Title: **Investigation of Groundwater Impacts at Demolition Landfills, Deer Pits, and Yard Waste Compost Sites**

Project I.D.: DNR Project No. 98

Investigators: Gunnar Svavarsson, Philip Fauble and Jack Connelly
DNR Bureau of Solid and Hazardous Waste Management

Period of Contract: July 1, 1991 through June 30, 1994

Background/Need: Construction and demolition (C/D) waste, yard waste, and road killed deer are disposed of in sites with less stringent designs than municipal solid waste landfills. Very limited information is available on the potential for groundwater contamination from these types of waste. This study provides this information to determine the most appropriate regulation for disposal of these wastes.

Objectives: To determine groundwater impacts from unlined construction and demolition waste landfills, deer pits, and yard waste compost sites, and if impacts are found, to evaluate the degree of contamination.

Methods: Two disposal sites for each waste type were selected and 5 groundwater monitoring wells were installed at each of the sites. One well at each site was located upgradient and three water table wells and one piezometer were located down or sidegradient. The C/D landfills and the deer pits were sampled on eight occasions over a two year period and the yard waste compost sites on 5 occasions over a period of one year. Surface leachate samples were also collected at the yard waste compost sites. Four well volumes of water were purged out of the wells prior to collection of samples with a bailer. Samples were analyzed at the Wisconsin State Laboratory of Hygiene for inorganic indicator parameters at all sites and for the following specific parameters by waste type: chloride, sulfate, manganese, metals and VOCs at demolition landfills; nitrate, BOD and COD at deer pits and nitrate, ammonia and pesticides at yard waste compost sites.

Results and Discussion: At one of the C/D landfills sulfate levels exceeded the Wisconsin enforcement standard for groundwater of 250 mg/L in two wells. Levels in those two wells ranged from 510 to 1900 mg/L. At the other site the standard was also frequently exceeded for two wells. Levels in those two wells ranged from 200 to 600 mg/L. Except for one confirmed detect due to well repair, no VOCs were found. Phenolics, arsenic, lead, were detected only once at low levels.

Two of the yard waste compost sites had downgradient nitrate+nitrite levels of up to 18 mg/L to 20 mg/L. Groundwater had very low levels of ammonia while surface leachate had concentrations up to 424 mg/L. Nitrate concentrations however, were low in the leachate. Chromium concentrations in the leachate ranged from 4 to 23 ug/L and the enforcement standard of 100 ug/L was not exceeded. Lead concentrations in the leachate ranged from 11 to 150 ug/L and the enforcement standard of 15 ug/L was exceeded a few times.

At the deer pits nitrate+nitrite was detected in downgradient monitoring wells in concentrations from 18 to 30 mg/L. The enforcement standard of 10 mg/L for nitrate+nitrite was frequently exceeded.

Conclusions/ Recommendations: The results indicate some adverse groundwater quality impacts resulting from C/D waste disposal. One of the C/D landfills had two wells with significantly higher chemical concentrations than background levels. The same can be said for one well at the other site. At both of these sites sulfate, chloride, and manganese commonly exceeded groundwater standards. A number of other parameters were elevated including hardness, alkalinity, total dissolved solids, and conductivity. Groundwater was not found to be contaminated by VOCs or with any heavy metal compound analyzed. The size of unlined C/D landfills should be limited in order to minimize the possibility of groundwater contamination. If the landfill has a liner and leachate collection system, the size could be increased.

At the yard waste compost sites studied, decomposition was occurring anaerobically because the piles were seldom turned to encourage aeration. There were definite, measurable impacts to groundwater quality in the form of elevated levels of nitrate, chloride, and at times sulfate. The leachate at these sites typically contained levels of chromium and lead with the lead values exceeding the Wisconsin groundwater quality standards. Pesticide concentrations were very low. The leachate also contained high levels of ammonia and total phosphorus that could be detrimental to surface water quality if allowed to reach a stream, lake or impoundment. It appears that production of many of the contaminants present in yard waste compost leachate could be lessened or eliminated by actively managing the compost to allow the waste to decompose under aerobic conditions. Further studies are needed to determine the groundwater impacts and leachate quality of unlined composting facilities that encourage aerobic decomposition.

Both the animal carcasses disposal sites were impacting groundwater. The most significant contamination was from nitrate+nitrite. At one of the sites two of the downgradient monitoring wells and at the other site all the downgradient wells had elevated levels of nitrate+nitrite. Groundwater quality standards were frequently exceeded for nitrate+nitrite in one monitoring well at each site. Nitrate+nitrite contamination is of great concern if carried into drinking water, where it can cause health risk for infants. However, because the wells were all in close proximity to the deer pits, it is likely that the nitrate+nitrite levels drop off rapidly in groundwater as the plume moves away from the site. If deer pits are properly managed and their size is kept small, they will probably not cause significant groundwater contamination.

Key Words: construction and demolition waste landfills, yard waste compost landfills, animal carcass disposal sites, groundwater sampling, groundwater monitoring

Funding: DNR

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.