Geological Setting and Mineralization Potential of the Southwestern Whitesail Lake Map Area (NTS 093E), Southwestern British Columbia: Preliminary Assessment

By J. Brian Mahoney[1], J.W. Haggart[2], R.L. Hooper[1], L.D. Snyder[1] and G.J. Woodsworth[2]

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INTRODUCTION

The primary objective of this investigation is detailed bedrock mapping and evaluation of economic mineralization potential in the southern and western Whitesail Lake map area (NTS 093E; Fig. 1, 2). Fieldwork in 2005 concentrated on the southwestern corner of the Whitesail Lake map area (NTS 093E/03, 04, 05, 06), extending work completed to the east under the auspices of the Rocks to Riches Program (Mahoney *et al.*, 2005; Gordee *et al.*, 2005). Year 2 of the project will focus on areas to the north and northeast of the present map area (Fig. 2), with the ultimate goal of providing a comprehensive evaluation of economic mineralization potential of the southern and western Whitesail Lake map area.

REGIONAL GEOLOGICAL SETTING

The southern Whitesail Lake (NTS 093E) 1:250 000 map area is located along the transition zone between the Coast and Intermontane morphogeological belts, straddling the boundary between igneous and metamorphic rocks of the Coast Plutonic Complex on the west and Jurassic and Cretaceous volcanosedimentary successions of southwestern Stikinia on the east (Fig. 1, 2). Bedrock geological mapping and economic mineral assessment in the eastern Bella Coola (NTS 093D) map area to the south was the focus of the 2001–2004 Bella Coola Targeted Geoscience Initiative (TGI) of the Geological Survey of Canada. The TGI project focused on constraining the geological evolution of the region and assessing the economic potential of Mesozoic volcanic assemblages and plutonic belts in the region (Haggart *et al.*, 2004). The geological framework established by the Bella Coola TGI was extended to the north, into the southern Whitesail Lake map area (NTS 093E/02, 03), under the auspices of the Rocks To Riches Program in 2004. Regional mapping and economic assessment were extended to the west and northwest (NTS 093E/04, 05, 06) in 2005 by a combined research team from the University of Wisconsin – Eau Claire, the Geological Survey of Canada and the University of British Columbia. This is an ongoing project, sponsored by Geoscience BC, that is designed to improve understanding of the geological evolution and economic mineral potential of the west-central portion of the Coast Mountains (52–54°N).

The primary focus of mapping during the brief 2005 field season was the southwestern corner of the Whitesail Lake map area, including portions of the Kitlope Lake (NTS 093E/04), Tsaytis River (NTS 093E/05) and Chikamin Mountain (NTS 093E/06) 1:50 000 map areas (Fig. 1, 2). This area contains Jurassic and Cretaceous volcanic and sedimentary successions, with volcanogenic massive sulphide mineralization potential, on the western edge of Stikinia and Jurassic to Eocene plutonic bodies, which are known hosts for a variety of porphyry deposits, along the eastern margin of the Coast Plutonic Complex (Woodsworth, 1980; Dawson *et al.*, 1991; Diakow *et al.*, 2002). Stream sediment geochemistry, MINFILE (2005) data and detailed geological mapping to the north (Whitesail Lake map area) and south (eastern Bella Coola map area) indicate potential for volcanogenic massive sulphide, Cu±Mo±Au porphyry, and Ni-Cu-Cr-platinum-group-element (PGE) mineralization in Mesozoic volcanogenic successions of western Stikinia and plutonic bodies along the eastern margin of the Coast Plutonic Complex (Fig. 3).

This report briefly describes the geology of the southwestern Whitesail 1:250 000 map area (NTS 093E/04, 05, 06), documented by detailed bedrock mapping during the 2005 field season (Fig. 4). Geochemical and geochronological analyses are ongoing. The bulk of the bedrock mapping slated for this project will be conducted during the 2006 field season. This investigation will integrate regional bedrock mapping, stratigraphic and structural analyses, geochronology, plutonic and volcanic geochemistry, isotopic analyses and mineral assays into a comprehensive assessment of the geological framework and economic mineral potential of the region.

STRATIGRAPHIC SUCCESSIONS

Hazelton Group

The southern Whitesail Lake and Bella Coola map areas represent the southernmost extent of significant exposures of the Lower to Middle Jurassic Hazelton Group. In the southern Whitesail Lake area (NTS 093E/02, 03), Hazelton Group strata are widespread and well preserved,

[1]*Department of Geology, University of Wisconsin, Eau Claire, WI (mahoney@uwec.edu)*

