GEOLOGICAL ASSOCIATION OF CANADA
Newfoundland Section

GUIDEBOOK

Baie Verte Peninsula Field Trip

October 11 and 12, 1997

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Trip Leaders: **Dave Evans and Chad Wells (Dept. of Mines and Energy), Pearce Bradley (Noveder Inc.), Peter Dimmell (Maple Mark International Inc.) and Kevin Regular and Staff (Richmont Mines Inc.)**

INTRODUCTION

The 1997 GAC field trip will visit some of the newer significant exploration and mining developments on the Baie Verte Peninsula. The Baie Verte Peninsula has been a focus of geological activity since the earliest days of mining and exploration in Newfoundland. It was the site of the first volcanogenic massive sulphide discoveries (Terra Nova Mine and Tilt Cove in 1857) and has the longest-lived mining camp (the Tilt Cove Mine, where more than 8 million tonnes of ore was mined over a mining life that spanned more than a century) in the province. The area is still highly prospective for VMS deposits; in fact, the Baie Verte Peninsula is the site of one of the newest significant VMS discoveries in Newfoundland, the Ming West deposit in 1988.

The Baie Verte Peninsula was also the site of one of the first gold mines in Newfoundland. The Goldenville Mine, which is located near Mings Bight, produced 158 ounces of gold during the period 1904-1905, and following the Hope Brook discovery of 1983, exploration emphasis shifted to gold. Major discoveries at Deer Cove, Stog'er Tight, Pine Cove, Romeo and Juliet and Nugget Pond, and scores of lesser discoveries, have earned the peninsula a well-justified reputation as a gold camp. In recent years, gold production has come from the reactivation of the Rambler/Ming (gold and copper), reclamation of the Rambler Tailings, and new developments at Stog'er Tight and Nugget Pond.

The Baie Verte Peninsula is bisected by a major structural zone, termed the 'Baie Verte Line', which separates Laurentian basement and miogeoclinal rocks of the Fleur de Lys Belt (Humber Zone) to the west from ophiolitic, volcanic, and intrusive and sedimentary rocks (vestiges of Iapetus) of the Baie Verte Belt (Dunnage Zone) to the east (Figure 1). Besides being a structural feature of major significance in the context of central Newfoundland geology, the Baie Verte Line has been the focus of much of the gold mineralization in the area. Many of the important gold discoveries are spatially related to the Baie Verte Line or to subsidiary structures. The VMS mineralization is mainly associated with volcanic rocks of the Baie Verte Belt; however, the Birchy Schist within the Fleur de Lys Belt is a potential host for VMS mineralization.

This guidebook relies heavily on the Field Trip Guidebook referenced below[1] which was prepared for the 8th IAGOD Symposium held in 1990 in Ottawa. The article on Pine Cove was reprinted from Ore Horizons Volume 1.

[1] *1990: Metallogenic Framework of Base and Precious Metal Deposits of Central and Western Newfoundland (Field Trip 1). Edited by H.S. Swinden, D.T.W. Evans and B.F. Kean. Geological Survey of Canada Open File 2156, 232 pages.*

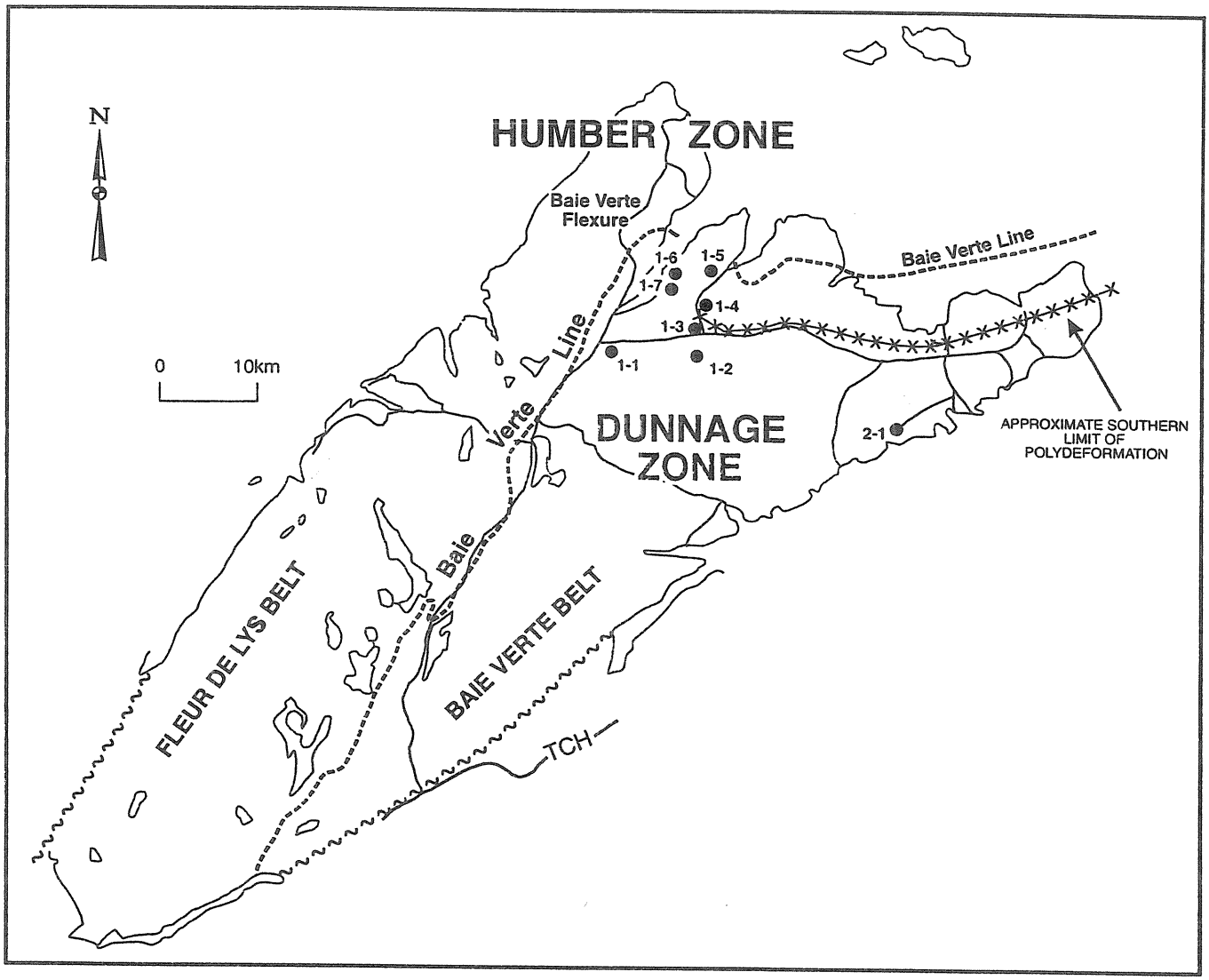


Figure 1: *Tectonic elements and field trip stop locations.*

FIELD TRIP ITINERARY AND STOPS (Figure 1)

(Detailed descriptions are in the main text of the guidebook.)

DAY 1 (Saturday 8:00 am, field trip leaves the Baie Vista Hotel parking lot).

STOP 1-1 Dorset Showing (Battle Mountain Canada Ltd.)

The Dorset Prospect is well exposed in a series of trenches. Trenches perpendicular to stratigraphic and structural trends provide a good cross section of the host rocks while those along the mineralized zones expose the structural features of the mineralized veins.

STOP 1-2 Rambler Mine (Ming Minerals Inc.)

Rambler Mill, Main Mine and Main Mine Footwall Zone. Consolidated Rambler Mines Ltd. produced 4,301,352 tonnes of polymetallic sulphides from four separate deposits between 1964 and 1982. The Main Mine produced 399,093 tonnes grading 1.3% Cu, 2.16% Zn, 5.14 g/t Au and 29.14 g/t Ag. Significant gold mineralization is associated with a unit of quartz-sericite schist in the footwall to the Main Deposit. Recently, Ming Minerals Inc. mined a portion of the Main Footwall Zone and the crown pillar from the Main Mine. Boulders of the quartz-sericite schist and high-grade massive sulphides from the Crown Pillar are stockpiled near the mill.

STOP 1-3 Ming West Deposit, optional (Ming Minerals Inc.)

The polymetallic Ming West Deposit open pit. Boulders of massive sulphide and wall rock are present near the pit margins.

STOP 1-4 Scrape Thrust

Talc–carbonate schist of the Point Rousse Complex is thrust southeast over the Pacquet Harbour Group along the Scrape Thrust. The mafic schists of the Pacquet Harbour Group are highly deformed and tectonically banded on a fine scale parallel to the thrust plane. Approximately 100 to 200 m south of this main thrust, a smaller thrust of similar attitude can be seen within the Pacquet Harbour Group schists.

The Point Rouse Complex is imbricated by a series of similar south-directed thrusts faults. Gold showings (Pine Cove, Romeo and Juliet, Stog'er Tight and Deer Cove) within the complex appear to be spatially associated with these south-directed thrusts.

STOP 1-5 Stog'er Tight (Ming Minerals Inc.)

Gold mineralization occurs within four zones referred to as the Gabbro, Stog'er Tight, Main and Magnetic zones, all except the Main Zone are hosted by subvolcanic gabbro sills. The Stog'er Tight Deposit, the most significant of the four zones, strikes 120° and dips moderately to the north. Channel samples collected by Noranda assayed up to 23 g/t Au over 7 metres.

Ming Minerals Inc. developed an open pit on the Stog'er Tight Deposit in 1996 but experienced difficulties with ore continuity. The mineralization and alteration is well exposed within the open pit.

STOP 1-6 Romeo and Juliet (Nova Gold and New Island Minerals)

An approximately 20 minute walk leads to a series of trenches that expose three milky-white quartz veins termed the Juliet, Connecting, and Romeo zones. Abundant fine-grained gold occurs along vein margins.

STOP 1-7 Pine Cove Deposit, (optional) (Nova Gold and New Island Minerals)

Bull-dozed area and open pit exposes gold mineralization within the Thunder and Lightening zones. Diamond drilling has outlined approximately 2.75 million tonnes grading 3.0 g/t Au.

DAY 2 (Sunday 8:00 am, field trip leaves the Baie Vista Hotel parking lot, approximately one hour drive to Nugget Pond).

STOP 2-1 Nugget Pond Mine (Richmont Mines Inc.)

Mill and underground mine tour by staff of Richmont Mines Inc., Nugget Pond Division.

INTRODUCTION TO THE GEOLOGY OF THE BAIE VERTE PENINSULA

Modified from Hibbard (1984)

(To accompany Map 82-2 – Geology of the Baie Verte Peninsula)

INTRODUCTION

The Baie Verte Peninsula is bisected into contrasting lithic terranes by a north-northeast to east trending steep structural zone termed the Baie Verte Line (Figure 1). To the west and north of the line lies an arcuate belt of Helikian(?) to lower Paleozoic, continentally derived, polydeformed schists and gneisses and granitoid intrusions termed the Fleur de Lys Belt of the Humber Zone, which farther north is mainly submerged beneath the Atlantic Ocean. The southeast portion of the peninsula comprises lower Paleozoic ophiolite suites, volcanic cover sequences, and various intrusions that collectively form the Baie Verte Belt of the Dunnage Zone (see Figure 2).

FLEUR DE LYS BELT

The Fleur de Lys Belt represents the eastern margin of the late Hadrynian to early Proterozoic North American continent. It comprises three major lithic elements, including a basement of schists and gneisses, a dominantly metaclastic schist cover sequence, and postkinematic granitoids; a fourth minor division of clastic rocks is confined to Granby Island in White Bay.

The structural basement, termed the East Pond Metamorphic Suite, contains intensely deformed metaclastic rocks that include eclogitic amphibolite pods and small anatectic zones that surround small windows of gneiss and migmatite.

Locally, a metaconglomerate unit, containing clasts of predeformed gneiss, surrounds one of the windows of migmatite. The gneisses and migmatites are interpreted as windows of reworked Grenvillian(?) basement within intensely deformed Hadrynian to lower Paleozoic supracrustal rocks. The suite is separated from less intensely deformed cover rocks by a steep tectonic zone of coarse mica schists.

The cover sequence, named the Fleur de Lys Supergroup, consists of metaclastic schists, marble, amphibolite and greenschist that are interpreted as tectonized submarine slope and basin deposits. Based on geochemistry and distribution, amphibolite pods and layers throughout the sequence are interpreted as being related to a rift episode responsible for the formation of the slope–basin environment.

Regional correlation with rocks outside the map area, and a single fossil occurrence in marble of the supergroup, indicate the cover sequence is late Hadrynian to Early Ordovician in age. The cover sequence was deposited on continental basement in the west and central parts of the belt; to the east, however, it interfingers with ophiolitic rocks included in the supergroup, indicating that the cover spans the junction of continental and oceanic crust. Both the basement and cover sequence are intruded by postkinematic granitoid rocks.

