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Geology of the Amber - El Amino Area, Ecstall Metamorphic Belt, British Columbia (NTS 103 H)

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INTRODUCTION

The Amber - El Amino area is located 75 kilometres southeast of Prince Rupert. Access to the area is by helicopter from Prince Rupert or Terrace (Figure 1). The El Amino showing (BC MINFILE 103H 071) is located on Sulphide Creek (Figure 2) which drains eastward into Hanna (El Amino) Creek. The Amber showing (BC MINFILE 103H 171) is located 700 metres north of the El Amino showing. Hanna Creek drains northwestward into Sparkling Creek, a tributary of the Ecstall River.

The Amber-El Amino area consists of a steep-sided, U-shaped glacial valley and rounded, undulating ridge-tops. The highest point along the ridgecrests is 1475 metres and elevation drops to 400 metres on the valley floor. The climate is wet and mild; vegetation ranges from dense, lush coastal rainforest in the valleys to alpine heather on the ridge tops. Proximity to the ocean results in high annual precipitation and a large accumulation of snow. In late August, much of the alpine areas were still covered with thick snow, and permanent snowfields cover parts of the ridgecrests.

The first reported prospecting in Hanna Creek was conducted by George Frizzell and J.B. Roerig of Prince Rupert sometime prior to 1950 (Mason, 1951, p.5, Holyk, 1952, p.29-31 and Douglas, 1953, p.21). Sulphide mineralization described in Frizzell's notes, and marked on a set of photographs, was later referred to as the "Frizzell outcrop". In 1952, some years after Frizzell's death, a prospecting party led by W. Holyk returned to the headwaters of Hanna Creek to relocate and resample the Frizzell outcrop, guided by the annotated photographs. From his notes and sketch map, reproduced in this report, it is clear that Holyk located the same mineralization now known as the El Amino prospect. The assay from Holyk's sample was disappointing, but one claim, the Billy Goat mineral claim, was staked and recorded at Prince Rupert.

The Amber- El Amino area was staked again in 1980 by US Borax as the Bent claims, after anomalous Mo and Pb values were obtained in a stream silt sample. Chalcopyrite-mineralized float was discovered in a follow-up prospecting visit (Shearer, 1988), but the company's primary target was porphyry Mo deposits and the Bent claims were allowed to lapse the following year.

In 1987, Algonquin Minerals staked the same area once more as the El Amino, Samson, Briton and Regal claims. The El Amino (Frizzell) showing was re-discovered during preliminary prospecting of the prominent rusty cliffs along a tributary on the west side of Hanna Creek. A follow-up soil sampling program was conducted in 1988, but these claims also lapsed.

In 1990, Darren Hayes staked the property as the Amber-1 claim and conducted a prospecting and silt sampling program (Renning, 1990). The Amber sulphide showing was discovered during a follow-up prospecting traverse in 1991 (Renning 1992).

This writer's work in the area during the 2000 field season included traverses along ridgecrests to the east, west and south of the Hanna Creek valley over a period of four days. Geological mapping of the Amber-El Amino area is part of a regional mapping program of the Ecstall greenstone belt for the Mid-Coast VMS Project (Alldrick and Gallagher, 2000). Samples were collected from representative lithological units and from strongly pyritic zones. The two prospects were not examined during these traverses, however the MINFILE location for the El Amino showing has been corrected and the deposit description updated, and the Amber showing has now been added to the MINFILE database.

REGIONAL GEOLOGIC SETTING

The Ecstall metamorphic belt is part of the Central Gneiss Complex which consists of Proterozoic(?) to Paleozoic metasedimentary and metavolcanic rocks (Alldrick and Gallagher, 2000 and Gareau, 1991). Regionally, these metamorphic rocks are bounded and intruded by late Silurian to Eocene plutons of the Coast Plutonic Complex.

Gareau (1997) produced a colour geological map of the Ecstall belt, which is interpreted as a Devonian volcanic arc, consisting of metasedimentary and metavolcanic rocks intruded by the comagmatic Big Falls orthogneiss (tonalite). The belt is bounded on the west by the Late Cretaceous Ecstall pluton, and on the east by the Late Paleocene to early Eocene Quotoon pluton.