[2]*Geological Survey of Canada, Vancouver, BC*

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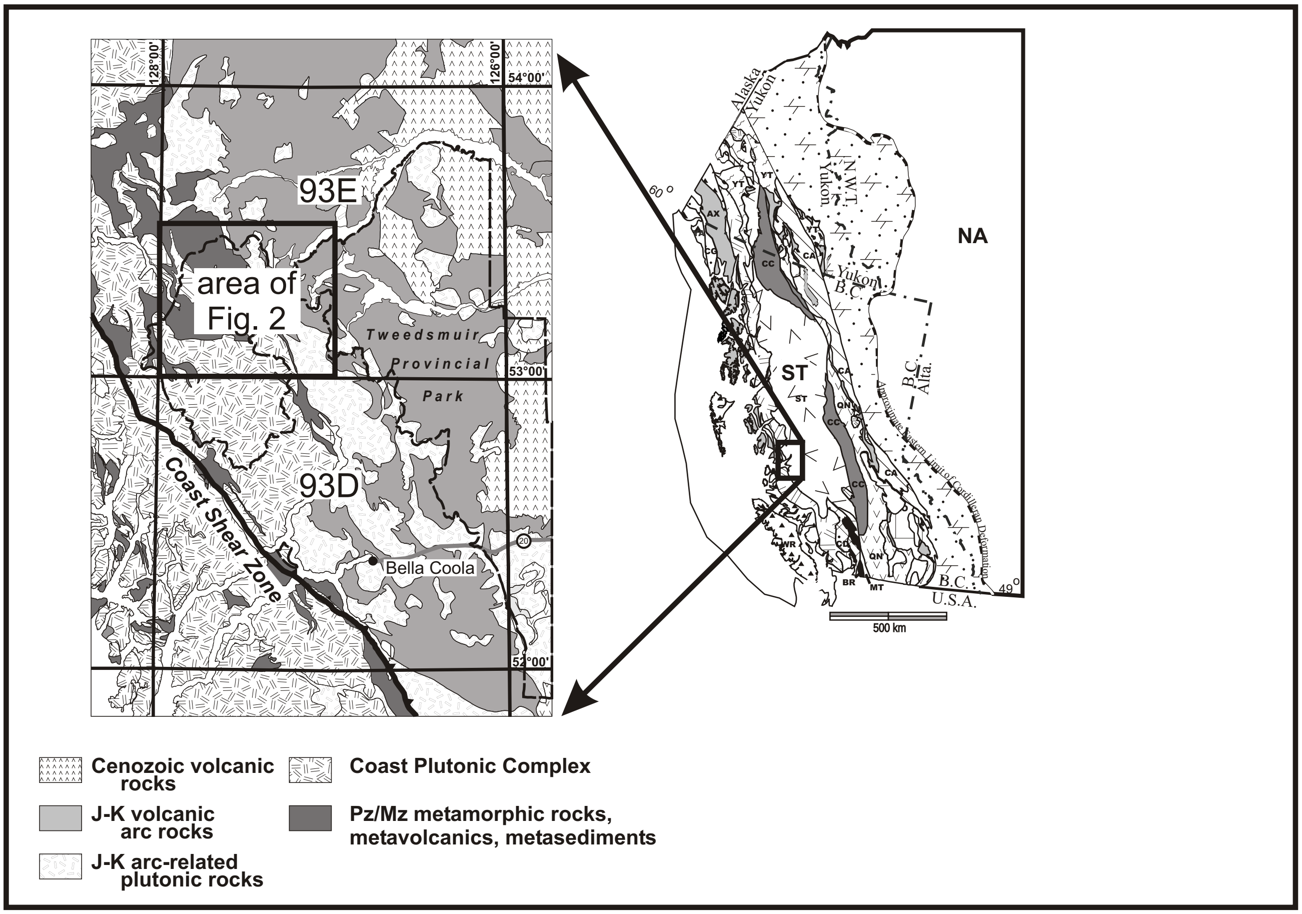

Figure 1. General geological setting of NTS 093D (Bella Coola) and 93E (Whitesail Lake) 1:250 000 map areas; inset map is a schematic terrane map of the Canadian Cordillera, modified from Wheeler and McFeeley (1991).

and occur in well-exposed, generally eastward-younging, gently dipping structural panels along the eastern margin of the Coast Plutonic Complex. These strata comprise a thick (>4 km), bimodal volcanic succession of basaltic and basaltic andesite flows and associated volcanogenic strata, interbedded with and overlain by rhyolitic tuff, lapilli tuff, tuff-breccia, tuffaceous sedimentary rocks and associated rhyolitic domes (Gordee *et al.*, 2005).

The homoclinal, eastward-dipping orientation of the Hazelton Group and available geochronological and biostratigraphic data suggest that Hazelton Group strata become progressively older to the west, with deeper levels of the volcanic system exposed adjacent to the Coast Plutonic Complex. In the southwestern Whitesail Lake map area, rocks

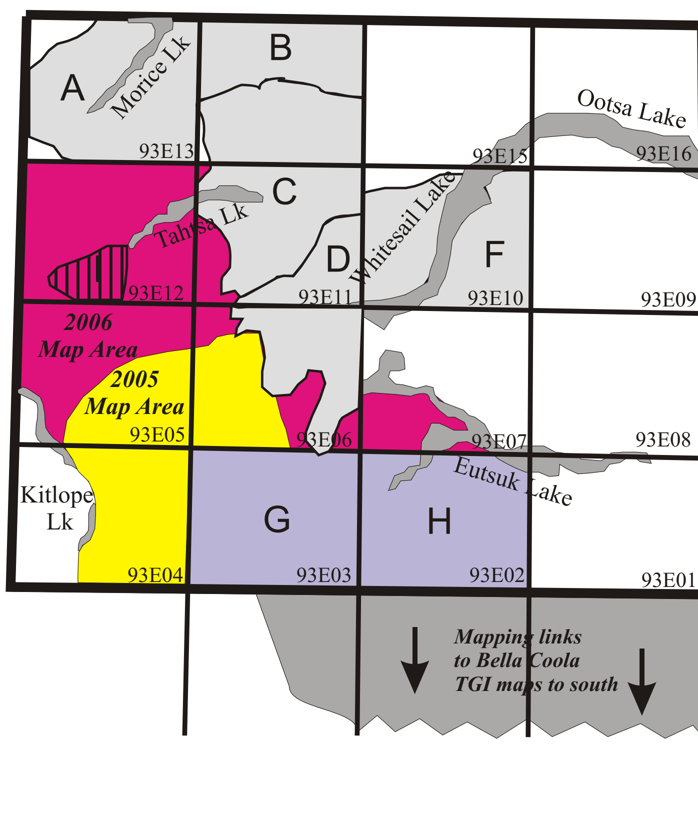

Figure 2. Geographic distribution of existing 1:50 000 geological maps in the Whitesail Lake map area, and the extent of mapping to be conducted under the Geoscience BC program. Light grey areas were mapped by BC Geological Survey teams (*ca.* 1985–1990; letters keyed to reference list); hatched area is thesis map of van der Heyden (1982); medium grey area was mapped by Bella Coola Targeted Geoscience Initiative project in Bella Coola area (NTS 093D; 2001–2003), and NTS 093E/02 and 03 were mapped under the auspices of Rocks to Riches Program (2004).