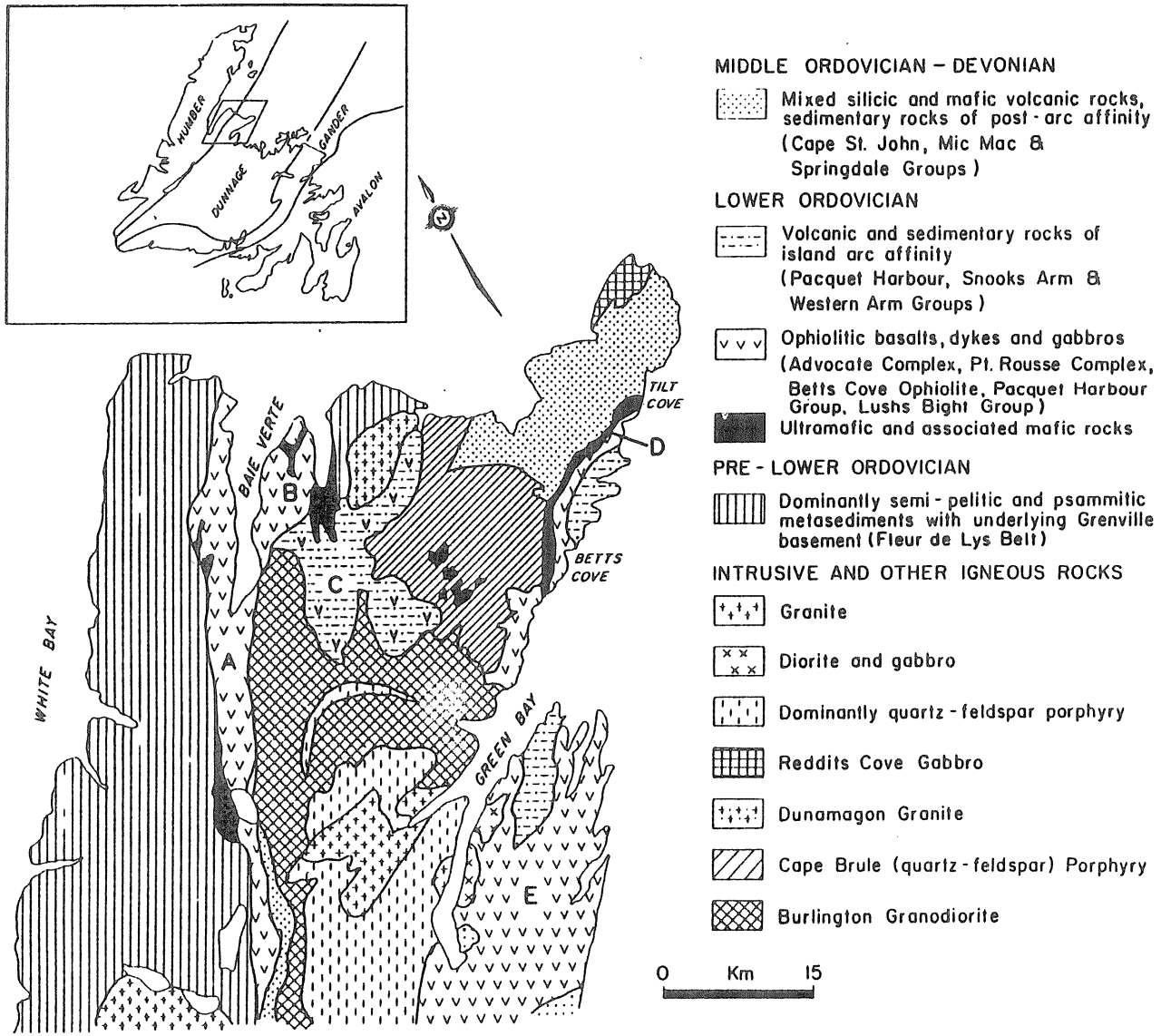


Figure 2. General geology of the Baie Verte Peninsula (after Strong, 1984). A-Advocate Complex with unseparated Flatwater Pond Group; B-Point Rousse Complex; C-Pacquet Harbour Group; d-Betts Cove Complex; E-Lushs Bight Group.

BAIE VERTE BELT

The Baie Verte Belt represents the westernmost vestiges of the early Paleozoic Iapetus Ocean. It encompasses three major stratigraphic elements, including ophiolitic basement, volcanic cover sequences, and a variety of intrusions; a minor patch of Carboniferous sedimentary rock is exposed at the southern end of the belt. Four partial or dismembered ophiolitic units are distinguished on the basis of geographic position and structural state; they are considered to be mutually correlative and to represent remnants of a single slab of oceanic crust. They are the Advocate and Point Rousse complexes, Betts Cove Ophiolite, and the Pacquet Harbour Group (Figure 2).

The Advocate Complex is highly dismembered and appears to be incomplete, lacking a definite ophiolitic pillow lava member. It consists of imbricated slices of gabbro, diabase dykes and serpentinized ultramafic interleaved with mafic volcanic and volcaniclastic rocks and dark grey to black slates of the presumed cover sequence.

The Point Rousse Complex is a dismembered but complete ophiolite suite, and is structurally more intact than the Advocate Complex. It consists of serpentinized ultramafic rock, gabbro, sheeted diabase dykes and pillow basalt. The various ophiolitic components occur in structural blocks bounded by high angle and thrust faults. The complex is conformably overlain by volcaniclastic and pyroclastic rocks and pillow lava.

The Betts Cove Complex is intact but appears to be incomplete because a noncumulate ultramafic tectonite member has not been recognized at its base. It includes layered ultramafic rocks, gabbro, diabase dykes and associated pillow lava. It is conformably overlain by volcaniclastic, pyroclastic and pillow basalt of the non-ophiolitic Snooks Arm Group.

The Pacquet Harbour Group consists of variably deformed and metamorphosed mafic volcanic and volcaniclastic rocks, felsic volcaniclastic rocks and mafic dykes. Gale (1971, 1973), Hibbard (1983) and Swinden *et al.* (1989) correlated parts of the Pacquet Harbour Group with the Betts Cove Ophiolite Complex to the east, based on the similarity of the volcanic rock types in the two areas (including the presence of similar magnesian basalts of boninitic affinity in both areas), suggesting that at least these parts of the Pacquet Harbour Group were of ophiolitic derivation.

The tightest age constraint on the ophiolites is on the Betts Cove Complex which has been radiometrically dated as Early Ordovician 488 +3.1/−1.8 (Dunning and Krogh, 1985), and is conformably overlain by fossiliferous Arenig strata. The Advocate Complex is apparently stripped of its pillow lava member and overlain unconformably by a volcanic cover sequence; this ophiolite also has a dynamothermal aureole at its base.

The volcanic cover sequences that overlie the rocks of ophiolitic derivation consist of two major divisions that are separated by an unconformity at two locales. The lower division is dominated by major submarine volcanic products, and directly overlies the ophiolites. These cover rocks are probably Middle Ordovician and older in age, and at one locale contain Arenig graptolites. The upper division is characterized by mainly subaerial felsic volcanic and associated rocks that

unconformably overlie the lower division. The upper division is considered to be Siluro-Devonian in age based on radiometric dates and regional correlation with units outside the map area.

Intrusive rocks of the belt are readily separable into two suites of different ages. The earlier suite is Early Ordovician and includes mainly granodioritic and granitic rocks, whereas the later plutons are Siluro-Devonian and exhibit a wide range of composition.

MAJOR STRUCTURES

The major structural feature of the peninsula is the Baie Verte Line, a wide zone of protracted movement that juxtaposes Iapetan oceanic sequences to the east with metamorphosed sedimentary and crystalline basement rocks of the Laurentian margin to the west. The Baie Verte Line is of considerable economic significance as the locus of epigenetic gold deposition, and second-order structures associated with this structure host many of the peninsula's important mesothermal gold occurrences. Recent structural studies have shown that the Baie Verte Line was a tectonically active zone from the Ordovician to, at least, the Carboniferous, with an early history involving westward-directed thrusting and a later strike-slip history which was variously dextral and sinistral in sense (Goodwin and Williams, 1990).

All pre-Carboniferous strata and structures on the peninsula, including the Baie Verte Line, are folded around a major structure, the Baie Verte Flexure. It is defined by the change in structural trends from north-northeasterly on the southern portion of the peninsula to easterly on the northern portion. The flexure appears to be a primordial structure that predates the tectonism of rocks on the peninsula and is considered to reflect the original shape of the ancient North American margin; younger structures have apparently been molded to its form. The tectonic history of the peninsula is largely controlled by the juxtaposition and interaction of the two lithostratigraphic belts along this irregular margin.

The entire Fleur de Lys Belt and the northern portion of the Baie Verte Belt display three main phases of deformation and exhibit upper greenschist to middle amphibolite facies regional metamorphism. The remainder of the Baie Verte Belt was affected by a single, penetrative fabric and up to lower greenschist facies metamorphism.

Radiometric cooling dates on metamorphic minerals indicate that Fleur de Lys rocks on the west limb of the Baie Verte Flexure were subjected to a Taconian event, whereas rocks of both belts along the eastern limb of the flexure record Acadian tectonism. The Taconian event is attributed to the westward regional obduction of ophiolites over the Fleur de Lys Belt; it appears to have affected the whole belt, although most evidence of its affecting Fleur de Lys rocks on the east limb of the flexure has been obliterated by the later Acadian event. The Acadian event may have been related to a reversal of the Taconic structural polarity along the Baie Verte Line during uplift of the metamorphic Fleur de Lys Belt.

MINERALIZATION

The structural juxtaposition of the Fleur de Lys and Baie Verte belts has concentrated many environments favourable to mineralization in the small area of the peninsula. The peninsula has

supported nine mines since 1864, eight for volcanogenic base and precious metals and one for asbestos. The recent intense exploration for, and discovery of, gold in the area provides promise for future mining activity. All of the mines and many major showings are associated with ophiolitic rocks of the peninsula, occurring at different stratigraphic levels within the mafic volcanic rocks or, in the case of the Rambler deposits, associated with felsic volcanic rocks.

Most of the volcanogenic massive sulphide deposits are associated with the mafic volcanic rocks and are mineralogically simple (pyrite–chalcopyrite–pyrrhotite), occurring as stockwork and massive stratabound zones in the sheeted dyke and pillow lava members. The Rambler deposits are mineralogically the most complex volcanogenic deposits on the peninsula, and are associated with felsic as well as mafic rocks. Volcanogenic massive sulphide deposits in all areas appear to be spatially related to the high magnesian (boninitic) basalts of the ophiolites.

Gold deposits are mainly of epigenetic mesothermal type (Dubé, 1990) and are hosted by rocks ranging from Early Ordovician to Silurian. The gold variously occurs as lodes in quartz veins associated with shear zones or disseminated in highly altered host rocks.

DETAILED STOP DESCRIPTIONS

(Figure numbers are internally consistent with each paper.)

THE DORSET SHOWING: A STRUCTURALLY CONTROLLED LODE GOLD OCCURRENCE ADJACENT TO THE BAIE VERTE LINE

Craig MacDougall and Dan MacInnis

INTRODUCTION

The showing is located 3 km southeast of the mining town of Baie Verte, on the Baie Verte Peninsula in north-central Newfoundland.

The Dorset gold showing is a high-grade, structurally controlled, quartz lode-gold occurrence hosted by mafic volcanic rocks of the Flatwater Pond Group. The rights are now held by Battle Mountain Canada Limited.

PREVIOUS WORK

The discovery of a spectacular visible gold occurrence by Noranda Exploration Company Limited in 1986 within ophiolitic rocks of the Point Rousse Complex on the Deer Cove Property near Ming's Bight initiated an aggressive regional exploration program for gold mineralization on the Baie Verte Peninsula by Noranda and its various joint venture partners as well as other exploration firms. The exploration target was structurally controlled gold mineralization localized along or adjacent to the regional structural break referred to as the Baie Verte Line.

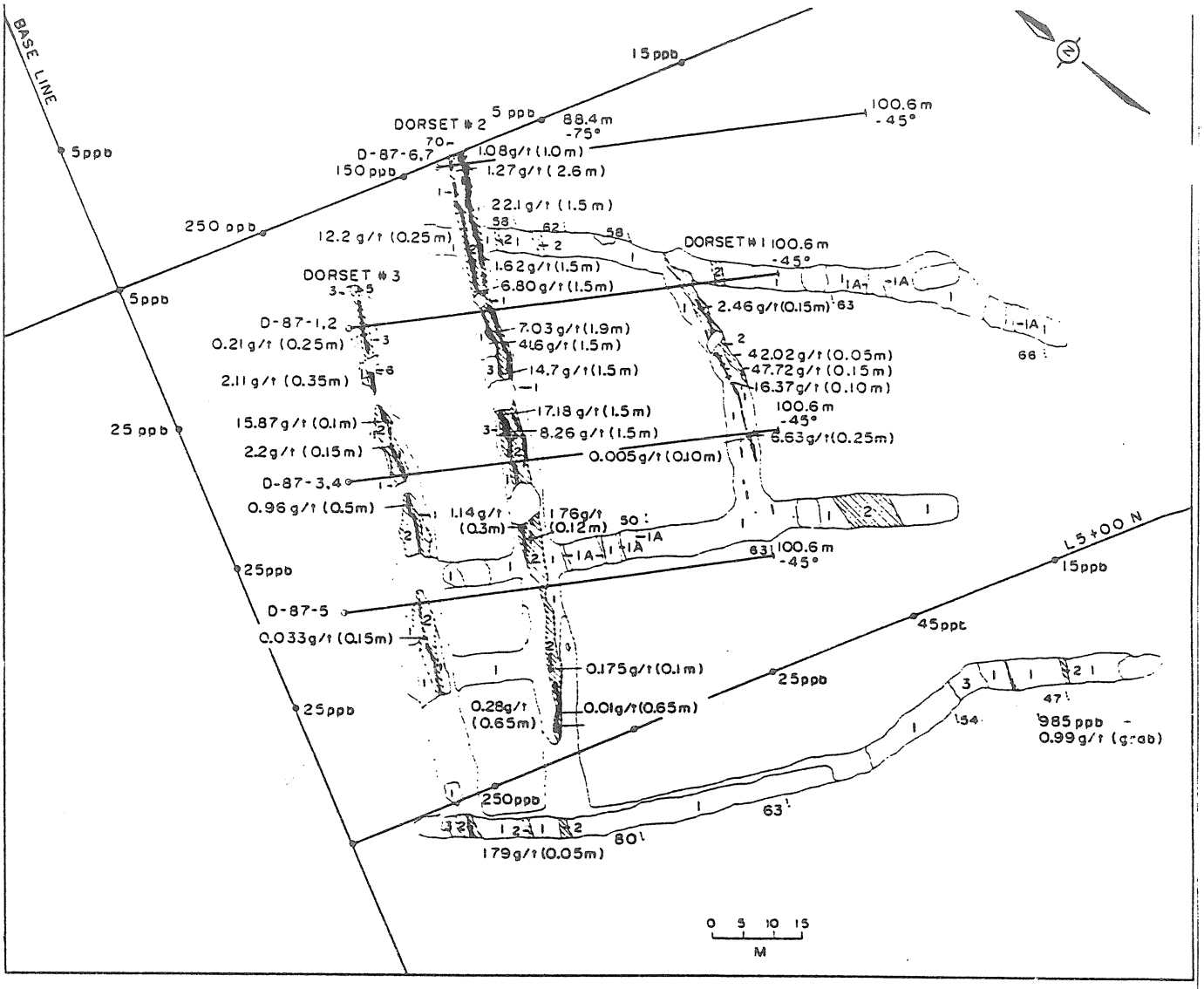
The program resulted in the discovery of a number of significant new gold occurrences and deposits on the Baie Verte Peninsula by Noranda and others.

