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GEOLOGY FACT SHEET

Geological Setting and Mineralization

Regional Geology

The Bralorne Property is situated within the Bridge River mining district in southwestern British Columbia. The geological setting and metallogeny of the region is described by Hart *et al.* (2008) and Church and Jones (1999). The regional geology is shown in Figure 1.

The Bridge River district is situated at a tectonic boundary between the Cache Creek and Stikine allochthonous terranes. The Bridge River Terrane is possibly equivalent to the Cache Creek Terrane and comprises slabs of oceanic and transitional crust that were stacked against the continental margin together with island-arc-related units of the Cadwallader Terrane, interpreted as part of the Stikine Terrane. Diverse rock units of these two terranes are structurally deformed and imbricated in the area, together with large fault-bounded slices of gabbroic and ultramafic rocks. These early structures are crosscut by later northwest- and north-trending major faults related to the Fraser-Yalakom regional dextral strike slip fault system, and by Late Cretaceous and Tertiary granitic plutons and related dikes (Church, 1996).

The Bridge River Terrane comprises Mississippian to Middle Jurassic accretionary complexes of oceanic basalt and gabbro and related ultramafic rocks, chert, basalt, shale and argillite. It is juxtaposed with Late Triassic to Early Jurassic island arc volcanic rocks and mostly marine, arc-marginal clastic strata of the Cadwallader Terrane. These assemblages are variably overlain, mostly to the north, by clastic, mostly non-marine successions belonging to the Jurassic-Cretaceous Tyaughton Basin (Hart *et. al*., 2008).

The region has been intruded by a wide range of Cretaceous and Tertiary plutonic and volcanic rocks and their hypabyssal equivalents. Most significant among these are the dominantly Cretaceous granitoid bodies that form the Coast Plutonic Complex (CPC), which is locally characterized by the 92 Ma Dickson McClure intrusions, and the large individual bodies of the Late Cretaceous Bendor plutonic suite. Hypabyssal magmatism is reflected by emplacement of porphyritic dikes between 84 and 66 Ma, with the youngest magmatic event being 44 Ma lamprophyre dikes (Hart *et. al.*, 2008).

The district has been deformed by mid-Cretaceous contractional deformation within the westerly trending Shulaps thrust belt, and by contractional and oblique-sinistral deformation associated with the Bralorne-Eldorado fault system. The timing of this deformation and metamorphism is ca. 130 to 92 Ma, with synorogenic sedimentary flysch, as young as mid-Cretaceous, cut by the faults (Hart *et. al*., 2008). The Bridge River and Cadwallader Terrane are juxtaposed along the Bralorne-Eldorado fault system, which in the Bridge River area consists of linear, tectonized and serpentinized slices of late Paleozoic mafic and ultramafic rocks known as the Bralorne-East Liza Lake thrust belt, a 1 to 3 km wide zone defined by Schiarizza *et al*., 1997.

The main gold-forming event in the Bridge River district took place at ca. 68 to 64 Ma at the Bralorne-Pioneer deposit (Hart *et. al.*, 2008). Mineralization pre- dated or was synchronous with the emplacement of the Bendor batholith, and the gold event overlaps initiation of dextral strike-slip on the regional fault systems in this region. The abundance of gold, antimony, and mercury deposits and occurrences along the various main structures in the district (Figure 1) suggests that the onset of dextral strike-slip in this part of the Cordillera facilitated widespread fluid flow along the reactivated fault systems (Hart *et. al*., 2008).

