

Title: **Distribution of Radionuclides in Wisconsin Groundwater**

Project I.D.: DNR Project No. 91

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Background/Need: Knowledge of the natural distribution of radionuclides such as radon in Wisconsin groundwater is well developed only in the north-central part of Wisconsin where naturally occurring radioactive constituents are present in groundwater at levels which exceed maximum contaminant levels specified or proposed by the Federal Safe Drinking Water Act. This study was undertaken to determine the magnitude and extent of naturally occurring radionuclides, principally radon, elsewhere in Wisconsin.

Objectives: Evaluate concentration and distribution of naturally occurring radionuclides in Wisconsin outside of the North Central Department of Natural Resources District area in order to determine whether the occurrence of radionuclides is widely spread.

Methods: In conjunction with colleagues in the Department of Natural Resources and the Central Wisconsin Groundwater Center, 40 ml samples of groundwater from documented wells (having a Wisconsin Unique Well ID and a construction report) were submitted to the State Laboratory of Hygiene for radon in water analysis by liquid scintillation. Results are reported in picocuries per liter of water.

Results: The occurrence of radon in groundwater is more widely spread than heretofore reported, and includes groundwater from dolomite aquifers in southern and eastern Wisconsin. Although elevated in comparison to the proposed EPA standard of 300 pCi/L, the elevated concentrations are much less than those found in central Wisconsin over granite. The only hydrogeologic unit found to be low in radon was sandstone.

Analytical techniques and laboratories were evaluated, and it was found that the Wisconsin State Laboratory of Hygiene reports radon in water concentration on an average 20 percent higher than other EPA certified laboratories. This results in an overestimate of risk, and errs on the side of caution. The less expensive kits may be falsely reporting lower radon concentrations than actually occur.

Gross alpha and gross beta analyses do not provide insight into which radionuclides are present, and their continued use is discouraged in evaluating radon. Gross alpha and gross beta analyses may be most useful as an inexpensive indicator of radium or uranium.

Conclusions: Elevated levels of radon in groundwater are not limited to the north-central part of Wisconsin. Moderately elevated concentrations can be found in all areas of the state.

Exceedingly high (over 100,000 pCi/L) concentrations appear to be restricted to north-central Wisconsin.

Implications/

Recommendations: Analysis of groundwater for radon should continue, and areas in eastern Wisconsin having granite bedrock geology, or surficial material derived from granite should be evaluated.

A more comprehensive evaluation of existing data should be undertaken to more fully evaluate the source of radon in groundwater in order to design well construction to minimize radionuclide contamination.

Related

Publications: Mudrey, M.G. and K.R. Bradbury. Distribution of radionuclides in Wisconsin Groundwater. WGNHS open-file report 93-9. 20 pp.

Key Words: radon, radionuclides

Funding: DNR, WGNHS

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.