Distribution of uranium in selected rock types in central mainland Nova Scotia: Implications for the occurrence of high levels of radon in domestic well waters and indoor air

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Elevated levels of the radioactive gas radon have been detected in well waters and in indoor air in diverse geologic and geographic areas in Nova Scotia. Ultimately the source of radon is the uranium in the rocks themselves. This project attempts to determine the nature of the uranium distribution within the rocks, and the processes involved in uranium

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release into the environment, in order to develop a model of radon potential for a region. Rocks in which all the uranium is locked in resistate minerals such as zircon, will not readily release uranium into the environment at near-surface conditions. Uranium concentrated along grain boundaries, cleavage traces, shear or alteration zones, or in weathered or altered minerals may be more loosely held in the mineral structures themselves. Such sites may readily release uranium and may serve as channelways for uranium or radon migration in the near-surface environment.

This study represents a first attempt at quantifying the mineralogical distribution of uranium in selected rock types. Preliminary fission track maps of granitoids of the South Mountain Batholith (SMB) and other spatially associated rocks, reveal the distribution of uranium in these rocks.

These data suggest that much of the uranium in "fresh" rocks is locked in resistate minerals such as zircon, and therefore is not readily mobilized. In altered and weathered samples of the granitoids of the SMB, the uranium occurs in resistate minerals, in cleavage traces within the biotite and chlorite, and along grain boundaries where the uranium is commonly associated with iron oxides; uranium may be more readily mobilized under these conditions.

In proximity to the granite, anomalously radioactive Meguma Group metasedimentary rocks exhibit uranium concentrations along veins postdating the contact metamorphism. These veins are sub-parallel to bedding planes and may serve as potential channels for uranium and radon migration. In anomalously radioactive Horton Group sandstone, uranium is concentrated in the matrix. This sandstone is loosely cemented, so uranium and radon could be readily released into the environment when the rock is physically or chemically disturbed.

The next stage of the project will integrate the above mineralogical relationships with airborne radiometric data and geological parameters, and spatially analyse these associations using GIS.