No mineral occurrences were known on the Dorset property until 1987, when prospecting resulted in the discovery of visible gold mineralization within several quartz veins (the Dorset Showing). The prospecting was following up on a 22,094 ppb Au heavy mineral concentrate stream sample from Southwest Brook.

Follow-up work has consisted of linecutting, geological mapping, soil geochemistry, ground geophysics (Mag, VLF, HLEM and I.P.), trenching, and diamond drilling.

PROPERTY GEOLOGY

The Dorset Grid area occurs immediately east of the Baie Verte line. The western part of the grid is dominantly underlain by medium-grained gabbro and faulted, serpentinized ultramafic slivers of the Advocate Ophiolite Complex. The central portion of the grid is underlain by a mixed assemblage of thin, interbedded mafic basalt flows, flow breccias and pillow lavas intermixed with intermediate to mafic tuffaceous units, and related volcaniclastic sediments of the Flatwater Pond Group. These rocks host the Dorset Showing. Numerous medium to fine grained, equigranular to porphyritic gabbro sills and dykes typically occur throughout the mafic flows.



1 *Fine to medium grained, massive to amygdaloidal basalt, locally interbedded with lenses of quartz porphyritic felsic tuff, minor mafic fragmental and (1a) diabase dyke; <1% to 5% disseminated pyrite.*

2 *Sheared, chloritized basalt with very strong penetrative cleavage and <1% to 5% disseminated and stringer pyrite.*

3 *Fine to medium grained, equigranular gabbro, minor porphyritic gabbro, rare pyrite.*

4 *Sheared gabbro*

Area of no outcrop

Cleavage/bedding (inclined)

channel/chip sample (g/t Au)

mineralized quartz vein: visible gold, py, cpy, bn, gal, sp, asp

X *grab sample (ppb Au)*

soil sample (ppb Au)

Drill hole (declination, depth)

shear zone

Figure 1. Map of the trenches at the Dorset Showing with assay values.

In the eastern portion of the grid area, the mafic volcanic rocks give way to the felsic pyroclastic rocks, which are in fault contact to the east with intrusive rocks of the Burlington Granodiorite along the Scrape Thrust.

The volcanic stratigraphy is dominantly northeast-trending at 030-060° and exhibits a well developed, penetrative cleavage that varies from vertical to steeply west-dipping. Contacts with gabbro intrusive rocks are generally strongly sheared and altered.

The volcanic rocks and gabbro intrusive rocks typically exhibit pervasive chloritization, Ca-carbonate alteration and veining. Intense quartz–carbonate (Fe,Ca) ± fuchsite alteration, generally associated with weak (1%) pyrite mineralization, is commonly developed within gabbroic intrusives and along or proximal to sheared gabbro contacts. Serpentinization and talc alteration is observed with fault slivers of ultramafic rocks.

MINERALIZATION – DORSET SHOWING

The Dorset Showing consists of three sub-parallel, northeast trending, steeply west dipping quartz lode vein systems localized within 1-3 m shear zones in mafic and tuffaceous rocks of the Flatwater Pond Group. The Dorset #2 vein system is the most significant.

Figure 1 shows the geology and assay information over a 110 m strike length of the Dorset #2 vein. This vein consists of multiple, boudined quartz veins up to 1.0 m wide, localized within an 045° trending, 1-3 m wide shear zone which exhibits a 70° dip to the west. Extensive trenching and limited diamond drilling have indicated a minimum strike length of 400 m.

Kinematic indicators concerning the sense of shear at the Dorset Showing are rare. However, rotated quartz boudins observed at other occurrences on the property indicate a dextral sense of movement, lineations on the quartz boudins are observed to plunge steeply north.

Mineralization within the veins consists of visible gold, with up to 10% disseminated pyrite, galena, chalcopyrite, bornite, and minor sphalerite and arsenopyrite. Mineralization is most intensely concentrated along vein contacts, although gold may be distributed throughout the veins. Minor disseminated pyrite mineralization, typically occurs in sheared country rock adjacent to the veins, but no gold mineralization is associated. Assays have returned up to 407.9 g/t Au from grab samples; while channel samples have returned up to 177.2 g/t Au over 0.35 m from individual veins. Best combined channels across the multiple veined shear zone include highs of 56.0 g/t Au over 2.5 m; 41.6 g/t Au over 1.5 m; and 22.1 g/t Au over 1.5 m. Diamond drilling to date has confirmed high grade gold values over narrow widths.

ACKNOWLEDGMENTS

The authors wish to thank Noranda Exploration Company Ltd. and Muscocho Exploration Ltd. (original holders of the mineral rights) for permission to publish the information contained in this paper. The authors would also like to acknowledge the contributions of Stephen Walker and Al Keats to this project.

GEOLOGY AND MINERAL DEPOSITS OF THE RAMBLER PROPERTY

Howard Coates

INTRODUCTION

The initial discovery of sulphide mineralization in the Rambler area was made near the Rambler Brook in October of 1903 by Enos England, a local prospector/trapper. Work was discontinued on this "England Vein" area in 1907 apparently because of the low metal contents. A second, more promising, discovery was made 200 m north of the England Vein in 1936 by Enos England and his son William. The initial assays from trenching in this area, known as the "Rambler Vein", returned what was considered to be promising gold contents.

In the ensuing decades the Rambler prospect was extensively explored by a number of different companies. This work delineated significant gold and base-metal concentrations. Ultimately in 1961, an operating company, Consolidated Rambler Mines Limited was formed to develop and mine the Rambler deposit. Subsequent work led to the discovery of additional mineral deposits. Consolidated Rambler Mines Ltd. produced 4,310,352 tonnes of polymetallic sulphide ore from four separate deposits between 1964 and 1982. Production from the individual orebodies was as follows:

Main Mine
(1964-1967) 399,093 tonnes
1.30% Cu, 2.16% Zn, 5.14 g/t Au, 29.14 g/t Ag

East Mine
(1965-1967) 1,932,757 tonnes
1.04% Cu

Big Rambler Pond
(1970-1971) 45,351 tonnes
1.20% Cu

Ming Mine
(1971-1982) 1,924,161 tonnes
3.50% Cu, 2.40 g/t Au, 20.57 g/t Ag

The Rambler property has undergone a significant rejuvenation in recent years. Exploration funded by the Rambler Joint Venture partners has resulted in a new massive sulphide discovery (the Ming West deposit), and a major reinterpretation of the stratigraphy and structural geology of the property. Many of the orebodies are exposed, as are most of the important geological features of the property. Ming Minerals Inc. are the current holders of the mineral rights.

GEOLOGY OF THE RAMBLER PROPERTY

The Rambler property (Figure 1) is underlain by pre-Middle Ordovician mafic to felsic volcanic and volcaniclastic rocks and sedimentary rocks of the Pacquet Harbour Group. Two strati-

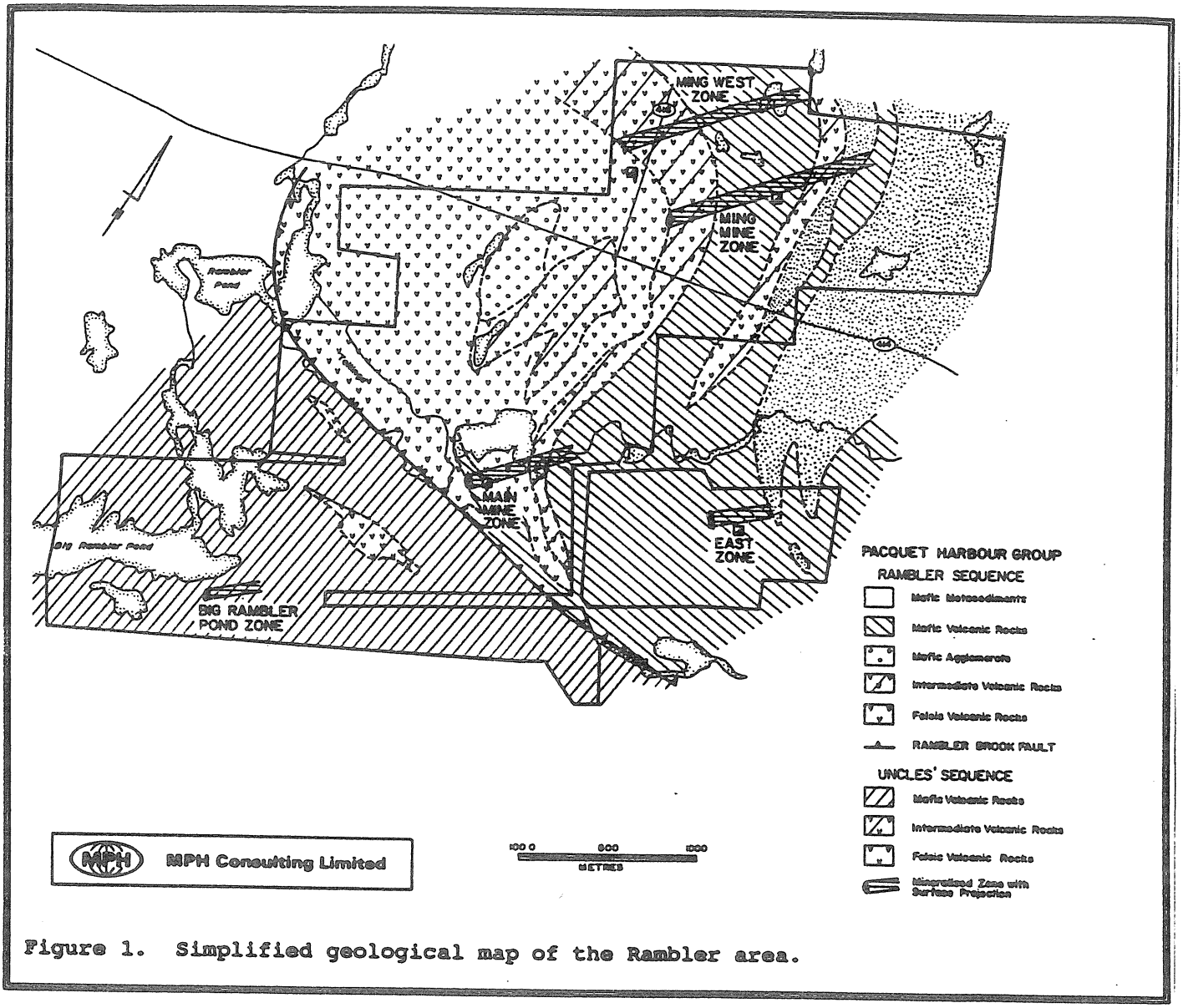


Figure 1. Simplified geological map of the Rambler area.

graphic sequences are juxtaposed along a prominent thrust fault, the Rambler Brook Fault. The sequence in the southwestern part of the property or below the fault, informally termed the "Uncles' Sequence", is dominantly mafic volcanic rocks. Felsic to intermediate volcanic rocks, informally called the "Rambler Sequence", predominate above the Rambler Brook Fault over the northeastern part of the property.

The Uncles' Sequence strikes approximately east–west and dips between 20 and 40 degrees to the northward. Strike directions of the Rambler Sequence define an open Z-shaped trend, being approximately east–west in the southeast part of the area, north–south in the east central part of the property, and east–west near the north property boundary. The sequence dips between 30 and 35 degrees to the northeast. Younging directions obtained from pillow lavas, graded bedding and massive sulphide-stringer zone relationships, indicate uniform upward facing successions on both sides of the Rambler Brook Fault.

The Rambler property exhibits many of the small-scale structural and metamorphic features that typify the polyphase deformation of the Pacquet Harbour Group. These include well-defined schistosities and lineations, minor folds, and metamorphic mineral assemblages typical of lower greenschist to amphibolite grade. The main structural observations are that the rocks have undergone significant linear tectonic strain and that there is no evidence of structural repetition of lithologic units due to major folding.

The degree of strain is evidenced by the development of lineations which plunge at between 25 to 45 degrees to the northeast. The lineation is seen in a variety of features which range in size from individual mineral crystals to large-scale geological units including the massive and stringer sulphide deposits. The amount of linear strain has been estimated at about a ratio of 1:1:5, based on observations of features whose approximate original shape is known including amygdules, pillows and volcanic bombs in agglomerate. The lack of major folding is evidenced by a uniformity of facing directions across the property and by the absence of repetition of lithologic units.

The deformed volcanic sequences on the Rambler properties have a combined thickness of about 3350 m (Figure 2). Approximately two-thirds of the total stratigraphy lies above and one-third occurs below the Rambler Brook Fault. Neither the upper limit of the Rambler sequence nor the lower limit of the Uncles' sequence is encountered on the Rambler property.

Rambler Sequence

The Rambler Sequence consists of a felsic volcaniclastic pile overlain and overlapped by a sequence of mafic to intermediate flows and volcaniclastic rocks which in turn are gradational upward into a metasedimentary succession.

