
**The Callie lode gold deposit, Northern Territory,
Australia: high grade, sheeted, auriferous quartz veins in
an anticlinal structural environment**

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The Callie lode gold deposit, located in the Tanami desert at Dead Bullock Soak, Northern Territory, Australia, is hosted by fine-grained, carbonaceous, clastic metasedimentary rocks of Paleoproterozoic age that have been folded into a complex anticline. Mineralization consists of coarse native gold within 1 to 2 cm thick sheeted quartz \pm chlorite veins that can be related to folding of the sedimentary sequence. Sericite and chlorite may represent associated hydrothermal alteration products, but do not generally exhibit any spatial relationship with mineralization or veining. Au-bearing veins occur within bleached (de-carbonized) zones within the productive pelitic host stratigraphy (Lower Blake Beds, Callie Laminated Beds, Magpie Schist). Production and reserves in the deposit consist of 6.5 M tonnes grading 6.7 grams per tonne, and are mined from underground workings developed from the bottom of the initial open pit.

Gold mineralization exhibits a very large nugget effect that creates significant reserve estimation challenges. Visible gold commonly occurs at the intersections of veins with the basal, coarse-grained portions of distal turbidite beds, suggesting an important precipitation control. Historic explanations for gold precipitation have involved redox reactions between oxidizing, auriferous fluids and carbonaceous sediments to precipitate gold. This model does not explain the relationship between gold shoots within the veins and the basal portions of turbidite beds. Detailed investigation of the higher grade portions of these veins reveals that an alternative precipitation mechanism is required. The strong relationship between the higher grade portions of veins and turbidite beds suggests a metasomatically driven precipitation control involving chemical reactions between the auriferous fluids and the minerals within the coarser turbidite bases.

The similarities and differences between the Callie deposit and saddle reef gold deposits in Nova Scotia and Victoria, Australia provide important insights into critical factors that control the genesis of these deposits.