Rocks of the Ecstall metamorphic belt have been deeply buried and metamorphosed to amphibolite facies.

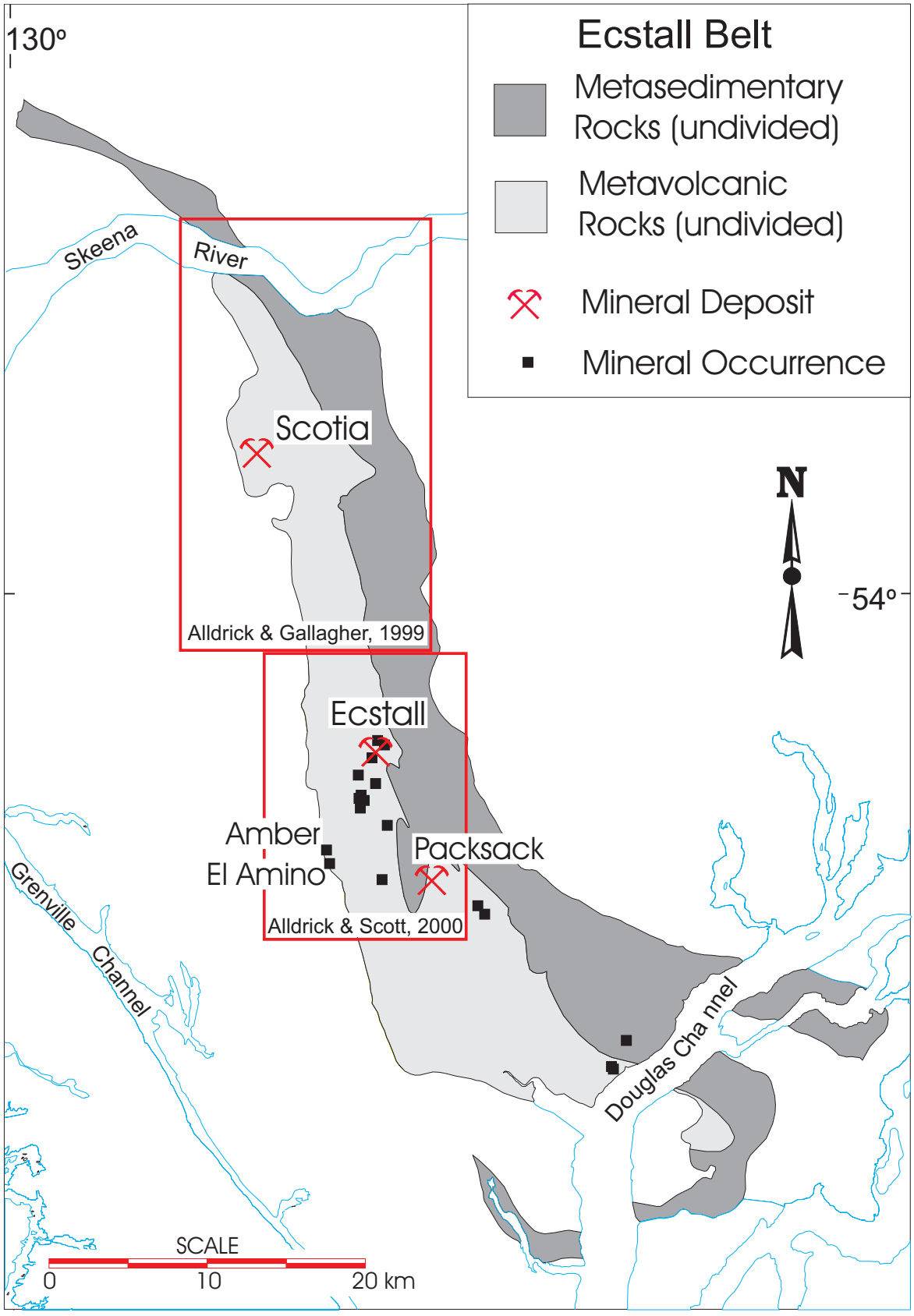

Figure 1. Simplified Geology and mineral prospects of the Ecstall Belt.

