1989 FINAL REPORT

on the

SURFACE GEOLOGY,

MARGIE, MOLLIE & YANKEE (MMY) CLAIMS

NTS 92B/13

by

Dr.M.G.Morrice

July, 1989 Vancouver, B.C.

SUMMARY

The 1989 surface geological program on the MMY Claims involved 1:5000 scale property-wide mapping. Objectives of the surface program were to provide a geological base map of the property, to document the stratigraphy of the McLaughlin Ridge Formation, to characterize and delimit alteration zones, to provide a structural synthesis and to attempt to constrain the more favourable areas of base metal deposition.

The MMY claims are underlain by a west-northwest trending belt of rocks composed of McLaughlin Ridge volcanics intruded by Karmutsen gabbros, which are overlain unconformably or are in fault contact with Cretaceous sediments of the Nanaimo Group. The lithologic package of exploration interest is the McLaughlin Ridge Formation, which, on the MMY claims is composed mainly of felsic, plagioclase +/- quartz-phyric flows and subordinate mafic and intermediate flows and sedimentary rocks.

All lithologies within the McLaughlin Ridge Formation have undergone several periods of deformation. An early period of ductile deformation produced a well-developed west-northwest trending, steeply dipping schistosity in all lithologies. A shallowly plunging mineral and stretch lineation accompanied the development of this schistosity. Late brittle features include kink bands and faults of various attitudes. The most prominent fault is a northwest trending fault that occurs in the east end of the property and which juxtaposes Karmutsen gabbro against Nanaimo sediments. These structural features are consistent with an early period of south-southwest directed compression followed by a period of relaxation to produce the brittle features. Renewed south-southwest directed compression resulted in a period of north-dipping listric reverse faulting, which has brought Karmutsen gabbro into contact with Nanaimo sediments.

There is no evidence for widespread or prolonged hydrothermal alteration having affected the McLaughlin Ridge volcanics on the MMY claims. The only indications of metal accumulation are quartz + pyrite +/- chalcopyrite veins which occur in shear zones in Karmutsen gabbros. However Ba-rich siliceous sediments (exhalites?) and associated felsic volcanics in the south part of the Yankee and Mollie M.C.'s may be significant with respect to base metal exploration.

RECOMMENDATIONS

The important features of the MMY claims that relate directly to further exploration are:

1) The McLaughlin Ridge Formation is composed dominately of felsic volcanics, most of which are interpreted to be flows.

2) The presence of Ba-rich sediments in the south part of the Yankee M.C.

3) There is no evidence for widespread hydrothermal alteration within the McLaughlin Ridge Formation.

4) There is no indication of base metal accumulation within the McLaughlin Ridge Formation.

5) The MMY claims encompass a very small area.

Despite the negative factors (lack of alteration, lack of mineralization), the abundance of felsic volcanic flows on the property, the presence of Ba-rich sediments and the relatively low amounts of exposure should be addressed through subsequent exploration. This should be a limited program designed to check for mineralization associated with the felsic flows.

I recommend that the next steps in the evaluation of the MMY claims be:

1) The establishment of a grid with a baseline oriented at 300 degrees. Grid lines should be established orthogonal to the baseline at 100m intervals.

2) Geological mapping, at 1:2500, utilizing this grid for control.

3) Geophysics (mag, VLF, I.P.) on the grid.

Results from this part of the program will determine future developments on the property. In the meantime, if drilling is required in 1989 in order to satisfy the option agreement, I recommend that one, 200 m hole (Azimuth: 020 degrees, dip: 50 degrees) be drilled from the south boundary of Yankee M.C. (3E/0+25S) to intersect the Ba-rich sediments and felsic volcanics to the north. This hole can be stopped when it encounters significant gabbro.

M. Morrice

Additional Comments; R. Stewart, August 15,1989: The hole recommended above would be better located about 165E,0+15N which is about 5m west of sample site VA11485. This setup would section more of the favourable stratigraphy before ending in gabbro. The setup is also logistically more efficient by its location on a pre-existing road.

