

Title: Evaluation of geology and hydraulic performance of Wisconsin ground-water monitoring wells

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Background/Need: Reliable ground-water level measurements are needed for ground-water research and effective management of ground-water resources in Wisconsin. Results of a similar study from 1994-1996 (DNR Project No. 118) indicated that a significant number of observation wells had poor hydraulic connection with aquifers. Geophysical logging and slug testing of the remaining accessible wells in the observation network will increase the quality of water-level measurements.

Objectives: The main objective is to improve the quality of the Wisconsin ground-water monitoring network, which in turn will contribute to the improvement of a ground-water level data base needed for the management of ground-water resources in Wisconsin.

Methods: Sixteen observation wells were identified as suitable for testing. Geophysical logs - caliper, natural gamma, spontaneous potential, and single-point resistivity - were run in the wells, where it was possible. A Mount Sopris MGX Digital Logger was used for geophysical logging. The hydraulic conductivity of geologic units tapped by the wells were estimated by displacement/recovery tests (slug tests).

Results and Discussion: The tested wells range in depth from 13 to more than 350 ft. Most of them are in the sand and gravel aquifer (11 wells); one well is open to the Silurian dolomite aquifer, one to the Galena-Platteville dolomite, and three to the sandstone aquifer.

Geophysical logs were obtained from 9 of the 16 selected network wells. Displacement/recovery tests were conducted in all 16 of the wells. The Hvorslev method was used to calculate hydraulic conductivity, which ranged from 1 to 90 ft/day. The tests provided reliable data for estimation of hydraulic conductivity of 9 wells, 7 wells exhibited very slow recovery during the test. Slow recovery in 1 well is believed to be due to low formation conductivity, the other 6 are interpreted to have a poor hydraulic connection with the aquifer.

**Conclusions/
Implications/
Recommendations:** The results suggest that a significant portion of the tested wells, 38%, had very slow or no response to the slug tests, and therefore, a poor hydraulic connection with aquifers. Most of these (5 out of 6) were wells older than 40 years. This proportion and a similar proportion from the 1994-96 study, 31%, indicates the need for regular testing of wells in the Wisconsin monitoring network, especially those that are older than 35-40 years. In this way, the efficiency and quality of the network could be maintained and the use of limited funds for monitoring optimized.

Key Words: Hydraulic conductivity, geophysical logs, Wisconsin observation-well network.

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Final Report: A final report containing more detailed information on this project is available for loan from Wisconsin's Water Library, University of Wisconsin - Madison, 1975 Willow Drive, Madison, Wisconsin 53706 (608) 262-3069.