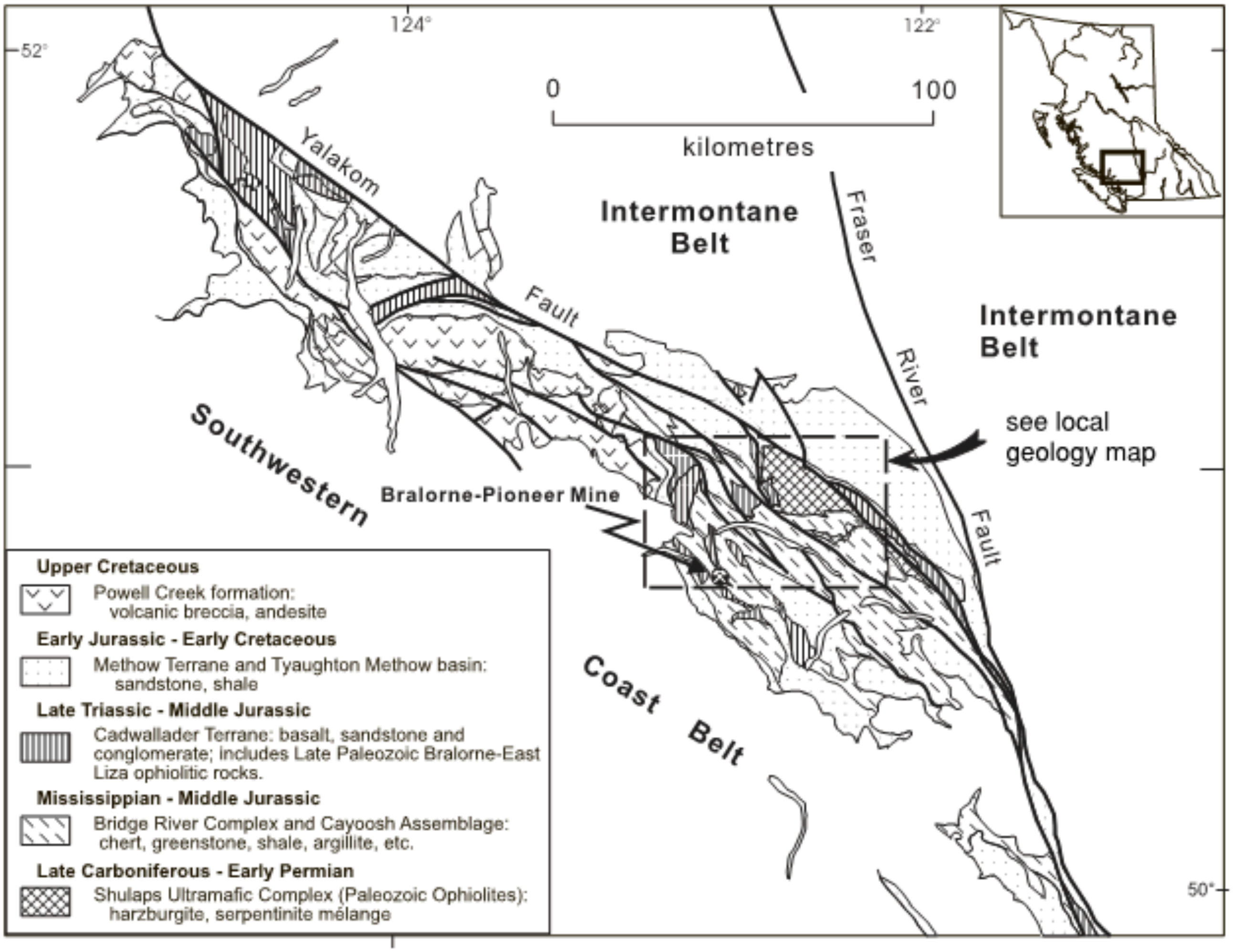

Figure 1 Regional Geological Setting of the Bralorne Property
Source: From Ash 2001, after Schiarizza and Garver, 1995

Local and Property Geology

The principal stratigraphic assemblages of the local area include the Bridge River Complex and Cadwallader Group. Nomenclature is described by Leitch (1990) and Church and Jones (1999). The Bridge River Complex is comprised of two packages, sedimentary and volcanic, with a thickness of 1,000 m or more of ribbon chert and argillite with very minor discontinuous limestone lenses, and large volumes of basalt, some pillowed (Cairnes 1937). The Cadwallader Group has been subdivided into three formations: the lowermost sedimentary Noel Formation, the Pioneer Formation greenstones, and the upper Hurley Formation sedimentary rocks (Cairnes, 1937). The Pioneer Formation, commonly termed “greenstones” in mine usage, ranges from fine-grained, massive amygdaloidal flows and medium-grained dykes or sills, to coarse lapilli tuffs and aquagene breccias. It is estimated to be at least 300 m thick in the Cadwallader Valley (Cairnes, 1937), but may be thicker elsewhere. The Hurley Formation comprises a rhythmically layered green volcanic wacke and darker argillite. The Noel Formation, consists of black argillites that are less calcareous than those of the Hurley; however, differentiation between the two formations is difficult (Cairnes 1937).

