Controls on Copper and Gold Mineralization along the Contact between the Coast Plutonic Complex and the Southeast Coast Belt, Taseko Lakes Region, Southwestern British Columbia (NTS 092O/04)

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Introduction

The Taseko Lakes region is located in southwestern British Columbia, approximately 215 km north of Vancouver (Figure 1), and straddles the boundary of the southeast and southwest Coast geomorphological belts (Figure 2). The geology of the region is dominated by intermediate intrusive, volcanic, volcaniclastic and clastic rocks that have undergone at least three phases of brittle deformation. Several mineral occurrences in the region are located within the southeast Coast Belt proximal to its contact with the Coast Plutonic Complex. The mineral occurrences include vein deposits and magmatic-hydrothermal systems, and are integral to the regional evolution of the eastern margin of the Coast Plutonic Complex (Figure 1). Numerous mineralized zones are present in the district, including the Bralorne (MINFILE 092JNE 001), Pioneer Mines (MINFILE 092JNE 004) and Prosperity (MINFILE 092O 041) deposits. Additional prospects, which are the subjects of this contribution, include the Pellaire, Empress and Taylor-Windfall mineral occurrences.

Figure 1. Map of British Columbia (*modified from* MapPlace, 2006), showing the location of Vancouver, Taseko Lakes, the Coast Plutonic Complex, and selected porphyry and vein-hosted deposits that occur immediately east of the Coast Plutonic Complex. The deposits shown formed between the Late Triassic and the Late Cretaceous (MacMillan et al., 1991; MINFILE, 2007).

To date, the relationship between faulting and mineralization has not been established for the Taseko Lakes region. As a result, the link between the structural history of the area and its mineral occurrences is poorly understood. A two-year M.Sc. project is in progress, integrating field mapping and laboratory analyses, to address this issue. The overall goals of this project are 1) to characterize the mineralization and alteration present at three mineral occurrences in the Taseko Lakes area (Empress, Taylor-Windfall and Pellaire occurrences) proximal to the Coast Plutonic Complex; 2) to characterize the chronology of fault generation in the region by determining the kinematics of the faults and, in doing so, to evaluate the importance of structural controls on mineralization; and 3) to determine the timing and physical-chemical conditions of hydrothermal fluids (e.g., temperature, depth of emplacement and likely fluid source) for each of the three mineral occurrences. These results will be integrated to

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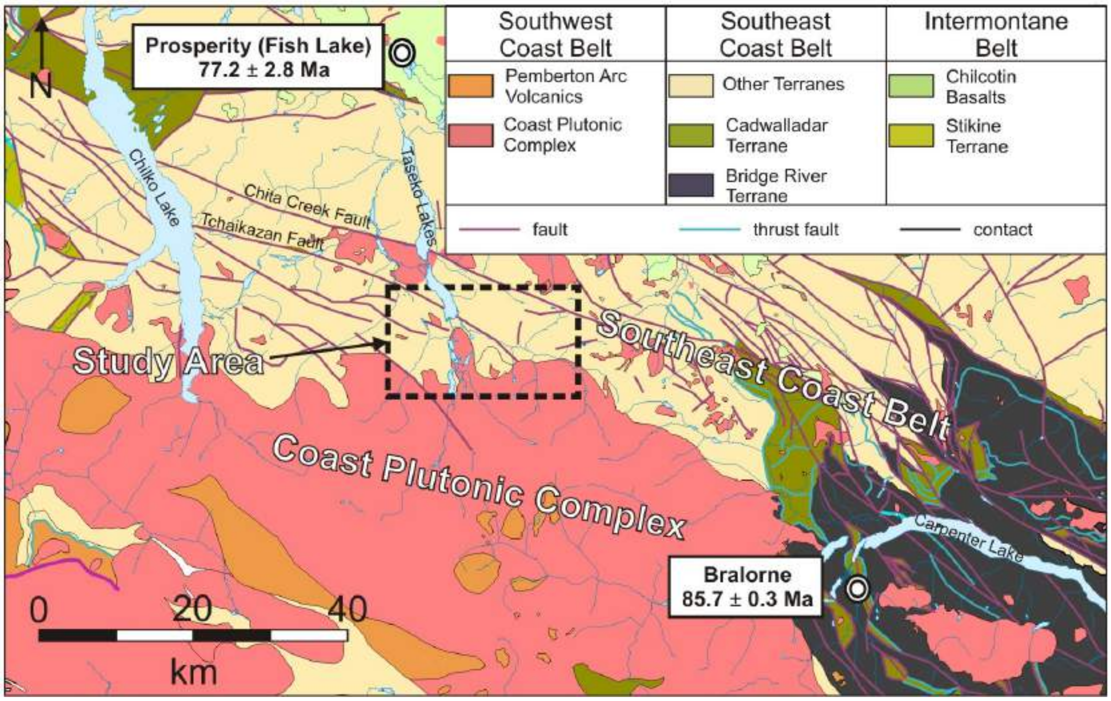

Figure 2. Geologic map (*modified from* MapPlace, 2006) of the Taseko Lakes area, showing the Coast Plutonic Complex and southeast Coast Belt as well as the approximate ages and locations of the Bralorne and Prosperity Deposits (MINFILE, 2007).

develop a coherent structural model for the mineralizing system(s) in the Taseko Lakes region.

This report provides an update from results presented by Hollis et al. (2007) and documents results from the second field season (2007) and preliminary laboratory results. Mapping in 2007 focused mainly on areas to the southeast of Taseko Lakes, with emphasis on the Mount McLeod batholith, the Tchaikazan fault (the major strike-slip fault in the area) and the known mineral occurrences in the region (Figure 3). The goals of this phase of the research are 1) to characterize the alteration and mineralization of three mineral occurrences in the area (Pellaire, Taylor-Windfall and Empress); 2) to determine any genetic relationships among the occurrences, the Tchaikazan fault and the Coast Plutonic Complex; and 3) to develop a model for the formation of the occurrences and address any links among them. In order to achieve these goals, the recent fieldwork entailed large scale mapping (1:10 000 scale) of the northern contact zone of the Mount McLeod batholith near the Spokane–Mount McLure, Pellaire, Taylor-Windfall and Empress occurrences. Additionally, more detailed mapping (1:5 000 scale) and sampling of rock types, structures, alteration and mineralization were also carried out in the area of the three occurrences. Drill core from previous exploration programs at the Empress and Taylor-Windfall occurrences was logged and sampled in detail. Field mapping and core logging involved distinguishing the different intrusive, extrusive and sedimentary rocks present in the area, and characterizing the style, intensity and distribution of hydrothermal alteration and mineralization at the three occurrences. Samples collected in the field have been submitted for petrographic thin sections, fluid inclusion analysis and geochronological dating (U-Pb and Ar-Ar). These results will be reported in the future. Alteration mapping of clay minerals has been aided by the application of short-wave infrared (SWIR) analysis of hand samples following the field season.

