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Fact Sheet 18a: Calvert Aquifer System Test Wells Located at Cordova, Talbot 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 and the U.S. Geological Survey (USGS), with funding support from the Maryland Department of the Environment (MDE).

Key Results

- Sands of the Calvert aquifer system at the site are fine-grained, muddy, and contain abundant weathered shell material.
- Transmissivity is relatively low (approximately 90 feet squared per day[ft²/d]).
- Only one sand unit is present in the Calvert aquifer system at this site. A pumping test indicated hydraulic connection between the upper and lower portions of the sand unit.
- The water type is calcium-bicarbonate with moderate total dissolved solids concentration. None of the U.S. Environmental Protection Agency's Primary Drinking-Water Standards were exceeded in samples collected from the wells.

Introduction

The Miocene-age Calvert aquifer system is an important water supply in the central Eastern Shore counties of Dorchester, Caroline, and Talbot, Maryland, as well as central Delaware. The Calvert aquifer system includes (from shallow to deep) the Frederica, Federalsburg, and Cheswold aquifers. These aquifers, more prevalent in Delaware, were described and mapped in Maryland by Cushing, Kantowitz, and Taylor (1973); however, the borehole correlations and hydraulic properties were not thoroughly documented. No subsequent studies of the Calvert aquifer system have been conducted in Maryland. It is uncertain whether these units act as independent aquifers or as a single hydraulic unit, and whether they correlate with units mapped in Delaware. These considerations are important in determining whether the MDE groundwater appropriations should be issued for three individual aquifers or for a single composite aquifer. Test wells are needed to assess the hydraulic characteristics of the Calvert aquifer system, and to determine the connectivity of the individual units. Additionally, observation wells are needed to help determine hydraulic continuity of individual aquifer units, monitor water-level trends, and estimate available drawdown. The Cordova test site is one of five drilled in central Eastern Shore of Maryland as part of a systematic investigation of the Calvert aquifer system.

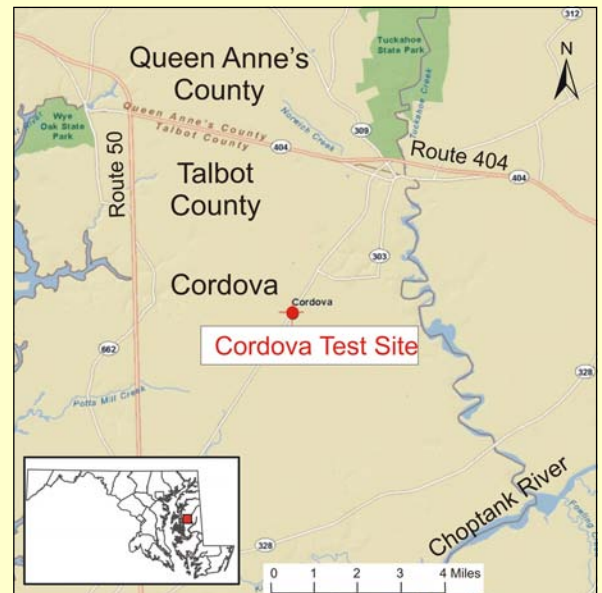
Well Construction and Testing

Test wells TA Bf 99 and 100 were drilled between August 16 and 19, 2010 to a depth of 240 and 140 feet (ft), respectively. Ditch samples were collected at 10-ft intervals and gross lithologic descriptions were made. 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 holes were drilled to 9 5/8-inch diameter and well screens (4.5-inch diameter SDR-17 PVC; 0.02-inch slot) were installed from 178 to 188 ft in TA Bf 99, and 110 to 130 ft in TA Bf 100. Both wells include 5-ft cellars. The wells were cased to the surface with 4.5-inch SDR-17 PVC pipe.

The wells were completed with a steel protective casings and locking caps.

The deepest test well (TA Bf 99) penetrated the Surficial aquifer, the Calvert aquifer system, and a portion of the Calvert confining unit. The wells were screened in two intervals of the Calvert aquifer system, which at this site consists of fine-grained, muddy sands with abundant weathered shell material.

The completed wells were developed using compressed air to remove drilling fluid and to develop the well screen. TA Bf 99 could not be cleared of formation mud and was non-productive. A 24-hour aquifer test was conducted on TA Bf 100 on September 1, 2010 at a constant rate of 12 gallons per minute (gpm). During the test, water levels were measured in the