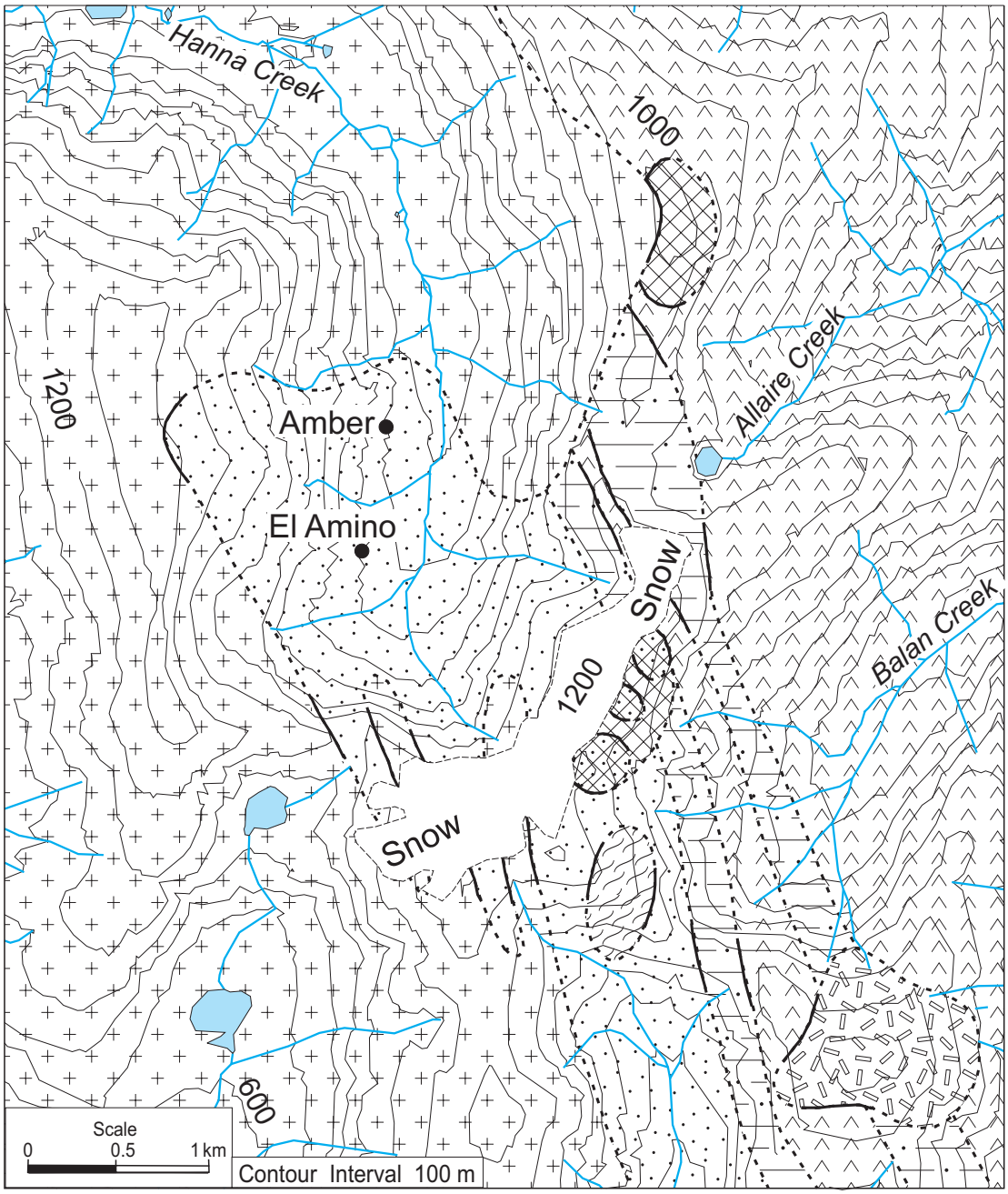

Figure 2. Geology of the Amber - El Amino area.

Regional retrograde metamorphism has been correlated with the intrusion of the Ecstall or Quotoon plutons.

