

# The Kitts Deposit – An Example of High-grade, Vein-hosted Uranium Mineralization, Labrador, Canada

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## Summary

The Kitts deposit represents the first potentially economic discovery of uranium mineralization within the Central Mineral Belt (CMB) of Labrador, and remains the highest-grade deposit yet discovered within the region. Mineralization within the deposit is predominantly structurally-controlled, and generally occurs as high-grade veins and lesser disseminated mineralization within the Paleoproterozoic metasedimentary rocks of the Post Hill Group. Mineral exploration carried out in the area between 1954 and 1975 consisted of surface drilling and limited underground development, which outlined an historical resource of 203,000 tonnes at 0.73%  $U_3O_8$ . Recent U-Pb dating of a quartz—feldspar porphyry dyke which locally crosscuts the mineralization provides a minimum age constraint of  $1881.8 \pm 3.4$  Ma on the development of the primary uranium mineralization. Subsequent deformation locally results in the remobilization of the uranium mineralization along discrete fractures and shear zones within the deposit. Currently this deposit lies within exempt mineral lands and has not benefited from the recent resurgence in mineral exploration within the region; however similar styles of mineralization certainly remain an attractive target for future uranium exploration.

## Introduction

While conducting reconnaissance prospecting on behalf of the British Newfoundland Exploration Limited (BRINEX), Walter Kitts discovered a zone of significant radioactivity within the eastern portion of the CMB in 1954. This discovery resulted in several periods of intensive exploration spanning two decades, during which time both surface and underground exploration work were carried out on the Kitts deposit. Today, the historical exploration reports along with several detailed geological studies carried out in the region during the late 1970s serve as the best resources for technical information on this deposit.

## Regional Geology

The Kitts deposit occurs within a structurally complex region in the northeastern portion of the Makkovik province, proximal to the contact between the Archean basement rocks and the overlying supracrustal sequences (Figure 1). Within this region, reworked Archean gneisses are structurally overlain by the Paleoproterozoic amphibolite-facies supracrustal rocks of the Post Hill Group (Ketchum et al., 2001, 2002). The Post Hill Group consists of ca. 2100 Ma psammite, schistose mafic metavolcanic rocks and minor pelite, which are interpreted to have been deposits within a continental margin type of environment (Culshaw and Ketchum, 1995). Uranium mineralization within the region predominantly occurs within the inferred upper portions of the Post Hill Group stratigraphy, at or very near the tectonic contact with the overlying Aillik Group (Gower et al., 1982). Elsewhere within the eastern portion of the CMB, the Aillik Group hosts the majority of known uranium occurrences, and is inferred to play a significant role in their genesis. Early interpretations as to the source of the mineralization at the Kitts deposit also favoured the Aillik Group as potential source rocks for the uranium (e.g. Evans, 1980; Gower et al., 1982).

