Radon in Nova Scotia: defining areas of geogenic enrichment

T. A. Goodwin[1], G. A. O'Reilly[1], R. J. Ryan[1], and A. M. O'Beirne-Ryan[2]

1. Nova Scotia Department of Natural Resources, Halifax, NS, Canada B3J 2T9 <goodwita@gov.ns.ca> ¶ 2. Department of Earth Sciences, Dalhousie University, Halifax, NS, Canada B3H 4H8

Exposure to radon is the second leading cause of lung cancer after tobacco smoking. Health Canada recently reduced the national guideline for exposure to indoor radon from 800 Bq/m^3 to 200 Bq/m^3 for an annual average exposure.

As part of the Canadian component of the North American Soil Geochemical Landscape Project (NASGLP), a tri-national geochemical initiative involving the federal, provincial, and state geological surveys of Canada, the United States, and Mexico, radon concentrations in soil gas were measured at selected sites throughout Nova Scotia.

Prior to commencement of the 2008 field season, a limited orientation program involving the Geological Survey of Canada and the Nova Scotia Department of Natural Resources was carried out to (1) test field methodologies, (2) determine the optimum sampling depth, (3) address issues of spatial variance, and (4) determine instrument accuracy and precision. The orientation study also involved the sampling of various till units as well as a number of different background and mineralized environments.

During the 2007 and 2008 field seasons, 72 regional sites were sampled for radon at an average sampling density of 1 sample per 800 km^2. At each site, soil samples from various soil horizons were also collected and analyzed for uranium and multi-element geochemistry. Measurements of *in situ* gamma ray spectrometry measurements (eU, eTh, K, and Total Counts) were also collected at each site. Soil permeability was measured at most but not all sites.

Approximately 40% of Nova Scotian residents live within the Halifax Regional Municipality (HRM), therefore, a higher density sampling program (1 sample per 70 km^2) for radon was completed within HRM. Soil samples representing the Public Health (PH) layer (0 to 5 cm depth) were also collected at each site and will be analyzed for uranium and multi-element geochemistry. *In situ* gamma ray spectrometry and soil permeability measurements were collected at all the HRM sites.

Initial results of the survey indicate that measureable radon in soil gas is present everywhere throughout the province in all geologic terrains. Radon tends to correlate positively with peraluminous granite, particularly with the highly evolved phases (leucomonzogranite) and to a lesser degree with sedimentary rocks of the Horton and Pictou groups that may be (locally) characterized by roll-front uranium mineralization.

One objective of this study is the establishment of a link between the presence of geogenic radon and indoor radon concentrations as an aid in identifying areas where exposure to radon may represent an increased human health risk.

Funding for the project was provided by the Geological Survey of Canada and by the Radiation Protection Bureau of Health Canada.

Atlantic Geology, 2009, Volume 45, Number 1