



*The Ohio Department of Transportation
Office of Research & Development
Executive Summary Report*

**Effects of Highway Deicing Chemicals on Shallow Unconsolidated
Aquifers in Ohio—Final Report**

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Problem

Road salt applied to highways during winter months is a primary source of solutes to ground water in Ohio. Brine resulting from salt application may run off into nearby streams or into ditches, where it infiltrates into the ground. Plowed snow from the highway, splash caused by vehicles, and wind may also transport salt considerable distances. In general, there has been a lack of detailed knowledge about the fate and transport of deicing chemicals after application to the highway.

Objectives

As part of an ODOT data-collection effort, the U.S. Geological Survey (USGS), in cooperation with ODOT and the FHWA, began a study in 1988 to monitor the use and fate of highway deicing chemicals in shallow (less than 50 ft deep), unconsolidated aquifers. This report describes the USGS study and the data collected at eight sites in Ohio designed to monitor the effects of application of highway-deicing chemicals on shallow, unconsolidated aquifers.

Description

This report is the follow-up to an interim report (Jones and Sroka, 1997), which included data collected through 1993. This report includes information about all data collected from January 1991 through

September 1999. The State routes monitored were the following: State Route (SR) 3 in Ashland County, SR 84 in Ashtabula County, SR 29 in Champaign County, SR 4 in Clark County, SR 2 in Lucas County, SR 104 in Pickaway County, SR 14 in Portage County, and SR 97 in Richland County. The section "Methods of investigation" provides technical information about data collection and analysis. The eight modules under "Effects of Highway Deicing Chemicals, by Site" present descriptive data in narrative, tabular, and graphical form; these modules are designed to be useful to readers who may be interested in only one or a few specific sites in a particular part of Ohio. Several sections or parts of sections in this report are repeated from the interim report to make this report understandable on its own. However, to obtain all of the information from this project, readers should also refer to the interim report (Jones and Sroka, 1997). Because of the large volume, raw data are not presented in either report; they can be retrieved from the USGS NWISWeb page at <http://waterdata.usgs.gov/oh/nwis/>. A list of well numbers and names at each site is provided in the appendix (table A-1 in the appendix) to assist in retrieving data.

Conclusions

Evidence from water analysis, specific-conductance measurements, and surface-geophysical measurements indicates that three of the eight sites (Ashtabula County, Lucas County, and Portage County sites) were affected by direct application of deicing chemicals. Climatic data collected during the study show that cold weather, and therefore deicing-chemical application rates, varied from south to north across the State.

As a consequence, only minor traces of dissolved chloride (mean, 24-43 mg/L) above background concentrations (mean, 13-23 mg/L) were determined in ground-water samples from the southernmost sites (approximately 39°30' to 40° N latitude-Champaign County, Clark County, and Pickaway County). At the Ashland and Richland County sites (approximately 40°30' N latitude), dissolved-chloride concentrations increased above background concentrations only intermittently (mean background concentrations 4-41 mg/L, rising to a mean of 40-56 mg/L in downgradient wells). At the northernmost sites (41° 30' to 42° N latitude-Lucas County, Portage County, and Ashtabula County), deicing-chemical application was consistent throughout the winter, and downgradient dissolved-chloride concentrations (mean, 124-345 mg/L) rarely returned to background concentrations (mean, 7-37 mg/L) throughout the study period.

Implementation Potential

ODOT plans to use these long-term data to help determine how deicing practices affect ground-water quality and to develop a baseline data base from which to monitor changes over time to better serve citizens who would like not only safe roadways but also high-quality water resources.

Reference

Jones, A.L., and Sroka, B.N., 1997, Effects of highway deicing chemicals on shallow unconsolidated aquifers in Ohio, Interim report, 1988-93: U.S. Geological Survey Water-Resources Investigations Report 97-4027, 139 p.