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INTRODUCTION

Location, Access and Physiography

The MMY Claims are located on southeast Vancouver Island with the centre of the property approximately 8 km southwest of the town of Chemainus, British Columbia (Figure 1). Access to the property is along active and abandoned forest access roads which traverse the Mount Sicker and Mount Prevost area (Figure 2). The topography of the claims is gentle. Elevations range from 410 to 640 metres above sea level.

The MMY Claims comprise 3 crown grants and fractional crown grant (Margie M.C.(5G), Mollie M.C.(6G), Mollie fraction (7G), Yankee M.C.(89G)) occupying a total of 67.1 hectares. The MMY claims are bounded by Minnova Corporation's Mount Sicker property.

A summary of the MMY claims status is presented in Table 1.

Table 1. MMY Claims Data.

Claim Name	No. of units	Record No.	Due date
Margie	1	729	Dec.16,1993
Mollie	1	728	Dec.16,1993
Mollie Fraction	fraction	727	Dec.16,1993
Yankee	1	724	Dec.16,1993

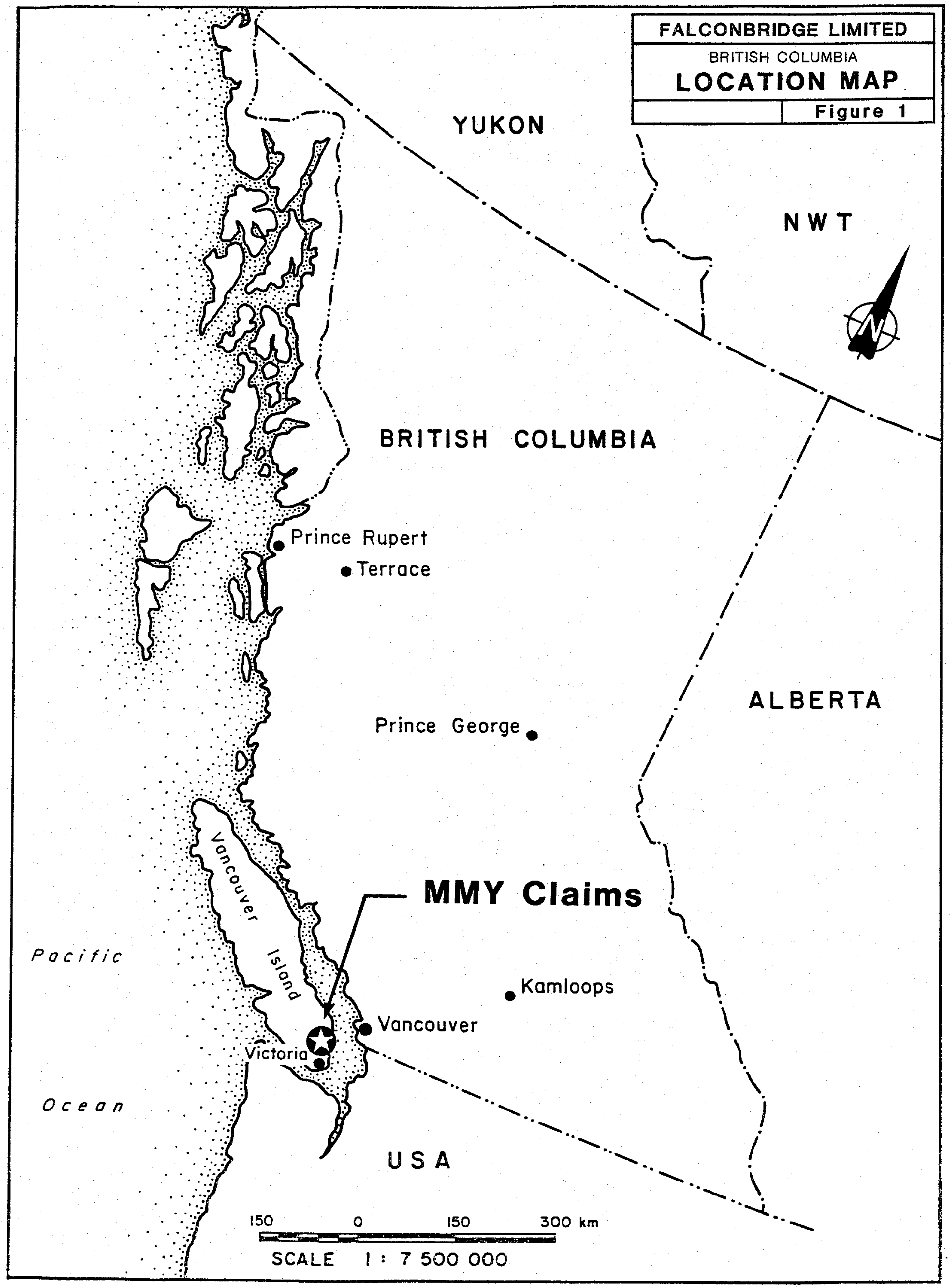
Previous Geological Work

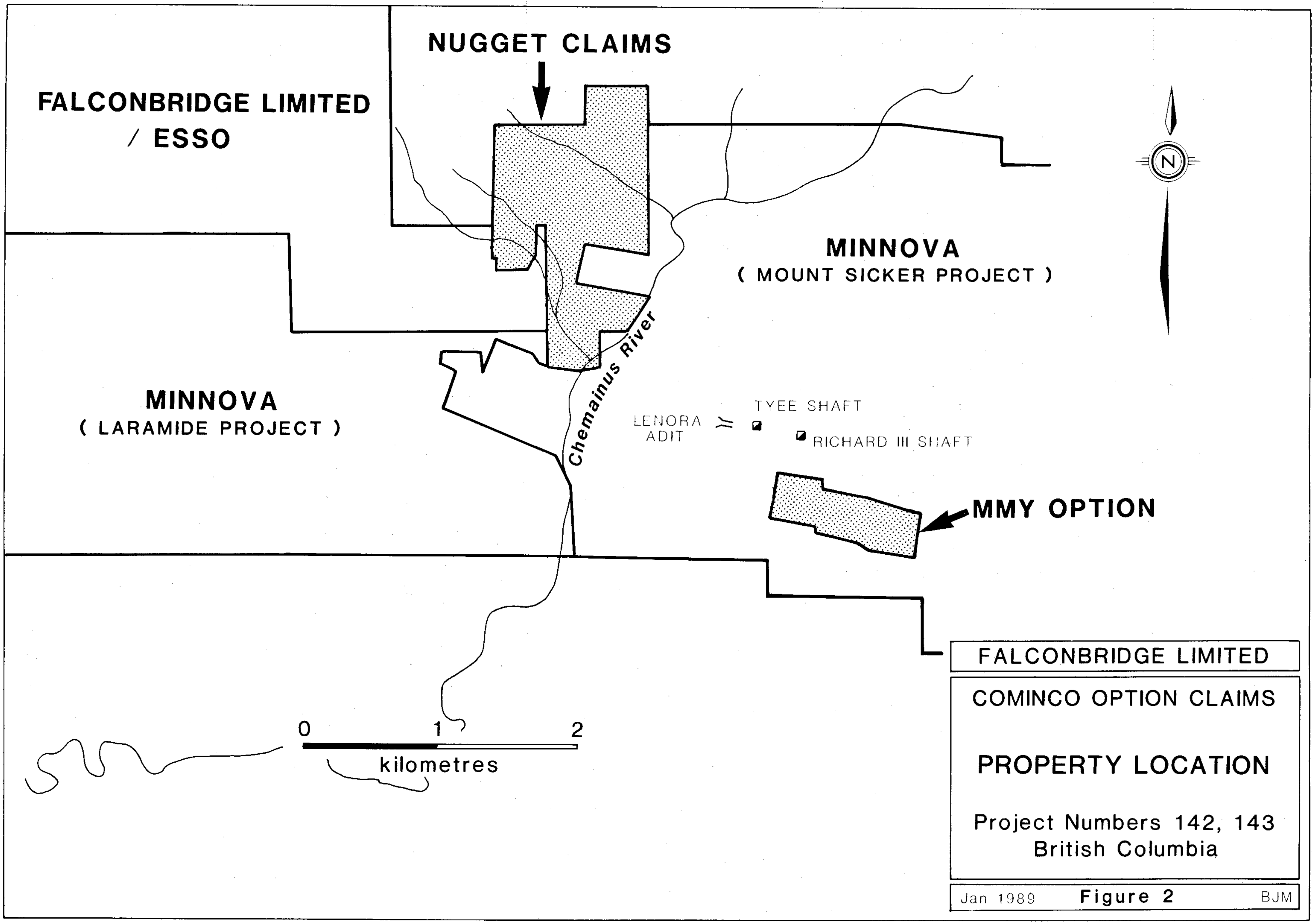
On a regional scale, the area underlain by the MMY claims is included in Muller (1980), Massey and Friday (1988) and Massey et al (1988). Previous property-scale geological mapping of the MMY Claims was by Deighton (1977), Ronning (1980), as part of a larger evaluation of SEREM's Mount Sicker property, and Sorbara (1983).

