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Fact Sheet 18g: Manokin Observation Well Located in West-Central Wicomico County, Maryland

This fact sheet is one in a series presenting results of test-drilling activities conducted as part of the Maryland Coastal Plain Aquifer Study to fill key data gaps. The test wells will help to better understand the structure, flow system, water-bearing properties, and natural water quality of the Aquia-Hornerstown, Miocene-age, and Manokin aquifers on the Eastern Shore of Maryland. In addition, the test wells will provide long-term water-level monitoring for resource assessment and flow-model calibration. The Maryland Coastal Plain Aquifer Study is a long-term, multi-phase initiative for comprehensive regional aquifer assessment developed in response to recommendations of the 2004 Maryland Advisory Committee on the Management and Protection of the State's Water Resources (Wolman Commission). The study is being conducted by the Maryland Geological Survey (MGS) and the U.S. Geological Survey (USGS), with funding support from the Maryland Department of the Environment (MDE).

Key Results

- The Manokin aquifer, consisting of fine to coarse-grained, clear and white, quartz sand, has relatively high transmissivity (6,390 feet squared per day [ft²/day]).
- A confining unit effectively separates the Manokin aquifer from the Surficial aquifer.
- Iron and manganese concentrations (1.6 and 0.079 milligrams per liter [mg/L], respectively), exceeded the U.S. Environmental Protection Agency's Secondary Maximum Contaminant Levels (MCLs) of 0.3 and 0.05 mg/L, respectively. No Primary MCLs were exceeded.

Introduction

The Manokin aquifer is pumped at a relatively high rate in Wicomico and Somerset Counties. A total of approximately 3.4 million gallons per day have been appropriated in the two counties primarily for municipal and irrigation supply. As a result of the groundwater use, water levels in the Manokin aquifer have declined. A relatively deep cone-of-depression has formed in the Princess Anne and the northern Somerset County-southwest Wicomico County areas. In 2008, four wells were added to the Maryland State groundwater-level network to evaluate the effects of pumping from the Manokin aquifer. The network is a cooperative effort between the USGS, MGS, and MDE. The additional wells were concentrated near the areas of greatest withdrawals. To further enhance the monitoring network, an observation well was constructed just west of Salisbury to help monitor the more regional effects of pumping. Well construction was funded through MDE as part of the Coastal Plain aquifer study initiative. The well will aid that study by providing additional information on the structure, hydraulic property, and water quality of an important regional aquifer, and by providing critical water-level data for calibration of future groundwater-flow models.

Well Construction and Testing

Test well WI Ce 327 was drilled on May 19, 2010 to a depth of 240 feet (ft) using a 6 5/8-inch drag bit. Ditch samples were collected at 10-ft intervals and gross lithologic descriptions were made.



Aquifer test

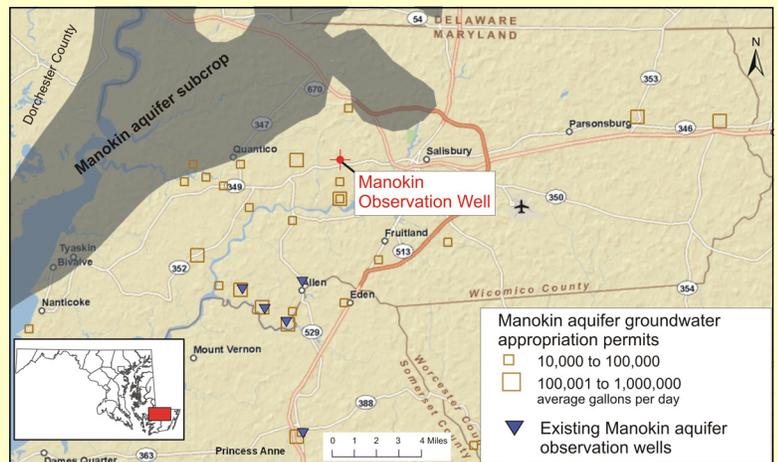


Drill rig



Drill cuttings

Geophysical logs (gamma radiation, 16- and 64-inch resistivity, single-point resistivity, self-potential, and 6-ft lateral) were run in the open hole by the USGS Maryland Water Science Center. The hole was reamed to 9 5/8-inch diameter and well screen (4.5-inch diameter SDR-17 PVC; 0.02-inch slot) was installed from 140 to 160 ft, with a 5-ft cellar to 165 ft. The well was cased to the surface with 4.5-inch SDR PVC pipe. The well was completed with a steel protective casing and locking cap.



