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# K-FELDSPAR CONNECTION: RELATIONSHIP OF K-FELDSPAR INTRUSIONS TO Cu PORPHYRIES AND Au VEINS, STEWART-ISKUT BELT, B.C.

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Hypabysaal copper-gold porphyries and mesothermal to epithermal gold-silver veins in the Stewart-Iskut gold belt are related to Early Jurassic intrusive rocks which are either alkaline or calc-alkaline in composition. In the Premier and Sulphurets areas the intrusive rocks feed and cut a Lower Jurassic volcano-sedimentary sequence of the Hazelton Group (Figure 1). At the Snip, Skyline and Galore Creek deposits the intrusive rocks cut Upper Triassic, Stuhini Group volcanid and sedimentary rocks. Porphyry and vein-type ore deposits are linked by:

1. their spatial and inferred temporal association with intrusive rocks, in particular distinctive two-feldspar porphyry with K-feldspar megacrysts (Premier porphyry is a well documented example)
2. potassic alteration -- pervasive sericite, K-feldspar (adularia), and less commonly biotite
3. a structural control, interpreted to be syn-volcanic (ex. Premier and Galore Creek)

At Premier, hornblende-plagioclase-K-feldspar-quartz porphyritic dacite dykes (Premier porphyry), derived from the Texas Creek granodiorite batholith, are emplaced along intersecting northeast and northwest structures. These appear to control volcanic stratigraphy and are interpreted to be synvolcanic faults. The ore consists of quartz-K-feldspar (adularia) veins, stockwork and breccia that follow the same structures as Premier porphyry (Figure 2). Past production at Premier is 4.7 mT at 13.0 g/T Au, 275 g/T Ag. Current pre-production reserves are 5.87 mT at 2.2 g/T Au and 80.3 g/T Ag. Mineralization dies out abruptly near overlying maroon (oxidized) strata, which suggests that ore deposition resulted from mixing of hydrothermal fluid with meteoric water (Figure 3). Silver and gold are most abundant in the upper part of the deposit, abundance of base metals and mineral grain size increase at depth. The sericite alteration zone flares outward toward the top of the deposit. These are classic features of an adularia-sericite epithermal deposit. Gold occurs primarily as electrum that has a close spatial association with tetrahedrite.

Mineralization in the Sulphurets area is controlled by two north-trending structures; the steep Brucejack fault and the Sulphurets fault, whose shallow west dip results in a sinuous map pattern. These, and secondary structures, control Early Jurassic diorite, syenite and granitic intrusions and localize sericite-K-feldspar alteration. An alteration zone of this type hosts the West Zone deposit (0.775 mT at 12.1 g/T Au and 786 g/T Ag) adjacent to the Brucejack fault (Figure 2). Mineralization is an anastomosing network of vein stockworks and breccia, interpreted to be a silicified shear zone, bounded by intrusive K-feldspar porphyry.

The Kerr deposit (60 mT at 0.84 % Cu, 0.34 g/T Au and 2.05 g/T Ag) occurs within sheared and sericite-altered volcanic rocks that are bounded by splays of the Sulphurets fault. A diorite body, K-feldspar porphyry dykes and high grade Au-Ag-Cu veins are all contained within the north-trending structural zone. The Kerr porphyry deposit contains pyrite, chalcopyrite, tennantite, bornite and chalcocite occurring as disseminations and disrupted quartz veins.

The Snip deposit (Twin zone 1.43 mT at 21.9 g/T Au) is a mineralized shear zone that trends $120^0$ and dips moderately to the southwest (about $55^0$). Discordant mineralization, that cuts massive feldspathic wackes, comprises pyrite, pyrrhotite, chalcopyrite, sphalerite, galena and arsenopyrite. The ore is both massive and strongly foliated, quartz is commonly brecciated with a crackle texture. Mineralization is restricted to the shear zone and contacts with wallrock are sharp. Potassic alteration is represented by pervasive biotite-flooding and irregular K-feldspar (adularia) replacement of the wallrock.

The Johnny Mountain gold mine, 10 km southeast of Snip, is a structurally disrupted mesothermal gold-bearing quartz vein deposit. Current reserves are 0.622 mT at 19.5 g/T Au and 0.75 % Cu. Silicification and potassic alteration occur along a series of northeast-trending structures in close proximity to an orthoclase porphyry.