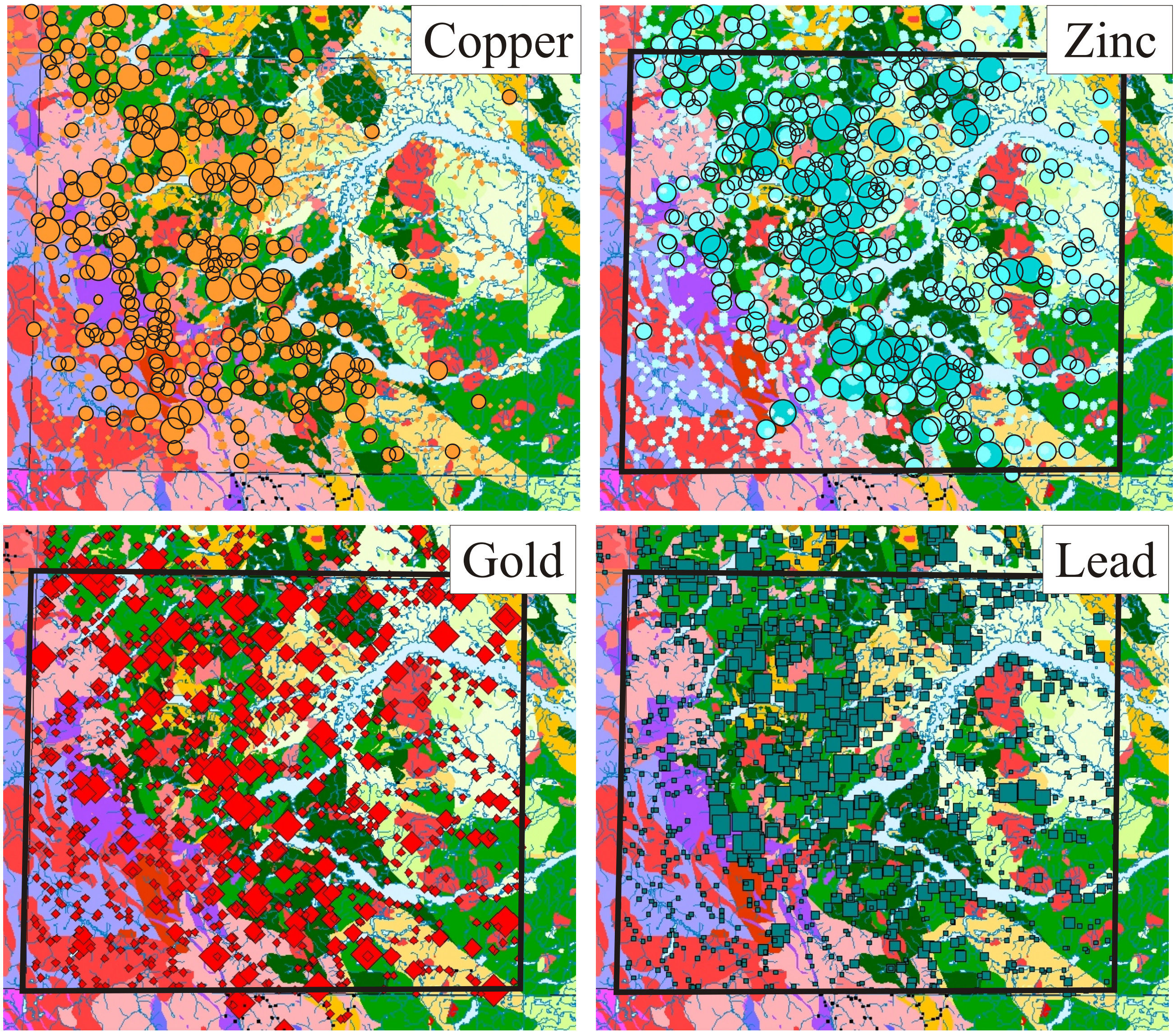

Figure 3. Regional stream sediment elemental anomaly maps for the Whitesail Lake map area. For each element, the relative size of the sample point indicates elemental abundance. Note strong concentration of anomalies along western edge of Mesozoic volcanic assemblages (BC Ministry of Energy, Mines and Petroleum Resources, 1986).

assigned to the Hazelton Group contain a higher proportion of mafic volcanic flows and lesser rhyolitic strata, and include intervals of dark, thin-bedded, fine-grained argillite, siltstone and sandstone. Sedimentary strata intercalated with andesitic flows south of Price Peak yielded a poorly preserved ammonite and bivalve fossil assemblage of Late Pliensbachian to Toarcian age (Haggart, 2005).

The east-to-west facies change to a higher proportion of fine-grained sedimentary strata intercalated with mafic volcanic flows within the Hazelton Group has resulted in previous misidentification of these strata as the Cretaceous Monarch assemblage (Mahoney *et al.*, 2005). It is now recognized, based on fossil ages on lithologically identical strata near Price Peak and on preliminary U-Pb ages (*ca.* 213 Ma) on volcanic strata north of Chatsquot Mountain, that volcanic strata in western Foresight Mountain (NTS 093E/03) and eastern Kitlope Lake (NTS 093E/04) map areas represent older, deeper components of the Hazelton Group stratigraphy. These strata are contained in a series of structural panels that are interpreted to represent an imbrication of several different stratigraphic-structural levels within a single volcanoplutonic-arc assemblage (Mahoney *et al.*, 2005). From the lowest structural level upward, these panels include 1) a foliated to nonfoliated hornblende quartz diorite complex with metavolcanic xenoliths (10–20%) and abundant, roughly east-west trending mafic dikes; 2) metavolcanic and metasedimentary screens (40–50%) within a 'matrix' of texturally and compositionally complex, locally magmatically foliated, biotite-hornblende, pyroxene-hornblende and hornblende diorite to quartz diorite; 3) massive basalt, basaltic andesite and andesite flows, associated tuff breccia and other fragmental rocks; and 4) volcaniclastic sedimentary rocks and associated pyroclastic strata. These structural panels are interpreted to represent 'slices' of a single volcanoplutonic-arc assem-