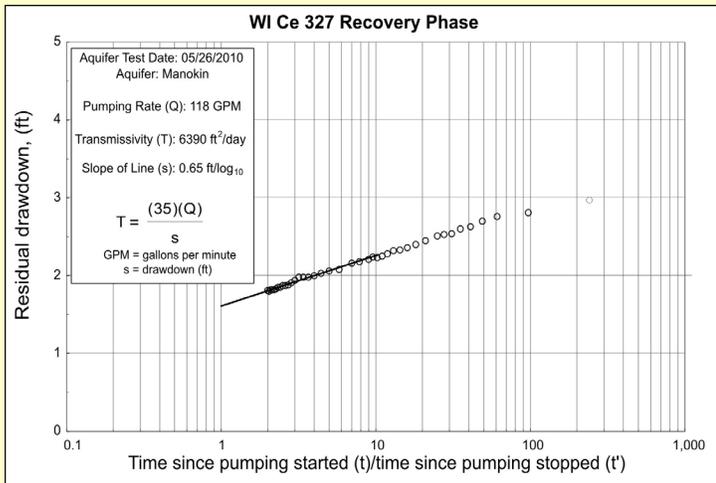
The test well penetrated the Surficial aquifer, the Upper Chesapeake confining unit (UC2), the Manokin aquifer, and part of the St. Marys confining unit. The Manokin aquifer at the test site consists of medium to coarse, well sorted quartz sand.

The completed well was developed using compressed air to remove drilling fluid and clean the well screen. A 4-hour aquifer test was conducted on May 26, 2010 at a constant rate of 118 gallons per minute (gpm). During the test, water levels were measured in the observation well and in a production well screened in the Surficial aquifer 35 ft from the pumped well. The specific capacity of the Manokin well at the end of the pumping phase was 9.34 gpm per foot of drawdown. The transmissivity calculated by the Cooper-Jacob method for the recovery phase of the test is 6,390 ft²/day.

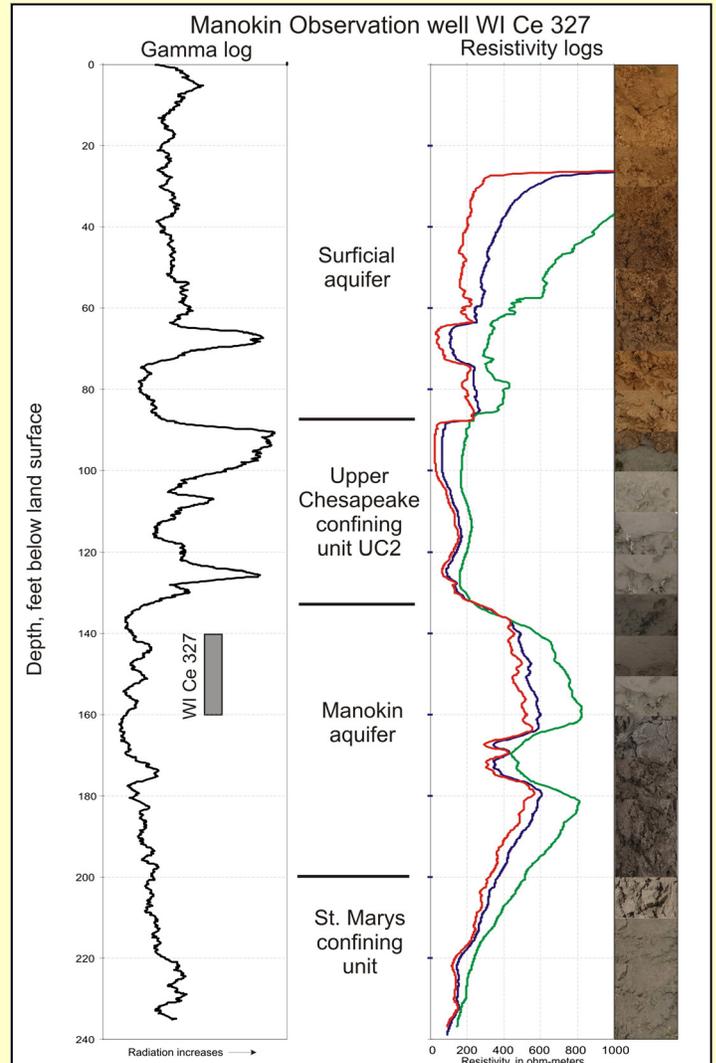
The static water level in the Manokin well measured prior to the aquifer test was 20.0 ft above sea level. The water level measured at the same time in the nearby Surficial well was 29.6 ft above sea level. There was no change in the water level in the Surficial aquifer well as a result of pumping from the Manokin well. During continuous monitoring over several months, water levels changed in response to atmospheric pressure and possibly local withdrawals.

Water samples from WI Ce 327 were collected during the aquifer test and were analyzed for field parameters (pH, alkalinity, specific conductance, dissolved oxygen), major ions, nutrients, metals, and radionuclides. Iron and manganese concentrations are relatively high (1.6 and 0.079 mg/L, respectively), and exceed the U.S. Environmental Protection Agency's Secondary (non-health related) Maximum Contaminant Levels (SMCLs) of 0.3 mg/L (iron) and 0.05 mg/L (manganese). No Primary MCLs were exceeded.

SUMMARY INFORMATION							
Well number	Permit number	Screened interval (feet below land surface)	Aquifer	Pumping rate (gallons per minute)	Transmissivity (feet squared per day)	pH	Total dissolved solids (residue on evaporation @ 180° C) (milligrams per liter)
WI Ce 327	WI-95-3050	140 - 160	Manokin	118	6,390	5.5	47



Water-quality sampling



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