The felsic pile attains a maximum thickness of approximately 1500 m south of the Ming Mine area but pinches out about 500 m east of the Main Mine. The felsic rocks are predominantly dacitic tuffs, lapilli tuffs and agglomerates and their metamorphosed equivalents. Along the flank of the pile, the felsic volcaniclasts pinch out or grade laterally into mixed felsic/intermediate and mixed felsic/mafic volcaniclastic rocks. Also occurring within the pile is an area of mafic agglomer-

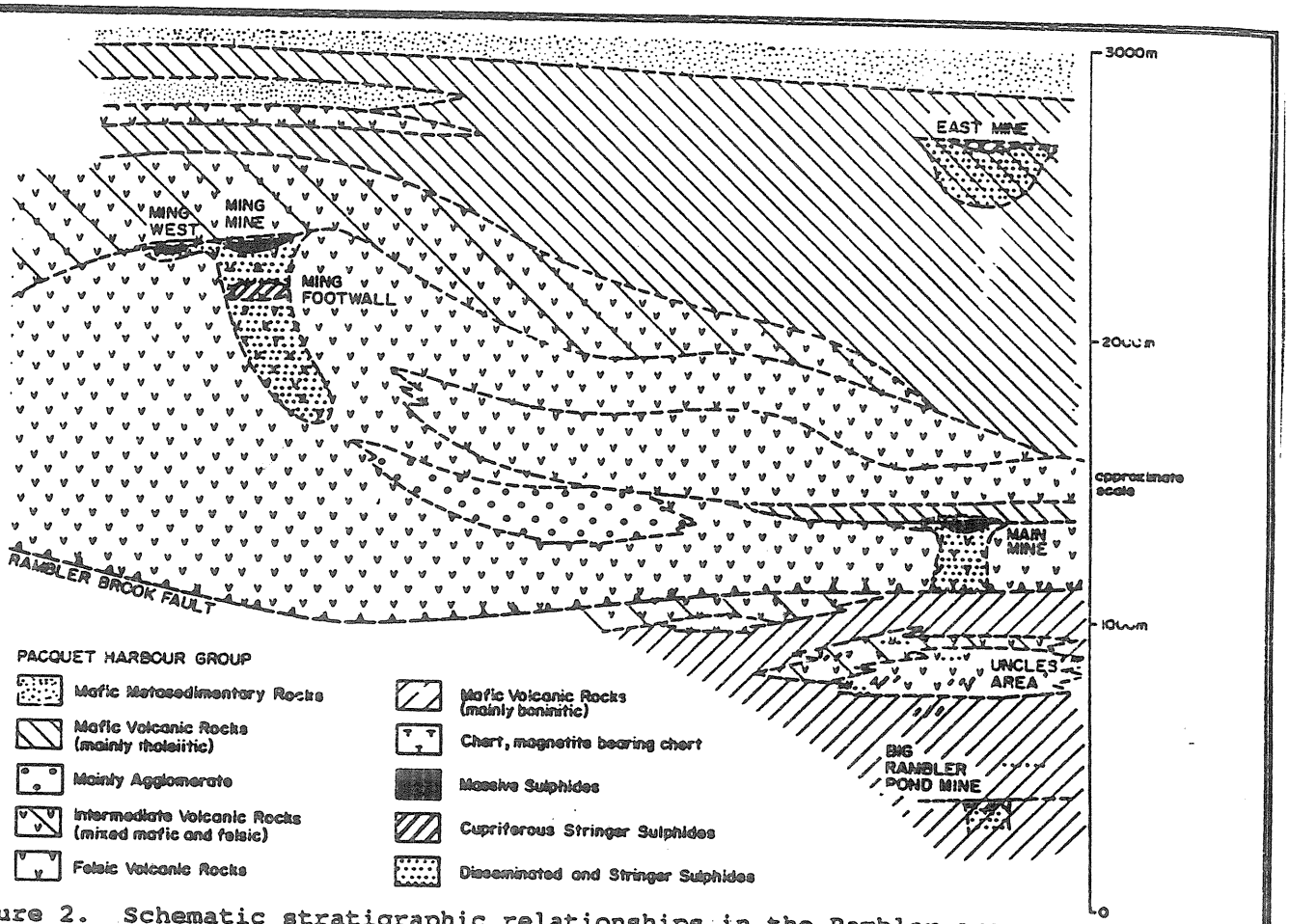


Figure 2. Schematic stratigraphic relationships in the Rambler area.

ate which consists of rounded fragments of variolitic lava in a chloritic matrix. Less widespread, but nevertheless very prominent, lithologic units include magnetite chert, sulphide impregnated chert and banded polymetallic massive sulphides. Hydrothermally altered felsic volcaniclastic rocks including quartz sericite and quartz chlorite sericite schist often containing disseminated and stringer sulphides occur in association with the massive sulphides. It is important to note that massive sulphide mineralization occurs at two different stratigraphic levels within the pile (Figure 2).

The mafic to intermediate sequence which interfingers with, and overlaps, the felsic pile attains a maximum thickness of about 1500 m in the Main to East Mine area and thins to approximately 750 m in the Ming Mine area. The wedging of the sequence is in the opposite sense to the felsic pile thereby maintaining a relatively uniform thickness of volcanic rocks across the property.

In the Ming Mine area the lower part of the mafic to intermediate sequence is characterized by thick alternating units of andesitic flows and volcaniclastic rocks and mafic flows and volcaniclastic rocks. layers of reworked tuffs and metasediments, some of which are magnetite bearing, occur near the contact with the underlying felsic pile. The upper part of the sequence is predominantly mafic in composition with sedimentary interbeds occurring near its top.

In the Main to East Mine area the lower intermediate unit is very thin. Most of the sequence consists of massive to pillowed amygdaloidal mafic lavas with a few 60 to 90 m thick mafic tuff and lapilli tuff units. Sedimentary interbeds occur near the top of the sequence.

The upper sedimentary sequence on the Rambler properties attains a maximum thickness of about 350 m in the area east of the Boundary Shaft. The stratigraphic top of the sequence has not been located as it lies outside of the property. The sediments are mainly derived from mafic rocks and include laminated metagreywackes and schistose argillaceous rocks and chloritic schists with occasional chert, magnetite bearing chert, oxide iron formation and intermediate tuff units. In the uppermost part of the sedimentary sequence the rocks are characterized by an increase in the degree of recrystallization and in increase in metamorphic amphibole content.

Mafic dykes ranging from a few centimetres to several hundred metres in thickness are found throughout the entire sequence. These range from being nearly conformable to stratigraphy, to crosscutting it at high angles. The dykes account for about 25% of the total lithological package in the Rambler Sequence. A few dykes encountered in drilling in the Ming Mine area are ultramafic in composition.

Uncles' Sequences

The Uncles' Sequence consists mainly of mafic lavas and pillow lavas with occasional mafic volcaniclastic units in its lower portion. A mafic to felsic volcanic and volcaniclastic sequence occurring near the top of the sequence is truncated by the Rambler Brook thrust fault. A stratigraphic thickness of about 1100 m is exposed on the property. The lower boundary of the sequence was not located during the current program since it lies outside of the property boundary.

The mafic volcanic rocks have been subdivided into massive flows, variolitic lavas, pillow lavas and pillow breccias during mapping. On the basis of whole-rock geochemistry by Gale (1971,

1973) and Hibbard (1984), these rocks have been determined to be predominantly high magnesian boninitic lavas characterized by between 14% and 16% MgO and high background levels of nickel and chromium. Recent drilling near the east end of Big Rambler Pond has encountered a talc and talc–chlorite schist unit which, on the basis of its mineralogy, should contain in the range of 20% to 30% MgO. Lenses of mafic tuff and lapilli tuff and mafic sediments generally less than 60 m in thickness occur locally in the volcanic sequence.

The upper part of the Uncles' Sequence contains a predominantly mafic volcaniclastic pile which attains a thickness of at least 300 m south of the Rambler Pond tailings area and pinches out to the eastward beneath the Rambler Brook Fault. The volcaniclastic pile, in addition to mafic tuffs and agglomerates, also includes lenses of intermediate to felsic tuffs, lapilli tuffs and agglomerates as well as mafic and intermediate flows. Chert and siliceous tuffs which locally contain weak to moderate concentrations of polymetallic sulphides occur at three different stratigraphic levels within the pile. Hydrothermal alteration and disseminated and stringer sulphide mineralization are widespread.

Mafic dykes, which may be subparallel to or crosscutting the stratigraphy, are found throughout the Uncles' Sequence. They are virtually identical in composition, size, range and distribution to those found in the Rambler Sequence.

Rambler Brook Fault

The Rambler Brook Fault is an east–west to northwest–southeast trending low angle (25 to 35°) fault which separates the Uncles' and Rambler sequences on the Rambler property. The fault zone outcrops in the Brook Showing area south of the tailings pond and also near the South Brook diversion at the west end of Rambler Pond. It has been interseded by diamond drilling in the Uncle Enos area, at the Main Mine and in the area east of the Main Mine and in the area east of the Main Mine. The fault is characterized by 1 to 3 m of intensely foliated chloritic schist, fault breccia or gouge within a broader zone of brittle fracturing.

The Rambler Brook Fault is interpreted as a thrust fault and is similar in orientation and character to the Scrape Thrust, the boundary between the Pacquet Harbour Group and the Point Rousse Complex.

MINERAL DEPOSITS OF THE RAMBLER PROPERTY

The Rambler deposits can be classified as polymetallic sulphide deposits containing copper, zinc and minor lead together with gold and silver as well as traces of other metals, all in variable concentrations. The following sections describe the known areas of mineralization.

Main Deposit

The Main Deposit is a volcanogenic polymetallic massive sulphide deposit which occurs within the Rambler Sequence along the flank of a felsic dome. The upper portion of the mineralized zone was mined for copper, zinc, gold and silver. The mineralized stratigraphic section has three main components: i) a massive sulphide lens, ii) altered footwall volcaniclastic rocks containing

bands, stringer veinlets and disseminations of sulphides, and iii) a cherty horizon which overlies the massive sulphides (Figure 3).

The massive sulphide lens has a strike length of 60 to 90 m, an average thickness of about 4.6 m and plunges at an angle of 30 to 35 degrees to the northeast to a vertical depth of about 550 m. Mineralization consists of both massive and banded sulphides, the former massive fine to medium grained pyrite with chalcopyrite and sphalerite and the latter interbanded fine grained pyrite and medium grained sphalerite. Rare traces of galena have been observed. The zone also has a significant gold and silver content.

The footwall to the massive sulphide mineralization consists of quartz–sericite and chlorite schists with bands, veinlets and disseminations of sulphides. Disseminated pyrite with occasional sphalerite is ubiquitous throughout the footwall zone. The immediate footwall contains bands of fine to medium pyrite with sphalerite and minor chalcopyrite. Deeper in the footwall, stringers of sulphides cut across the foliation. The stringers are of three dominant compositions: i) fine to medium grained pyrite, ii) fine to medium grained pyrite and sphalerite and iii) pyrite, chalcopyrite and pyrrhotite.

A portion of the footwall zone lying directly below the massive sulphides has a significant gold content. This footwall gold zone is known to extend from the discovery outcrop to a depth of 520 m.

A 1.5 to 5 m thick cherty fragmental unit consistently occurs in the hangingwall within 6 m of the massive sulphides. The unit is generally a distinctive lapilli tuff with fragments of magnetic dark purple grey chert. The horizon occasionally occurs as a massive or finely laminated chert.

Ming Mine Area

The Ming Mine area contains two volcanogenic massive sulphide deposits; the Ming deposit which has been mined to a vertical depth of 800 m and the Ming West deposit discovered in 1988 by the Rambler Joint Venture. The deposits occur near the top of the Rambler Sequence felsic volcaniclastic pile about 300 m stratigraphically above the Main Mine mineralized horizon. The felsic rocks underlying the massive sulphides are extensively altered and contain widespread disseminated and stringer sulphides. A substantial copper bearing stringer zone, known as the Ming Footwall deposit lies within the altered rocks several hundred feet below the Ming Deposit (Figure 4).

The geological description of the Ming deposit is based on the work of Heenan (1973), Tuach (1976), Tuach and Kennedy (1978), Hibbard (1983) and Norman (1973). The Ming West description is based on work conducted for the Rambler Joint Venture. The Ming Footwall information is from Burton (1982).

The Ming orebody was a massive sulphide band averaging 3.7 m in thickness, 140 m in strike length and plunging northeasterly at 30 degrees for at least 1500 m to a vertical depth of 850 m. Mining has been carried out utilizing a decline and a 600 m vertical shaft to the 800 m level.

