Potential for porphyry- and epithermal-style precious metal deposits in the Mira terrane of Cape Breton Island, Nova Scotia, Canada

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Numerous features indicate significant potential for precious metal deposits in the Mira terrane of southern Cape Breton Island, in particular, those in the broad class of epithermal Au(-Ag) and porphyry Cu(-Mo-Au) deposits. The Mira terrane is closely analogous to the Avalon zone of Newfoundland, which is experiencing increased exploration activity focused on these deposit styles, including extremely active exploration on the Burin Peninsula – notably at Big Easy (Cartier Iron) and Heritage (Puddle Pond Resources). Farther to the southwest, rocks of Avalon zone age host the Hope Brook Mine, the richest producing Au deposit in the late Neoproterozoic of North America to date. In the Newfoundland Avalon zone, metallogeny is clearly related to specific episodes of granitoid plutonism (at ca. 620 Ma, ca. 575–580 Ma and ca 565 Ma), and contemporaneous episodes of similar plutonism and associated volcanism are recognized in the Mira terrane (Coxheath Hills-East Bay Hills-Sporting Mountain belts, and Fourchu and Main-à-Dieu groups in the Coastal belt). Some workers have also made the analogy with more modern Andean or Cordilleran terranes with respect to the evolution of the broader Avalon terrane (Avalonia), an environment considered auspicious for these deposit types.

The Mira terrane hosts the former Coxheath Mine, a Cu-Au porphyry deposit within the ca. 620 Ma Coxheath Hills Pluton. This indicates strong potential for additional porphyry-style and related epithermal-type deposits, although affiliated epithermal-type Au-Ag deposits have remained unrecognized in the broader Coxheath Hills-East Bay Hills-Sporting Mountain belts to date. However, both low- and high-sulfidation epithermal-style deposits can be cryptic. For example, some styles of low-sulfidation veins (e.g., low vein density peripheral occurrences) can go unrecognized as such during prospection, and highsulfidation systems can have substantial volumes of relatively Au-barren alteration surrounding a smaller auriferous core.

Our initial field and laboratory work deployed petrography, geochemical assay. and infrared absorption spectroscopy (NIR-SWIR) to characterize currently listed mineral occurrences that might have the hallmarks of these deposit styles. Our study is also directed at narrowing prospective host lithotypes and paleoenvironments for epithermal-style deposits, including, for example, epiclastic rocks characteristic of caldera-fill sedimentation during active shallow hydrothermal activity (low sulfidation deposits), and areally extensive zones of high-sulfidation hydrothermal alteration. These initial studies are designed as a first step in providing an improved framework for exploration for precious metal resources in the Mira terrane.

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