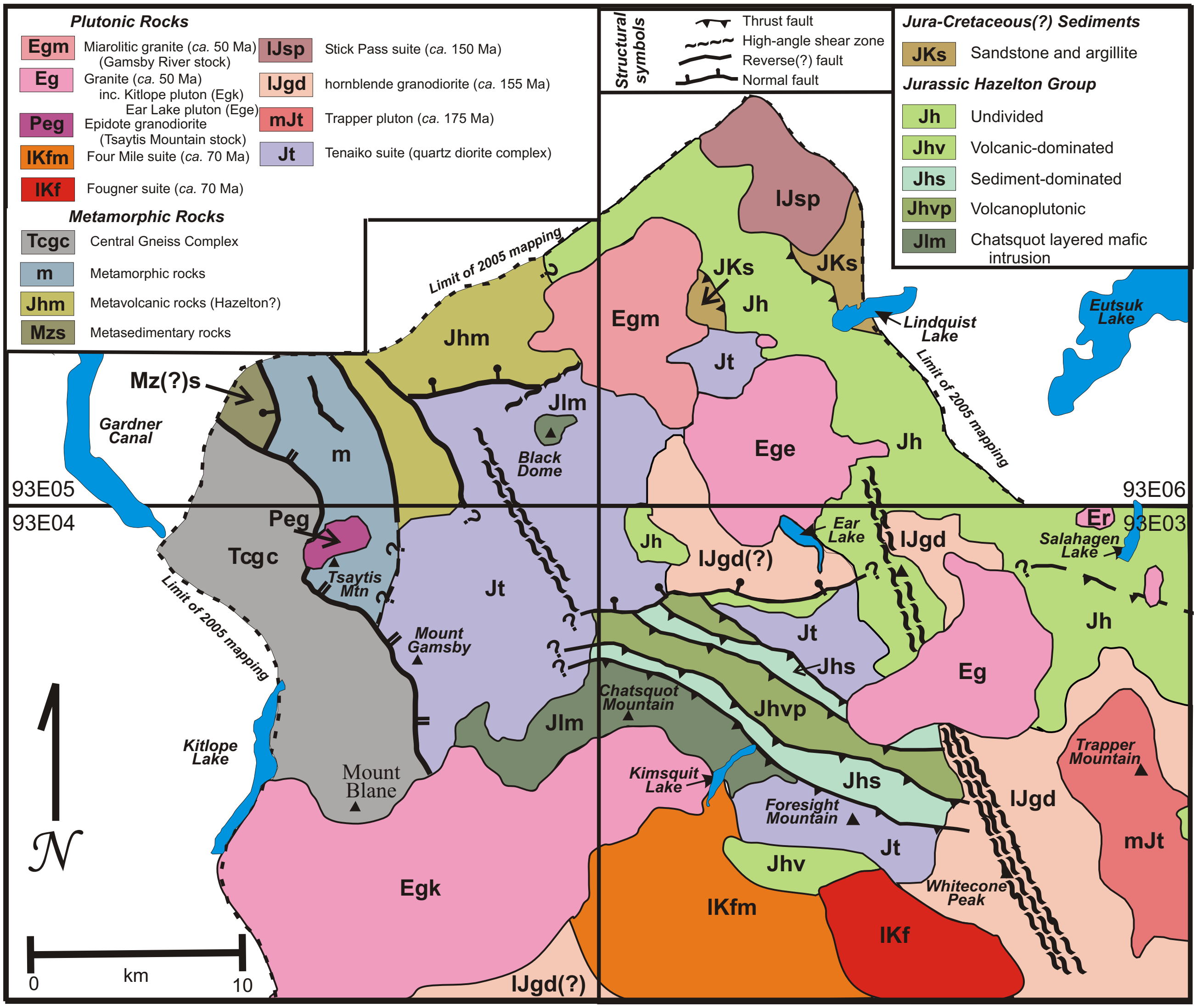

Figure 4. Generalized geology of the southwestern Whitesail Lake map area, showing major lithological units, structures and physiographic features referred to in the text.

blage, from the subvolcanic plutonic roots through the plutonic-volcanic intrusive contact to the surficial volcanic flows and associated volcanogenic sedimentary rocks (Fig. 3). In this succession, the rheologically weak sedimentary intervals tend to form décollement surfaces, whereas the massive flow units tend to be structurally resistant.

Chatsquot Layered Mafic Intrusion (Unit Jlm)

Spectacular exposures of a mineralized layered mafic intrusion (Jlm), exposed on Chatsquot Mountain and the ridges immediately to the southeast and northwest of the main massif, form an important component of the regional volcanic stratigraphy (Fig. 4, 5). Compositional banding in unit Jlm typically consists of variable proportions of olivine, pyroxene, plagioclase and magnetite, and ranges in composition from ultramafic magnetite-olivine websterite to anorthositic gabbro. The prominent foliation in the rock parallels the compositional layering and results in a distinctly layered appearance visible from several kilometres away. Typical compositional layers are less than 1 m thick, with clinopyroxene-rich gabbro (80% clinopyroxene) alternating with more plagioclase-rich layers that distinctly weather to a lighter colour (Fig. 5). Subordinate ultramafic layers include magnetite-olivine-rich rocks, apparent cumulate layers, which weather to a distinctive rusty brown, knobby surface. Along the ridge northeast of Chatsquot Mountain, unit Jlm is cut by numerous andesite porphyry dikes that locally exceed unit Jlm in volume and form intrusion breccias. Unit Jlm extends from Chatsquot Mountain to the southern end of the Mount Gamsby ridge, and also caps the high peaks near Black Dome, where the layered mafic intrusion appears as a large screen within the Tenaiko intrusive suite (Fig. 4).

Hazelton Group (Metamorphosed; Unit Jhm)

The Hazelton group consists of variably metamorphosed mafic to silicic volcanic and volcaniclastic rocks, including andesitic to basaltic flows, tuff-breccia and tuff, with lesser argillite. The metamorphic grade varies widely and generally increases to the west. The metavolcanic rocks include abundant quartzofeldspathic schist and gneiss, epidote-chlorite schist and, locally, actinolite-bearing amphibolite. These rocks have previously been assigned to the Gamsby Group, a succession of pre – Lower Jurassic metasedimentary and metavolcanic rocks (Woodsworth, 1978, 1979, 1980), but are herein inferred to be metamorphosed equivalents of the Lower to Middle Jurassic Hazelton Group, based on their dominantly volcanic character and lack of carbonate interbeds.