Igneous rocks within the Bralorne area include Upper Paleozoic ultramafic rocks and associated Bralorne intrusive suite, Mesozoic Coast Plutonic rocks, Tertiary Bendor intrusive rocks, and dykes of Cretaceous-Tertiary age. Ultramafic rocks, called the President ultramafics, form narrow serpentinized bodies and with the pillow basalts and radiolarian ribboned cherts of the Bridge River Complex, they complete the trinity of a typical ophiolite package. The ultramafic rocks in the Bralorne area range from dunite to pyroxenite, but peridotites are most common (Cairnes, 1937). Usually, they are partly to completely serpentinized, or altered to talc-antigorite-tremolite-carbonate and are intruded by diorite. Hornblendite occurs mainly along the southwestern flank of the Bralorne Diorite near the ultramafic rocks of the Cadwallader fault zone. It is a variable unit, including rocks ranging from dark, mafic-rich diorite, to ultramafic-rich diorite, to ultramafic-looking rocks with a peculiar “network” texture as the contact with the ultramafic is approached.

The Bralorne intrusive suite includes “augite diorite” and “soda granite”, which commonly occur together. The main mass is called Bralorne Diorite (hornblende quartz diorite) and occurs between the bounding Fergusson and Cadwallader faults. It varies locally over short distances from fine- to coarse-grained and light grey to dark green in color; several intrusive phases of diorite may be present, based on their relatively fine or coarse nature. Abundant small areas of “greenstone diorite” are included within the diorite unit and are characterized by variations in color and grain size from dark fine portions to coarse lighter portions. Contacts between the two units are highly complex, forming an intimate mixture. The Bralorne Diorite complex is crosscut by intrusions of soda granite with complex dyke relations. The main body of soda granite (trondhjemite/albite tonalite) is found along the northeast side of the Bralorne Diorite, but also forms many dykes cutting the diorite. Typically, the soda granite is a leucocratic, coarse-grained granitic rock, and low-grade alteration of the soda granite is widespread. Thin (less than 1 m) irregular aplite dykes cut the Bralorne soda granite but are difficult to separate. They are even more leucocratic than the soda granite. Five Cretaceous-Tertiary dykes, including grey plagioclase porphyry, albitite, green hornblende porphyry, Bendor porphyry and lamprophyre, intrude the plutonic rocks at Bralorne.

The ophiolitic rocks in the area were assigned to the Bralorne-East Liza Complex by Schiarizza *et al*. (1997). The Bralorne-East Liza Complex consists of greenstone, diorite, tonalite, gabbro and serpentinite that are imbricated with Cadwallader Terrane throughout the southern part of the Taseko-Bridge River area (Figure 2). It includes rocks previously assigned to the Bralorne and President intrusions, as well as some rocks that had been included in the Pioneer Formation the Cadwallader Group. These rocks have yielded late Paleozoic radiometric dates and may represent slices of oceanic crust that were imbricated with Cadwallader Terrane during obduction (Schiarizza *et al*., 1997).

All the rocks in the Bralorne area, except the Bendor and lamprophyre dykes, are affected by low-grade, sub-greenschist to lower greenschist facies static or burial metamorphism and show little or no penetrative fabric.

