Geological investigation of the Coxheath Cu-Mo-Au System, Cape Breton Island, Nova Scotia: structurally controlled porphyry-type mineralization

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The Coxheath Cu-Mo-Au porphyry-type deposit, located in the Coxheath Hills southwest of Sydney, occurs within a Late Precambrian (~620 Ma) volcanic-plutonic complex. High-grade (ca. 10%) mineralization was mined in the early 1900's and more recently its potential as a low-grade Cu-Au system has been realized. The deposit has generally been regarded as anomalous in the Canadian Appalachians, as porphyry-type mineralization of pre-Mesozoic age is relatively rare in the geological record.

Previous geological studies of the Coxheath area include regional and detailed mapping, geochemical studies and mineralogical investigations. This study integrates previous work with ongoing investigations of vein structure, mineral paragenesis and geochemical studies of both host rocks and alteration. During the past summer, field work on the main mineralized zone focused on structure, alteration, and mineralization and the inter-relationships of these features. In addition, drill core of the deposit was logged.

Mineralization-related alteration of the host hornblende diorite and plagioclase-phyric andesite at Coxheath includes zones of potassic, phyllic, argillic, tourmaline, and propylitic assemblages; however, within the study area only potassic, tourmaline, and propylitic alteration occur. Ore mineralization consists of chalcopyrite, molybdenite, minor bornite, and gold, while the most abundant sulphide mineral in the system is pyrite. Based on our investigations there is a strong structural control for both the alteration and mineralization at Coxheath. Mineralization is associated with two distinct structural features; shear zones and sheeted veins. The shear zones dip steeply and strike southeast, and are typically several metres thick. These shear zones form a stockwork of massive tourmaline veins bordered by pervasive alteration halos of pink K-feldspar. Chalcopyrite is abundant in the stockwork, occurring as discontinuous veinlets and blebs. Sheeted vein networks 10-20 m wide consist of hundreds of subparallel veins per metre. These sheeted veins, typically a few millimetre to several centimetres thick, consist of quartz and chalcopyrite fill, with localized occurrences of molybdenite. Silicification and potassic alteration associated with the sheeted veins is very intense, completely overprinting the primary features of the host rock.

Mineralization is considered to reflect the focusing of late-stage magmatic fluids into a volcanic-plutonic complex located within a zone of active deformation. The widespread development of alteration reflects the interplay of both magmatic and non-magmatic fluids and favourable structural conditions.