GEOLOGY

The geology of the Amber-El Amino area is shown on Figure 2.

Stratified Rocks

Paleozoic metasedimentary rocks are interlayered siltstones and sandstones (arkose and quartzite). These are well-foliated and locally highly folded and contorted. Small, discontinuous carbonate lenses were noted in several outcrops and a 5 metre thick band of calc-silicate-altered metasedimentary rock was mapped at one location. A 10 metre thick fine-grained diorite sill intrudes the metasedimentary rocks at one site, and rare, narrow pegmatite dikes also cut these units.

Metasiltstone is dark grey to black fine-grained rock with granoblastic to schistose to hornfelsed texture. These rocks weather medium to dark grey to black, but pyritic exposures are rusty to buff weathering. Units are typically a few metres thick, finely laminated and interbedded with meta-arkose and/or quartzite, however they can form bands several metres thick. This rock is locally garnetiferous, with up to 10 percent fine to medium-grained (up to 8 mm diameter) red garnets.

Quartzite is typically coarsely laminated (tens of centimetres thick), with local exposures showing fine laminations. Quartzite is commonly interlayered with metasiltstone and meta-arkose, but may form monolithologic sections up to 40 metres thick. It forms a hard, pale grey, granoblastic rock, with widely spaced (5 to 10 cms) micaceous partings.

Meta-arkose is the least common metasedimentary rocks and does not form thick units. It consists of dark grey, arkosic, micaceous bands within metasiltstones and quartzites, and it typically grades into quartzite.

Metavolcanic rocks crop out in the southwest map area as foliated, contorted, greenish-grey to black, medium-grained, chlorite-altered mafic tuffs, which are locally epidote-rich.

Contacts between metasedimentary units and metavolcanic rocks and between different metasedimentary lithologies typically consist of wide zones of alternating interlayered bands. Contact relationships with intrusive rocks are complex. Metasedimentary rocks tend to be highly buckled near intrusive contacts. Within plutonic rocks, rafts of metasediments up to 40 metres thick appear for hundreds of metres into the pluton; small sills of the intrusive also occur interlayered within the metasedimentary rocks near the contact. The result is an overall `gradational' contact between a pluton and enclosing sediments.

Plutonic Rocks

Ecstall Tonalite

Regionally, the late Early Cretaceous Ecstall batholith includes diorite, tonalite and granodiorite phases (Gareau, 1991). In this study area, two distinct phases were noted: equigranular tonalite and porphyry. A distinctive feature of the Ecstall pluton is the presence of magmatic epidote, which increases in abundance from the margins to the centre of the intrusion. Within 200 metres of the contact, no epidote is apparent; it becomes progressively more abundant moving into the pluton, appearing first in fractures, then as fine interstitial grains, finally as equigranular coarse grains making up to 5% of the rock volume.

Equigranular hornblende-biotite-epidote tonalite ranges from light to medium grey on fresh surfaces, weathers medium to dark grey, and is locally rusty coloured. Grain size typically ranges from medium to coarse-grained equigranular, but local very coarse-grained phases were noted. The rock ranges from massive to moderately foliated, with the foliation defined by the alignment of mafic minerals. Foliation is generally more intense near the pluton margins. Primary layering (flow-banding or cumulate layering) was noted in one location. The pluton is highly sheared in places, mylonitic and pyritic shear zones were mapped in the northwest map area. Cobble to boulder size mafic xenoliths are locally abundant. Screens of metasedimentary rock up to 40 metres wide are typically incorporated near the margins. Narrow (50 to 100 cm wide) lamprophyre and pegmatite dikes cut the Ecstall pluton.

Ecstall porphyry is dark grey massive diorite(?) with an aphanitic groundmass and feldspar phenocrysts 3 to 4 millimetres across. Narrow lamprophyre dikes cut this unit and in one location the porphyry incorporates a 15-metre-thick screen of country rock composed of a calc-silicate unit and a thin metavolcanic interval.