Present Geological Survey

The present geological survey was conducted from June 5 to 7, 1989. Objectives of the surface program were to provide a geological base map of the property, to document the stratigraphy of the McLaughlin Ridge Formation, to characterize and delimit alteration zones, to provide a structural synthesis and to attempt to constrain the more favourable areas of base metal deposition.

Geological mapping was done along roads and and a makeshift grid network that was established during the present survey. The baseline that was used is a control line established in 1988 by F. Renaudat, during a survey of the MMY claims for Falconbridge. This baseline trends at 087 degrees and corresponds to the boundary between Sections 18 and 19. The baseline is flagged (but not cut) with pink and/or blue and white striped flags. Distance marked


FALCONBRIDGE LIMITED
BRITISH COLUMBIA
LOCATION MAP
Figure 1
YUKON
NWT
N
BRITISH COLUMBIA
Prince Rupert
Terrace
Prince George
ALBERTA
MMY Claims
Vancouver Island
Pacific Ocean
Kamloops
Vancouver
Victoria
USA
150 0 150 300 km
SCALE 1 : 7 500 000



FALCONBRIDGE LIMITED

COMINCO OPTION CLAIMS

PROPERTY LOCATION

Project Numbers 142, 143
British Columbia

Jan 1989 **Figure 2** BJM

along this baseline is in metres east, from a point south-southwest of the southwest corner of the Yankee M.C. (Figure 3). Traverses, spaced at 150 metre intervals were run at right angles (ie. at 357 degrees) to this baseline; these traverses were flagged at 25 metre intervals with fluorescent orange flagging. The grid lines correspond approximately (but not precisely) with the baseline distances as established by Renaudat. A total of 4.07 km of grid were established in this manner. This makeshift grid was tied in to the surveyed boundaries of the MMY claims (McGladrey, 1988). These claim boundaries are marked by tree blazes that are painted with fluorescent orange paint and pink and/or blue and white striped flagging.

An effort was made to visit all major outcrops in the claim group. Information was plotted in the field, at a scale of 1:5000, on gridded paper. The geological map is presented at 1:5000 (Figure 3).

Acknowledgements

The author was capably assisted in the field by R. Barrick.

GENERAL GEOLOGY

Introduction

Vancouver Island is underlain by a diverse assemblage of lithologies, which, with the exception of the extreme southern tip of the island, belong to Wrangellia, an allochthonous terrain which was accreted to the continental margin of North America during the Cretaceous (eg. Muller, 1977; Jones et al, 1977). The oldest rocks within Wrangellia are Paleozoic volcanics and sediments of the Sicker Group which is exposed on Vancouver Island in several structural culminations, the largest of which are the Cowichan-Horne Lake, Buttle Lake, Tofino and Nanoose uplifts (Figure 4). The MMY claims occupy a portion of the southeast part of the Cowichan-Horne Lake uplift (Figure 4).