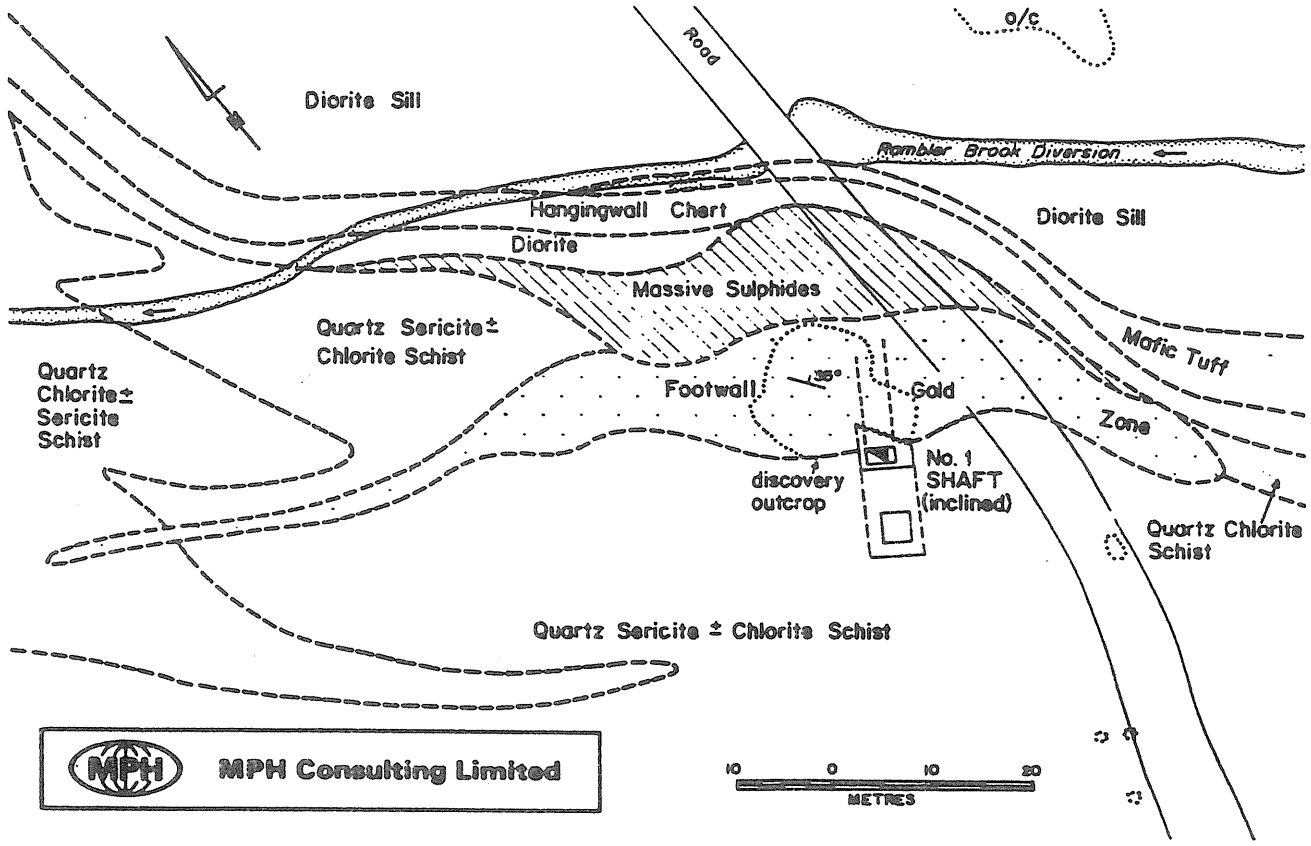


Figure 3. Geological map of the Rambler (Main) deposit.

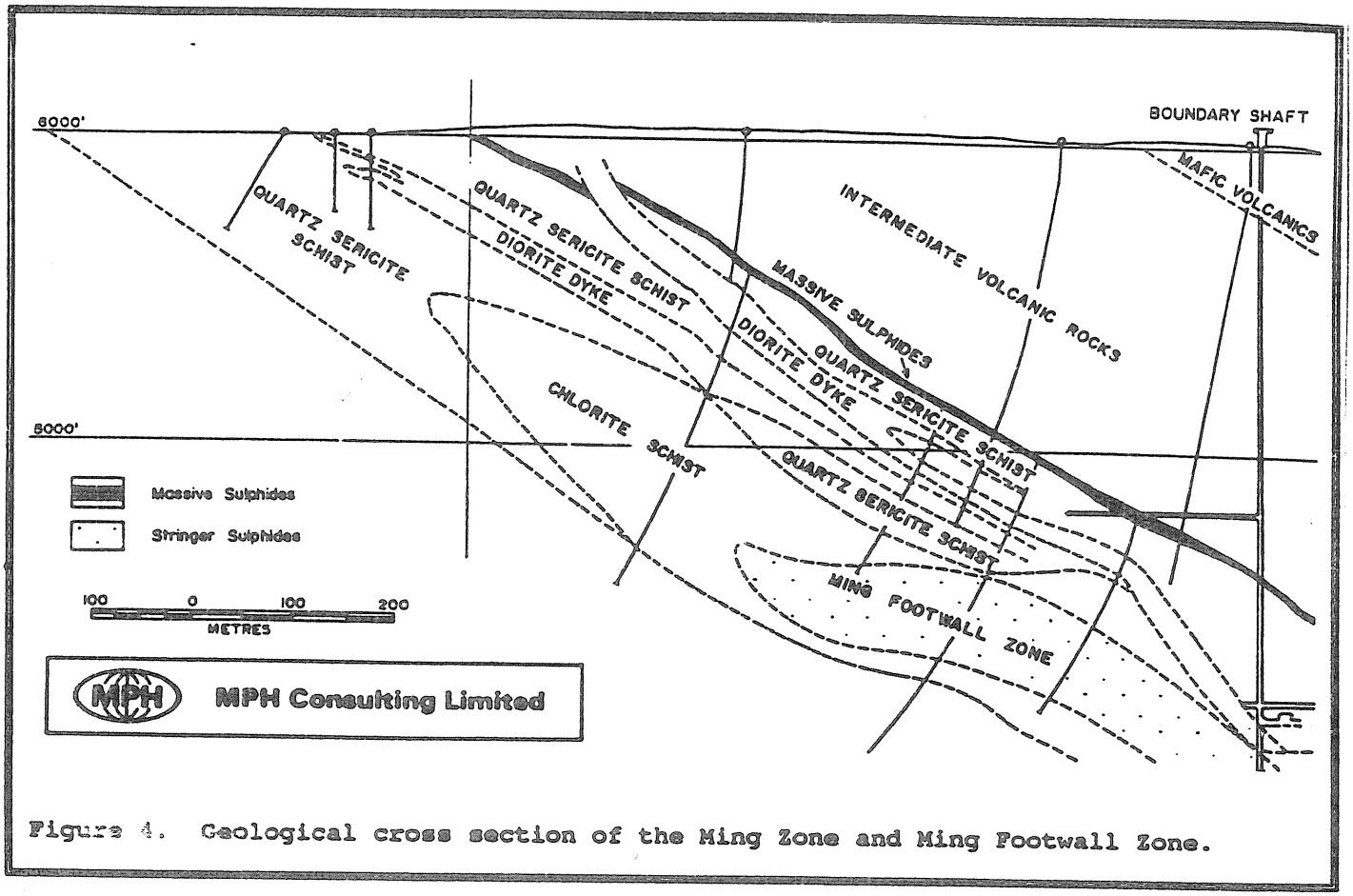


Figure 4. Geological cross section of the Ming Zone and Ming Footwall Zone.

Four types of ore are present in the deposit including, in order of abundance, massive pyrite ore, banded ore, massive chalcopyrite–pyrrhotite ore and breccia ore. The massive pyrite ore consists of about 70% fine-grained pyrite with lesser chalcopyrite and minor galena, sphalerite and silicate minerals. The banded ore consists of alternating bands of pyrite and chalcopyrite–quartz–actinolite–biotite. Massive chalcopyrite–pyrrhotite ore occurs as lenses and layers throughout the deposit. Chalcopyrite can constitute up to 80% of this ore type. Breccia ore consists of fragments of massive ore in a matrix of chalcopyrite and pyrrhotite. Several subordinate metallic minerals occur locally throughout the deposit. These include arsenopyrite, galena, tetrahedrite, native gold, tennanite, and cubanite.

Disseminated pyrite, which locally reaches concentrations of up to 10% of the felsic volcaniclastic schists, occur throughout the footwall sequence. Only minor disseminated pyrite is found in the hangingwall mafic volcaniclastic and sedimentary sequence.

The Ming West deposit (Figure 5) is located about 365 m northwest of the Ming deposit at the same stratigraphic level. At surface it has a strike length of about 90 m and an average thickness of about 3 m. The zone strikes at 100 degrees and plunges to the northeast at 30 degrees. It has been traced to a vertical depth of 250 m but is limited in size below 125 m.

Sulphide minerals present are mainly pyrite, chalcopyrite and pyrrhotite, with lesser bornite and sphalerite and minor amounts of galena and tetrahedrite. Four styles of sulphide mineralization have been observed in the outcrop. The most common mineralization is fine to medium grained, massive to banded pyritic sulphides with interstitial and interbanded chalcopyrite, pyrrhotite and sphalerite. Another type of mineralization, known as cherty fragmental sulphides, consists of sub-angular to rounded clasts of magnetite bearing chert in a matrix of fine to medium grained pyrite and chalcopyrite. A third mineralization type consists of massive sulphides as described above containing intermittent patches and lenses of massive chalcopyrite and bornite ranging from several square centimetres up to a square metre in surface area. The fourth mineralization type is coarse massive chalcopyrite and bornite which occurs directly adjacent to crosscutting diorite dykes. Minor structures and textures observed in the various types of sulphide mineralization indicate that the mineralization predates the regional deformation and metamorphism. Linear features are oriented parallel to the regional trends.

In general, the hangingwall stratigraphy consists of intermediate to mafic ash to lapilli tuffs and mafic flows. Several diorites and mafic dykes crosscut the stratigraphy. The footwall is predominantly dacitic tuffs, agglomerates and flows with little to minor alteration. Locally, a quartz sericite schist occurs as the immediate footwall to the sulphides. A magnetite hangingwall above the massive and/or breccia matrix sulphides.

The Ming Footwall deposit is a zone of quartz chlorite schist which hosts disseminated and stringer pyrite and chalcopyrite with minor sphalerite, galena, pyrrhotite and arsenopyrite. the zone has an approximate strike length of 200 to 250 m with an average thickness based on a cutoff grade of 0.50% copper of 45 m. It's structural attitude is similar to that of the Ming deposit striking north-northwesterly with a dip of 35 to 40 degrees to the eastward.

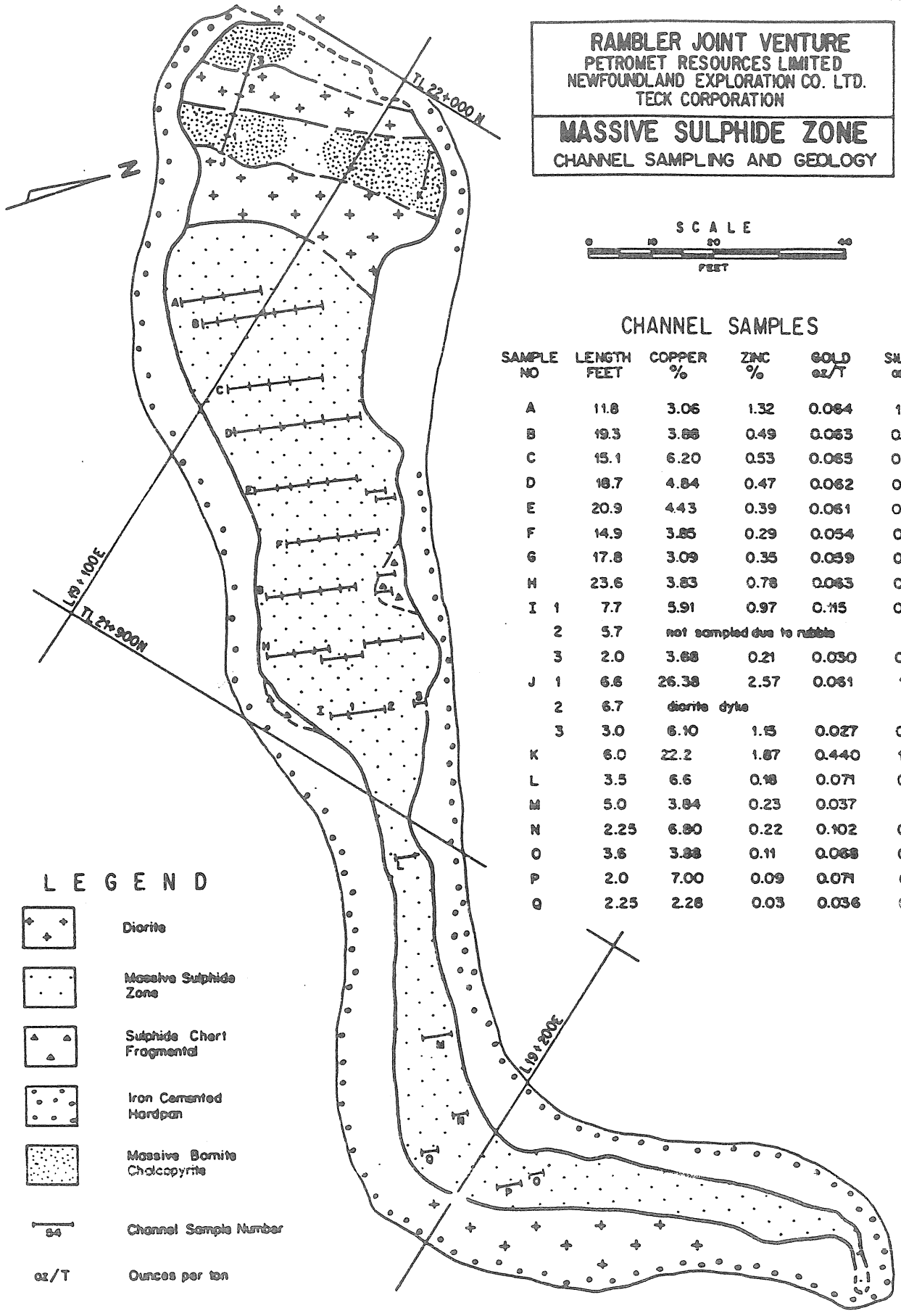


Figure 5. Geological map of the Ming West discovery trench.

The deposit is characterized by gradational contacts both in terms of host rocks and sulphide mineralization. The quartz–chlorite schist host grades upward through quartz–sericite–chlorite schist into the quartz sericite schist footwall of the massive sulphides. The size of the mineralized zone is essentially based on the cut-off grade employed to calculate geological reserves.

East Deposit

The East Mine lies within the predominantly mafic volcanic sequence which onlaps and overlies the felsic volcanic sequence which hosts the Main Ming area deposits.

The orebody (Figure 6) was a disseminated and stringer type pyrite, chalcopyrite, pyrrhotite deposit (Gale, 1971). It is characterized by an absence of massive sulphide horizons and by a lack of significant gold and zinc mineralization.