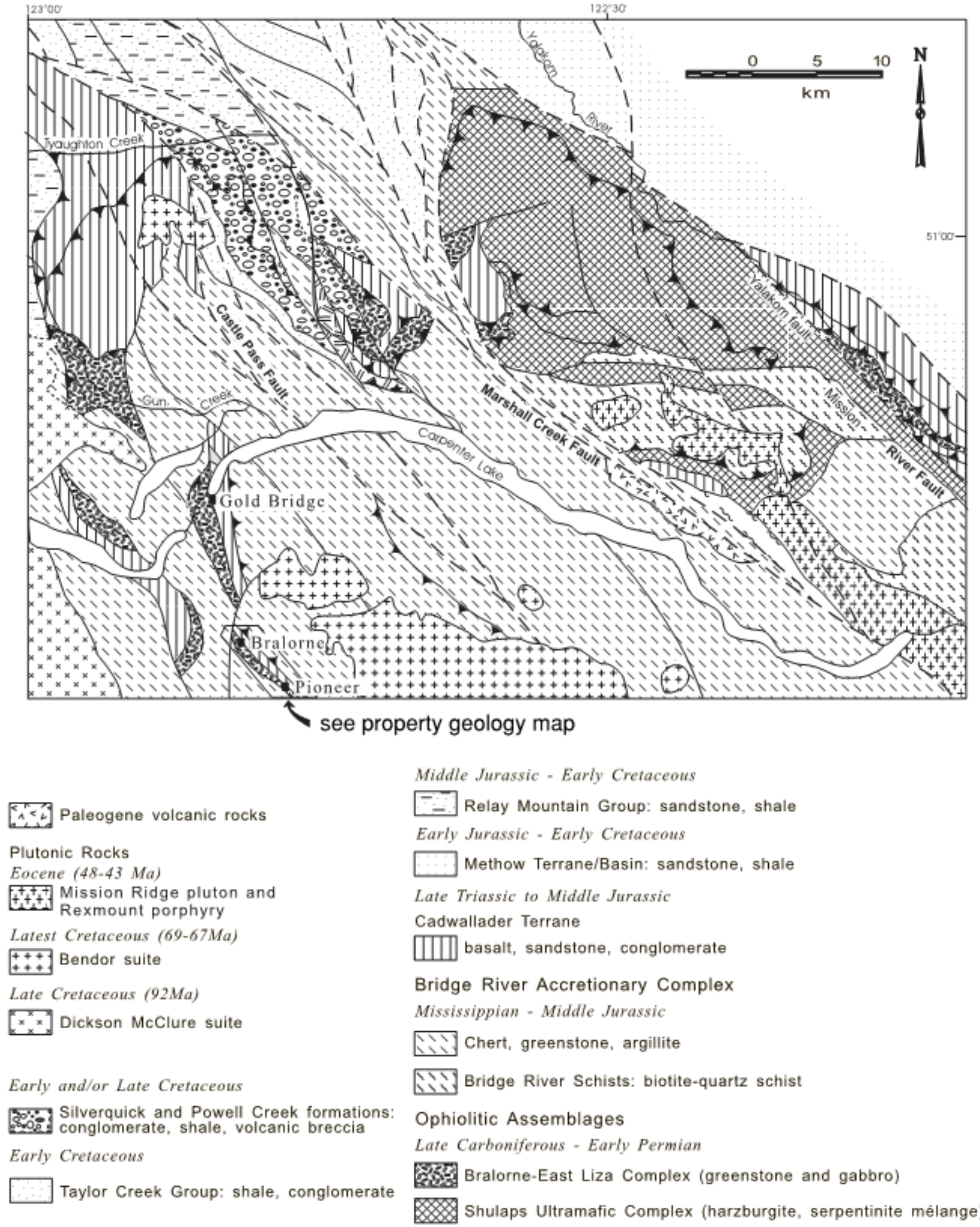

Figure 2 Local Geological Setting of the Bralorne Property
Source: From Ash 2001, after Schiarizza and Garver, 1995

The Bralorne-Pioneer gold-quartz vein system is hosted in variably altered mafic and ultramafic rocks that occur as fault-bounded lenses in a structurally complex zone between the Cadwallader and Fergusson faults referred to as the Bralorne-Pioneer fault lens or Bralorne Block (Figure 3). The ore bodies occur within a lens-shaped area with an approximate 4.5 km strike length, mostly along, adjacent to, or between these two faults.

Throughout the Bralorne Mine, quartz veins are preferentially hosted in the more competent Bralorne Diorite complex of coarse to medium-grained gabbroic, dioritic, and trondhjemitic phases, less commonly in metabasalt, and rarely in ultramafic rocks (Cairnes, 1937; Ash, 2001). Mineralization was interpreted by Leitch (1990) as synkinematic and structurally controlled by secondary fault sets related to westerly-directed, sinistral transpressional movement along faults bounding the Bralorne ophiolite.