The Galore Creek alkalic porphyry Cu-Au deposit (125 mT at 1.06% Cu, 0.40 g/T Au and 7.7 g/T Ag) comprises 10 tabular to manto-shaped deposits. Mineralization is hosted in volcanics, breccia pipes and K-feldspar megacrystic syenite dykes and plugs. The mineralization and several phases of syenite porphyries are in part controlled by north and northeast structures, interpreted to be synvolcanic. The deposits are characterized by skarn-type, metasomatic or late magmatic alteration products (epidote, garnet, diopside and magnetite) along with pervasive K-feldpsar and biotite alteration, anhydrite and gypsum. Ore minerals consist of pyrite, chalcopyrite, magnetite, bornite and minor sphalerite and galena.

Porphyry and mesothermal mineralization could be incorporated into the Premier ore depositional model. This would suggest synchronous mineralization and depth/temperature dependency in a single stage process. This a probably too simplistic. Intrusive, structural and mineralization histories are known to be multi-stage and the ore fluids probably range from magmatic to mixed juvenile/meteoric. More work needs to be done to answer questions concerning:

1. age, displacement, history of ore controlling faults
2. relative and absolute ages of mineralization types
3. composition of fluids.

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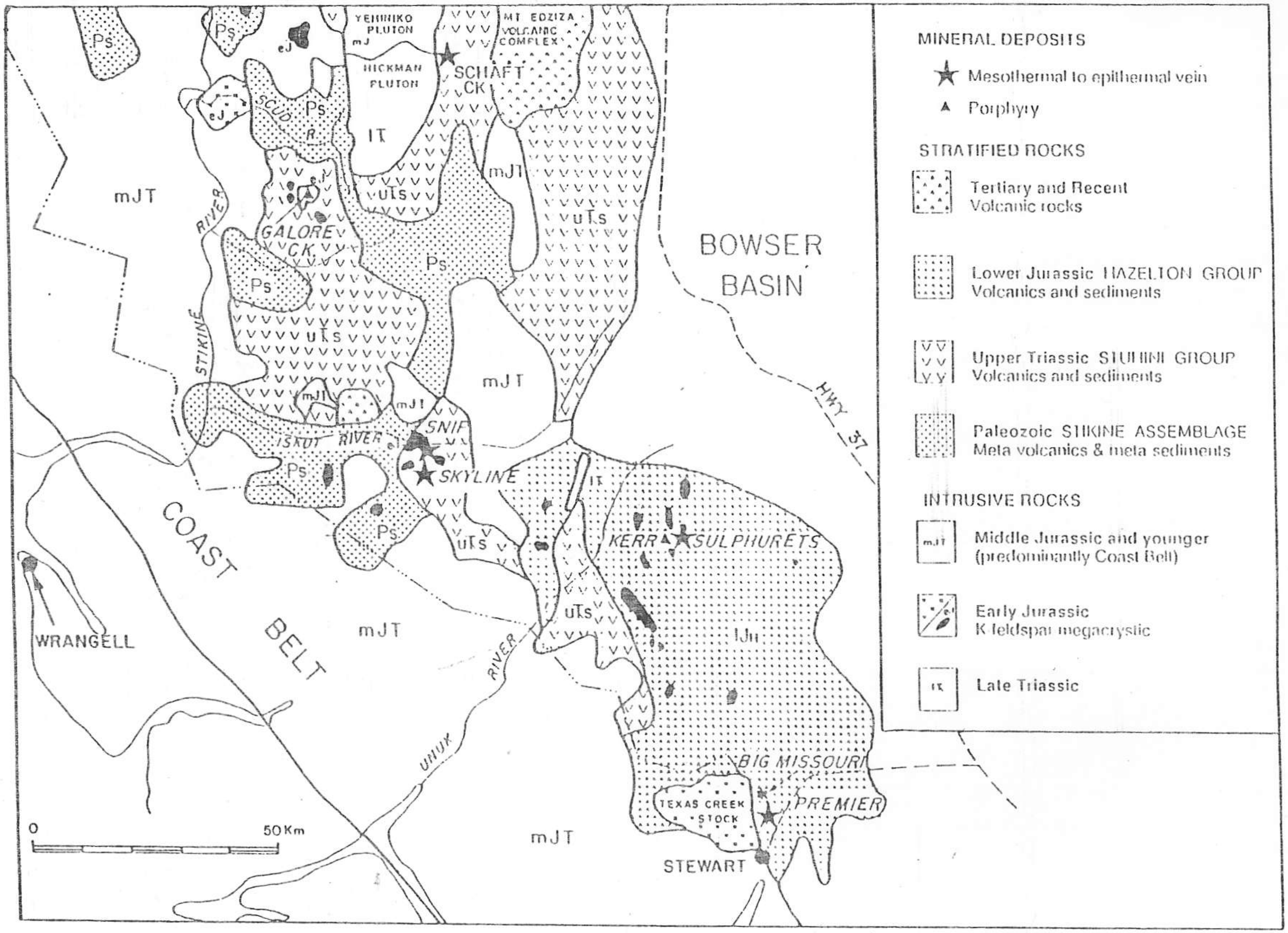


