

Carlin Deposits: More Than Just Pyrite? The Unexpected Coexistence of Arsenian Pyrite, Marcasite, Arsenopyrite, and Native Gold at Fourmile, Nevada

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Carlin-type gold deposits contain fine-grained Fe-As-sulfides that preserve key information on ore-forming processes. Auriferous pyrite and marcasite are the primary ore minerals in Carlin-type deposits, whereas auriferous arsenopyrite is rarely described. Native gold is also rarely observed and is not considered a significant part of the ore assemblage in Carlin-type deposits. There has been little research on how the distribution of Fe-As-sulfides and native gold relates to the genesis of Carlin-type deposits and the distribution of gold at the deposit scale.

Fourmile¹ and Goldrush are Carlin-type deposits in northern Nevada, USA. Goldrush is dominantly stratigraphically controlled, while Fourmile is structurally controlled with a significantly higher gold grade. Fourmile is located within the metamorphic aureole of the adjacent Jurassic Mill Canyon stock. Its mineral assemblage is distinctive, with arsenopyrite and native gold occurring more commonly than in other Carlin-type deposits.

The complexity in geochemistry, textural character, mineral ratio, spatial distribution and paragenesis of Fe-As-sulfides and free gold at Fourmile give rise to several critical research questions. These include:

What impact has the Mill Canyon stock and associated metamorphism had on the mineralogy and geochemistry of Fe-As-sulfides?

How do mineralogical and geochemical characteristics of Fe-As-sulfides correspond to gold concentrations within these minerals, and to the spatial distribution of native gold, from thin section to deposit scale?

What insights can be gained regarding the physicochemical evolution and flow paths of ore-stage hydrothermal fluids?

This study seeks to address these questions and enhance the current understanding of ore genesis in Carlin-type gold deposits.

¹Fourmile is currently 100% owned by Barrick. Barrick anticipates Fourmile will be incorporated into the Nevada Gold Mines joint venture, at fair market value, if certain criteria are met