

The Lower Detour Lake Au Discovery, Ontario, Canada: A High-Grade Oxidized Intrusion-Related Au Deposit

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Newly discovered (2014) high-grade Au mineralization in the Lower Detour Lake region of the Archean Detour Lake mining camp (NW part of the Abitibi Greenstone Belt, Canada) is hosted within high-level felsic porphyries located 7 km south of the world-class orogenic-type Detour Lake Au deposit (15.5Moz Au at 1.02 g/t reserves, 4.8Moz at 1.11g/t resources, as of January 2014). The Au mineralization is hosted by a coalesced swarm of felsic dikes that intrude 2.72 Ga mafic volcanic rocks of the Deloro Assemblage, parallel to the main E-W structural fabric of the area. Within these felsic dikes, the Au mineralization is centered on widespread zones of phyllic alteration hosting arrays of vein quartz. The leucocratic dikes are variably feldspar phyric with $Plg \geq Kspar$, have a range of Qtz:Plg ratios, and chemically are enriched in LILE with strongly fractionated REE patterns ($(La/Lu)_N \approx 8-10$) and lack Eu anomalies ($Eu_N/Eu^* \approx 1$). Thus, the petrology of the dikes reflects melt extraction from an underlying magmatic source that evolved over time. The Au mineralization, which is characterized by a $Bi \pm W \pm Te \pm Ag$ elemental association, is localized to brittle-ductile zones flooded by quartz \pm carbonate \pm tourmaline \pm pyrite veins with alteration halos enriched in sericite \pm quartz \pm carbonate \pm pyrite \pm albite \pm chlorite \pm biotite \pm titanite \pm epidote which reflect differing fluid:rock ratios and wall-rock bulk composition. The presence of inter-mineralized felsic dikes cross-cutting the mineralization suggests both a spatial and temporal relationship between the Au event and magmatism. Both the intrusive host rocks and mineralization/alteration have textures reflecting an intense ductile overprint. The characteristics of the Au mineralization and setting suggest affinities to the syenite-associated style of mineralization (e.g., Kirkland Lake) versus the orogenic style seen in the Detour Lake deposit, thus the new discovery equates to an oxidized intrusion-type gold deposit.