

---

### Radon soil gas in Halifax Regional Municipality

---

KELSEY O'BRIEN

*Department of Earth Sciences, St. Francis Xavier University,  
Antigonish, Nova Scotia B2G 2W5, Canada <x200600q@stfx.ca>*

Naturally occurring radon is found in measurable quantities in all soil gas across Nova Scotia. Next to smoking, radon exposure is the leading cause of lung cancer. Several tested buildings within Halifax Regional Municipality (HRM) contained elevated indoor radon gas, and a positive correlation between radon soil gas and indoor radon gas concentrations has been previously established. While the production of radon is an important precondition for its presence in surficial soils, the permeability and rate of transport are important controls on the surface expression of radon. The objective of this study is to identify relationships between the permeability of the soils through which radon passes, the composition of the overlying surficial soils, and the geology of the respective bedrock types within HRM. Over 200 radon soil gas samples from 40 sites were collected and analyzed during the 2009 field season using protocols developed for the North American Soil Geochemical Landscapes Project. The study focused on soil developed over the three major bedrock types in HRM: the Cambrian-Ordovician Goldenville Group metasandstone and Halifax Group slate, and granite of the Devonian-Carboniferous South Mountain Batholith (further subdivided based on its cooling history). All of the soils sampled contained radon soil gas. The average values ranged from 19.1 kBq/m<sup>3</sup> in metasandstone, to 36.1 kBq/m<sup>3</sup> in slate, and 44.3 kBq/m<sup>3</sup>, 50.2 kBq/m<sup>3</sup>, and 51.0 kBq/m<sup>3</sup>, respectively, for the primitive, middle, and evolved SMB granites. The highest concentrations were associated with granite, then slate, and then metasandstone. On-going analysis of the permeability readings with respect to HRM's four major

till types (Beaver River Till [Granite, Metasandstone, and Slate facies], and the Lawrencetown Till) may solidify an important relationship between radon soil gas, and overlying till. The soil radon potential index will be used to correlate the soil gas and permeability readings with the indoor radon potential. This study should be beneficial in understanding radon soil gas in HRM where over 40% of Nova Scotia's population resides.