Regional Geology

The Taseko Lakes region straddles the boundary between the southeast and southwest Coast Belt, which together comprise the southern Coast Belt in the Canadian Cordillera (Monger and Journeay, 1994; Umhoefer et al., 2002). The southeast Coast Belt consists mainly of late Paleozoic to Mesozoic volcanic arc rocks and clastic basinal lithotectonic assemblages (Schiarizza et al., 1997; Umhoefer et al., 2002). In contrast, the southwest Coast Belt is dominated by Middle Jurassic to Late Cretaceous plutonic rocks of the Coast Plutonic Complex (Friedman and Armstrong, 1995).

The southern Coast Belt separates the Intermontane Superterrane to the east from the Insular Superterrane to the west. The Intermontane Superterrane is composed of the smaller Cache Creek, Quesnel and Stikine terranes, and was accreted to the western margin of North America during the Early to Middle Jurassic (Monger et al., 1982).

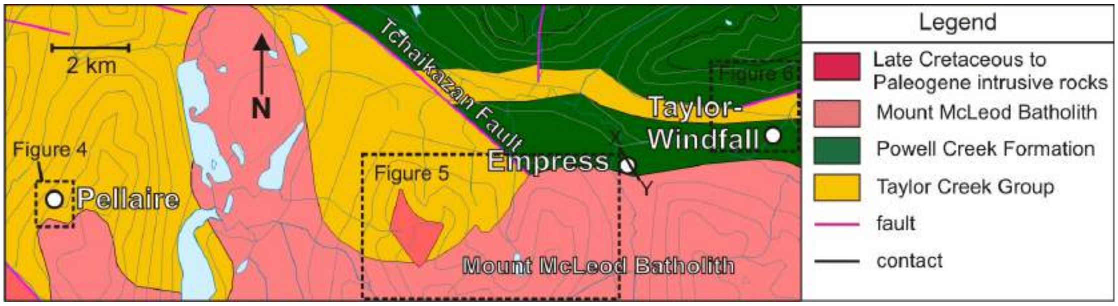

Figure 3. Geologic map (*modified from* MapPlace, 2006) showing the locations of the Mount McLeod batholith, Tchaikazan fault and mineral occurrences in the area south of Taseko Lakes. Locations of subsequent figures are also denoted. Line XY denotes the approximate location of the cross-section shown in Figure 6.

Likewise, the Insular Superterrane is composed of the smaller Wrangellia and Alexander terranes, and is believed to have accreted to the western margin of North America during latest Jurassic to the mid-Cretaceous (Monger et al., 1982; Schiarizza et al., 1997; Israel et al., 2006). The southeast Coast Belt is an overlap assemblage, representing the geologic material present between the Insular and Intermontane superterranes at the time of the accretion of the Insular Superterrane (Monger and Journeay, 1994). The southeast Coast Belt consists of the smaller Bridge River, Cadwallader and Methow oceanic terranes.

An extensive system of northwest-trending faults dominates the structural architecture of the Taseko Lakes area. These faults are dominantly strike-slip and contractional faults that developed during at least three phases of transpressional deformation from the mid-Cretaceous to the Tertiary (Schiarizza et al., 1997; Israel et al., 2006). Steeply dipping, sinistral, strike-slip faults are interpreted to represent the earliest deformation phase (D_1). These sinistral faults are interpreted as high-strain, but are discontinuous along strike (Israel et al., 2006; Hollis et al., 2007). Contractional faults formed during the second phase of deformation in the Late Cretaceous (Rusmore and Woodsworth, 1991, 1994). This shortening is characterized by mainly north- to northeast-verging thrust faults, believed to have developed during the accretion of the Insular Superterrane to the western margin of North America and interpreted to be a part of the Waddington Thrust Belt (Rusmore and Woodsworth, 1991). Eocene, dextral, strike-slip faults are the largest and dominant structures in the region, and appear to cut all other faults (Schiarizza et al., 1997). The largest of these are the Tchaikazan and Twin Creek faults.

The Taseko Lakes region is bounded to the south by the Mount McLeod batholith, which is part of the Coast Plutonic Complex and is dated at 103.8 ±0.5 Ma (Israel et al., 2006). This batholith intrudes stratigraphic units of the southeast Coast Belt previously classified as the Taylor Creek Group (Schiarizza et al., 1997). The Tchaikazan fault runs through the centre of the study area and offsets all observed rock types. The areas north of the Tchaikazan fault are dominated by the Powell Creek Formation, but also include units of the Taylor Creek Group.

Results From First Field Season

The objectives of the first year of the project were 1) to characterize the geology and geologic structures of the Taseko Lakes area, 2) to place age constraints on identified rock types and faults in the study area, and (3) to identify any structural controls on mineralization in the area (Hollis et al., 2007). Results from the first mapping season and subsequent laboratory studies include the following:

1) Broad compositional similarities between the stratigraphic rock units in the area suggest that no single unit possesses an apparent greater capacity to react with mineralizing fluids resulting in precipitation of ore minerals from solution.
2) Andesitic dikes as young as 22 Ma (Ar-Ar of hornblende) in the area indicate that magmatism was active in the area until Miocene time.
3) Sinistral shear zones belonging to D_1 are lithologically heterogeneous, and host variable alteration but negligible mineralization. Ar-Ar dates from shear fabrics defined by muscovite, biotite and illite provide cooling ages of 96.77 ±0.92, 91.98 ±0.75 and 88.15 ±0.57 Ma, respectively.
4) Thrust faults belonging to D_2 host mylonitic fabrics, propylitic (chlorite, epidote, carbonate) alteration and minor mineralization (pyrite, chalcopyrite). An Ar-Ar date of illite from the mylonitic fabrics provides a cooling age of 60.53 ±0.33 Ma, which may represent the late stages of movement along the fault zone.
5) Dextral strike-slip faults belonging to D_3 are characterized by brittle deformation and appear to host no significant mineralization or alteration. No fault material was suitable for geochronology, but regional correlations suggest that these faults were active during Eocene time.

