbonate mud. The basal Cape Fear Formation is absent at updip sites, pinching out along a line that extends from Windsor, S. C., to the confluence of Town and Long Branch Creeks, located north of Jackson, S. C. The Black Creek Formation is well dated (Campanian). Dates from other Cretaceous formations are sparse. High clay content in the Black Creek and Steel Creek Formations in the southeastern part of the study area suggests that the eastern flank of a delta complex extends along a line from Williston to Allendale, S. C.

The Tertiary section is 100 to 7000 ft thick and consists of siliciclastic and calcareous sediments. Calcareous sediments are most abundant in the middle Eocene section. Lithofacies relationships indicate three major transgressive sequences in the Eocene epoch that occurred during: 1) lower Eocene to early, middle Eocene (Congaree/Fourmile time); 2) late, middle Eocene (Santee time); and 3) upper Eocene (Dry Branch time). Palynological data from a sample in the Tobacco Road Formation indicates an Oligocene age, suggesting that the formation may be younger than originally thought.

The basal McQueen Branch aquifer is the coarsest grained and most productive aquifer in the study area. Well yields as great as 1,500 gpm (gallons per minute) are available. Transmissivity as great as 50,000 ft^2/d (feet squared per day) and hydraulic conductivity of 210 ft/d (feet per day) are indicated for this aquifer by pumping tests. Sediments of the Crouch Branch aquifer are slightly finer grained than those of the McQueen Branch. Well yields as large as 1,000 gpm can be obtained. Transmissivity as great as 19,000 ft^2/d and hydraulic conductivity of 140 ft/d

are indicated by pumping tests. Wells in the Gordon aquifer can yield 400 gpm. This aquifer's transmissivity and hydraulic conductivity are as high as 5,000 ft^2/d and 40 ft/d, respectively. Yields decrease downdip, owing to an increase in clay content and a decrease in grain size. The Upper Three Runs aquifer contains the water table and generally does not yield great amounts of water (< 50 gpm). Downdip, however, where the aquifer is confined, yields of 500 gpm are recorded, owing to lithofacies changes in the Santee Limestone. The Ocala Limestone, a major water-bearing formation of the Upper Floridan aquifer in coastal areas, is present in the southern region of the study area but is thin and discontinuous and is, therefore, not an important aquifer in the region.

Maximum water-level fluctuations (12 ft) occur in the water table aquifer and minimum fluctuations (< 1 ft) in the basal McQueen Branch aquifer. Continuous water-level measurements made in the upper and lower parts of each aquifer are similar and fluctuate together, indicating a high degree of vertical hydraulic continuity in each aquifer. During the drought of 1993, water levels were not dramatically affected. Declines occurred during the summer months, but these declines were not significantly greater than in previous years.

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