Mineralogy and geochemistry of the Whale Tail Zone, Amaruq gold project, Nunavut

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The 3.7 Moz Amaruq gold project, 100%-owned by Agnico Eagle Mines Ltd, is located in the Kivalliq region, 50 km north of the Meadowbank gold mine, Nunavut. The ore zones at Amaruq are hosted in an E-W-trending, strongly deformed, steeply N- to S-dipping volcano-sedimentary succession that belongs to the Archean Woodburn Lake Group, Churchill Province. Two main auriferous zones (Whale Tail and IVR) and their extensions have been extensively drilled to date, the Whale Tail zone being the best understood so far. A mineralogical and geochemical study of the auriferous mineralization of that zone is being carried out as part of an honours thesis research project to characterize its proximal footprint and better understand the relative timing of events. Sampling of representative altered and mineralized core intervals (e.g., 9.97 g/t Au over 6.4 m) was completed along a representative drill hole (IVR14-158) that crosscuts a succession of chert, the principal ore-hosting rock, intercalated with argillite and greywacke. Detailed petrography and electron probe micro-analysis (EPMA) indicate two major gold-bearing mineralization styles at Whale Tail. The first occurs as silica flooding with significant pyrrhotite and arsenopyrite in and around veinlets and/or disseminated in the wallrock, the latter of which is preferentially developed in chert bands. The second mineralization style consists of quartz-pyrite-pyrrhotite±chalcopyrite±gold extension veins at high angle to the main foliation. The sulphides are mainly within a gangue of Mn-, K-, and Al-rich amphiboles, chlorite, mica (biotite and muscovite), and carbonates (ankerite and calcite). The fine-grained (1–25 μm) gold is closely associated with arsenopyrite and loellingite, where gold is present within both phases and at the contact between them. The gold phase present, as determined using EPMA, is electrum (%Au 63.56–86.73%), but significant quantities of gold were detected in loellingite (172–196 ppm) and arsenopyrite (69–113 ppm) and substantially lower values in pyrite (<DL – 54 ppm) and pyrrhotite (<DL– 17 ppm). The sulphides paragenetic sequence is complex with at least three pyrrhotite and arsenopyrite generations. Although the relative timing of events in the study area has yet to be fully resolved, observations from this study indicate that gold was present before prograde metamorphism of arsenopyrite. During retrograde metamorphism gold was exsolved as visible grains at the interface of loellingite and arsenopyrite and/or within arsenopyrite and loellingite grains with equilibrium temperature of the arsenopyrite-loellingite-pyrrhotite assemblage that range from 318 ºC to 374ºC.