

Identifying Carbonate Alteration Signatures and Vectors Toward Mineralization in the Sams Creek Dike-Hosted Gold Deposit

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Sams Creek is believed to be an intrusion-related gold deposit in NW Nelson, New Zealand, with an inferred resource estimate of approximately 1 Moz of gold. Carbonate veins are an integral part of the alteration at Sams Creek, yet little is known about their paragenesis or potential to aid as a vector towards gold mineralization. This MSc project examines the paragenesis, chemistry, and stable isotope composition of carbonate veins within and around the intruded peralkaline granite porphyry dike, which is host to the gold mineralization.

Carbonate distribution at Sams Creek manifests as siderite with minor ankerite, and trace parisite (REE-rich carbonate) is present within the dike, as well as within the unaltered schist and shale of the country rock. Carbonate appears to have formed from the earliest recognized alteration phase (T₁) through the latest stage (T₄). Leapfrog® 3D modeling of logged carbonate distribution and gold assay data suggests it is spatially associated with gold, consistent with carbonate alteration commonly associated with both intrusion-related and mesothermal gold deposits.

Stable isotope studies of the composition and evolution of hydrothermal carbonate minerals in intrusion-related gold systems are few. We will collect stable isotope data throughout the altered dike to evaluate if the isotopic composition changes from distal to proximal to ore, and whether the isotope signatures are consistent with a sedimentary or magmatic origin. Vein geochemistry will be evaluated using portable and lab XRF, LA-ICPMS, SEM-EDS, and integrated with existing geochemical data. This will allow for assessment of the chemical zonation of vein chemistry to provide geochemical indicators towards gold mineralization in dike and host rocks. Vein textures, the timing relationships of vein sequences and how these are related to mineralization will also be studied.

Ultimately, the nature and scale of geochemical and isotopic haloes and potential pathfinders will aid in providing vectors to high grade ore zones. Gaining a geochemical and isotopic understanding of this type of deposit will help in predicting possible locations of similar deposits as well as targeting other orebodies within the Sams Creek dike.