Figure 1. Regional geological setting of mineral deposits in the Stewart-Iskut gold belt, northwestern B.C.

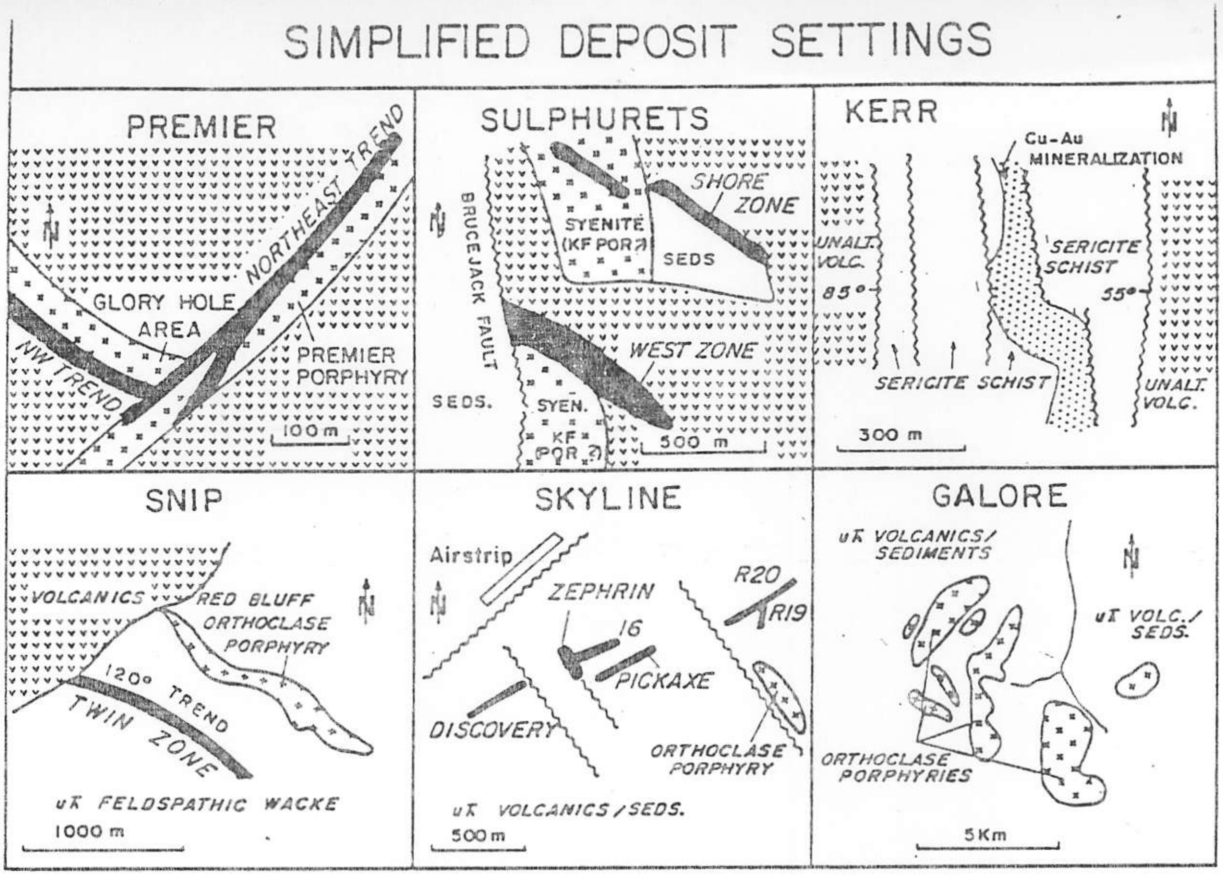


Figure 2. Simplified geology around selected mineral deposits.

