

POTENTIOMETRIC SURFACE AND HYDROLOGIC CONDITIONS OF THE UPPER AQUIFER IN THE MANATÍ-VEGA BAJA AREA, NORTH CENTRAL PUERTO RICO, MARCH 1995

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A ground-water level survey and reconnaissance of the hydrologic conditions of the upper aquifer in the Manatí-Vega Baja area were conducted during March 20-31, 1995. The potentiometric surface was delineated for the area north of latitude 18°25'. This study area is within the Manatí 7 1/2-minute topographic quadrangle map and is the approximate inland-most extent of the upper aquifer (Giusti and Bennett, 1972, p. 10). Fifteen wells and piezometers were referenced to mean sea level datum using third order leveling during this hydrologic reconnaissance. Potentiometric levels measured at these sites are reported to one decimal place. Potentiometric levels at other wells and piezometers for which the land surface datum was obtained from the 1:20,000 scale topographic map are reported to the nearest foot. Third order leveling was also used to establish the present water-surface altitudes at Laguna Tortuguero (0.9 foot on the map) and at Ojo de Agua spring (4.3 feet) near Vega Baja. The data obtained during the field reconnaissance included: (1) measurement of the depth to water from established reference points at 19 wells and 7 piezometers; (2) instantaneous discharge rates from flow meters at public-supply wells; and (3) instantaneous discharge measurements at the ocean outlet of Laguna Tortuguero and at Ojo de Agua spring, which are the two most important natural aquifer discharge features within the Manatí quadrangle. In addition, the mean daily discharge for the month of March 1995 for each public-supply well and from wells within industrial

facilities were obtained from well owners. Hydrologic data presented in this map (aquifer water-level contours and discharge from Laguna Tortuguero and Ojo de Agua spring) are considered representative of base flow conditions. Antecedent rainfall prior to the hydrologic survey, as measured at the National Weather Service observation station Manatí 2E (shown on map), was 2.91 inches during February 1995 and 2.53 inches during March 1-19, 1995. Rainfall during the synoptic survey (March 20-31, 1995) was 0.28 inch all of which was recorded on March 27, 1995. Long-term rainfall data indicate that February and March are typically the driest months of the year, with average rainfall at Manatí being 3.14 inches in February and 3.23 inches in March.

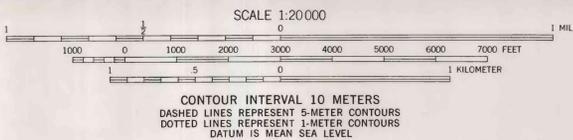
Results of the hydrologic survey indicate that ground-water withdrawals from the upper aquifer during March 1995 totaled approximately 11.1 million gallons per day; 9.8 million gallons per day for public supply and 1.3 million gallons per day for industrial self-supplied use (Wanda Molina, U.S. Geological Survey, written commun., 1996). Ground-water levels in the area of El Pueblito and Combate have recovered from levels that existed in the mid 1980's when a cone of depression covering approximately 2 square miles lowered the potentiometric surface as much as 10 feet below sea level (Renken and Gómez-Gómez, 1994, p. 11, plate 2). Several public-supply wells have since been closed within this area (between June and November 1989; Fernando Gómez-Gómez, U.S. Geological Survey,

written commun., 1996) as a result of nitrate concentrations, which exceeded the maximum contaminant level of 10 milligrams per liter (as N) permitted for public-supply wells by the Puerto Rico Department of Health. Water-level measurements at public-supply wells Coto Sur #2 (site with potentiometric level of 8.2 feet) and Pugnado Afuera #3 (site with potentiometric level of 8.6 feet) were -3.9 feet and -19.4 feet, respectively, on April 19, 1990 (unpublished data, U.S. Geological Survey, Caribbean District). Ground-water level measurements at these two locations are the only data available to assess past ground-water level changes. The only long-term reference for water-level change within the Manatí quadrangle is at Laguna Tortuguero. This lagoon contains fresh-to-slightly-saline water and constitutes the principal regional discharge feature of the upper aquifer within the study area. Specific conductance at the ocean outlet canal has ranged from 897 to 3,060 microsiemens per centimeter at 25°Celsius based on bi-monthly measurements obtained since 1974 at the USGS quality of water station 50038200 (U.S. Geological Survey, 1975-96). The water surface altitude of Laguna Tortuguero has declined from an estimated maximum of 5 feet prior to dredging of the ocean outlet in about 1943 (Bennett and Giusti, 1972; p. 11) to about 3.3 feet in the late 1960's (1.0 meter as shown on USGS 7 1/2-minute 1:20,000 topographic quadrangles, revised from aerial photographs taken in 1967 and field checked in 1969), to 1.5 feet in 1975 (Quiñones-Márquez and Fuste, 1978, p. 7) and to 0.9 foot in 1995.

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- Quiñones-Márquez, Ferdinand, and Fuste, L.A., 1978, Limnology of Laguna Tortuguero, Puerto Rico: U.S. Geological Survey Water-Resources Investigations Report 77-122, 84 p.
- U.S. Geological Survey, 1975-96, Water resources data for Puerto Rico and the U.S. Virgin Islands, Water Years 1974-94: U.S. Geological Survey Water-Data Reports.

Additional information is available at the U.S. Geological Survey, GSA Center, 651 Federal Drive, Suite 400-15, Guaynabo, Puerto Rico 00965, telephone (787) 749-4346.



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