Most of our understanding of the Sicker Group derives from recent geological studies within the Buttle Lake (Juras, 1987) and Cowichan-Horne Lake (Massey and Friday, 1987, 1988, 1989; Massey et al, 1987, 1988; Sutherland Brown et al, 1986; Muller, 1980) uplifts. While there are striking similarities in the geology of the Cowichan-Horne Lake and Buttle Lake uplifts there has been no concentrated effort on correlating units between the two uplifts; each uplift has its own set of formational names. Nevertheless, a tentative correlation of lithologies between the two uplifts is presented in Table 2. Of prime importance in this correlation is the presence of volcanic-hosted massive and semi-massive sulphide deposits within the McLaughlin Ridge Formation in the Cowichan Lake Formation (Twin J, Coronation, Anita) and the Myra Formation of the Buttle Lake uplift (Lynx, Myra, Price, H-W). However, the reader should view this correlation with due caution due to the abrupt

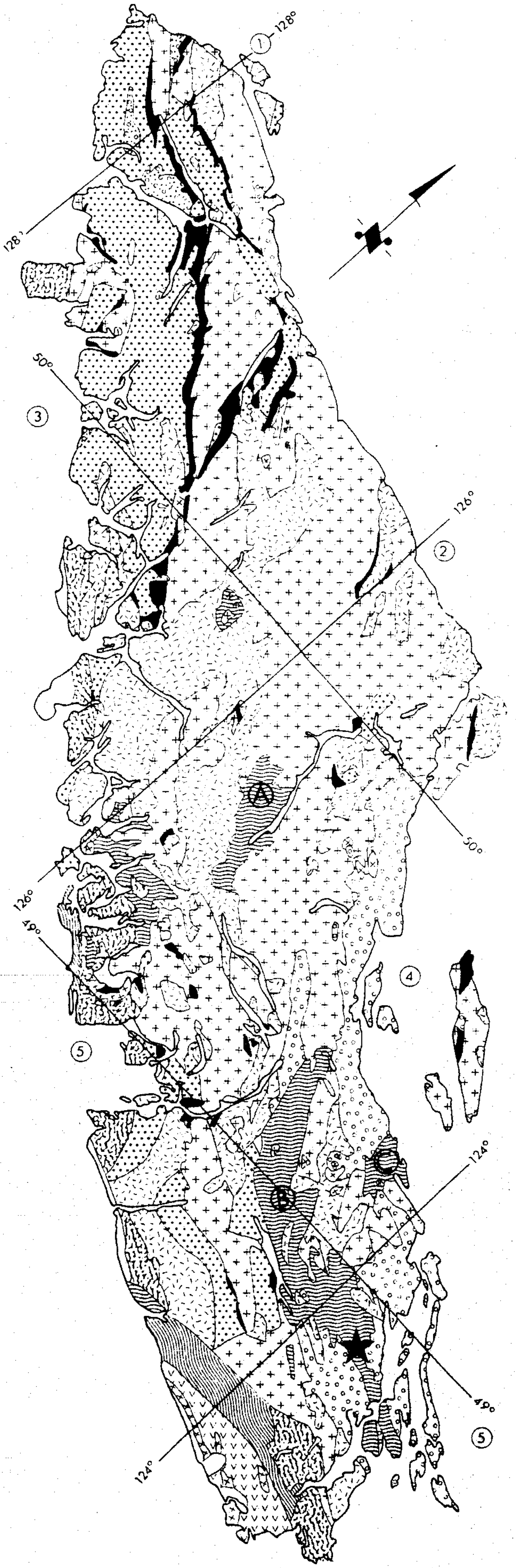


Figure 4

Geological sketch map of Vancouver Island.