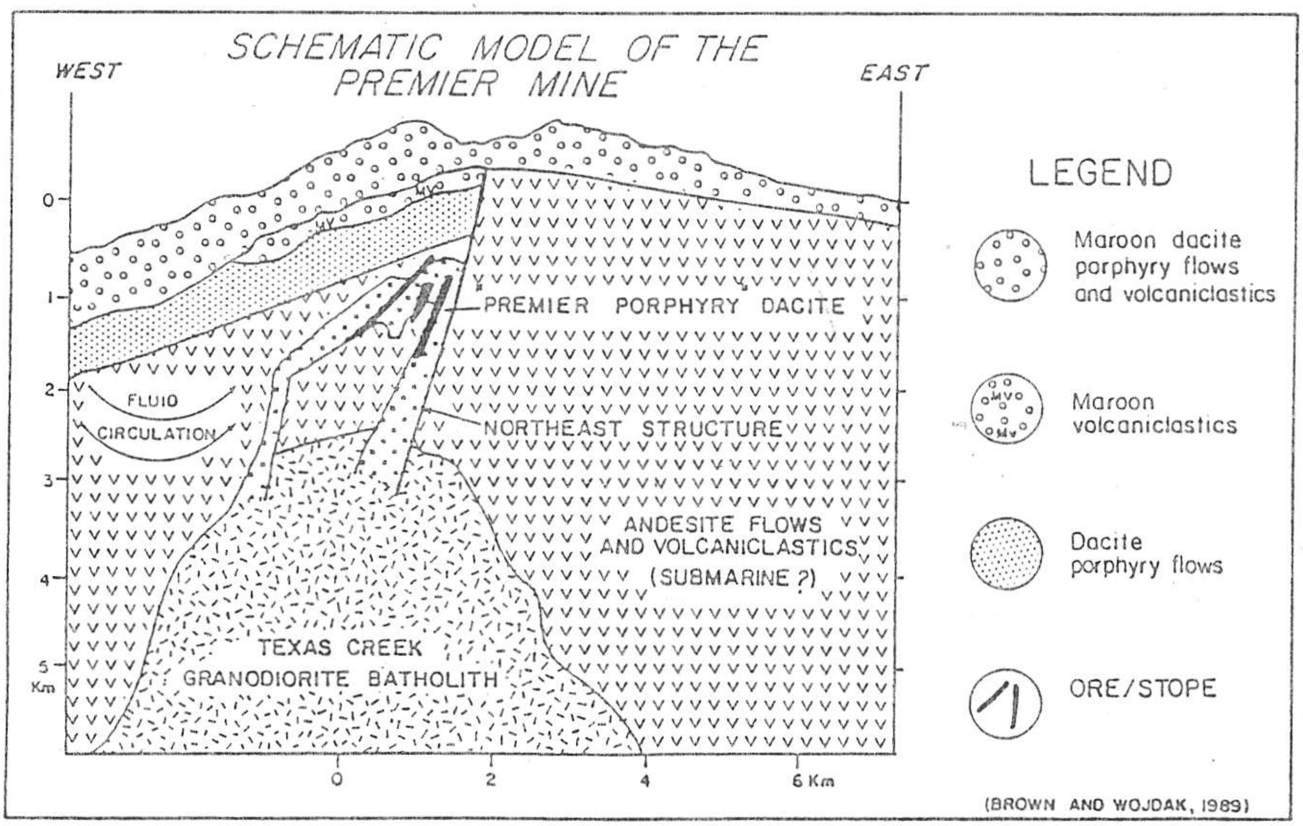


Figure 3. Schematic ore deposition model for the Premier mine, northwestern B.C.

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