Short Wavelenth Infrared Analysis

Short wavelength infrared (SWIR) analysis can be performed on samples in the field with the use of the portable infrared mineral analyzer (PIMA). A PIMA allows for speedy identification of hydrothermal and clay minerals, which ultimately allows the mapping of different zones of hydrothermal alteration when individual mineral species are indiscernible (Herrmann et al., 2001). The short wavelength infrared range consists of electromagnetic wavelengths from 1 300 to 2 500 nm. This range incorporates fundamental absorption features of OH, H_2O, CO_3, NH_4, AlOH, FeOH and MgOH. From the relative magnitude of these absorption features, relative abundances of many hydrothermal alteration minerals can be estimated (Thompson et al., 1999). SWIR measurements for this project were made using a TerraSpec® SWIR spectrometer from Analytical Spectral Devices, Inc.

Areas Studied in Second Field Season

Pellaire Gold Deposit

The Pellaire gold deposit is classified as a polymetallic vein-hosted deposit by Holtby (1988). This deposit was mapped at a scale of 1:5 000, to determine the structural controls on the mineralization and to collect samples of veins and wallrock for laboratory analyses in order to place constraints on temperature, depth and age of mineralization. Results from these studies will potentially provide insights into any temporal and genetic links present between mineralization at the Pellaire and the other showings in the area.

Pellaire is a past-producing gold-silver deposit located approximately 7 km south-southwest of Upper Taseko Lake (Figure 3). The deposit occurs at the contact of the Falls River succession with the Mount McLeod batholith (Hollis et al., 2007). Mineralization occurs in quartz veins that are hosted in south-verging thrust faults (Pezzot, 2005). Ore minerals include pyrite, chalcopyrite, galena, sphalerite, arsenopyrite, tetrahedrite and hessite. The majority of the gold in the deposit is associated with hessite. Hydrothermal alteration in the area is not intense or widespread, but is dominated by muscovite, illite, ankerite and jarosite. Probable geological reserves are 30 841 tonnes grading 22.9 grams per tonne gold and 78.8 grams per tonne silver (Holtby, 1988).

The Falls River succession was defined by Israel et al. (2006). Prior to this it was included in the Taylor Creek Group (Jeletzky and Tipper, 1968; McLaren, 1990; Schiarizza et al., 1997). The succession consists of intermediate, coherent and clastic volcanic units with subordinate amounts of sedimentary rocks, typified by siltstone and shale. At the Pellaire deposit, it is intruded by the Mount McLeod batholith to the south (Figure 4). A minimum age of deposition for the Falls River succession is 103.8 ±0.5 Ma, based on a uranium-lead zircon age from the Mount McLeod batholith (Israel et al., 2006).

The Mount McLeod batholith, part of the Coast Plutonic Complex, occurs in the southern part of the study area (Figures 4 and 5). The gold-bearing quartz veins on Pellaire are dominantly hosted within the granodiorite of the Mount McLeod batholith (Figure 4A).

The batholith is a medium- to coarse-grained, hornblende granodiorite. It is equigranular, with crystal sizes ranging from 1 to 10 mm and an average size of about 2–3 mm (Figure 5A). It is composed of about 40% quartz, 30% euhedral plagioclase, 15% subhedral hornblende, 10% euhedral K-feldspar, 3% hematite and magnetite, and 2% subhedral biotite. The quartz crystals appear to occur interstitially to all other minerals, and the feldspars occur interstitially to the mafic minerals. Oxide minerals appear to be a post-crystallization overprint of the hostrock. In some areas at Pellaire, the Mount McLeod batholith also contains up to 20% cobble-sized, fine-grained mafic enclaves. Areas of significant clay alteration and oxidation occur sporadically throughout the batholith in the study area. The grain size of the batholith decreases slightly towards its margin. Discrete zones of intense Cu- and Fe-oxide alteration are commonly observed in the Mount McLeod batholith.

The mineralized quartz veins range in texture from isolated massive veins, to stockworks, to brecciated veins cemented by subsequent generations of quartz. The veins vary in thickness from about 20 cm to 2 m and strike west to southwest with dips ranging from 40 to 80 degrees to the north. Faults of similar orientation to the veins are observed in the country rock surrounding the granodiorite. The veins are interpreted to have formed during or after the displacement along these faults, but only precipitated from hydrothermal solution when the circulating fluids interacted with the granodiorite. Subsequent displacement along these faults also occurred after vein emplacement, as evidenced by faulted lower contacts along some veins. The kinematics observed in fault gouge are consistent with thrusting towards the south.

Hydrothermal brecciation occurs at the contact between the Mount McLeod batholith and the Falls River succession on the eastern side of the property (Figure 4B). Clasts of both units are present in the breccia and are cemented by quartz, sericite and minor jarosite and gypsum. Disseminated pyrite is also present in the granodiorite clasts within the breccia. The contact between the granodiorite and quartz-sericite-cemented hydrothermal breccia has subsequently been faulted (Figure 4C), but only minor displacement is observed across the fault, and quartz veins are continuous a short way into the hydrothermal breccia from the granodiorite.