LEGEND

	CARMANAH GROUP	MIDDLE TERTIARY
	CATFACE INTRUSIONS	EARLY TO MIDDLE TERTIARY
	METCHOSIN VOLCANICS	EARLY TERTIARY
	NANAIMO GROUP	LATE CRETACEOUS
	QUEEN CHARLOTTE GROUP KYUQUOT GROUP	LATE JURASSIC TO EARLY CRETACEOUS
	LEECH RIVER FORMATION PACIFIC RIM COMPLEX	
	ISLAND INTRUSIONS	EARLY AND (?) MIDDLE JURASSIC
	BONANZA GROUP	EARLY JURASSIC
	VANCOUVER GROUP	LATE AND (?) MIDDLE TRIASSIC
	PARSON BAY FORMATION QUATSINO FORMATION	
	KARMUTSEN FORMATION	
	SICKER GROUP	PALEOZOIC
	METAMORPHIC COMPLEXES	JURASSIC AND OLDER

★ **MMY CLAIMS**

① ALERT BAY – CAPE SCOTT, 92 L – 102 I (G.S.C. PAPER 74–8)

② BUTE INLET, 92 K (IN PREPARATION), O.P. MAP 345

③ NOOTKA SOUND, 92 E (IN PREPARATION)

④ ALBERNI 92 F (G.S.C. PAPER 68–50)

⑤ VICTORIA, 92 B, C (FIELD WORK IN PROGRESS; SEE G.S.C. PAPERS 75–1A, p. 21–26; 76–1A, p. 107–111, 77–1A, p. 287–294.)

A — BUTTLE LAKE UPLIFT

B — COWICHAN – HORNE LAKE UPLIFT

C — NANOOSE UPLIFT

MILES

0 20 40

facies changes which characterize volcanic deposits, the great distances over which these correlations are made, and the rather poor age constraints on lithologies of the two uplifts.

Cowichan-Horne Lake Uplift

Within the Cowichan-Horne Lake uplift the Sicker Group has been subdivided into five formations (Table 2). From oldest to youngest these are the Duck Lake, Nitinat, McLaughlin Ridge, Cameron River and Mount Mark Formations.

The Duck Lake Formation is exposed in the northwest part of the Cowichan-Horne Lake uplift, near Port Alberni. This formation comprises a monotonous sequence of variolitic pillowed and massive basalts of probable MORB-like geochemistry (Massey and Friday, 1989). The Duck Lake Formation is overlain by the Nitinat Formation, a fairly homogeneous sequence of mafic clinopyroxene +/- plagioclase-phyric flows and pyroclastics of calcalkalic to alkalic (shoshonitic) affinity. The Nitinat Formation is overlain by the McLaughlin Ridge Formation, a heterolithic sequence of calcalkalic to alkalic (shoshonitic) felsic, intermediate and mafic volcanics, and derived sediments. Felsic volcanics are quartz +/- plagioclase-phyric pyroclastics, flows and subvolcanic intrusions. The Saltspring Intrusion, centred in southern Saltspring Island, may represent an intrusive phase (volcanic centre?) related to McLaughlin Ridge felsic volcanism. Intermediate and mafic volcanics are aphyric to clinopyroxene +/- plagioclase - phyric pyroclastics, flows and subvolcanic intrusions, texturally and geochemically similar to lithologies within the Nitinat Formation. The McLaughlin Ridge Formation is overlain, apparently conformably, by the Cameron River Formation, a dominately epiclastic and chemical sedimentary package comprised of thinly bedded cherts, argillites, siltstones and wackes. The uppermost formation within the Sicker Group of the Cowichan-Horne Lake uplift is the Mount Mark Formation. This formation is composed of massive and laminated crinoidal calcarenites and argillites (Massey and Friday, 1987). Only the McLaughlin Ridge Formation is exposed on the MMY claims.

