

**Title:** Hydrogeologic Investigation and Groundwater Quality Assessment (Study No. 28)

**Investigators:** Principal Investigator

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**Objectives:** To provide an assessment of groundwater degradation, determine the horizontal and vertical boundaries of the landfill in the Havenwoods State Forest, and evaluate the hydrogeologic conditions at the site.

**Background/Need:** There is concern that this abandoned landfill, which is located on State Forest property, may have negative impacts on local soils and groundwater.

**Methods:** Soil borings were completed and monitoring wells and piezometers were installed. A geophysical study was conducted to determine the areal extent and depth of refuse fill and depth to bedrock in areas away from the borings locations. Laboratory testing included grain size analysis and soil classification. Background air quality was analyzed with an organic vapor analyzer. Monitoring wells and piezometers were purged and samples collected for chemical parameter testing.

**Results/Conclusions:** Six sampling rounds showed high heavy metal concentrations in the piezometer wells. Groundwater concentrations appear to decrease in a pattern consistent with estimated groundwater table elevation contours and flow directions, which may be indicative of landfill contributions. Non-volatile organics and biological sources of pollution do not appear to have a significant impact on the study area wells.

**Recommendations/  
Implications:** Investigators recommend preliminary remedial action to mitigate the negative effects of the refuse fill deposit. Suggestions include stripping of the refuse area of all vegetation, constructing an additional clay cap over the fill area and containment barrier around the perimeter of the fill area. Excavating the landfill and transporting the refuse to an alternate site may also temporarily alleviate the problem. Further study is recommended of the lateral and areal extent of the refuse, surface water quality, heavy metal concentrations in the vicinity of the bedrock, groundwater flow directions, surrounding groundwater quality and fluctuations in chemical parameter concentrations. Comprehensive restorative measures can be taken with the greater understanding of these parameters.

**Availability of Report:** This report is available for viewing and loan at:

The Water Resources Center  
1975 Willow Drive  
Madison, WI 53706  
(608) 262-3069  
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**Key Words:** Hydrogeology, landfill

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