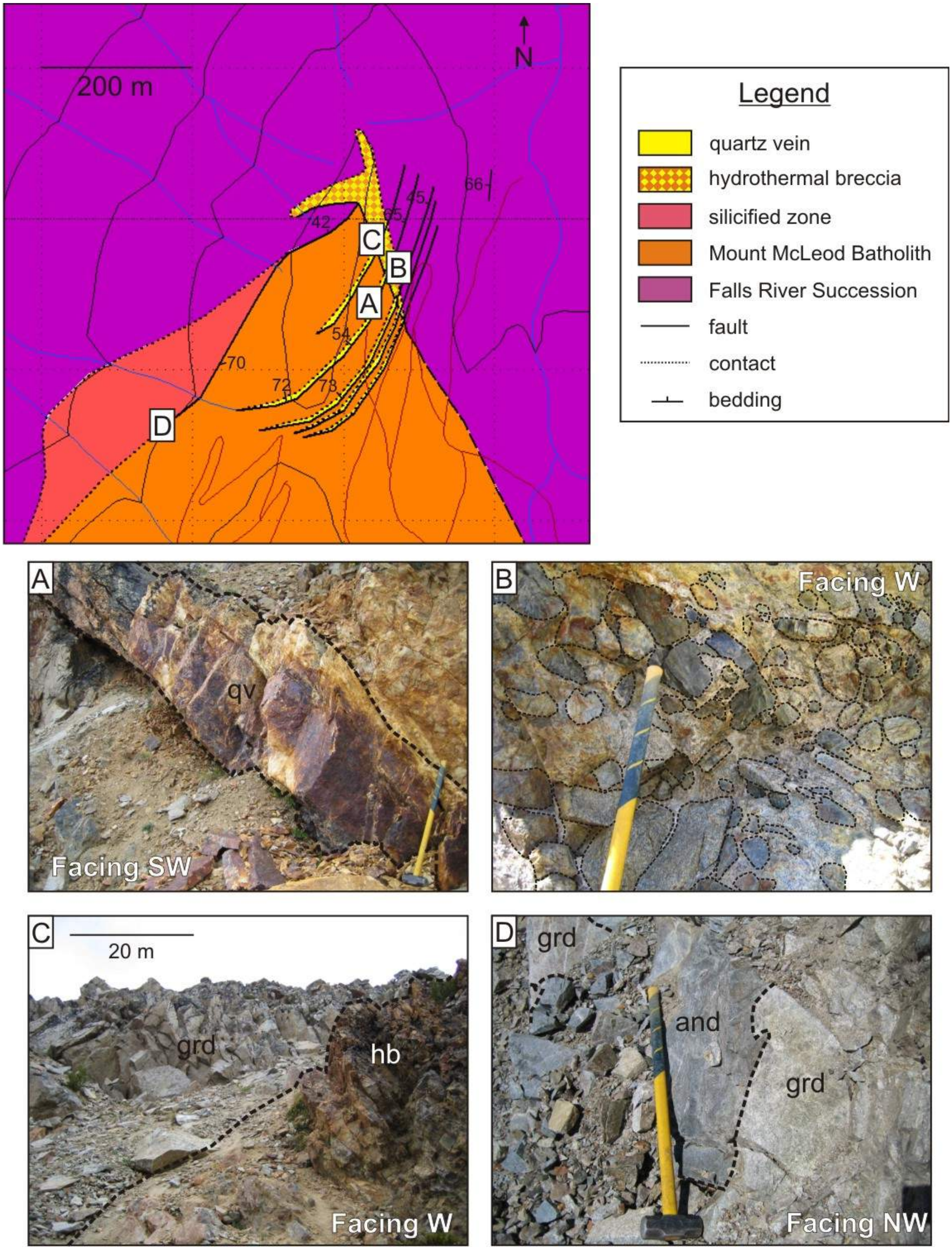

Figure 4. Geologic map of the Pellaire area, showing the locations of photographs: **A**) one of the main quartz-veins (qv) hosted by the Mount McLeod batholith at Pellaire; **B**) part of the hydrothermal breccia at Pellaire, which contains clasts from both the Mount McLeod batholith and the Falls River succession (Ar-Ar date of sericite is pending for the hydrothermal breccia matrix); **C**) a faulted contact separating the Mount McLeod granodiorite (grd) from the hydrothermal breccia unit (hb) and **D**) irregular, intrusive contact between the Mount McLeod granodiorite (grd) and an andesite of the Falls River succession.