Diorite

Fine-grained foliated diorite intrudes the metasedimentary rocks. The diorite crops out as a single large intrusion (400 metres wide) and as smaller sill-like layers in the metasediments. Near the margins of the main intrusion, 10 to 15-metre-thick screens of quartzite occur. In one outcrop, the diorite grades into black, moderately foliated, medium-grained, chlorite-altered amphibolite. This unit may be a phase of the mid-Devonian Big Falls tonalite.

Hornblendite

Coarse, massive hornblendite intrudes quartzite and mixed metasediments in the eastern map area. The fresh rock is black, and weathers rusty brown. The hornblendite is medium to very coarse-grained, with hornblende (var. pargasite) crystals ranging up to 1.4 centimetres in diameter. Metasediments within 1 to 2 metres of the intrusive

contact are buckled, and screens of quartzite are incorporated near the margin of the intrusion.

STRUCTURE

Rocks in the Amber - El Amino area are dominantly northwest-trending and dip steeply. S_1 foliation is defined by the alignment of micas in metasedimentary and metavolcanic rocks, and by the alignment of mafic minerals in plutonic rocks.

S_0 is not well preserved, however two clear examples were found. In an outcrop of metasediments an S_0/S_1 intersection lineation was displayed, and cumulate layering was observed in one outcrop of Ecstall tonalite. Lineations, consisting of intersection lineations and minor fold axes, plunge steeply to the southeast. Together, these features suggest large-scale folding about an axis plunging 72º towards 150º.

MINERALIZATION

There are two MINFILE occurrences in the map area, the Amber and El Amino showings (Figure 2). Both showings consist of disseminated to massive sulphides hosted within the metasedimentary rock package. This contrasts with all other mineral occurrences in the Ecstall metamorphic belt, which are hosted within the metavolcanic rock sequence (Gareau, 1997 and Alldrick and Gallagher, 2000).

El Amino

Shearer (1988) describes this massive sulphide prospect that crops out in Sulphide Creek, a small tributary to Hanna Creek. The host rock sequence includes quartzite and limy siltstone, with minor calcareous sandstone. This succession is cut by pegmatite dikes. The sulphides are conformable and can be walked out for 30 metres then visually traced for another 30 metres up steep cliffs. The host rock metasediments are folded into a tight antiform; the sulphide layer ranges from 40 centimetres thickness in the west limb to 1.4 metres wide at the fold nose. Mineralization consists of pyrrhotite and chalcopyrite with minor sphalerite and galena.

Three styles of mineralization are present:

- Light green-grey granular rock with abundant disseminations and small lenses of pyrrhotite and 2-3 cm biotite knots with pyrrhotite and chalcopyrite rims. Gangue is mainly massive, non-foliated medium to coarse-grained calcite.
- Sulphides occur in rough layers, with massive pyrrhotite layers and pyrite nodules in some exposures. Gangue is fine grained and siliceous.
- Abundant chalcopyrite-bearing float boulders are found in the valley downslope. Grab samples from these boulders assay up to 4.46 % copper and 240 ppm silver, while the best assay obtained at the El Amino showing is 1.0% copper and 31 ppm silver. Shearer (1988) concludes that the likely source of the high-grade boulders is another sulphide horizon high up the cliffs.

The El Amino prospect described by Shearer is undoubtedly the Frizzell outcrop mentioned by Mason (1951, p.5), Holyk (1952, p.29-31) and Douglas (1953, p.20-21) and visited by Holyk 36 years earlier. Holyk's description and prospecting sketch map (Figure 3) are reproduced below:

"Massive sulphide deposits were found in the upper reaches of Hanna Creek. The deposits are located on the west side of Hanna Creek about 600 feet above the main valley floor and alongside an intermittent stream which flows into Hanna Creek at 1300 feet elevation. This position is approximately a half mile from the head of Hanna valley. The deposit occurs at a position corresponding with one of Frizzell's photographs and is believed to be the deposit reported by G. Frizzell, Prince Rupert B.C. to occur in the area.

