

Structural and alteration history of a small gold deposit formed during D3 mylonitic deformation, Buffalo mine, Red Lake, Ontario

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Detailed structural analysis of the Buffalo Deposit in the Archean Red Lake greenstone belt, northwestern Ontario, suggests that gold was localized during D3 mylonite-style deformation and associated retrograde metamorphism. The deposit is therefore younger than much larger deposits elsewhere in the belt. The deposit was mined from 1980 to 1982 and produced 1,656 troy ounces of gold at an average grade of 0.11 oz Au/ton. The mine was dewatered in October of 1998 by Claude Resources and is currently under production. The deposit is hosted by the ~7 km-diameter, 2718 Ma Dome stock granodiorite and the ore occurs in quartz + tourmaline + sulphide veins and associated alteration zones.

Field work included detailed mapping at a scale of 1:24 of a well-exposed outcrop at the Buffalo deposit. Several basalt xenoliths up to tens of meters in size were incorporated into the stock at the Buffalo gold deposit which are aligned and sheared parallel to the contact. Aplite dikes intruded soon after crystallisation and are also highly deformed. These structures were subsequently crosscut by two generations of auriferous quartz + sulphide veins during a mylonitic M3 metamorphic event. The first generation of veins is small (~3 cm or less wide), with a strike of 239° and dipping 73° north. These veins were crosscut by ~10 cm wide veins with a strike of 119°

dipping 76° south.

Most of the quartz in the second generation veins was replaced by tourmaline, and a ~10 cm wide metasomatic aureole bleached the granodiorite to pink around the altered veins. This late boron metasomatic fluid also permeated the granodiorite at the Buffalo deposit and produced small (1 mm or less wide) tourmaline-bearing black veinlets decorating all previous structural fabrics.

Fifty-four gold/silver assays and 23 whole rock samples were analysed; boron and sulphur content were also determined on select samples. Geochemical analysis indicates that the boron metasomatism surrounding the altered veins enriched the gold and sulphide mineralization with respect to the surrounding granodiorite. There is also a strong correlation between the degree of gold and sulphide mineralization throughout the Buffalo Deposit.

Compilation of structural fabrics in the Buffalo deposit and the surrounding area suggests that the two generations of quartz + sulphide veins represent the c-axis of two intersecting M3 mylonitic zones. These two mylonitic zones are represented in the literature as the Flat Lake-Howey Bay Deformation Zone (239° / 73° north veins) and Pipestone Bay-St. Paul Bay Deformation Zone (119° / 76° south veins).