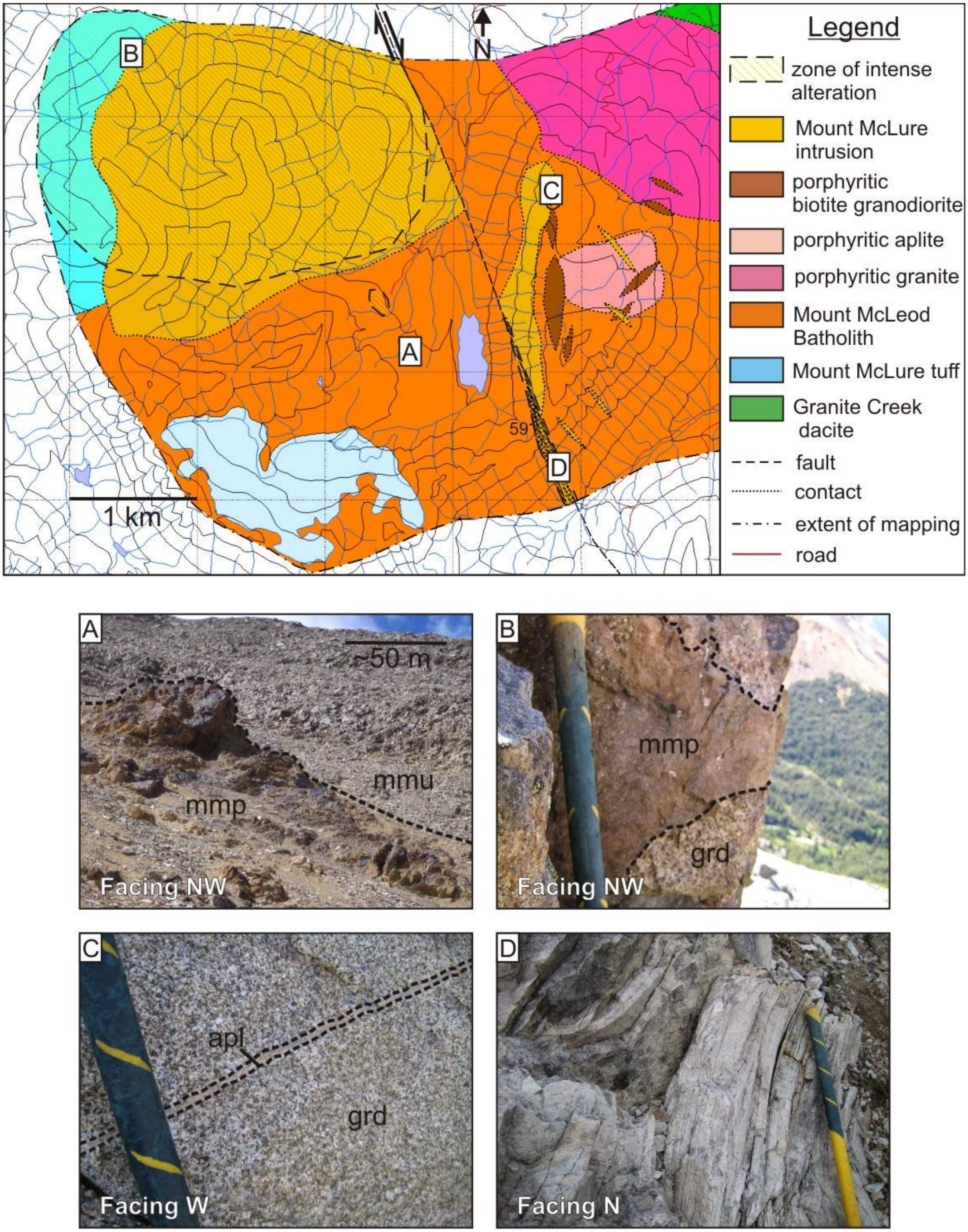

Figure 5. Geologic map of the Mount McLure area showing locations of photographs: **A**) aplite dike (apl) cutting the Mount McLeod granodiorite (grd), **B**) contact between the rusty Mount McLure pluton (mmp) and the grey Mount McLure pluton (mmu), **C**) irregular contact between the Mount McLure pluton (mmp) and the Mount McLeod granodiorite (grd), **D**) silicified fault zone (Ar-Ar date for sericite from the fault zone is pending).

On the western side of the property, the Mount McLeod batholith has an intrusive contact with the Falls River Succession (Figure 4D). The Falls River succession is highly silicified proximal to this contact, but there are no observed signs of brecciation.

Empress Deposit

The Empress deposit is classified as a copper porphyry deposit (Lambert, 1991). Work was undertaken to map in detail the alteration and mineralization in the deposit and to place temperature, depth and age constraints on the conditions of its formation.

The Empress deposit occurs approximately 12 km to the southeast of Upper Taseko Lake, east of Granite Creek, just above its junction with the Taseko River (Figure 3). The altered and mineralized zone extends outwards from the contact with the Coast Plutonic Complex into rocks inferred to be part of the Lower Cretaceous Taylor Creek Group, and is underlain by a porphyritic granite, named the Empress pluton for the purpose of this study. There is no outcrop exposed in the vicinity of the deposit, thus information on it is limited to examination of drill core. The Empress deposit has been interpreted as a porphyry copper deposit; however, much of the reported alteration in the area is also characteristic of high-sulphidization epithermal systems (Osborne, 1999). The Empress deposit contains 10 048 000 tonnes of 0.61 percent copper and 0.79 gram per tonne gold (MINFILE, 2007), with chalcopyrite being the predominant ore mineral.

The only outcrop exposure in the area occurs in the gulley around Granite Creek, just beyond the western margin of the deposit. Six drillholes (89-3, 89-6, 90-17, 90-19, 90-22 and 90-30) from the 1989 and 1990 exploration programs on the property by Westpine Metals Ltd. were logged and sampled in detail (Figure 7). In drill core, three intrusive phases were distinguished, including a porphyritic granite and associated dikes, andesitic dikes and aplitic dikes. Five separate alteration types were distinguished: their classification was aided by SWIR analysis. The alteration types include clay-dominated, quartz-chlorite–dominated, quartz-sericite–dominated, quartz-dominated and quartz-magnetite–dominated. Quartz appears to be overprinted by all other alteration minerals, and chlorite appears to overprint magnetite. Up to several percent pyrite and chalcopyrite occur in all alteration phases, but the highest sulphide grades occur within quartz-magnetite alteration.

The Granite Creek unit crops out west of the Empress deposit in the gulley surrounding Granite Creek (Figure 5). It is composed of feldspar-phyric dacite and associated volcaniclastic rocks and interpreted to be part of the Taylor Creek Group (Jeletzky and Tipper, 1968; McLaren, 1990; Schiarizza et al., 1997). It is inferred to be the host lithology of the Empress deposit.

The Empress pluton underlies the zone of intense alteration and mineralization at the Empress deposit. Proximal to the deposit, the pluton does not crop out at the surface and is only visible in drill core. Similar rock types crop out in Granite Creek southwest of the deposit and on the ridge above it to the southeast, and are interpreted to be part of the same intrusive phase. The pluton is composed of porphyritic hornblende-biotite granite, with quartz and feldspar phenocrysts ranging from 0.5 to 1 cm in size (Figure 7H). Hornblende tends to be variably altered to biotite, which is then in turn variably altered to chlorite. The groundmass of the intrusive rock is also variably altered to K-feldspar. Small dikes of the intrusion are observed in drill core of the overlying rocks and possess similar alteration styles. The Empress pluton is locally a host to mineralization, but further investigation is required to establish whether it has any causative role in mineralization.

A similar porphyritic monzonite occurs in the Empress and Mount McLure areas and is interpreted to be from the same intrusive phase as the pluton that underlies the Empress deposit, although more detailed study is required to confirm this interpretation. It consists of about 40% euhedral feldspar laths ranging from 5 to 10 mm in size, and 15% mafic phenocrysts (biotite and hornblende variably altered to chlorite) in a grey, aphanitic groundmass. It often contains minor amounts (up to 5%) of disseminated magnetite and/or hematite. The porphyritic monzonite cuts the Mount McLeod batholith, but is cut by other porphyritic dikes in the area.

Clay-dominated alteration of the Empress deposit is characterized by blotchy, intermingling layers and patches of paragonite, montmorillonite, halloysite, pyrophyllite, dickite, kaolinite (Figure 7A). These zones typically also consist of significant quartz and Fe-oxide, but are composed of at least ca. 30% clay minerals. Fe-oxide, carbonate and gypsum veinlets, as well as clay fracture coating, are observed in clay-dominated alteration. Clay-dominated alteration tends to host the lowest concentration of pyrite and chalcopyrite out of any alteration type.

Quartz-chlorite–dominated alteration consists of at least 10% chlorite in a quartz-dominated rock (Figure 7B). Chlorite can be patchy, disseminated or grade in as veinlets. Minor amounts of illite are also present in quartz-chlorite alteration. Magnetite and hematite are present in variable proportion with chlorite, and grade into quartz-magnetite–dominated alteration. Gypsum and Fe-oxide veinlets typically cut quartz-chlorite alteration.

