Defining time space relationships between hydrothermal and volcanic activity in a complex epithermal system, Bruner Au-Ag property, NV*

*Corresponding author: Dylan Baldwin, Department of Geological Sciences and Engineering, University of Nevada, Reno, baldwin.dylan@gmail.com

Co-authors:
Greg B. Arehart, Department of Geological Sciences and Engineering, University of Nevada, Reno, arehart@unr.edu

The character of veins, ore mineralogy, and volcanic/hydrothermal relationships at the underexplored Miocene-age Bruner low sulfidation epithermal Au-Ag deposit have been determined using field, petrographic, and geochronologic studies. Bruner is located in central Nevada, United States, within the Great Basin extensional province, on the eastern edge of the Walker Lane strike-slip belt, within 75 km of the Paradise Peak, Round Mountain, and Denton-Rawhide mines. Early 20th century production from the ~13 km² property totaled 90,000 tonnes at 17 g/t Au equivalent. Drilling by Canamex Resources Corp. since 2011 has encountered mineralization grading 1-5 ppm Au over 10-100 m widths, as well as 30-130 ppm Au intercepts over 1-2 m. Despite its proximity to several >1 Moz Au epithermal deposits and promising drill results, Bruner remains poorly characterized, and the vectors to mineralization have not been well-defined.

Mineralization occurs in quartz + adularia ± pyrite veins that manifest as stockworks, swarms, and larger 0.3-1 m wide veins within a Cenozoic dacitic to rhyolitic flow dome complex. Vein textures are typical of open-space filling and boiling epithermal fluids. Post-mineral fault movement has comminuted many large veins into clayey vein breccias. The most prominent structural controls on veining are N-S and NW striking faults, joints sets, and dike contacts. Fluid boiling was the dominant depositional mechanism for ore minerals, although paleo-depth and fluid pulse composition also appear to have controlled localization of economic mineralization. There is prominent vertical zonation of veins across the property: massive veins with elevated Hg, Sb, and As near sinter blocks and opal alteration lack Au-Ag; chalcedonic banded veins with elevated As and Sb contain minor Au-Ag; and macrocrystalline quartz-adularia veins with high-grade Au-Ag have broadly elevated trace elements.

Ore minerals are native gold, electrum, and acanthite, with minor uytenbogaardtite (Ag₃AuS₂) and supergene Ag(Br,Cl) minerals. Veins are remarkably “clean”, typically containing <1% pyrite + Au-Ag minerals. Base metal values are typically <20 ppm, and with the exception of trace Fe-deficient sphalerite, appear to be below the mineralogic limit. Gold correlates strongly with silver, and Ag: Au is >10:1. Preliminary estimates of fluid composition based on sulfide mineral relationships and fluid inclusion data give temperatures of <280° C, and sulfur activities of 10⁻⁸ to 10⁻¹³.

Alteration types and patterns determined by thin section and SWIR spectroscopy are consistent with other low-sulfidation epithermal systems, with proximal quartz-sericite-pyrite alteration grading outward into interlayered illite-smectite clays, and finally to peripheral chlorite. Although many veins crop out, the surface expression of deeper veins are resistant ribs cut by narrow fractures.
$^{40}$Ar/$^{39}$Ar geochronology (in progress) will supplement three existing K/Ar dates, better constrain the timing of volcanic activity within the Bruner flow dome complex, establish whether overlapping hydrothermal systems are present, and relate Bruner to other Walker Lane epithermal deposits. Seven samples were chosen for analysis: adularia from three different vein types, and K-bearing minerals from four volcanic units: a regionally-extensive latite flow that is the dominant ore host, two flow domes spatially associated with veining, and a mineralized mafic dike that crosseuts volcanic stratigraphy.