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Irrigation Supply Potential of the Shallow Aquifer, Hilton Head Island, South Carolina

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ABSTRACT

The shallow aquifer will yield sufficient water for lawn irrigation nearly everywhere on Hilton Head Island. Two geologic mapping units, Q_{2b} and Q_{2o}, together form the shallow aquifer. Measured aquifer hydraulic conductivity varies from 6 to 20 feet per day. The nearly island-wide occurrence of units Q_{2b} and Q_{2o}, and the narrow range found for hydraulic conductivity, allows construction of planning models without the collection of extensive additional hydraulic data.

Aquifer recharge as a response to rainfall occurs during any season of the year. Cool-season rainfall results in recharge on a time scale of hours. Warm-season recharge appears more temporally varied. Rainfall on the first day of multiday events satisfies soil-moisture deficits. Rainfall on the second and third days of multiday events results in recharge and subsequent runoff.

Aquifer water is of suitable quality for use as an irrigation supply. Locally high concentrations of dissolved iron are troublesome, but this does not render the water unusable for irrigation. Locally elevated concentrations of chloride result from golf course irrigation with wastewater effluent. Elevated chloride is related to effluent application rates, evaporative concentration during extended dry periods, and the comparatively slow mixing and transport rates of shallow water. Aquifer water with chloride concentration exceeding 200 mg/L may not be suitable as irrigation water for salt-intolerant species during extended dry periods.

The shallow aquifer is hydraulically connected to the upper Floridan aquifer. Simulation shows that lowering the shallow aquifer water level by 2 feet will not cause a measurable increase in the lateral rate of saltwater intrusion presently affecting the upper Floridan aquifer.

The aquifer is divided into a set of local flow systems that discharge to the island's many wetlands. Simulation shows that pumping removes water from storage and captures flows heretofore destined for wetlands and marshes. Locally, wetlands and natural drainage courses have been deepened and connected to form a system of drainage sloughs that have been intruded by saltwater. Saltwater in the sloughs limits the areas where freshwater can be pumped from the shallow aquifer. The interconnected slough system also short-circuits the local shallow-aquifer flow systems, resulting in more rapid runoff.

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