

# SEG 2024 Conference: Sustainable Mineral Exploration and Development

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## Geology and Gold Mineralization at the Leeville Underground Complex, Carlin, Nevada

Koray Tasbicen<sup>1</sup>, Elizabeth A. Holley<sup>1</sup>, Kendle Fraley<sup>2</sup>, Elizabeth Stock<sup>3</sup>, Carl Pollard<sup>4</sup>, Joseph Becker<sup>2</sup>  
1. Colorado School of Mines, Golden, CO, USA, 2. Nevada Gold Mines LLC, Elko, NV, USA, 3. Barrick Gold Corporation, Toronto, ON, Canada, 4. Barrick Gold Corporation, Elko, NV, USA

The Leeville Underground Complex, within the Carlin district, Eureka County, Nevada, hosts the Four Corners, West Leeville, Turf and North Leeville high-grade Carlin-Type Gold Deposits.

The complex is confined to the hangingwall of the NNW-trending Leeville Fault, bounded by the WNW-trending Castle Reef Fault to the south and the NNE-trending Basin Bounding normal fault to the west. Mineralization is commonly stratabound hosted in calcareous siltstones of the Devonian Rodeo Creek Formation and micritic limestones of the Popovich Formation. Favorable stratigraphy gently plunges to the north and is covered by >200 meters of Ordovician Vinini Formation comprised of siliciclastics of the Roberts Mountain allochthon.

Since the late Devonian, multiple pre-mineral compressive events have locally folded and thrust stratigraphy, generating a NNE and NNW-trending structural framework and creating fluid pathways for Eocene mineralization. Carlin-type fluids are acidic, gold-bearing, sulfur-rich and low temperature. Mineralization is associated with sulfidation, decalcification and silicification, often occurring as tabular silica-sulfide breccia, which are spatially related to the high-angle feeder and low-angle lateral fluid flow structures.

Throughout the complex, high-grade centers of gold mineralization are also spatially associated with pre-mineral Mesozoic dikes. A Mesozoic Stock, to the west of the complex, is currently interpreted to be the northern margin of a larger buried intrusive complex interpreted source of diking and metasomatism in the district. Host stratigraphy on the west side of the complex exhibits pre-mineral metasomatism manifested as low-temperature hornfels.

The study will initially document the geology at the Leeville Complex through detailed observations and a series of crosssections. Detailed petrography, mineralogy and geochemistry will constrain the genetic relationship between magmatism, structures and mineralization. This study will identify the cumulative factors controlling the Eocene gold mineralization. The expected outcomes will improve the ore body knowledge in the Leeville Complex and exploration targeting in northern Nevada.