Jurassic(?) Argillite and Sandstone (Unit JKs)

A thick argillite and sandstone unit forms the massif of Lindquist Peak, east of Mount Irma (Fig. 4). Although locally overturned, the succession dips to the north and northeast. The overall succession is approximately 2.5 km thick and consists of five alternating units of argillite and sandstone, although one or more of these may be thrust repeated, thereby diminishing the total thickness. Similar lithological facies make up the five sedimentary units, which are, in descending stratigraphic order: 1) an upper mixed argillite and sandstone package; 2) a dominantly argillaceous package, with minor interstratified sandstone; 3) a dominantly massive sandstone package, with minor shale interbeds; 4) a massive, strongly foliated argillite package; 5) a massive sandstone package, similar to 3; and 5) a basal mixed sandstone and argillite package.

The argillite is typically massive, often strongly bioturbated and locally includes lenticular bedding and fine sandstone and siltstone stringers with climbing ripple cross-stratification. Rounded calcareous nodules occur locally. Argillite typically displays strongly developed pencil cleavage and local orange-coloured oxidation. The sandstone is typically massive to cross-stratified, thin to medium bedded (up to 2 m) and fine to medium grained, although it can locally become coarse grained. Sandstone is micaceous but poorly sorted and mud rich, exhibiting flaser bedding and abundant bioturbation. Wood fragments are abundant and bivalve moulds are found as shell lag deposits in a fine-grained, calcareous-cemented facies.

The age of these strata is unclear, although it is likely they are post-Hazelton sedimentary rocks and possibly represent the base of the Jura-Cretaceous Bowser Lake Group in this region.

Figure 5. (Top) Layered mafic intrusion on the flanks of Chatsquot Mountain; (Bottom) distinct banding within the layered mafic intrusion on Gamsby Ridge.

Mesozoic(?) Sedimentary Rocks (Unit Mzs)

In the southern portion of the Tsaytis River 1:50 000 map area (NTS 093E/05), a small fault block north of Tsaytis Mountain contains a rusty-weathering succession of brown to light grey, thin-bedded calcsilicate, micaceous phyllite and fine-grained quartzite. The metasedimentary rocks are tightly folded, displaying abundant mesoscale (0.25–1 m) tight to isoclinal folds. These rocks differ significantly from the metavolcanic rocks that dominate the region. These strata are potentially pre – Early Jurassic in age and may be correlative with continental margin strata of the Burke Channel assemblage described by Gehrels and Boghossian (2000).

PLUTONIC ASSEMBLAGES

Tenaiko Suite (Unit Jt)

The central portion of the map area is underlain by the Tenaiko Range, which is dominated by a heterogeneous assemblage of hornblende diorite to quartz diorite, characterized by complex intrusive relations with adjacent metavolcanic rocks and layered mafic intrusions (Fig. 4). The Tenaiko suite refers to a compositionally and texturally heterogeneous intrusive suite that ranges from a coarse-grained pyroxene-hornblende gabbro to medium to coarse-grained hornblende diorite to quartz diorite with lesser hornblende granodiorite. The suite contains locally abundant mafic and ultramafic xenoliths and metavolcanic screens ranging from a few centimetres to tens of metres in length. The density of the inclusions is variable, ranging from isolated mafic xenoliths to dense intrusion breccias with distinctive interlocking jigsaw clast boundaries (Fig. 6). Intrusive boundaries are highly irregular, with felsic stringers and dikelets invading adjacent country rock. The intrusive rocks are complexly foliated, locally displaying magmatic foliation surrounding entrained, structurally deformed metavolcanic screens, and locally displaying syndeformational folds and postdeformational tectonic foliations.

Figure 6. Tenaiko suite autoclastic breccia, consisting of angular mafic metavolcanic clasts within hornblende diorite.

The age of the Tenaiko suite is unclear. The suite is similar, in part, to rocks on Whitecone Peak and Crawford Peak that yield Late Jurassic U-Pb ages (*ca.* 154–155 Ma), and the suite clearly intrudes rocks mapped as Hazelton Group. However, the close spatial and compositional relationship between the more mafic components of the Tenaiko suite and the layered mafic intrusion (unit Jlm) suggests the Tenaiko suite may be subvolcanic with respect to unit Jlm, which is probably Early Jurassic in age. Geochronology on both packages is in progress.

Paleocene-Eocene Plutonic Rocks

TSAYTIS MOUNTAIN STOCK (PEG)

The Tsaytis Mountain stock is a medium-grained epidote-bearing biotite granodiorite to tonalite exposed on the north flank of Tsaytis Mountain (Fig. 4). The stock displays an upper intrusive contact with dark green pyroxene-hornblende gabbro and chloritic amphibolite, and an intrusive lower contact with quartzofeldspathic gneiss of the Central gneiss complex, and clearly intrudes the Central gneiss detachment fault (see below). The unit displays magmatic foliation defined by biotite segregations, and the foliation parallels the trace of the detachment structure. Geochronology for this unit is critical, as it will constrain the age of extensional faulting in the region.

KITLOPE PLUTON (UNIT EG)

The Kitlope pluton is a massive, homogeneous biotite granite to granodiorite that intrudes the Central gneiss complex southeast of Kitlope Lake. The unit is characteristically medium to coarse-grained, equigranular, locally K-feldspar porphyritic, biotite granite with clean, fresh books of biotite, white to pink K-feldspar, euhedral white plagioclase and large, anhedral quartz blebs. Oxidation of biotite leads to a distinct yellow weathering rind. The intrusive contact is generally sharp, with a locally well-developed intrusion breccia along the boundary. Preliminary age data suggest an Eocene age.

EAR LAKE PLUTON

The Ear Lake pluton is a pink, medium to coarse-grained, locally muscovite-bearing biotite granite. The unit is relatively homogeneous, with minor amounts of mafic xenoliths along the pluton margins and a minor component of aplite dikes. The pluton is cut by abundant east-trending, steeply north-dipping joints that produce blocky, angular talus. The unit intrudes rocks of the Hazelton Group and Tenaiko suite along a sharp irregular contact that seems to represent emplacement by passive inflation of overlying country rock.

