

Mineralogy and Geochemistry of the Butte Valley Copper Skarn-Porphyry Project, White Pine County, Nevada, USA

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The Butte Valley Cu(-Mo) skarn-porphyry system, White Pine County, Nevada, is completely blind and covered by a slide block ranging from 150–700 m of Cenozoic fanglomerates. Eighteen historic and 6 recent diamond core drill holes intercept Paleozoic sedimentary rocks and numerous Cretaceous igneous dikes and sills, that range from granite to andesite porphyry. The sedimentary rocks have been altered to pyroxene-epidote skarn with minor garnet in the more calcareous layers, with retrograde epidote, actinolite, tremolite, and chlorite. This diffuse calc-silicate alteration zone is overprinted by veins and locally massive pyrite>>pyrrhotite with minor sphalerite, galena, and chalcopryrite associated with sericite in igneous rocks and chlorite in sedimentary rocks. Drill hole BV-24 intersects skarn-hosted mineralization over an interval of 760 to 1050 m that is partly associated with an extensive breccia zone consisting of non-or weakly mineralized pyroxene>>garnet skarn fragments cemented by massive magnetite pyrite>pyrrhotite>chalcopryrite. This skarn breccia zone and the larger diffuse calc-silicate carapace are thought to overlie a deeper intrusion to which the dikes/sills are related that fed mineralizing fluids into the upper zone. The lower Paleozoic strata, including the dolomitic Devonian Guilmette Formation, could be converted to magnesian skarn with abundant magnetite adjacent to this hypothesized deeper intrusion, which would be consistent with the large +900 nT magnetic anomaly over the Butte Valley deposit.

LA-ICP-MS U-Pb geochronology of zircon from various igneous units constrains the main magmatic activity to 94.2±1.3 Ma to 99.8±1.4 ±1.4 Ma. LA-ICP-MS U-Pb geochronology of skarn garnet ranges from 97.9±3.7 to 101.4±5.7 Ma, suggesting alteration coincides with the main magmatic event. This is further supported by hydrothermal phlogopite that was dated at 98.0±2.0 Ma by LA-ICP-MS Rb-Sr geochronology. These ages constrain the timing of mineralization at Butte Valley to Late Cretaceous Cordilleran arc magmatism, similar to the Robinson Mine near Ely.