Quartz-sericite–dominated alteration is characterized by one or more phases of quartz alteration that appear to have been weakly to moderately overprinted by illite-dominated alteration (Figure 7C). Illite occurs as blebs or patches within the quartz alteration and comprises at least 10% of

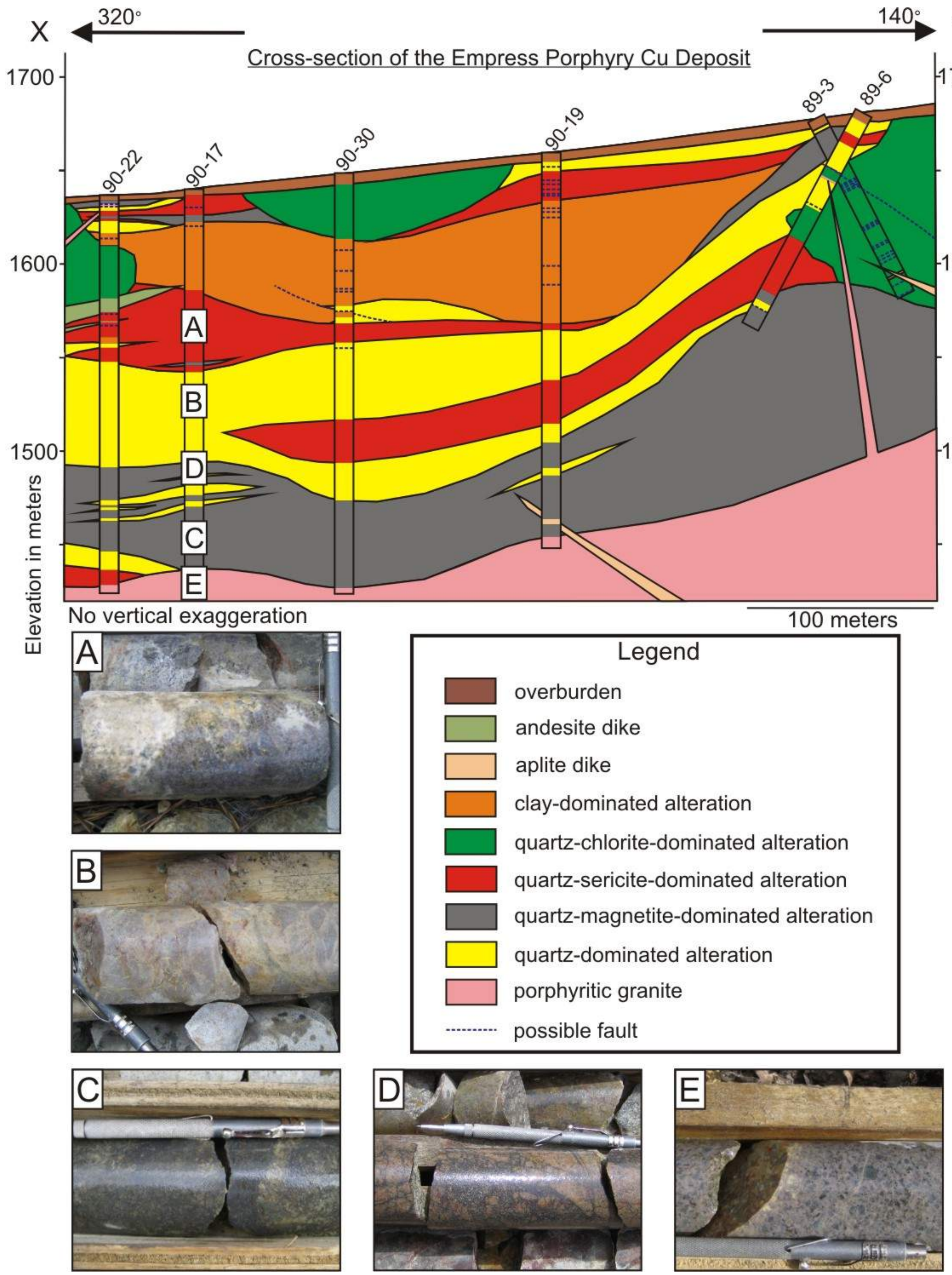

Figure 6. Cross-section of the Empress deposit constructed from the alteration mapping (in conjunction with information from SWIR analyses) from the drill holes indicated. Locations of photographs are indicated on the cross-section: **A**) blotchy quartz-sericite-dominated alteration (Ar-Ar date of sericite is pending), **B**) a quartz-dominated breccia with dark grey quartz clasts and light grey quartz matrix, **C**) relatively uniform quartz-magnetite–dominated alteration, **D**) magnetite-cemented, quartz-magnetite breccia, **E**) K-feldspar-altered porphyritic granite of the Empress pluton.

the rock. Illite and Fe-oxide veinlets and fracture coating are typically present in quartz-sericite–dominated alteration. Quartz-sericite alteration can also show gradational changes into both clay-dominated and quartz-dominated alteration, and is inferred to be an intermediate alteration style between the two.

Quartz-dominated alteration is characterized by one or more generations of quartz coexisting in the same rock (Figure 7D). These separate quartz phases vary from milky, to clear, to light and dark grey phases. They coexist as either separate zones of blotchy or patchy, uneven alteration, or can occur as brecciation with one or more phases comprising the clasts of the breccia, and the other comprising the matrix. For this study, quartz-dominated alteration is defined to be at least 90% quartz. This alteration phase typically contains small amounts of magnetite, hematite, chlorite or illite. It may also contain small Fe-oxide veinlets and quartz-cemented fractures.

Quartz-magnetite alteration is characterized by at least 10% magnetite overprinting quartz-dominated alteration (Figure 7E). Magnetite has a disseminated or banded occurrence, and also occurs as the matrix of a quartz-magnetite breccia. It can grade in as dense magnetite and hematite veining in quartz-dominated alteration. Intense quartz-magnetite alteration may consist of up to 90% magnetite. This alteration type also tends to host the highest grades of ore (up to 40% disseminated chalcopyrite in discrete zones). Pyrite and chalcopyrite also occur as veinlets cutting quartz-magnetite alteration. Chlorite also appears to variable replace magnetite and hematite and certain zones. This can result in a gradational change in alteration style from quartz-magnetite to quartz-chlorite.