GAMSBY RIVER STOCK (UNIT EGM)

The Gamsby River stock is a pink, medium to coarse-grained, miarolitic biotite granite. The pluton appears massive, homogeneous and undeformed. Adjacent to the margin, 30–50 m wide, locally flow-foliated granitic dikes with aplitic margins occur. The pluton has sharp, well-defined contacts with the Hazelton Group, associated metavolcanic rocks and the Tenaiko suite. The steep, near-vertical lateral margins, convex upward upper contact and presence of miarolitic cavities suggest diapiric emplacement at shallow crustal levels. The pluton yields a K-Ar age on biotite of 48.9 ±2.5 Ma (Wanless *et al.*, 1979), which is an uplift age, but the evidence for shallow emplacement suggests that this age approximates the timing of crystallization.

METAMORPHIC ASSEMBLAGES

Central Gneiss Complex (Unit Tvgc)

The eastern half of the Kitlope Lake (NTS 093E/04) 1:50 000 map area is underlain by a distinctive series of upper amphibolite to granulite-facies quartzofeldspathic gneisses that have been strongly deformed in a ductile fashion. These rocks are part of a broad belt of high-grade metamorphic rocks, referred to as the Central gneiss complex, that extends up the eastern edge of the Coast plutonic complex from about 53° to 56°N (Rusmore et al., 2005). In the southern Whitesail Lake map area, the Central gneiss com-

Figure 7. Tight folds with quartzofeldspathic gneiss of the Central gneiss complex, looking south toward Kitlope Lake.

plex is dominated by orthogneiss, including interleaved quartzofeldspathic gneiss, hornblende-biotite tonalitic gneiss, amphibolitic gneiss and lesser amphibolite. Mineralogy is predominantly quartz, plagioclase, hornblende and biotite, with locally abundant epidote. Pegmatitic garnet-bearing granitic dikes occur locally. Ductile deformation fabrics, primarily mesoscale (0.5–1.5 m amplitude) tight to isoclinal folds and associated axis-parallel foliation planes, are common (Fig. 7). The mean fold-axis orientation, estimated from the ridges north of Tsaytis Mountain (n = 29), is 53–143° (Fig. 8).

Paleocene(?) Metamorphic Rocks

The Central gneiss complex is exposed in the lower plate of a major low-angle extension fault that separates the gneiss complex from lower grade rocks in the upper plate (see below; Fig. 4). The upper plate consists of a series of imbricate structural panels of metaplutonic and metavolcanic rocks that distinctly decrease in metamorphic grade to the east of the detachment fault. Northwest of Black Dome, approximately 7–8 km east of the detachment fault, greenschist to locally lower amphibolite facies metavolcanic rocks are inferred to be metamorphosed Hazelton Group rocks (unit Jhm; Fig. 4). The area between these metavolcanic rocks and the detachment fault is underlain by an imbricated series of amphibolite, chloritic mafic metavolcanic rocks and strongly foliated diorite, tonalite and granodiorite that ranges in metamorphic grade from upper greenschist to upper amphibolite. The increased metamorphic grade and significantly higher proportion of metaplutonic rocks distinguish this succession from lower grade rocks to the east, and the presence of abundant chlorite distinguishes it from the Central gneiss complex to the west. The succession apparently consists of a number of imbricated structural panels that interleave metavolcanic and metaplutonic rocks of different metamorphic grade, and these rocks presumably represent a structural level intermediate between the Central gneiss complex and lower grade rocks of the upper plate to the east. Regionally, peak metamorphism in the Central gneiss complex is interpreted to be Paleocene in age (Hollister and Andronicos, 2000), and the spatial proximity and metamorphic similarity of these rocks to the Central gneiss complex suggests they are Paleocene in age.

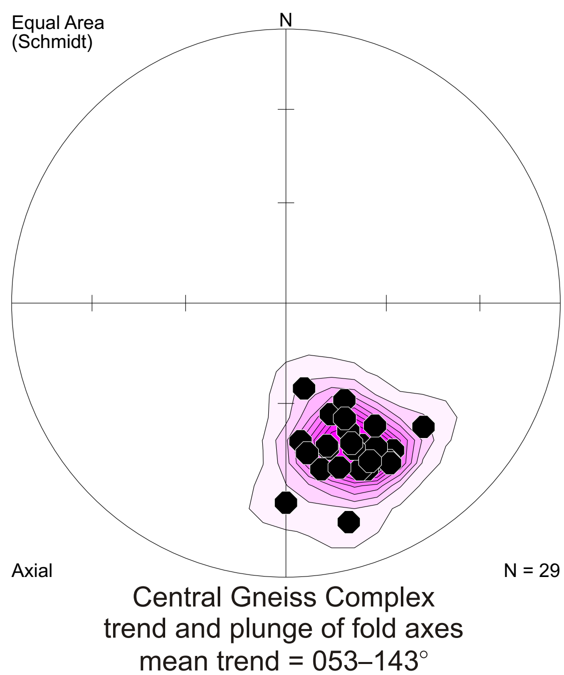

Figure 8. Stereonet of fold-axis orientations in Central gneiss complex northwest of Tsaytis Mountain.

