Geology of the Dufferin gold deposit, Port Dufferin, Nova Scotia

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The Dufferin gold deposit occurs in the hinge zone of the Crown Reserve Anticline (CRA), a minor fold on the south limb of the Salmon River Anticline, and represents the faulted extension of the 'old' Dufferin mine, which operated in the late 1800s and early1900s. The CRA is a tight, steeply inclined chevron fold in the Goldenville Formation, and in the mine area stratigraphy consists of thickly bedded metasandstone with minor slate. The hinge zone generally defines a flat arch approximately 10 m across. The deposit consists mainly of stacked "saddle-reef" veins, occurring within slate beds at fairly regular intervals. Diamond-drilling has identified up to thirteen individual or groups of saddle reefs to a depth of 400 m, and a strike extension of 700 m has been defined for the upper two saddle reefs. Three northwest-trending, oblique faults with east-side-down, sinistral displacement offset the veins approximately 10 m.

Vein types at Dufferin include saddle reefs in the fold hinge, bedding-concordant veins (leg reefs) extending down fold limbs, and discordant veins. Saddle reef veins are defined by thick (up to 4 m) bedding-concordant veins of massive, commonly vuggy quartz in the hinge zone. Laminated quartz veins locally occur at the margins of the saddle reef veins and are cross-cut by massive quartz of the saddle veins. Bedding-concordant, en echelon shear veins (EESV) occur adjacent to saddle reef veins and, locally, the internal structure of saddle veins resembles amalgamated EESV separated by thin septa of wall rock. This suggests saddle reef formation may reflect a combination of extension related to bedding-parallel shear and hinge zone dilatency. Saddle reef geometry is strongly asymmetric, with thick north limbs thinning near the fold hinge This asymmetry may reflect hinge migration, or an asymmetric fold geometry; the inferred geometry implies a relatively short north limb.

Leg reef veins, the down-limb extension of saddle reefs, include laminated bedding-concordant veins and EESV arrays within slate horizons. Laminated veins are typically 5–8 cm thick and consist of dark banded quartz; movement striae on internal laminae support a shear origin. EESV consist of massive, locally vuggy quartz, are strongly sigmoidal (pegged in sandstone and rotated within the slate intervals), record significant reverse, dip-slip bedding-parallel shear, are locally boudinaged (at high shear strains), and include multiple generations of veins which record progressive vein formation during shearing. Fold-related bedding-parallel shear is also recorded by movement horizons at most slate-sandstone boundaries.

Discordant veins are common and are related to the saddle reef veins. They commonly merge with and taper away from saddle reef or related leg reef veins. The observed vein array is consistent with syn-folding vein emplacement along structures related to flexural folding and chevron fold development, characterized by bedding-parallel shear and hinge zone dilatency.

Carbonate and sulphide minerals (abundant arsenopyrite and minor pyrite, galena, and sphalerite) are common as accessory phases within veins and occur with wall rock. Of note is an apparent positive correlation of visible gold and galena. Gold was observed in all vein types.