

Geology and structural characteristics of the Roberto gold deposit, Eleonore property, Superior Province, Baie-James, Québec, Canada

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The Roberto deposit, a major discovery in the Baie-James region, hosts 4 million ounces of gold in proven and probable reserves (at a grade of 6.5 g/t) and 4.1 million ounces of gold in inferred resources (at a grade of 9.6 g/t). Located a few kilometres south of the boundary between the La Grande and Opinaca subprovinces, gold mineralization is largely hosted in Timiskaming-age clastic sediments, within a N-S-trending corridor some 70 to 80 metres wide. The latter encompasses five to six high-grade (>3 g/t) mineralized zones. Typically associated with a potassic alteration zone and a Au-As-B signature, the main type of mineralization (Roberto-type) consists of a stockwork with replacement zones composed of an assemblage of quartz-dravite-microcline-phlogopite-arsenopyrite-loellingite-pyrrhotite, as well as quartz-diopside-arsenopyrite veins. The bulk of the gold mineralization predates the metamorphic peak and also predates or is early relative to the main D_2 deformation. It is mainly confined within a steeply dipping N-S-trending envelope, coplanar with an F_2 fold and concentrated in the fold hinge.

Observed structural relations confirm that: 1) phase of folding F_2 overprints the mineralization; 2) specific stratigraphic horizons constrain the development of Roberto-type mineralization; and 3) certain pegmatites are late orogenic as they are undeformed and include metamorphosed and foliated Roberto-type fragments. At depth, Roberto-type mineralization and its host rocks undergo significant textural changes resulting from prograde metamorphism. Underground mapping led to a better definition of intense, occasionally mylonitic, E-W-trending deformation zones that crosscut the stratigraphic sequence. The hangingwall zones are geometrically controlled by these structures and are characterized by an echelon quartz-tourmaline veins, disseminated arsenopyrite-pyrrhotite-pyrite mineralization, dislocated quartz veins with visible gold, and diffuse silica and epidote alteration. These zones are inferred to be late relative to D_2 to coeval with D_3 , as they modify the pre-existing S_2 schistosity and occasionally include pegmatite fragments (2616-2603 Ma). These shear zones are probably present within the Kasak volcanic Formation (2704 \pm 1.1 Ma), the polygenic conglomerates (2702 \pm 3 Ma) and the Ell Lake intrusive (2705 \pm 1.9 Ma). These observations suggest that phase of deformation D_2 is related to the prograde burial phase of the turbiditic sequence, whereas phase of deformation D_3 is related to the retrograde late orogenic exhumation of the sequence.

At a regional scale, N-S-trending corridors that crosscut Timiskaming-age clastic sediments at the top of the Low Formation, strong E-W-trending deformation zones, and the presence of two distinct phases of folding and of proximal calcic or potassic alteration with As and B are important exploration metallogenetic in the Baie-James region, particularly if they occur near the boundary between the La Grande and Opinaca subprovinces.