

# SEG 2024 Conference: Sustainable Mineral Exploration and Development

---

## Genesis and Mineralogy of the Golddigger Property in British Columbia, Canada

Randall Karcher<sup>1</sup>, Simon Kocher<sup>1</sup>, Holly Stein<sup>2</sup>, Roger Rosmus<sup>3</sup>, Simone Pujatti<sup>3</sup>, Manuele Lazzarotto<sup>3</sup>, Thomas Monecke<sup>1</sup>

1. Center to Advance the Science of Exploration to Reclamation in Mining, Department of Geology and Geological Engineering, Colorado School of Mines, Golden, CO, USA, 2. AIRIE Innosphere Ventures, Fort Collins, CO, USA, 3. Goliath Resources, Toronto, ON, Canada

The Golddigger property is a recent discovery in the Golden Triangle of British Columbia which has drawn interest for its high-grade gold. At Golddigger multiple major structurally controlled quartz veins with semi-massive to massive sulfide accumulations are hosted by Upper-Hazelton sedimentary and volcanic rocks. Ongoing research on the deposit is focused on developing a deposit model to aid with future exploration on the property and in the surrounding region. Methods include petrography of surface and drill core samples by transmitted and reflected light microscopy, cathodoluminescence microscopy, scanning electron microscopy, fluid inclusion petrography, U-Pb geochronology, and Re-Os geochronology. Petrography and fluid inclusion analysis of the quartz veins indicate formation close to the brittle-ductile transition, with hydrothermal fluids having high CO<sub>2</sub> content, indicating entrapment pressures of >500-600 bar (>5-6 km paleodepth). Ore minerals observed include major pyrrhotite, chalcopyrite, pyrite, arsenopyrite, sphalerite, and galena with lesser molybdenite, Bi-Te minerals, Sb minerals, native silver, and native gold. The paragenetic sequence at Golddigger is consistent with that of a magmatic-hydrothermal system. Petrographic analysis suggests the presence of spatial mineralogical gradients, which is supported by statistical analysis of geochemical data demonstrating a southerly depletion of Sb and enrichment of Bi. U-Pb geochronology from early-stage garnet alteration and Re-Os geochronology of molybdenite inclusions withing pyrrhotite both suggest mineralization to have occurred in the Eocene (50-55 Ma), potentially linked to the Alice Arm Intrusive suite which is known to be associated with molybdenum and polymetallic deposits in the region. Depth of mineralization, ore mineral assemblage, apparent zoning, and a coincident date with intrusive activity known for polymetallic mineralization all suggest Golddigger to be a reduced intrusion-related gold deposit. This discovery is significant due to the deposit type's distinct characteristics relative to orogenic or epithermal deposits which have implications for exploration.