The mineralization lies within quartz chlorite schist with interbanded quartz sericite units. It is overlain structurally by basic agglomeratic and tuffaceous rocks basic lavas and felsic tuffs. Mafic dykes intrude the sequence.

The deposit is approximately 120 m in strike length, has an approximate true thickness of 30 m and has been traced down its 40 degree dip to a vertical depth of 450 m.

Big Rambler Pond Deposit

The Big Rambler Pond deposit, unlike the deposits described earlier, lies within the dominantly boninitic rocks of the Uncles' Sequence to the west of the Rambler Brook Fault. The host rocks are pillow lavas and pyroclastic rocks. Pyrite and mariposite-bearing chert beds occur near the deposit.

The deposit is a small pipe-shaped body consisting of disseminated and stringer pyrite, chalcopyrite and pyrrhotite in chloritized and silicified mafic volcanic rocks. The deposit has a strike length of about 30 m, is 15 m in thickness and has a plunge length of 60 m. Approximately 45,000 tonnes of 1.2% copper ore, without appreciable gold, silver, or zinc contents, was produced from a small open pit operation.

ACKNOWLEDGEMENTS

The author acknowledges all his co-workers on the Rambler Project, whose efforts provided the basis for this summary. The Rambler Joint Venture's permission to publish this information is also greatly appreciated.

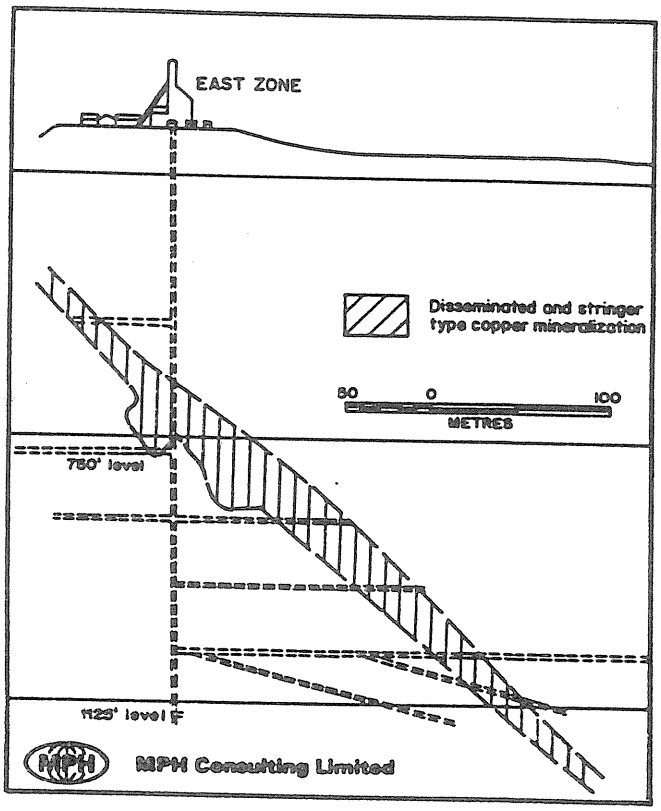


Figure 6. Longitudinal section through the East mine.

THE STOG'ER TIGHT GOLD DEPOSIT

(After: A.A. Huard, 1990; J Ramezani, 1992 and Donna Kirkwood and Benoit Dube, 1992)

INTRODUCTION

The Stog'er Tight gold deposit is located on the Mings Bight Peninsula, southwest of the community of Mings Bight. It occurs within mafic volcanic and volcaniclastic rocks and associated gabbroic intrusives of the Point Rouse Ophiolte Complex. The deposit is the most significant of a cluster of four auriferous zones (Gabbro, Stog'er Tight, Main and Magnetic) discovered in 1987-1988 by Noranda Exploration Ltd. as a result of prospecting gold in soil geochemistry anomalies (Huard, 1990).

In 1996, Ming Minerals Inc. attempted to mine the Stog'er Tight Deposit by open pit. However, problems with ore continuity resulted in cessation of mining.

PROPERTY GEOLOGY

The gold mineralization within the Stog'er Tight deposit is hosted by a variety of subvolcanic gabbroic sills (Figures 1 and 2), informally termed the Stog'er Tight gabbro, which have been dated by U-Pb zircon geochronology as 483 +3/2 Ma (Ramezani, 1992). The gabbro sills intrude a sequence of pyroclastic, volcaniclastic and effusive volcanic rocks, which generally strike WNW-ESE and dip to the north.

Kirkwood and Dube (1992) reported that three phases of deformation affected the rocks within the Stog'er Tight area. These include: i) D_1, which produced intense ductile shearing and the regional S_1 cleavage; ii) D_2, which produced south-verging asymmetric folds (F_2) with associated ductile-brittle, high angle faults and a fracture cleavage; and iii) D_3, which resulted in north-northeast- to northeast-trending, broad open folds (F_3) which refolded the earlier structures.

MINERALIZATION AND ALTERATION

The gold within the Stog'er Tight Deposit occurs as fine-grained (<.05 mm) microveinlets and disseminated blebs within the pyrite. Visible gold was observed as rare very delicate flakes localized within weathered-out pyrite cubes. Channel sampling across the Stog'er Tight Zone returned values of up to 23.0 g/t Au over 7.0 m and grab samples up to 115.3 g/t Au (Huard, 1990). Diamond drilling by Noranda Exploration Company Ltd. traced the zone approximately 150 m down-dip (Figure 3) and indicated a plunge to the east, which increased its strike length to 650 m. However, open-pit mining of the deposit revealed that the ore is not continuous but occurs as discrete lenses or pods separated by barren wall rock.

Ramezani (1992) defined four alteration zones based on distinct mineral assemblages. These include; i) a chlorite-calcite zone, ii) an ankerite-sericite zone, iii) a chlorite-magnetite zone, and iv) a red albite-pyrite (+gold) zone. The red albite-pyrite zone is termed a replacement vein by Ramezani (1992).

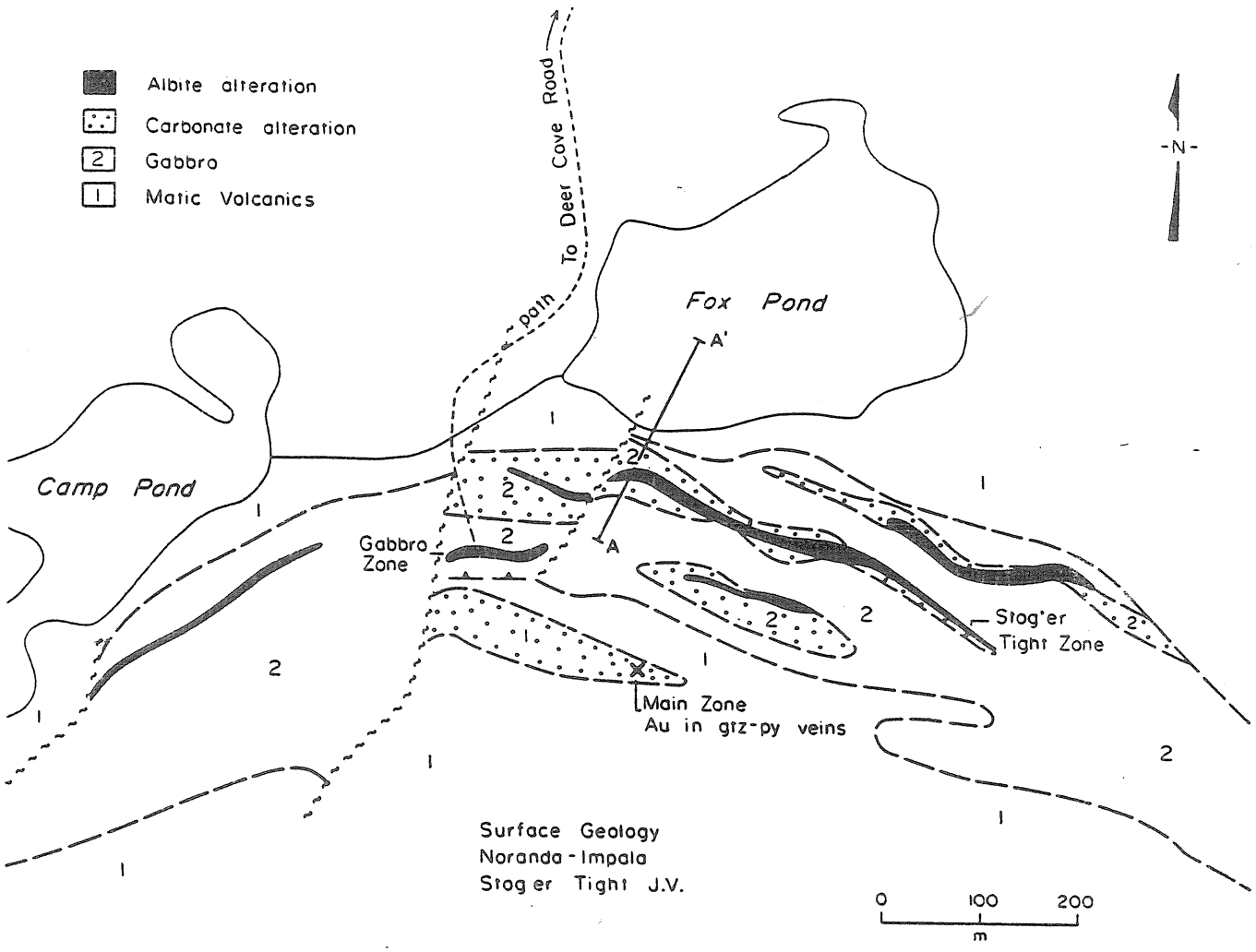
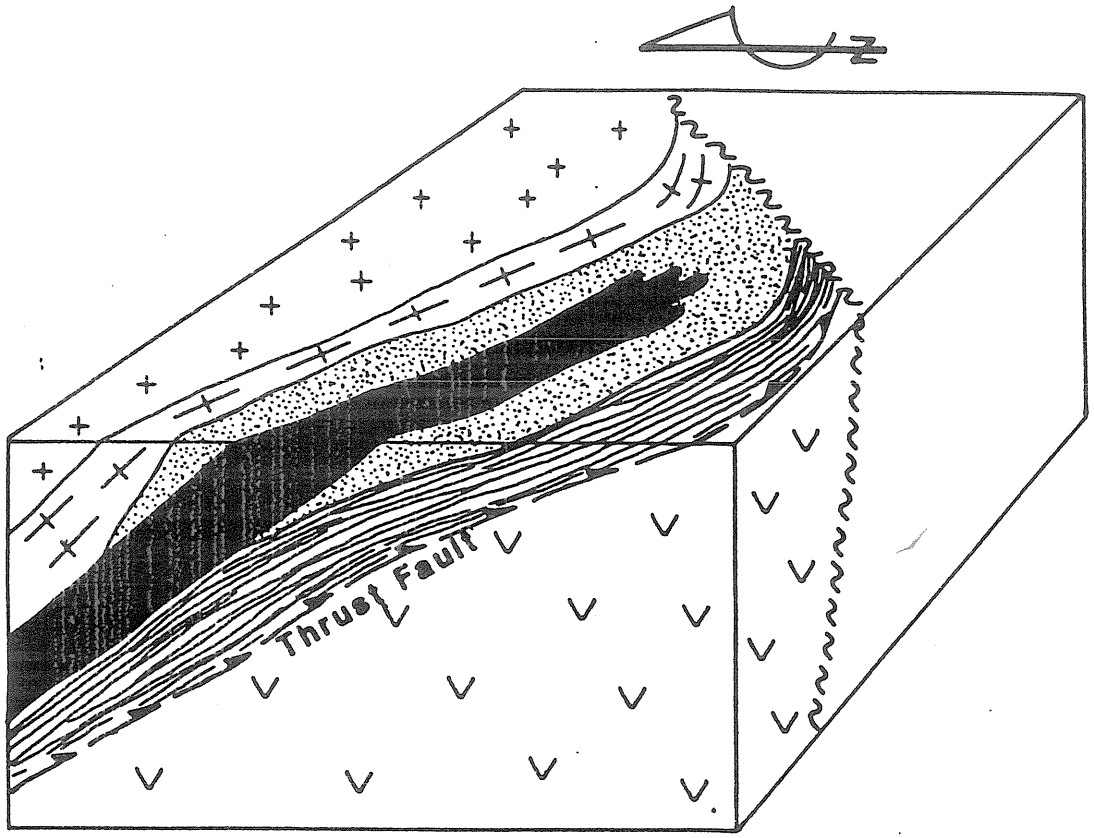


Figure 1. Surface geology of the Noranda-Impala Stog'er Tight Prospect. Line of cross section in figure 3 indicated by line A-A'.



Massive, coarse-grained gabbro.

Sheared gabbro with magnetite.

Albitized gabbro with magnetite.

MINERALIZED ZONE;
Albitized gabbro with pyrite.

Intensely sheared gabbro.

Basalt

Figure 2. Schematic block diagram of the Gabbro Zone.