The Empress deposit is cut by at least two generations of post-mineralization dikes. One generation is slightly to moderately chlorite-carbonate–altered, sparsely plagioclase-phyric andesitic dikes (Figure 7F). These dikes tend to host significant carbonate veining. They vary from less than 1 to greater than 10 metres in apparent thickness in drill core, and are interpreted to have been emplaced post-mineralization because of the lack of significant hydrothermal alteration and mineralization observed in them relative to the rocks that they intrude. The other set of dikes are fine-grained, pink, feldspar-dominated, aplitic dikes (similar to those described in the Local Geology section) that contain disseminated Fe-oxide (Figure 7G). No cross-cutting relationships were observed between the two generations of dikes, but the aplite dikes are interpreted to be emplaced late- to post-mineralization and are therefore older than the andesitic dikes. This interpretation is based on the higher Fe-oxide content and higher degree of alteration observed in the aplite dikes.

Taylor-Windfall Deposit

The Taylor-Windfall deposit is classified as a high grade epithermal gold-silver vein deposit (Lane, 1983). The deposit was mapped at scales of 1:5 000 and 1:10 000 with the aim of characterizing the intense alteration zones present in the vicinity of the deposit and to identify any structural controls on the alteration and mineralization. Results from field and laboratory work will provide insights into the conditions of formation of the Taylor-Windfall deposit and possible links with the Empress deposit.

The Taylor-Windfall deposit is a past-producing, vein-hosted gold deposit. It occurs within the Upper Cretaceous Powell Creek Formation (Price, 1986). Production records show that 555 tonnes of ore were mined in 5 years: 14 525 grams of gold and 156 grams of silver were recovered from this ore. The deposit is located in the gulley surrounding Battlement Creek just above its junction with the Taseko River; approximately 15 km southeast of Upper Taseko Lake (Figure 3). Hydrothermal alteration of the host rock is dominated by minerals characteristic of advanced argillic alteration (corundum, andalusite, pyrophyllite, alunite, dickite, kaolinite) and silicification (Price, 1986). Known mineralization is largely restricted to two discrete veins: one, sulphide-dominated and one, tourmaline-dominated (Lane, 1983). The occurrence of ore minerals including chalcopyrite, tennantite, enargite, sphalerite, galena and native gold, together with the alteration mineralogy, is suggestive of a high-sulphidization epithermal system.

The underground workings at the Taylor-Windfall deposit were inaccessible during field work. As a result, sampling and mapping were restricted to limited surface exposures, and incorporated logging of drill hole 84-03 from an 1984 exploration program by Westmin Resources. The Powell Creek Formation underlies the region north of the Tchaikazan fault on the north side of Taseko Valley (Figure 6). These rocks were originally assigned to the Powell Creek Formation by McLaren (1990). Maxon (1996) documented ages for the Powell Creek Formation that ranged from 94.6 ±6.6 Ma and 95.9 Ma at its base to 78.95 ±4.1 Ma upsection. The base of the formation is intruded by the Dickson-McClure batholith, which has been dated at 92 Ma (Parrish, 1992). The Powell Creek Formation is inferred to host the Taylor-Windfall deposit (Price, 1986). The majority of the rocks exposed at the surface and in drill core are intensely altered, however, and it was not possible during this study to discern the protolith and therefore to confirm the hostrock.

The majority of the alteration observed in the gulley around the Taylor-Windfall deposit exhibits some degree of fracture control (Figure 6A). As a result, variations in alteration style and intensity are easily observed, depending on proximity to pervasive fractures at the outcrop scale. Common alteration assemblages observed are vuggy quartz±pyrite (Figure 6B), quartz-sericite-pyrite, and quartz-chlorite-sericite. Illite, paragonite, halloysite, kaolinite and dickite are common clay minerals associated with the quartz-sericite-pyrite and quartz-chlorite-sericite alteration phases. Dissemination and veining of tourmaline is also observed in concentrations up to 10%. Discrete zones of hydrothermal brecciation are also observed in surface exposures (Figure 6C). These zones are less than ca. 2 m thick and are cemented by quartz-illite-palygorskite. On the ridge to the east and above the deposit, significant quartz-alunite alteration is present (Figure 6D). This alteration also appears to be confined to a few tens of metres on either side of a marked fracture or fault zone, and is characteristic of leached cap alteration that commonly overlies epithermal systems.

Mount McLure Area

The contact between the Coast Plutonic Complex and the southeast Coast Belt was studied mainly in the Mount McLure area, between the Empress and Pellaire deposits (Figure 3). This work was done in order to identify the different intrusive phases that occur along the margin of the Coast Plutonic Complex, and to determine any potential relationship among the intrusive phases, alteration zones, and observed mineralization. Separate lithological units, alteration zones and intrusive were identified, mapped and sampled (Figure 5).

Intrusive phases in the Mount McLure area include porphyritic plagioclase-hornblende-pyroxene porphyry (named the Mount McLure pluton for the purposes of this study), aplitic to porphyritic biotite-hornblende granite, porphyritic plagioclase diorite, and the Mount McLeod granodiorite. A zone of intense alteration in the western area of Mount McLure is centred on the Mount McLure pluton. There is a sharp contact in the westernmost part of the area, marked by a sharp change in colour and alteration style (Figure 5A). This contact is inferred to result from primary lithological differences between the units prior to the alteration event. The Mount McLure pluton is observed to intrude the Mount McLeod granodiorite (Figure 5B). Aplite dikes are common within the Mount McLeod batholith (Figure 5C) and at the Empress deposit in the Granite Creek unit. A sub-vertical fault zone trends south-southeast through the centre of the Mount McLure area. The rocks within the fault zone are variably silicified and foliated (Figure 5D). The fault is interpreted to have acted as a conduit for hydrothermal fluids, resulting in intense alteration of the rocks within the zone. Mafic dikes cut the fault zone, and run parallel to the trend of the fault. These dikes are therefore inferred to have intruded after the deformation and silicification events.

