Production and transport of radon-222 gas through Halifax Regional Municipality's bedrock and till units

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Radon-222 gas is a human health risk, as long-term exposure to high radon concentrations through inhalation is the second leading cause of lung cancer after smoking. Studies from the Halifax Regional Municipality (HRM) area have documented radon gas levels high enough to be classified as a potential health risk (> 200 Bq/m^3). The objectives of the study were: to create a map for indoor radon potential using indoor radon values, surficial and bedrock geology maps, radiometric maps, and known uranium occurrences; and, to quantify the dominant transport processes through HRM tills. A detailed map of potential radon exposure was developed for the HRM that linked spatially integrated residential radon levels with radon measurements from previous field studies, known uranium deposits and radiometric surveys. The second objective was to examine, in detail, the production and transport through depth of the fine grained leucomonzogranite till facies of the South Mountain Batholith within HRM as it returned the highest radon soil gas values (51.0 kBq/m^3) and soil radon potential index values (34.5). Using laboratory soil column apparatuses, the dominant transport processes in HRM tills were quantified by measuring the permeability, diffusivity, and radon soil gas profiles through depth. Examining field soils and bedrock in a controlled environment concluded that production and transport of ^{222}Rn in the till was determined overall to be a more important control on the potentially dangerous indoor radon risk than ^{238}U production from the HRM bedrock; both permeability and diffusivity were significant controlling parameters.

Atlantic Geology, 2013, Volume 49, Number 1