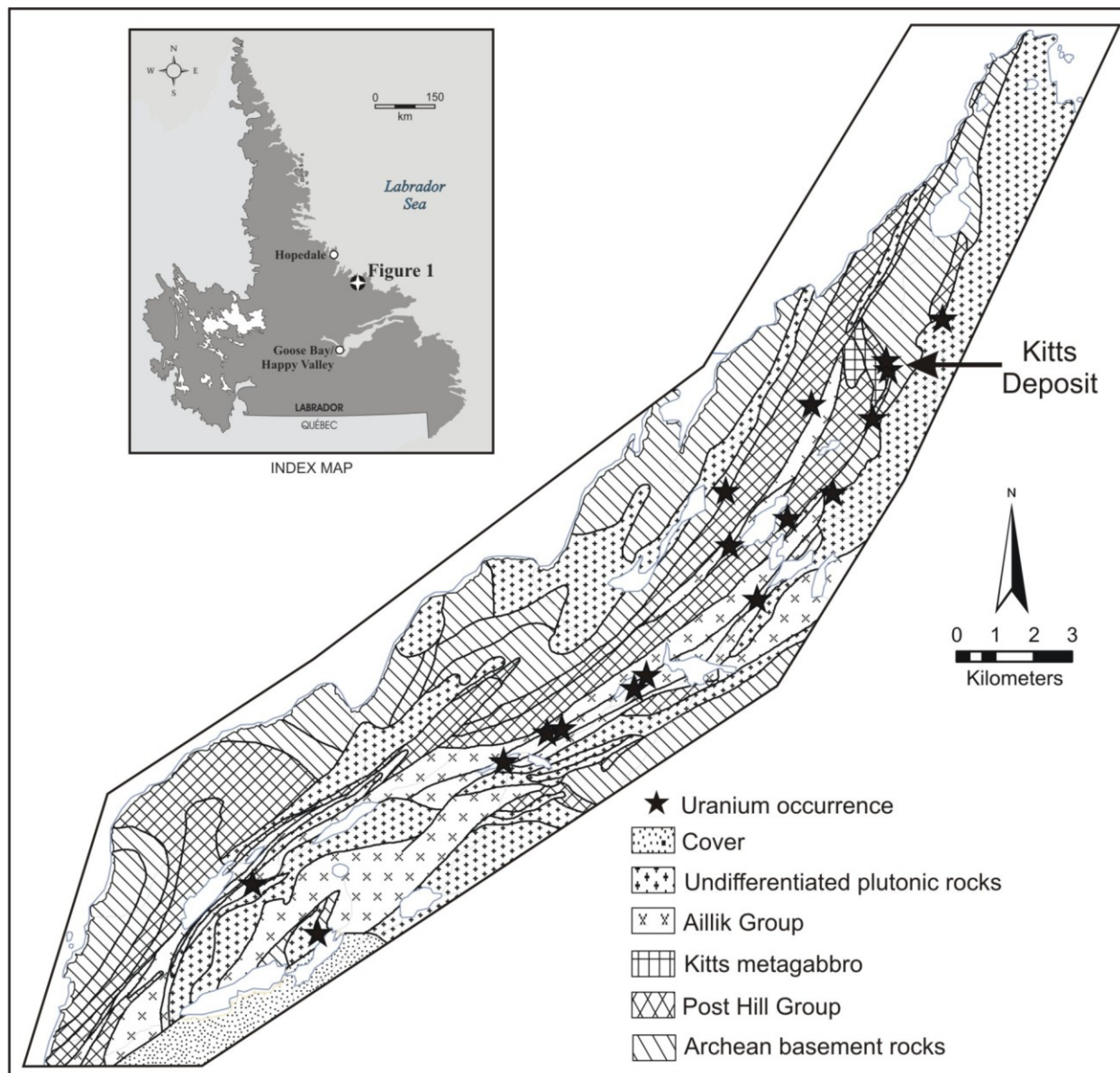


Figure 1: Simplified geological map showing the distribution of the Post Hill Group in the vicinity of the Kitts deposit. Modified after Gower et al., 1982.

### Local Geology

Within the Kitts deposit, uranium mineralization is predominantly hosted within a northeasterly dipping metasedimentary sequence which is comprised of sulphidic argillite, albitic greywacke and mafic tuff (Evans, 1980; Gandhi, 1978). These metasedimentary rocks are interbedded with the Kitts Pillow Lava, which forms the upper portion of the Post Hill Group. Uranium mineralization occurs within the metasedimentary rocks along the northeastern margin of a metamorphosed gabbro intrusion, known as the Kitts metagabbro. Here the mineralization is hosted within a north-northwest trending shear zone, termed the Main Shear Zone, which is developed subparallel to the margin of the metagabbro and is primarily focused along the less competent rocks of the metasedimentary sequence (Evans, 1980).

The metasedimentary rocks along the Main Shear Zone locally display a dextral displacement due to the development of the Cross Shear Zone which crosscuts at an oblique angle to the lithological contacts within the area and locally results in the redistribution of the primary uranium mineralization. The development of the Cross Shear Zone is highlighted by the intrusion of distinctive quartz—feldspar porphyry dykes which are generally developed subparallel to the structure. The porphyry dykes are interpreted to crosscut the primary uranium mineralization, but are locally host to remobilized uranium which occurs as discrete fracture fillings and along sheared margins of the dykes. Recent U-Pb SHRIMP data obtained from a porphyry dyke provides an age of  $1881.8 \pm 3.4$  Ma (Sparkes et al., 2010); this age provides a minimum constraint on the development of the primary mineralizing event within the Kitts deposit.

## Mineralization

Uranium mineralization within the Kitts deposit is unequally distributed between the A, B and C Zones, with the B zone hosting the bulk of the mineralization. The reason for this is that the B zone is affected by a higher degree of folding, which locally results in greater concentrations of uranium at the crests and troughs of fold hinges, combined with the fact that the intersection of the Main and Cross shear zones also occurs within this region (Gandhi, 1978). Uranium mineralization consists of uraninite with minor coffinite and occurs as high-grade veins and fracture fillings, with lesser fine-grained disseminated mineralization. The mineralized zones can be roughly subdivided into 6 separate ore shoots which plunge towards the southeast along the Main Shear Zone (Evans, 1980). Gandhi (1970) noted that mineralization is preferentially concentrated along particular stratigraphic horizons within the metasedimentary rocks, which he inferred to represent a primary stratigraphic control on the mineralization.

## Conclusions

The Kitts deposit represents the highest-grade uranium deposit yet discovered within the CMB region of Labrador, and is hosted within the Paleoproterozoic Post Hill Group. Mineralization within the deposit is primarily restricted to early shear zones related to the juxtaposition of the Archean basement rocks and overlying supracrustal sequences. Recent U-Pb age dating of a post-mineralization quartz—feldspar porphyry dyke now provides a minimum age constraint on the primary uranium mineralization, indicating that the mineralization is somewhat older than previously envisaged. The new data highlights a potential genetic link between the formation of the uranium mineralization and the Post Hill Group, as was previously proposed by Gandhi (1970); however further geochronological data is required to substantiate this relationship.

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