

**Title:** Volatile Organic Compounds in Groundwater and Leachate at Wisconsin Landfills (Study No. 4)

**Investigators:** Principal Investigator  
Marci A. Friedman, Hydrogeologist  
Wisconsin Department of Natural Resources  
Bureau of Solid & Hazardous Waste Management

**Objectives:** To determine the extent of volatile organic compound (VOC) contamination and whether differences in landfill design should influence VOC monitoring requirements.

**Background/Need:** A large number of clay-lined landfills have been developed in Wisconsin. The Bureau of Solid & Hazardous Waste Management did not have a large data base of VOC sampling results to determine whether differences in landfill design would influence VOC monitoring requirements.

**Methods:** 26 landfills were selected for sampling based on design, age and performance. Samples were collected on two different occasions from upgradient and downgradient monitoring wells, leachate collection systems and from lysimeters. The sample accuracy and replicability were also tested over a two-year period between 1985 and 1987.

**Results:** VOCs were present in groundwater in 12 of the 26 landfills, in leachate in 18 of the 19 landfills with leachate collection systems and in collection lysimeters at 3 of the 7 landfills. Tetrahydrofuran was most frequently detected in collection lysimeter samples. No discernible relationship existed between specific gravity of a compound and detection. Concentrations of VOCs in leachate were generally greater than in groundwater. Halomethanes, aromatic hydrocarbons and halogenated hydrocarbons were detected more frequently and in greater concentrations in leachate than groundwater. Clay-lined landfills were found to collect leachate and limit the amount reaching groundwater. Chloride concentrations were not elevated where VOCs were detected. Industrial waste leachates sampled generally contained fewer VOCs with lower concentrations than municipal leachates. At landfills where VOCs were detected in groundwater, inorganic parameters such as alkalinity, hardness and specific conductivity were often elevated.

**Conclusions:** The design of the landfill, presence of elevated indicator parameters, goal of the monitoring program and variability of the data are factors to be considered when choosing an appropriate VOC monitoring program for a specific site.

**Recommendations/Implications:** Investigators recommend that landfill facilities be required to monitor groundwater for VOCs at differing frequencies depending on landfill design, leachate quality, treatment method and parameter detection levels.

**Availability of Report:** Copies of this report are available from:  
Vera Starch  
Bureau of Solid and Hazardous Waste Management  
Department of Natural Resources  
P. O. Box 7921

Madison, WI 53707  
608-267-7564  
Technical Report 23

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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**Related Publications:**

Study No. 5

**Key Words:**

Hydrocarbon, landfill, landfill design, tetrahydrofuran, volatile organic compounds

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