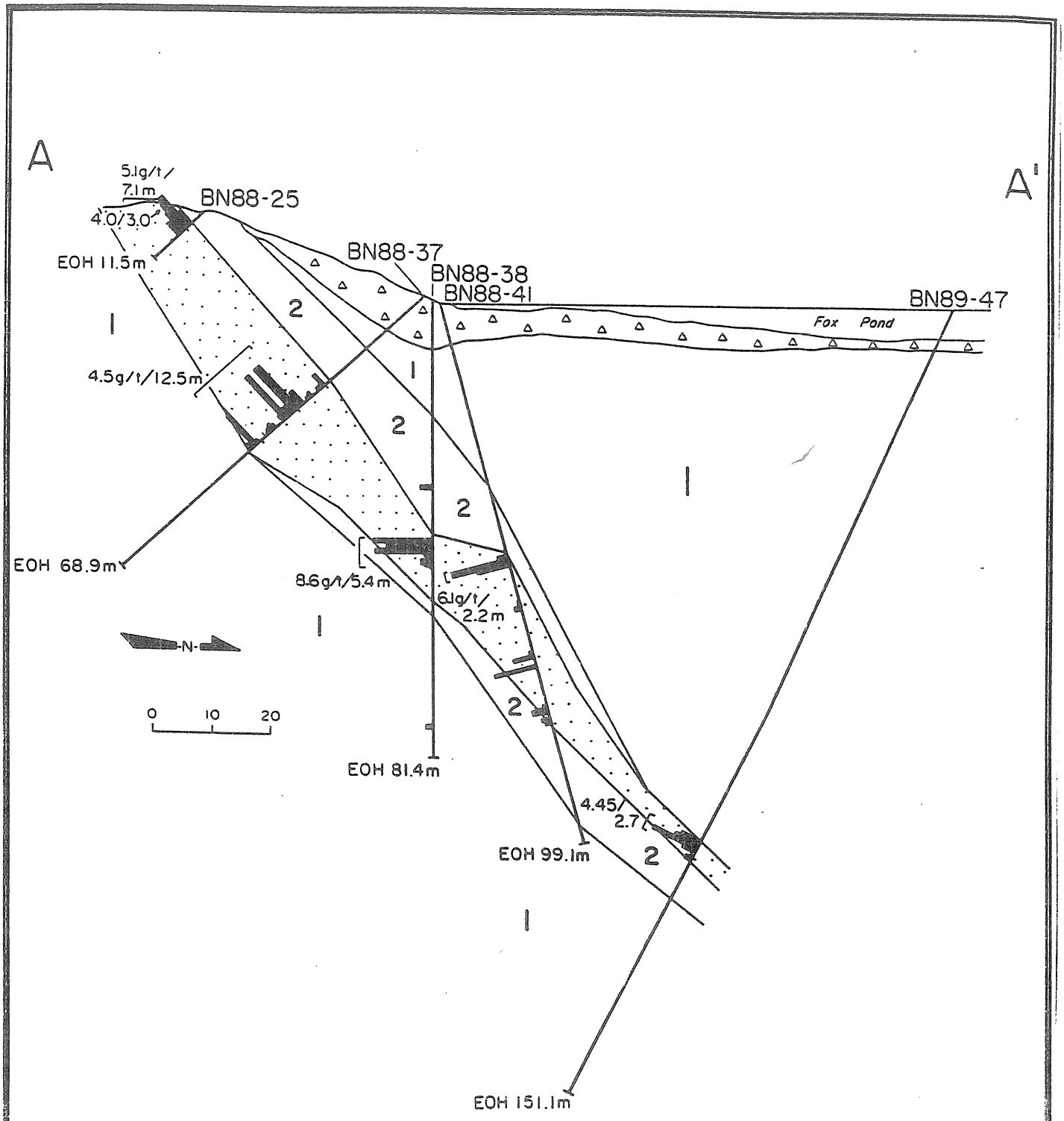


Figure 3. Cross section of the Stog'er Tight zone from drill hole data. Legend as for figure 1.

Quartz veins occur within the mineralized zones both as barren tension gash veins, which are interpreted to postdate the mineralization, and as shear-parallel, quartz–albite–ankerite veins (Ramezani, 1992). The gabbroic wall rock adjacent to the shear veins is characterized by intense red-albite alteration and by coarse auriferous pyrite. The intensity of the alteration diminishes within 5 to 15 cm from the shear-parallel veins.

The gold mineralization and associated alteration at Stog'er Tight are structurally controlled (Ramezani, 1992; Kirkwood and Dube, 1992). The alteration and mineralization is interpreted to have formed during brittle-ductile deformation attributed to a late D_1 event. Auriferous fluids percolated along the shear zones until they reacted with the Fe-rich gabbros and precipitated the gold. The hydrothermal alteration at Stog'er Tight has been dated by U-Pb zircon at 420 ± 5 Ma.

ROMEO AND JULIET PROSPECT

INTRODUCTION

The Romeo and Juliet prospect was discovered by Corona Corporation during regional prospecting of their Pine Cove property. The property is underlain by pillow basalt and fine grained gabbroic intrusions of the Point Rouse Complex. The prospect has been trenched and tested by four diamond-drill holes. The prospect is currently the property of Nova Gold Inc. and New Island Minerals. A 10 tonne bulk sample from the Juliet South Zone produced approximately 10 oz. of gold (Kevin MacNeill, pers. comm, 1997).

MINERALIZATION AND ALTERATION

The prospect consists of three sub-parallel large quartz veins (Juliet South–Juliet North, Connecting and Romeo zones) which have been exposed over a strike length of 250 m. The veins which trend 30° and dip 60° to the southeast are associated with an intense north-northeast-trending shear zone. They are interpreted to have formed as large *en echelon*, dilational (antitaxial) quartz veins which formed at an oblique angle to the shear zone (Calon and Weick, 1990). However, recent work suggests that the Juliet and Connecting zones once formed a single continuous vein which has since been offset by a series E–W trending brittle faults. The large veins are comprised of smaller, multiple generations of parallel milky white quartz veins as evidenced by crack and seal textures, comb textures, weakly preserved lamination and altered wall rock fragments.

Wall rock marginal to the veins exhibits intense Fe-carbonate alteration resulting in a speckled appearance. Numerous quartz-carbonate tension gash veins occur throughout the altered wall rock. Alteration locally extends up to 10 m from the veins and appears to be best developed in fine-grained gabbroic rocks.

Visible gold has been observed along most of the 250 m strike length of the Romeo and Juliet prospect. Gold occurs as very fine flecks and locally coarse patches sporadically developed along the multiple vein margins and along the external margins to the large veins. Channel sampling across the strike of the veins generally returned low gold values as the gold bearing surfaces are oriented parallel to the vein margins and perpendicular to the channel direction. Diamond drilling on the

Juliet prospect intersected 2.32 g/t Au over 3 m (including 0.5 m of 11.1 g/t Au) (Dimmell and Hartley, 1991). The veins generally contain less than 1% coarse grained pyrite.

THE PINE COVE AREA GOLD PROPERTY

Peter Dimmell and Charlie Hartley

INTRODUCTION

The Lightning and Thunder Zones, that make up the Pine Cove deposit, are hosted by the Point Rousse Complex, a dismembered, internally disrupted ophiolite that is thrust over the Pacquet Harbour Group along the Scrape Thrust. The Scrape Thrust describes an arcuate pattern that defines the apex of the Baie Verte Flexure in the Pine Cove area, trending north-northeast to the west of the deposit and southeast to the east of the deposit. Plunge is approximately 30 to 35 degrees north.

The Point Rousse Complex consists of tuffs and volcanic flows intruded by gabbro and diabase rocks. The rocks are metamorphosed in the greenschist facies. Gabbroic rocks may be abundant based on the occurrence of the leucoxene (altered titano-magnetite) content.

The structurally underlying Pacquet Harbour Group is composed of mafic to intermediate volcanic units (mainly basalts) which are also intruded by mafic plutonic rocks. Adjacent to the Scrape Thrust, the Pacquet Harbour Group is metamorphosed in the greenschist facies.

The property is currently held by Nova Gold and New Island Minerals.

MINERALIZATION

In the Lightning and Thunder zones, gold is associated with pyrite in quartz veins (meso-thermal lode gold type) and in sheared, altered host rocks (disseminated shear-hosted type; Calon and Weick, 1990). Mineralized zones appear to be restricted to the thrust sheet bounded by the Pasture Pond and Scrape thrusts (Figures 1 and 2). They dip approximately 30 to 35 degrees to the north, sub-parallel to the Scrape Thrust, and lie a minimum of 75 to 80 m above it (Figures 3 and 4). Gold tenor is related to pyrite content with an average of 3 to 5 percent pyrite commonly indicating gold values in the 3 to 5 g/t range. Reserves (undiluted, geologically inferred) based on 79 drill holes are 2,750,000 tonnes at 3.0 g/t Au to 150 m vertical depth. The mineralized zones remain open to the east along strike and down dip to the north.

Gold mineralization is best developed in basalt and hematitic arenite, indicating that rock composition played an important role in concentrating the gold. Mineralized zones are silicified, chloritized (basalt and massive, fine grained pyroclastic rocks), oxidized and sulphidized (basalts and hematitic arenite). There is a direct correlation between the presence of auriferous veins and the lithology and state of alteration of the host rocks (Calon and Weick, 1990). Pyrite is concentrated marginal to the veins or within country rock inclusions in the veins. Minor disseminated pyrite and scattered blebs of visible gold are found isolated within the veins (Lakefield Research, 1990; Wilton, 1990).

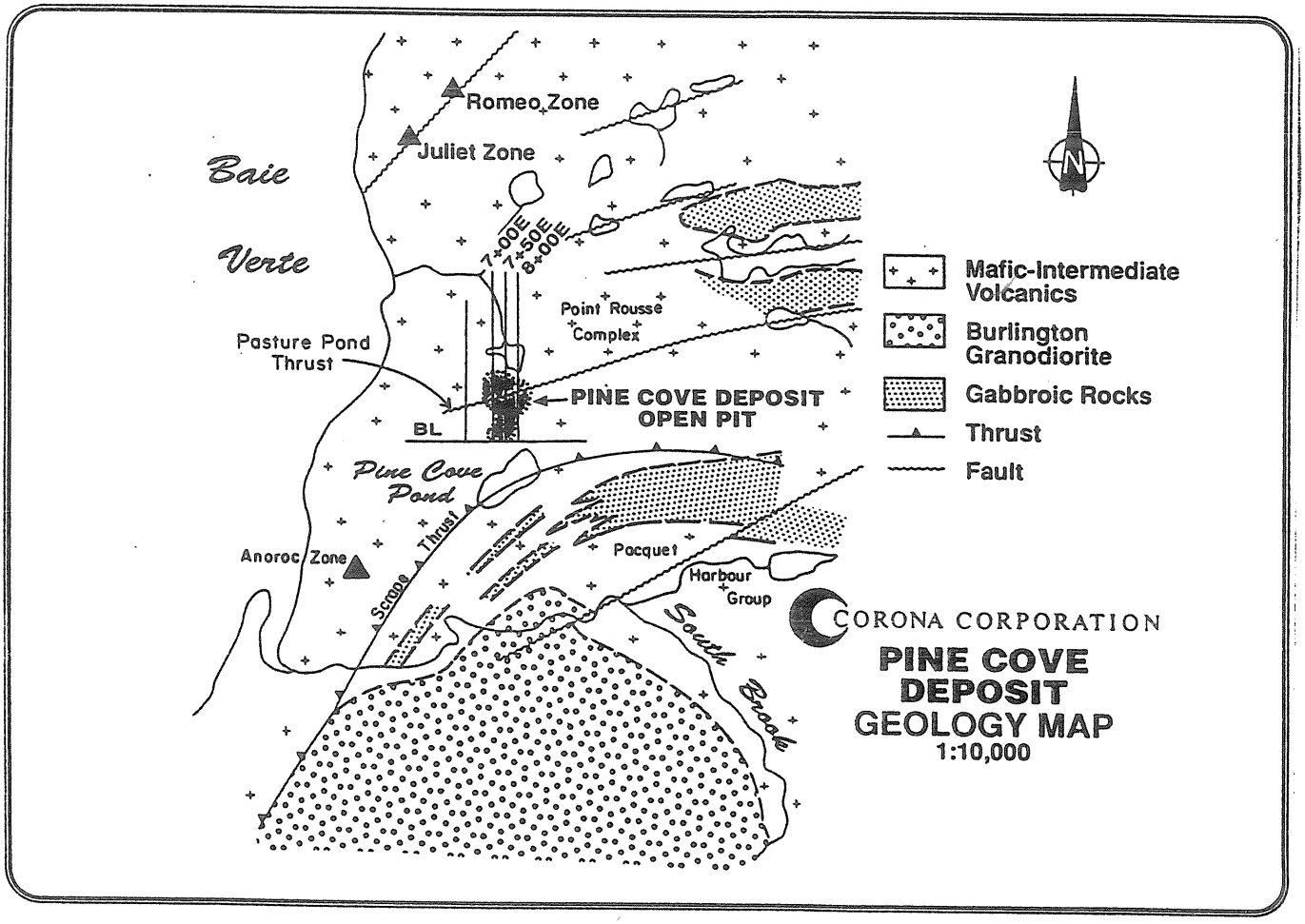


Figure 1. *Geology in the area of the Pine Cove deposit, showing the location of the proposed open pit, the traces of the Scrape and Pasture Pond thrust faults, and the associated Romeo, Juliet, and Anoroc zones.*