At the Pioneer mine, the Bralorne Diorite is exposed in the north and northwest but pinches out to the southeast between Soda Granite and the serpentinite belt that follows the Cadwallader fault. Granitic rocks (mostly Soda Granite) comprise a narrow tongue adjacent to the northern margin of the Bralorne Diorite. The gold-quartz veins at Pioneer mine are hosted mainly in Pioneer greenstone and to a lesser extent in the granitic rocks related to the Bralorne intrusions. The Pioneer greenstone is commonly fine-grained and massive. The soda granite is medium grained, light colored and hypidiomorphic granular. The composition and texture is modified locally by alteration and cataclasis. According to Joubin (1948) the contacts between the soda granite and the greenstone are generally sharply defined and sheared (Church and Jones, 1999).

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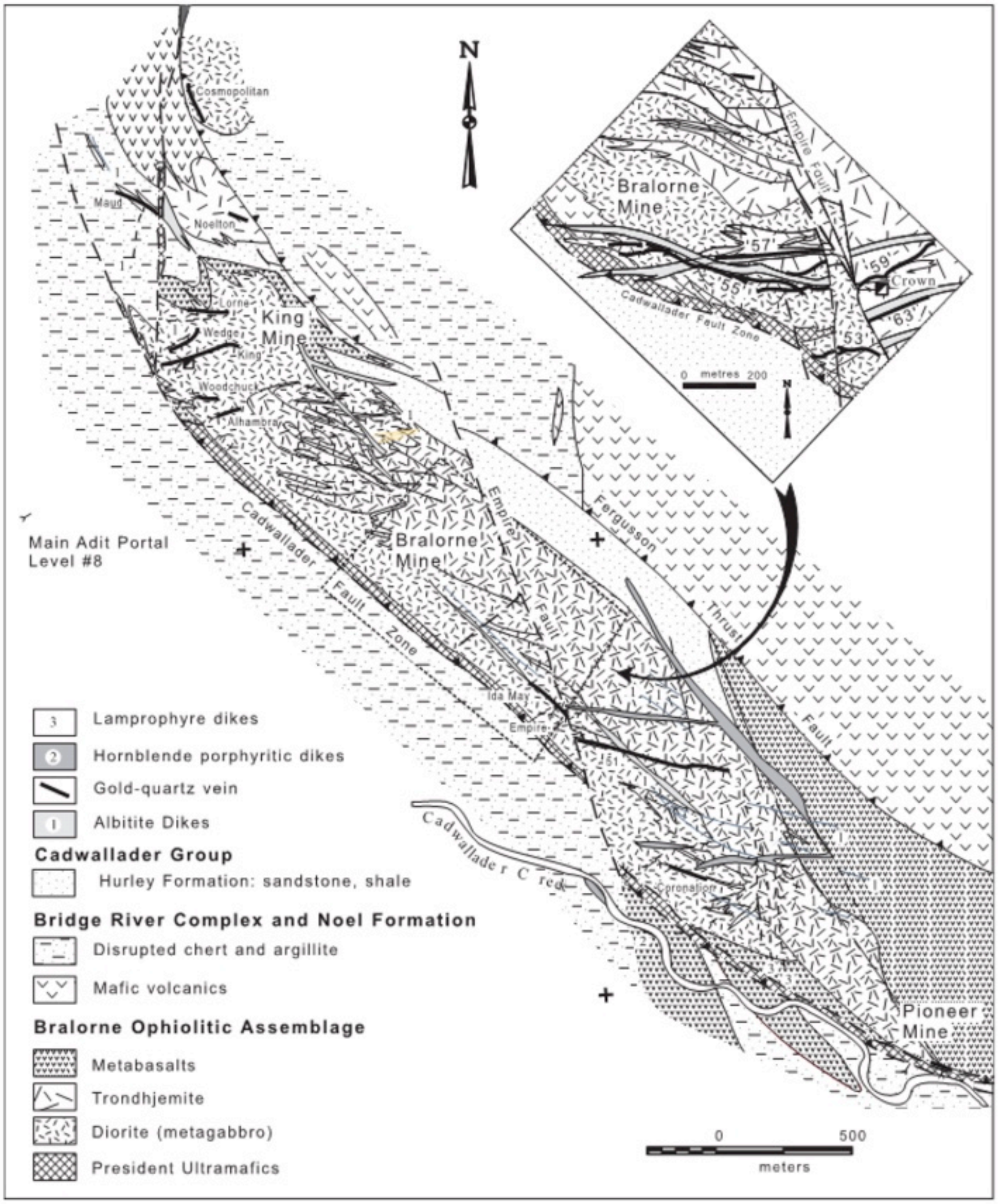