The sulphide deposits occur as four separate lenticular bodies along a horizon of argillaceous quartzite and are replacements of this bed. ...The largest body is 40 feet long, has a maximum true width of 3 feet at its mid portion, pinches out along strike at both ends, and is exposed along a dip slope (55º) distance for 10 to 15 feet. Three other lenticular bodies occur along strike of the quartzite horizon above the largest lens. They are 10 feet or less in length and have a true width of 1 foot or less. The four bodies are exposed along a slope distance of 200 feet."

The lenticular bodies are sulphide replacements of the quartzites and generally the sulphides form about 20-30% of the rock, but irregular plums of massive sulphide occur. Pyrrhotite is the dominant mineral. Sphalerite and chalcopyrite are locally abundant. A chip sample of the largest body assayed as follows: trace Au, 0.2 opt Ag, trace Pb, 0.6% Zn, 0.5% Cu, 35.6% Fe, 23.4% S.

Overburden conceals the mineralized horizon east of the sulphide outcrops down to Hanna Creek 600 feet be-

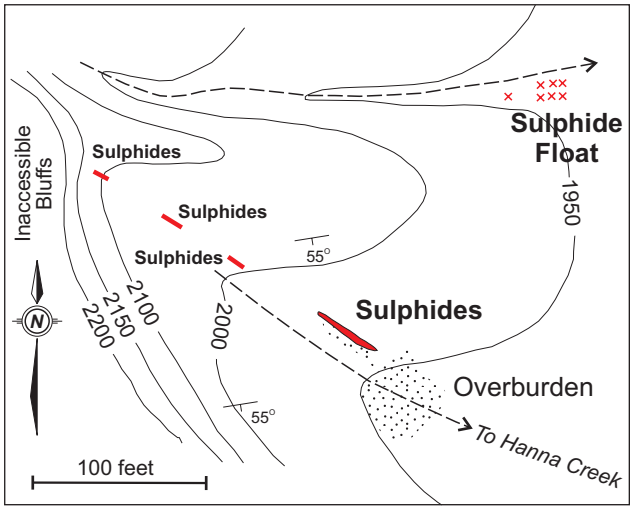

Figure 3. Sketch map of the Hanna Creek (El Amino) sulphide deposit (from Holyk, 1952).

low. The same horizon extends uphill to the west and occurs near the top of shear bluffs. This area is not accessible. Sulphide float was observed in a creek below these bluffs indicating that other lenses of sulphide might be present. The same horizon was investigated 1000 feet higher in elevation above the sulphide showing, but no mineralization was found.

Most of the rocks in the Hanna Creek area are granites with the exception of a quartzite wedge approximately 1000 feet wide in the upper reaches of the valley and in which the sulphides occur. The writer feels that the favourable area (non-granite) has been adequately prospected and that no major deposit in the area has been overlooked.

One claim, the "Billy Goat" mineral claim, was staked in this area and recorded at Prince Rupert B.C....The claim covers most of the area favourable to further sulphide occurrences."

Amber

At the Amber prospect, 700 metres north of the El Amino Prospect, massive sulphide mineralization is exposed along an east-draining creek (Renning, 1992). Sphalerite, chalcopyrite, pyrite and galena are hosted by dark quartzite. The showing is 60 centimetres wide and exposed for just 1.5 metres along strike before it is covered by overburden. No assay results are reported by Renning (1992), however analyses of soil and stream silt samples include 9 ppb gold, 1 ppm silver, 110 ppm copper, 186 ppm zinc and 1320 ppm barium.

DISCUSSION AND CONCLUSIONS

The Amber and El Amino deposits are significant because they are hosted by metasedimentary units, while all other prospects in the Ecstall Metamorphic Belt are hosted in the metavolcanic sequence. This indicates the potential for further discoveries within these largely unexplored units. The Amber-El Amino area has not been fully explored; steep valley walls hinder prospecting, and ropes and specialized climbing gear will be required to further investigate the mineral potential in the area of these two prospects (Shearer, 1988). Abundant chalcopyrite-rich float boulders along the valley floor of El Amino Creek (Shearer, 1998) and in the creek bed immediately north of Sulphide Creek (Figure 3 and Holyk, 1953), indicate the presence of additonal higher grade mineralization that has not been located in outcrop. All of the numerous tributary creeks should be sampled for stream sediment geochemistry.

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