

Hydrothermal alteration and exploration vectors at the orogenic Island Gold deposit, Michipicoten greenstone belt, Wawa, Ontario

TJ Ciuffo¹, C Yakymchuk¹, S Lin¹, K Jellicoe¹, P Mercier-Langevin²

¹Department of Earth and Environmental Sciences, University of Waterloo, Waterloo, Ontario;

²Geological Survey of Canada, Quebec City, Québec;

The Island Gold mine is an orogenic gold deposit in the Michipicoten greenstone belt and is part of the Goudreau-Lochalsh gold district. This producing mine boasts some of the highest-grade intersections in the Superior Province. While the structural setting of the deposit is well-constrained, alteration associated with gold mineralization has yet to be studied in detail. The objective of this study is to characterize the protoliths and alteration envelopes associated with gold-bearing quartz veins as well as establish mineralogical and textural indicators of gold mineralization at Island Gold. The major ore-hosting lithologies at this deposit are dacitic volcanic rocks, gabbro, and trondhjemite. Deformation and alteration intensifies towards gold-bearing quartz vein corridors and the alteration assemblage includes quartz, sericite, biotite, pyrite, carbonates, chlorite, pyrrhotite, and magnetite. Concentrations of K, S, Au, Te, Rb, W, As, Ge, Bi, Mo, Ag, Si, and volatiles increase towards gold-bearing quartz veins whereas Na concentration decreases. Smoky quartz veins are the most reliable indicators for economic gold grades. Adjacent to these veins, sericite and/or biotite, and pyrite are the best mineral indicators. Potassium and sulphur enrichment are the most reliable geochemical vectors towards mineralized zones. The alteration signature of the auriferous quartz vein corridors will assist with geological modelling and drill hole targeting in the Goudreau-Lochalsh gold district. A preliminary comparison between the alteration profile at the Island Gold deposit and the alteration associated with other orogenic gold deposits in the Superior Province reveals significant similarities. However, each deposit may have a number of prominent differences. Most notably, alteration envelopes at many of the orogenic deposits are characterized by albitization and mass gains in sodium, which is not characteristic of the Island Gold deposit. This suggests that the geochemical signatures of alteration haloes around auriferous veins in orogenic gold deposits can vary substantially. Further work will aim at explaining those differences and how they potentially impact on exploration and genetic models for orogenic gold.