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Vectors to Porphyry Copper Mineralization in Carbonate Rocks at the Bingham Canyon Mine, Utah, USA

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The Bingham Canyon porphyry Cu-Mo-Au occurrence (Utah, USA) is a highly productive mineral system with an extensive hydrothermal alteration halo. Such systems likely cause subtle, far-field alteration patterns, which may be useful in vectoring toward the system center. This study presents initial results from our investigation into the effects of this hydrothermal system on two laterally extensive carbonate units, the Jordan and Commercial limestones, by analyzing the trace elements of calcite in veins and in adjacent carbonate wall rocks and will compare the findings with signals from other systems such as the Candelaria Cu-Au deposit, Chile [1].

Bingham Canyon comprises a multiphase sequence of Eocene-aged igneous rocks emplaced within a folded and thrusted Paleozoic carbonate and siliciclastic sequence [2], producing proximal Cu-Mo-Au porphyry-style mineralization and adjacent Cu-Au skarn deposits in carbonate host rocks, mainly in the Jordan and Commercial beds. Outboard from the porphyry-skarn zones (~0.5-2.5 km) there are Pb-Zn-Ag vein and carbonate replacement orebodies, and even more distal (~7-9 km) sediment-hosted Au deposits.

A series of vein and wall-rock samples were collected beginning at the Bingham Canyon open pit and extending 17 km to the W-SW along a transect terminating at the subeconomic Stockton porphyry system. LA-ICP-MS analysis was completed on vein and wall-rock calcite. Preliminary analysis reveals a decreasing trend in Fe, Mg, Ba, and several REEs from the Bingham Mine outboard to a distance of ~3-5 km, while Mn and Zn display an increase to about 2-km distance before dropping off to background levels ~4 km outboard. These initial findings are based on 12 samples, which we will corroborate through further LA-ICP-MS analysis of additional samples along the transect to produce a robust spatial data set.