**Petrographic and geochemical evidence for a hypogene origin of granite-hosted, vein-type Mn mineralization at the New Ross Mn mines, Lunenburg County, Nova Scotia**

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The abandoned New Ross Mn mines are hosted in megacrystic biotite monzogranite of the South Mountain Batholith (SMB) 10 km north of New Ross, Lunenburg County. Past workers disagree as to whether the deposits are of supergene or hypogene origin. Recent deep diamond-drilling at one of the deposits and geological mapping has provided new data on the origin of these deposits. The SMB in this area consists mostly of coarse grained megacrystic biotite monzogranite. A swarm of small, elongate leucomonzogranite plutons both intrude and are in fault contact with the monzogranite to the north and west of the Dean and Chapter mine and at depth below the past mine workings. These plutons occur elongate parallel to a series of persistent, northeast-trending topographic linears which traverse this region of the SMB and, in most cases, represent faults and/or shear zones. This spatial association suggests these structures played a role in the localization of the plutons. Brecciation and hydrothermal alteration of the leucomonzogranites indicates movement and hydrothermal activity continued on the faults after final crystallization of the plutons.

Several types of hydrothermal alteration are well-developed in the mineralized zones at the mines and along other northeast-trending structures in this region of the SMB. Diamond drilling at the Dean and Chapter mine shows that, although the Mn mineralization is absent at depth, the shear zone and hydrothermal alteration persists to at least 452 m (1482 ft) below the mine workings. Low temperature, postmagmatic hematization and kaolinization is best developed within the main ore-bearing zones from surface to a depth of about 150 m (492 ft). With increasing depth, the amount of kaolinization decreases but hematization remains important. Desilicification accompanies hematization at several locales both in the megacrystic monzogranite and the leucomonzogranite intrusions. The desilicification is developed to the point that no free quartz remains in the rock. Higher temperature alterations such as silicification, greisenization and K-feldspathization occur associated with emplacement of the leucomonzogranite. The silicification occurs as total replacement of the rock and grades through greisenized selvages into fresh leucomonzogranite or monzogranite.

The activity of phosphate during the alteration sequences is of particular importance. At depth below the Dean and Chapter mine, $P_2O_5$ enrichment occurs in the higher temperature silicified, greisenized and K-feldspathized rocks (up to 5.20 wt. % $P_2O_5$). The importance of phosphate in the system continued into the lower temperature alterations and also crystallized as apatite intergrown with the Mn- and Fe-oxides on the mineralized zones (up to 9.95 wt. % $P_2O_5$). The textural relations and geochemical signatures indicate the entire alteration sequence and the mineralization comprise an evolving hydrothermal system developed from upward migrating hydrothermal fluids. These processes operated over much of this region of the SMB and suggest a high potential for as yet undiscovered deposits.