Discussion and Future Work

The southeast Coast Belt hosts several prospective and past-producing mineral deposits, including the Bralorne (MINFILE 092JNE 001), Pioneer Mines (MINFILE 092JNE 004), and Prosperity deposits (MINFILE 092O 041). The Bralorne and Pioneer Mines deposits are located approximately 50 km southeast of the Taseko Lakes area, and together represent British Columbia's largest historical gold producers (Bellamy and Arnold, 1985; Figure 2). These deposits and similar ones to the south are vein-hosted mesothermal gold deposits. The Bralorne mining area was in operation from the late 1920s to the early 1970s, during which it produced over 4 million ounces of gold (Sanche, 2004). The Prosperity deposit, formerly known as Fish Lake, is a developed porphyry Cu-Mo-Au prospect. It is situated approximately 30 km north of the Taseko Lakes region and most recent information gives an estimated measured and indicated resource of 491 million tonnes grading 0.43 grams per tonne gold and 0.22 percent copper (Brommeland and Wober, 1999). The Bralorne area is located more or less along strike with the Taseko Lakes area, and has a mineralization age constrained at 85.7 ±3 Ma by a K-Ar date from hornblende within a syn-post mineralization hornblende porphyry dike (Ash, 2001).

The Empress, Pellaire and Taylor-Windfall deposits all show different styles of mineralization and alteration, but occur in similar geologic settings. The connection, if any, among the deposits remains unclear, but laboratory studies during the winter of 2007–2008 should help to better understand the P-T conditions of formation and the ages of mineralization. If there is a temporal link among the deposits, it is possible that they are in some way genetically linked and may be a part of the same system, with local differences perhaps reflecting local variances in depth of formation in the crust, or relative contributions of magmatic fluids versus buffering due to crustal interactions of fluids.

Laboratory work will also provide more information on lithological compositions and alteration mineralogy, as well as provide insight into age relationships between separate alteration and intrusive phases. Further study of fluid inclusions and thermochronological data will provide insight into temperatures and depths of mineralization for the deposits studied. From these data, it is anticipated that the mineral deposits within the Taseko Lakes region will be placed into a regional geologic context and a model for mineralization of the area can be developed.

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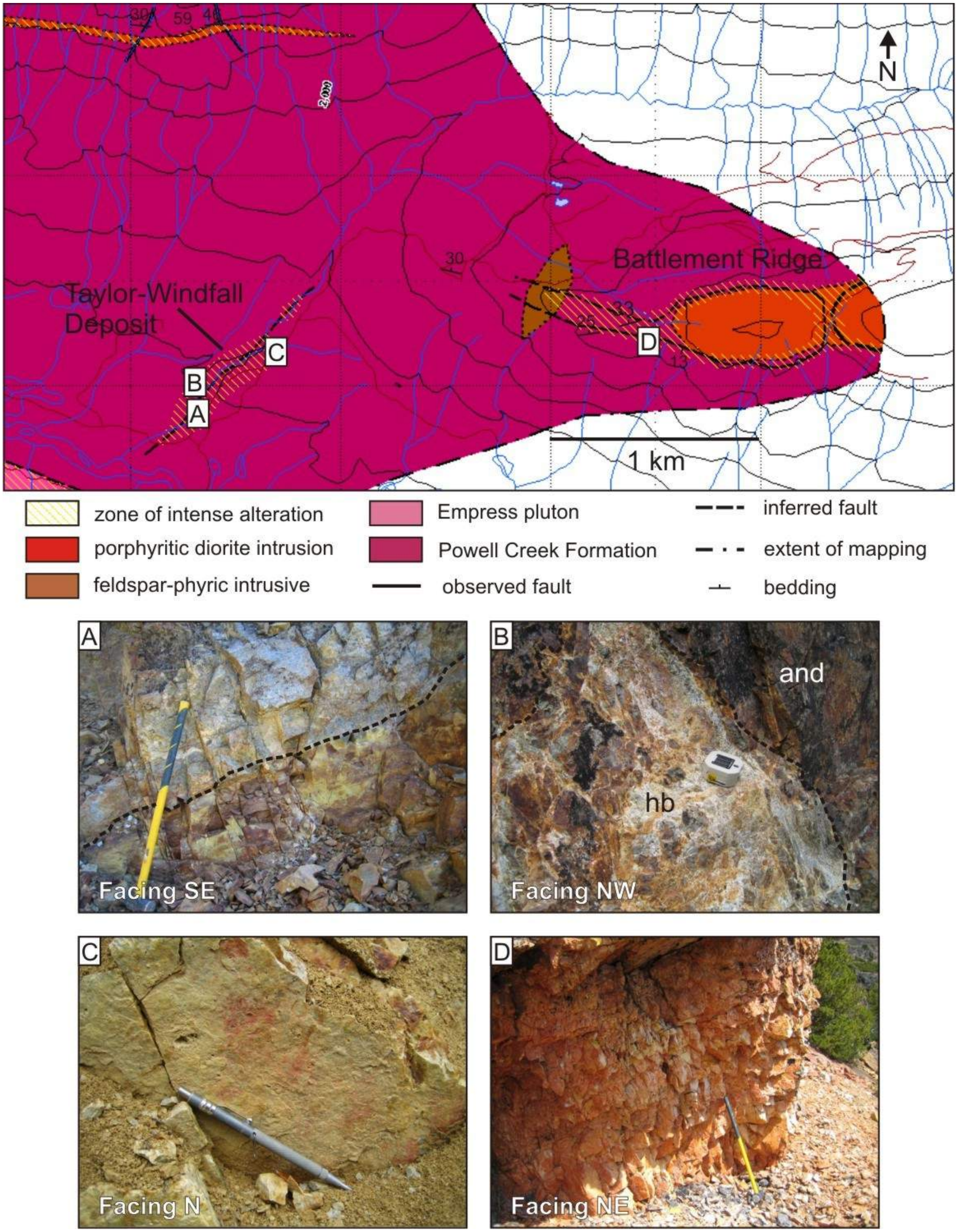

Figure 7. Geology of the Taylor-Windfall and Battlement Ridge areas, showing locations of photographs: **A**) marked changes in alteration intensity inferred to be fracture-controlled; **B**) hydrothermal breccia (hb) cutting andesite of the Powell Creek Formation (an Ar-Ar date of sericite is pending for the hydrothermal breccia); **C**) red staining on fractures in an intensely silicified, vuggy unit; **D**) pervasive, bright orange, intense quartz-allunite alteration proximal to a fault-fracture zone on Battlement Ridge, indicative of leached cap environments.

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