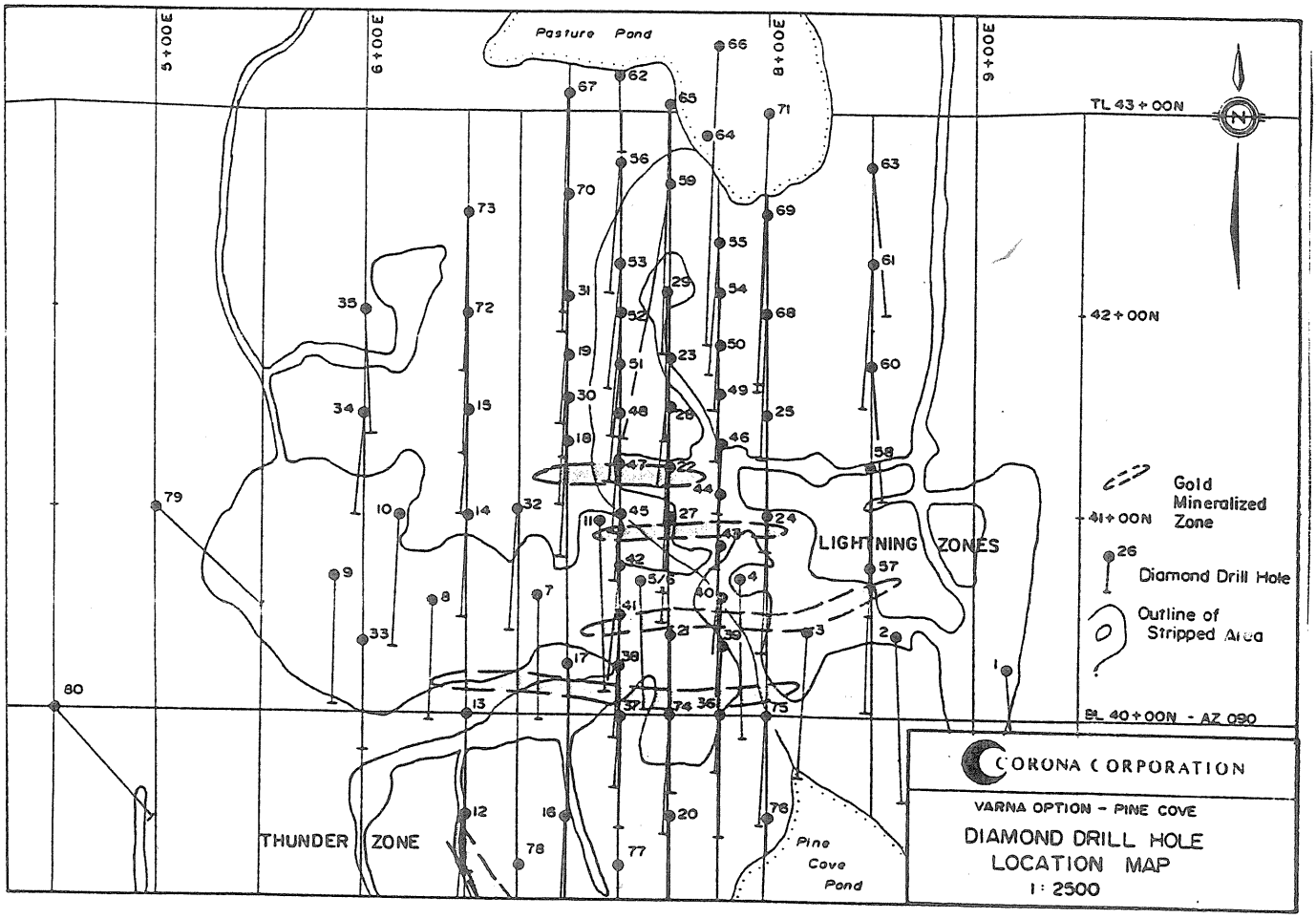


Figure 2. *Surface traces of mineralized zones that make up the Lightning Zone (stippled) and location of diamond drill hole.*

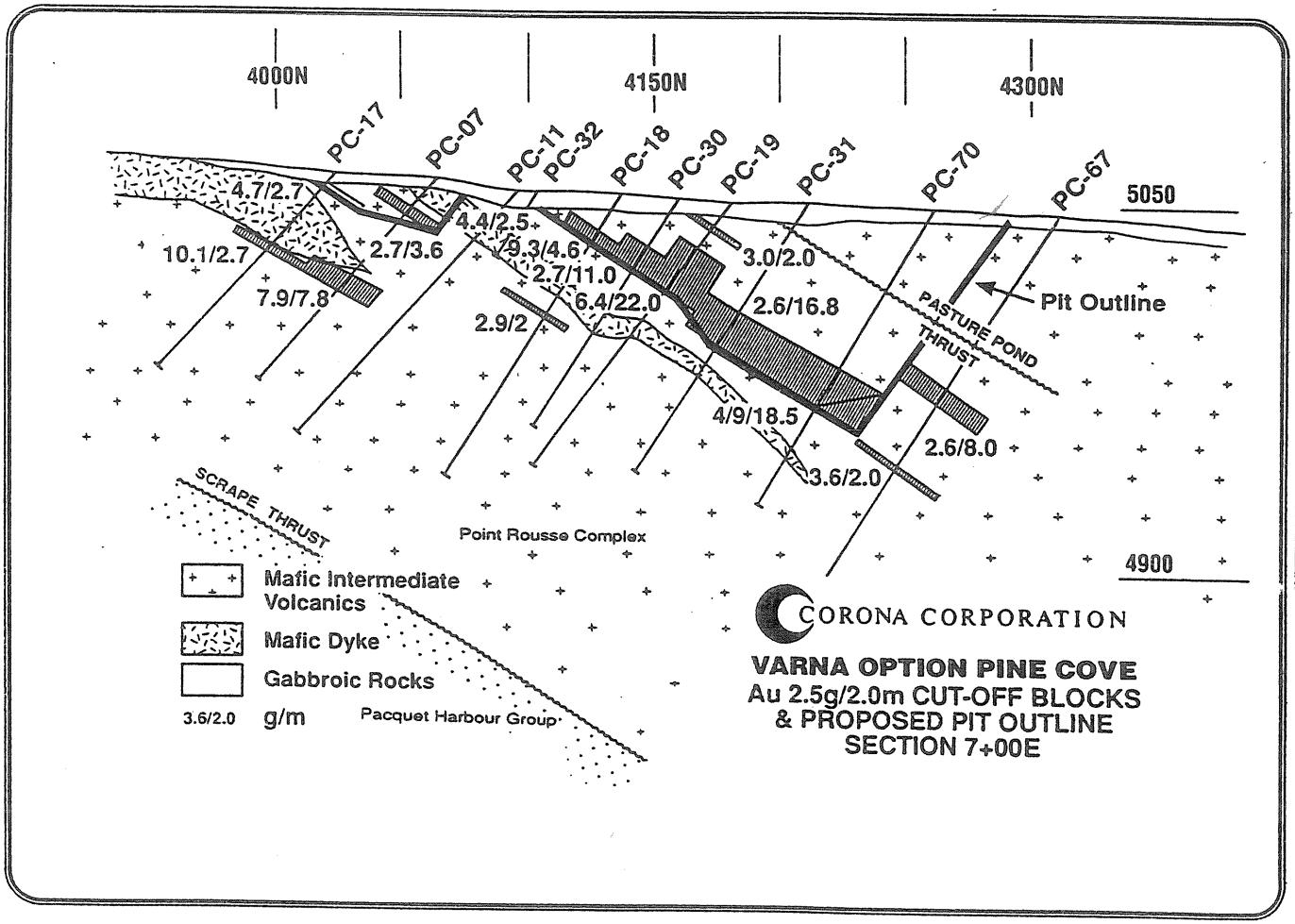


Figure 3. *Geological section along 7+00E showing Au 2.5g/2.0m cut-off blocks and proposed pit outline. Vertical hatching shows mineralized zones.*

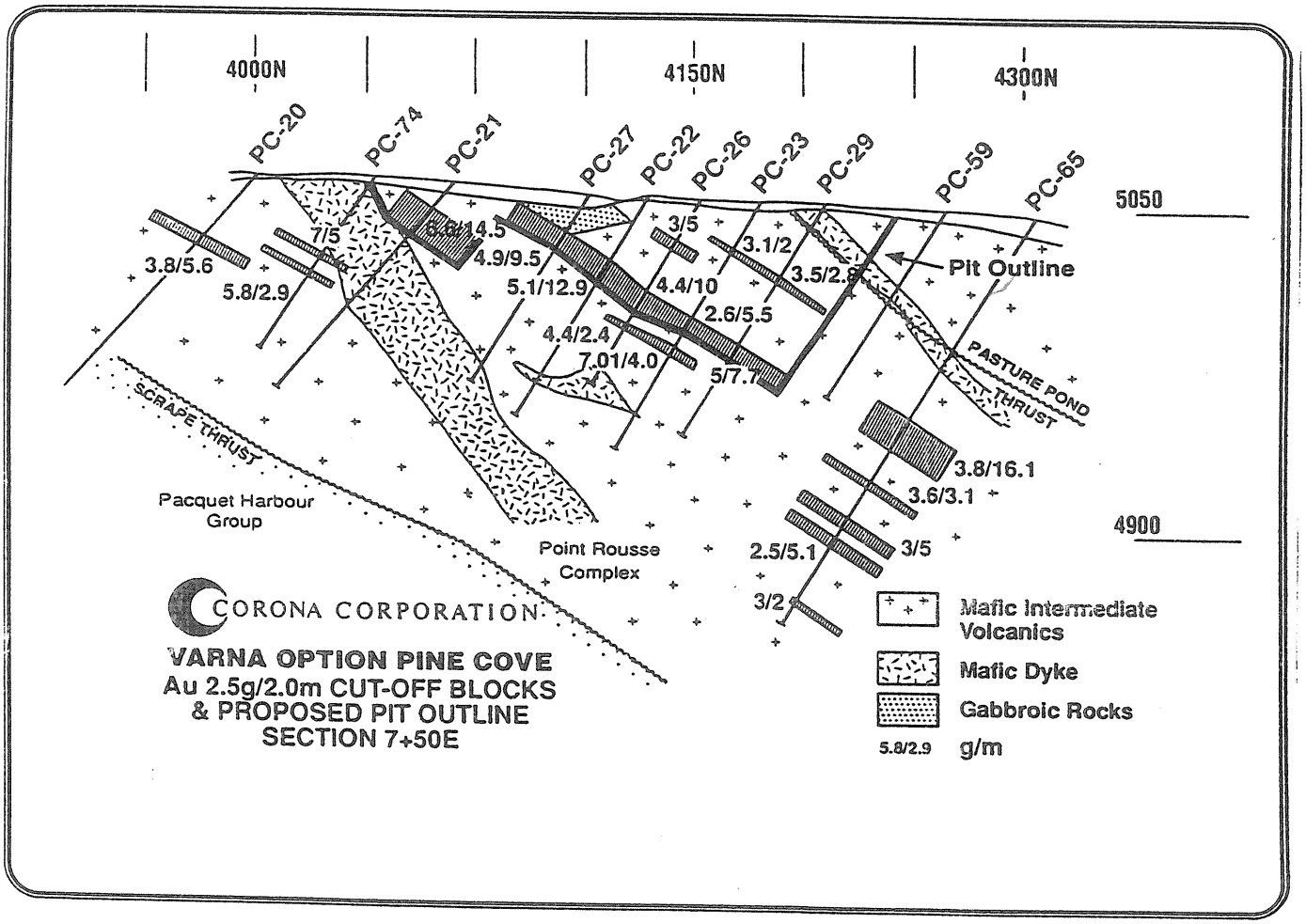


Figure 4. *Geological section along 7+50E showing Au 2.5g/2.0m cut-off blocks and proposed pit outline. Vertical hatching shows mineralized zones.*

STRUCTURAL SETTING

Gold mineralization is associated with pyrite in quartz veins (mesothermal lode gold type) and with disseminated pyrite in sheared, altered host rocks (disseminated shear-hosted type). The orientation patterns and distribution of auriferous quartz veins and host rock zones are controlled by the geometry of the D_3 fold system and by the distribution of lithological units in the D_1, D_2 fold pattern (Calon and Weick, 1990). Most quartz veins are concentrated in the central and eastern part of the property, associated with the more competent sequences of mafic volcanic and volcaniclastic rocks and hematitic arenite. Veins in the western tuffaceous sequence, are less frequent and more barren.

The mixed brittle-ductile D_3 deformation is interpreted as a thrust fault propagation fold system with associated shears developed in response to movement on the Scrape Thrust (Calon and Weick, 1990). The D_3 deformation exerted geometric controls on the orientation of the quartz veins with the veins occurring in two distinct sets of planes. One set represents steeply oriented, E–W striking veins, with dilational features which represent an en echelon tension gash system. In the central and eastern area, these veins are roughly perpendicular to the gently to moderately north-dipping axial surfaces of the D_3 fold system. The second set represents the thicker, massive and brecciated veins which dip both steeply and moderately to the north in the central and eastern area. The breccia veins are generally more gently inclined than the massive veins. They represent injections into shear zones parallel to the axial surfaces of the D_3 folds (Calon and Weick, 1990).

NUGGET POND (RICHMONT MINES INC.)

INTRODUCTION

The Nugget Pond Deposit was discovered in the late 1980s by Bitech Resources during regional prospecting of the Betts Cove Ophiolite Complex. In early 1995, Richmont Mines Inc. acquired a 60 percent interest in the deposit and in 1996 they acquired the remaining 40 percent interest to become sole owner and operator. Underground development commenced, bulk sampling was completed and the decision to bring the project into production was made. Mineable reserves as of the end of December, 1996, were calculated to total 488,000 tonnes grading 0.357 oz/t Au (Richmont Mines Inc., Annual Report, 1996). Construction of the mill and mine facilities was completed in February, 1997 and milling commenced.

Regional Setting (after J.H. Bedard, K Lauziere, A. Sangster and E Boisvert, 1997)

The Nugget Pond Horizon unconformably overlies boninitic and primitive-arc tholeiititic pillow lavas of the Betts Cove Ophiolite Complex. The horizon consists of a locally developed basal boulder conglomerate, comprised of basalt and chert fragments cemented by magnetite; thin-bedded sandstone, red siltstone, ironstone grading up into a green sandstone/siltstone turbidite unit. The horizon is intruded locally by medium to coarse grained mafic sills. The horizon has been traced discontinuously for approximately 8 to 10 km between Betts Cove to the southwest and Tilt Cove to the northeast.

GEOLOGY AND MINERALIZATION

The Nugget Pond Deposit consists of three pyritiferous zones located near the middle of the sedimentary horizon. The ore zones consist of stratabound layers of disseminated megacrystic (1 to 3 cm.) auriferous euhedral pyrite, concentrated near the contact between a lower brick red distal turbidite and interbedded distal to proximal pale green turbidites. Megacrystic pyrite replaces and overgrows magnetite on the upper part of the red unit and replaces biogenic pyrite, pyrrhoite and magnetite in the lower part of the green unit. Quartz-feldspar-carbonate stockwork is spatially associated with the mineralization. Stilpnomelane is the principal alteration mineral. Xenotime from the stockwork has been dated at 374 Ma.

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