STRUCTURAL FEATURES

Central Gneiss Detachment

The contact between high-grade gneissic rocks of the Central gneiss complex and lower grade rocks of the eastern Coast plutonic complex and western Stikine Terrane is commonly difficult to locate accurately. In the southwestern Whitesail Lake map area, upper amphibolite to granulite facies rocks of the Central gneiss complex are separated from greenschist to lower amphibolite grade rocks of the Tenaiko suite and Paleocene(?) metamorphic rocks by a low-angle, east-dipping detachment fault (Fig. 4). Northeast of Tsaytis Mountain, the upper plate of this structure contains imbricated structural panels of greenschist facies chloritic metavolcanic rocks, lower amphibolite facies metavolcanic rocks and metatonalite. The structural panels are apparently separated by steep, west-dipping faults of unknown displacement. These faults locally juxtapose amphibolitic metavolcanic rocks and metatonalite against greenschist facies metavolcanic rocks; in other cases, the metamorphic transition appears more gradational. These structurally interleaved panels decrease in metamorphic grade from west to east, and grade into sub-greenschist to greenschist grade basaltic to andesitic metavolcanic rocks to the northeast. South of Mount Gamsby, the lower plate consists of the Tenaiko suite with locally abundant metavolcanic screens. The volume of plutonic rocks decreases to the south, where diorite of the Tenaiko suite intrudes mafic rocks of the Chatsquot layered mafic intrusion (Fig. 4). The detachment fault is exposed due west of Mount Gamsby, where high-grade rocks of the Central gneiss complex are structurally overlain by lower grade rocks of the Tenaiko suite across a low-angle, east-dipping shear zone. Elsewhere, the detachment structure is either not exposed or is intruded by a distinctive epidote-biotite granodiorite. However, the boundary between the upper and lower plates is readily recognized by the abundance of chloritic rocks in the upper plate and the absence of chlorite in the lower plate.

Contractional Structures

The western portion of the Foresight Mountain 1:50 000 map area (NTS 093E/03) is underlain by an imbricate stack of northeast-vergent thrust sheets that complexly imbricates various structural levels within the Hazelton Group. The primary décollement horizons are within sediment-dominated intervals, with the massive mafic volcanic units acting as structural buttresses. Regional mapping suggests this thrust system is continuous with the Late Cretaceous Mount Waddington fold-and-thrust system, exposed in the Bella Coola map area to the south (Haggart *et al.*, 2003, 2004). The system is truncated on its eastern side by a high-angle north-northwest-trending dextral shear zone that roughly parallels the Kimsquit River valley. This shear zone is cut by a biotite granite of presumed Eocene age, providing a minimum age for the contractional deformation. The northwestern extent of the thrust system is unclear. Rocks in the upper plate of the Central gneiss detachment are cut by numerous northwest-trending, steeply west-dipping structures that imbricate fault panels of differing metamorphic grade. These structures may represent deeper levels of the thrust system.

Translational Shear Zones

Several high-angle shear zones transect the area and cut all pre-Paleocene rock units. One of the larger shear zones parallels the Kimsquit River valley, extending north from the northern end of Dean Channel through Whitecone Peak and the eastern flank of Crawford Peak and continuing out of the area (Fig. 4). This shear zone continues south into the Bella Coola map area, where it apparently connects into the Pootlass shear zone (Haggart *et al.*, 2004). The shear zone is recognized in plutonic rocks by the presence of pervasive near-vertical fracture planes and locally in-

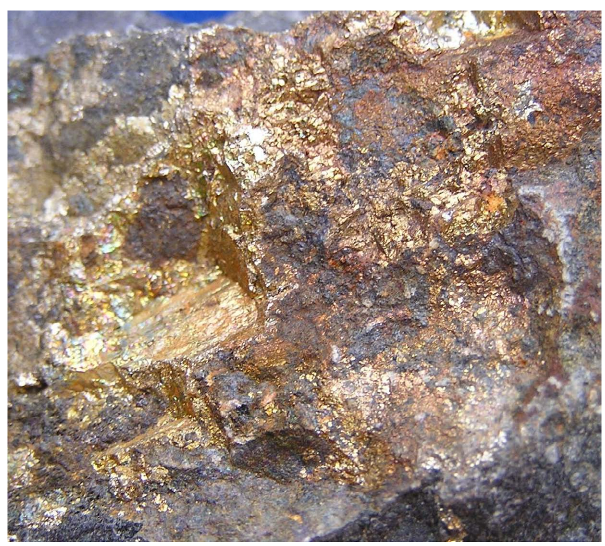

Figure 9. (Left) View looking north at the south flank of Chatsquot Mountain shows rusty gossan developed along pyrite-chalcopyrite veins near the top of the peak. (Right) Pyrite-chalcopyrite vein mineralization is most intense where localized along shear zones and along boundaries with Eocene(?) granite dikes crosscutting the Chatsquot layered mafic intrusion. Copper-nickel sulphide mineralization is also widely disseminated in individual pyroxenite and norite layers near the southern edge of the intrusion and along veins where sulphide minerals have been subsequently remobilized by hydrothermal fluids.

tense foliation development, manifested by mineral re-alignment and the stretching and reorientation of xenoliths and metamorphic screens. East of Crawford Peak, graphitic phyllite, chloritic schist, and clastic metasedimentary and metavolcanic rocks are incorporated into the shear zone, and dextral transpression is indicated by the orientation of kink bands and isoclinal folds with moderately plunging (30–35°) fold axes (Mahoney *et al.*, 2005). A second prominent shear zone extends from Chatsquot Mountain northwest toward Black Dome. This shear system is approximately 1–1.5 km wide and consists of chloritic schist, micaceous schist, local actinolitic schist, foliated hornblende diorite and granodiorite, and pods of pyroxene gabbro that are crosscut by syndeformational andesitic to basaltic dikes. The shear zone is characterized by northwest-trending foliation containing prominent, moderately northwest-plunging intersection and mineral-elongation lineations. The shear zone is flanked on both sides by the Tenaiko suite, suggesting a lack of major offset along the system. The shear zone must dissipate at its southern end, as it cannot be traced through the series of thrust faults mapped north of Chatsquot Mountain. The presence of high-angle shear zones at both ends of the thrust system suggests that the thrust system may represent a contractional step over at a restraining bend along a dextral transpressional system.

ECONOMIC POTENTIAL

The primary objective of this investigation is to evaluate the economic mineral potential of Mesozoic volcanogenic assemblages and Jurassic to Tertiary plutonic rocks in the southern Whitesail Lake map area. Preliminary analysis of bedrock geological mapping, both in the current map area and in areas to the east and southeast, suggests that there are three potential targets of economic importance.