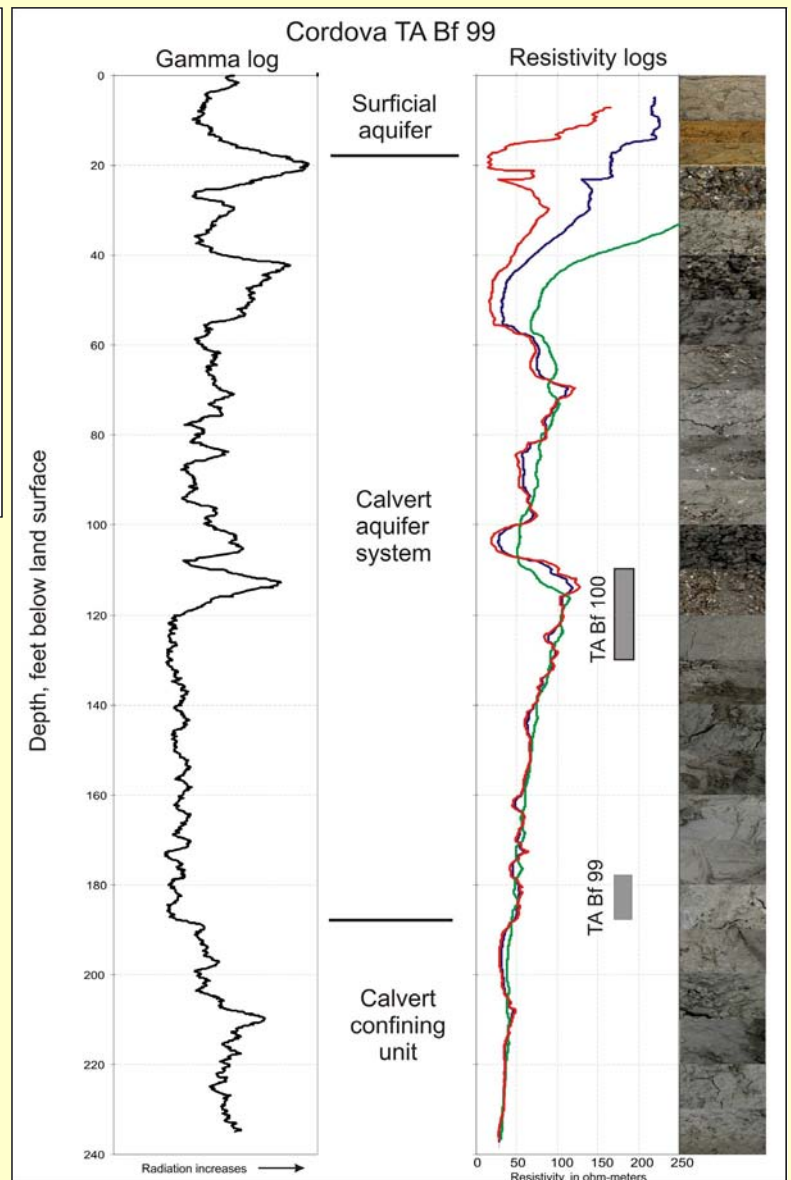
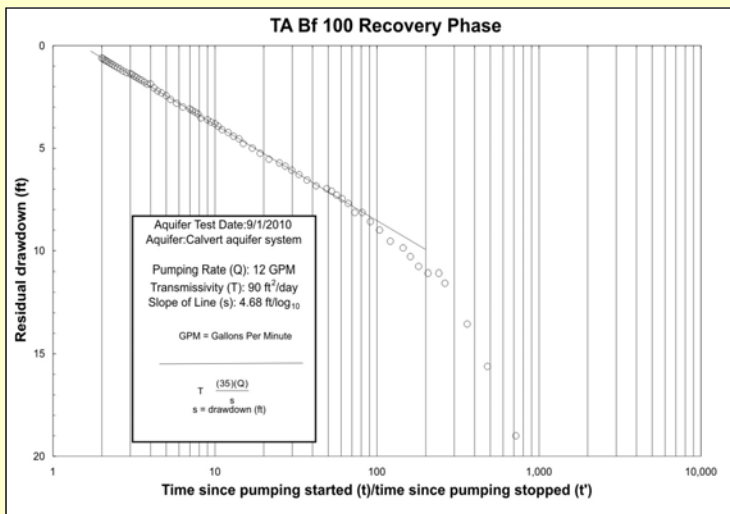


Drilling equipment

observation well (TA Bf 99) and in the production well. The specific capacity of TA Bf 100 at the end of the pumping phase was 0.32 gpm per foot of drawdown. The transmissivity calculated by the Cooper-Jacob method for the recovery phase of the test was 90 ft²/day. The static water level in TA Bf 99 and TA Bf 100 measured prior to the aquifer test was approximately 39 ft above sea level. At the end of the aquifer test, the water level in the deeper sand (TA Bf 99) declined 6.2 ft. During continuous monitoring over several months, water levels changed in response to atmospheric pressure and possibly local withdrawals.

Water samples from TA Bf 100 were collected during the aquifer test. Samples were analyzed for field parameters (pH, alkalinity, specific conductance, dissolved oxygen), major ions, nutrients, metals, and radionuclides. None of the U.S. Environmental Protection Agency's Primary Drinking Water Standard were exceeded in samples collected from the wells.

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)
TA Bf 99	TA-95-1559	178 - 188	Calvert	No pumping test conducted			
TA Bf 100	TA-95-1560	110 - 130	Calvert	12	90	7.6	248



Well development

Reference

Cushing, E.M., Kantrowitz, I.H., and Taylor, K.R., 1973, Water Resources of the Delmarva Peninsula: U.S. Geological Survey Professional Paper 822, 58 p.

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