Figure 3 Geological Map of the Bralorne Property
Source: From Ash 2001, after Leitch et al., 1990

Mineralization

The gold-quartz veins form an approximate *en echelon* array. They have strike lengths of as much as 1,500 m between bounding fault structures, and extend to at least 2,000 m in depth, with no significant changes in grade or style of mineralization recorded. Ores consist mainly of ribboned fissure veins with septa defined by fine-grained chlorite, sericite, graphite or sulphide minerals. Massive white quartz tension veins also comprise some of the ore, although thinner connecting cross-veins are generally sub-economic. The fissure veins tend to be larger, thicker, and host the higher gold grades. The most conspicuous alteration mineral is bright green, chrome-bearing phyllosilicate that occurs in basaltic and ultramafic host rocks, composed of fuchsite, mariposite or Cr-illite.

Most veins are 0.9 m to 1.5 m wide, ranging up to 6 m in a few places, and are composed of quartz with minor carbonates, talc, mica, sulphides, scheelite and native gold. The quartz is milky white and usually banded with numerous partings and septa of grey wallrock included in the veins (Church and Jones, 1999).

Veins are dominantly composed of quartz, with minor carbonate minerals, mainly calcite and ankerite, and lesser amounts of chlorite, sericite, clay altered mariposite, talc, scheelite and native gold. Sulphides are present and, although locally abundant, make up less than 1% of total vein volume. Pyrite and arsenopyrite are the most abundant sulphides with lesser marcasite, pyrrhotite, sphalerite, stibnite, galena, chalcopyrite and rare tetrahedrite.

Three types of veins are recognized on the Property: fissure, tension and cross veins. Fissure veins are the richest and most continuous in the camp and include the 51, 55 and 77 veins at Bralorne, the Main vein at Pioneer and the Peter vein. They have been traced continuously for up to 1,500 m along a 110° to 145° strike and to a depth of 1,800 m down a steep northerly dip. The fissure veins are commonly ribbon-banded. They have an average width of 1 m to 1.5 m but often pinch and swell, ranging from centimeters to seven meters in width. Tension veins are generally less continuous than the fissure veins with maximum strike lengths of 500 m and similar dip extensions. They are characterized by massive white quartz with erratic high-gold values, open- spaced filling textures, commonly including pockets of drusy to cockscomb quartz between widely spaced and slickensided septae. They are usually not as rich as fissure veins and are hosted in fault sets that strike roughly 70° and dip about 75° northwest. These tension veins form oblique splays off of the fissure veins. They include the 75 and 83 veins at Bralorne and the 27 vein at Pioneer. Cross veins are sub economic and are interpreted to be connecting structures between the fissure and tension veins (Ash, 2001).

The historic King, Bralorne and Pioneer mines all lay within the current Bralorne Property (Figure 7-5). These mines developed a total of 30 veins through a number of shafts and 80 kilometers of tunnels on 44 levels, the deepest of which traced the 77 vein to a depth of 1,900 m (Church and Jones, 1999). The areas between these mines were not controlled by the main producing

Deposit Types

The Bralorne-Pioneer gold-bearing veins were deposited from low salinity fluids at 300°C to 400°C and 1.25 kbar to 1.75 kbar (Leitch, 1990). The vein style, structure, mineralogy, and alteration are all similar to those defined for orogenic gold deposits (Groves *et al.*, 1998).

The Bralorne Pioneer gold deposit, therefore, belongs to a well-recognized group of deposits referred to as mesothermal, orogenic or greenstone-hosted quartz-carbonate gold vein deposits. These deposits include the Mother Lode district in California and most of the greenstone-hosted gold deposits in the Canadian Shield, including the Timmins, Val d'Or and Red Lake camps. These deposits are quartz-carbonate veins hosted in moderately to steeply dipping brittle-ductile shear zones and, locally, in shallow dipping extensional fractures.

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