Volcanogenic Massive Sulphide Deposits within the Hazelton Group

Preliminary facies analysis, geochronology and geochemistry from the southern Whitesail Lake map area (Gordee *et al.*, 2005) and the Bella Coola area to the south (Diakow *et al.*, 2003) indicate that these rocks are age equivalent to host rocks for the Eskay Creek volcanogenic massive sulphide (VMS) deposit, and are characterized by predominantly shallow-water deposition, probably in a rifted-arc setting. The similarities between these strata and those in the Eskay Creek area suggest that the Hazelton Group in the southern Whitesail Lake area is highly prospective for VMS mineralization. In a regional sense, Hazelton Group strata form an east-dipping homocline, with older, deeper strata exposed to the west. These strata also display a higher degree of structural and metamorphic alteration. However, the recognition of stratiform sulphide mineralization, primarily disseminated chalcopyrite, pyrite in bedded volcanogenic metasedimentary rocks, at several locations in metamorphosed Hazelton Group strata north of Black Dome (Fig. 4) indicates that there is VMS potential in western exposures of the Hazelton Group.

Chatsquot Layered Mafic Intrusion

The Chatsquot layered mafic intrusion (described above) may have potential for significant Cu-Ni sulphide and PGE mineralization. Some pyroxene-rich compositional layers (clinopyroxene gabbro) near the southwestern contact have substantial chalcopyrite (or Cu-Ni sulphide) mineralization, both as disseminated stratiform sulphides and sulphide veins (Fig. 9). Preliminary geochemical values in unmineralized gabbro indicate elevated Cu and Ni values (>130 ppm Cu, >400 ppm Ni); PGE assays are in progress.

Cu±Mo±Au Porphyry Mineralization

Paleocene and Eocene plutonic rocks in the southwestern Whitesail Lake map area are generally coarse grained, locally porphyritic granitic rocks that were apparently emplaced at relatively shallow levels. Intrusive contacts with adjacent country rock are generally sharp, although extensive (tens of metres) of variably mineralized intrusive breccia occur locally, and there is evidence of sulphide, primarily Cu and Mo, remobilization along some intrusive boundaries. Geochemical and geochronological studies of these plutons are underway, and assay samples collected from alteration zones adjacent to pluton margins have been submitted. The character of potential porphyry targets will be examined in detail during the course of this investigation.

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ADDENDUM

PROGRAM PURPOSE AND SCOPE

This fieldwork article reports the preliminary findings of a bedrock mapping project designed to examine the western side of the Whitesail Lake, 1:250 000-scale map area. The principal goal of this investigation is detailed geologic mapping (1:50 000 scale) and economic mineral assessment of the eastern Coast Plutonic Complex and western Stikinia in the southwestern and western Whitesail Lake map-area.

Stream sediment geochemistry, MINFILE data and detailed geologic mapping farther north in Whitesail Lake map-area, and to the south (eastern Bella Coola map-area), indicate potential for volcanogenic massive sulphide, Cu±Mo±Au porphyry, and Ni-Cu-Cr-PGE mineralization.

The primary objective of this current program is to establish the geologic framework for potential economic mineralization in the region, as opposed to targeting specific mineral occurrences. Documentation of the regional structure, stratigraphy, geochemical character and geochronology benefits not only local but also regional exploration programs. The area under investigation includes the area surrounding the Kitlope Heritage area and the areas along the western edge of Tweedsmuir Park (Figure 1). Our goal is to establish the regional geologic framework with respect to potential economic mineralization. Maps from this investigation will be linked with our mapping to the east (Mahoney *et al*., 2004), south (Haggart *et al*., 2004) and the northeast (numerous BCGS maps) to provide comprehensive regional coverage of a significant portion of the eastern Coast Belt.

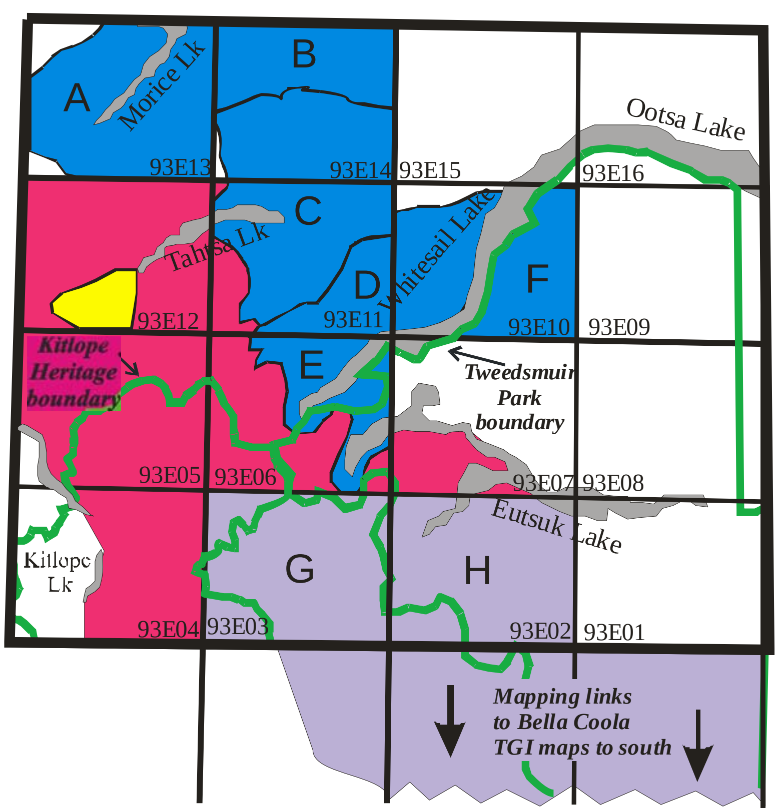

Figure 1: Geographic distribution of existing 1:50,000 geologic maps in the Whitesail Lake map area, and the extent of proposed map area (shown in red). Blue areas were mapped by BCGS teams (ca 1985-1990; letters keyed to reference list); yellow area is thesis map of van der Heyden (1982); purple area was mapped by Bella Coola TGI project in Bella Coola area (93D; 2001-2003), and 93E2/3 were mapped under auspices of Rocks to Riches program (200