The Sicker Group has been intruded by gabbro and diorite sills and dykes which fed Karmutsen Formation volcanics of the overlying Vancouver Group, in reponse to Late Triassic crustal dilation (Massey and Friday, 1988). The Sicker Group and Karmutsen intrusions are overlain unconformably by clastic sediments of the Late Cretaceous Nanaimo Group (Muller and Jeletzky, 1970).

Available age constraints on various formations within the Sicker Group are summarized in Brandon et al (1986) and Juras (1987). The best estimate for the age of the Saltspring Intrusion is a U-Pb zircon date of 393(+25,-10)Ma (Early Devonian). A U-Pb zircon age of 370(+18,-6)Ma (pre- Late Devonian) is the best estimate for the age of the Myra Formation at Buttle Lake. Faunal data indicate that the Cameron River Formation is Early to early Late Mississippian. The Mount Mark (Cowichan-Horne Lake uplift) and Buttle Lake (Buttle Lake uplift) Formations contain early Middle Pennsylvanian through Early Permian conodonts.

Table 2. Stratigraphic Comparison Between the Cowichan-Horne Lake Uplift and the Buttle Lake Uplift.

AGE	LITHOLOGY	COWICHAN-HORNE LAKE UPLIFT	BUTTLE LAKE UPLIFT
E.Per-Penn	Limestone	Mount Mark	Buttle Lake
Penn or Miss	Ves.MV		Flower Ridge
E.Miss?	V,S,G		Thelwood
E.Miss	S,G	Cameron River	
L.Dev.	M,I,FV,MS	McLaughlin Ridge	Myra
L.Dev.	MV	Nitinat	Price
Devonian?	MV	Duck Lake	

Ages from Brandon, et al, 1986, Juras, 1987.

Formation names from Sutherland Brown and Yorath (in preparation) and Juras (1987), except Duck L., from Massey and Friday (1989).

Abbreviations: E.-Early, L.-Late, Per-Permian, Penn-Pennsylvanian, Miss-Mississippi, Dev-Devonian, Ves-vesicular, V-volcanic, S-sediment, G-gabbro, M-mafic, I-intermediate, F-felsic, MS-massive sulphides.

PROPERTY GEOLOGY

Introduction

The current geological interpretation of the MMY claims is shown in Figure 3. The MMY claims are underlain by approximately 40% McLaughlin Ridge Formation, 35% Karmutsen gabbro, and 25% Nanaimo Group.

Lithologies within the MMY claims trend west-northwest. Bedding attitudes are difficult to discern in most of the property. Those that were observed trend west-northwest with steep dips. Virtually all lithologies are characterized by a steeply dipping, variably intense schistosity. Mineral and stretch lineations are shallow plunging within the plane of schistosity.

Devonian

McLaughlin Ridge Formation

(i) Introduction

The McLaughlin Ridge Formation is the lithologic package of exploration interest, hosting massive and semi-massive sulpide deposits elsewhere in the Cowichan-Horne Lake uplift and being remarkably similar to the massive sulphide-hosting Myra Formation in the Buttle Lake uplift. The McLaughlin Ridge Formation is composed mainly of felsic volcanics with subordinate mafic and intermediate volcanics and sediments.

Classification in the field, as to composition, is based on colour index (CI) (% mafic minerals); mafic volcanics have CI>35, intermediate volcanics 15-35 and felsic volcanics <15. The quartz-phyric nature of felsic volcanics distinguishes them from the more felsic intermediate volcanics. These colour indices correspond approximately with SiO_2 contents of 55%, 55-67% and >67%, respectively. Textural classification follows that of Fisher (1966) and Schmid (1981), whereby tuffs are composed mainly of ash-size fragments (<2 mm), lapilli tuff of lapilli-size clasts (2-64 mm) and tuff breccia of block-size clasts (>64 mm).

(ii) Mafic Volcanics (Unit 2)

Mafic volcanics are interbedded with intermediate and felsic volocanics and sediments in the south part of the Yankee and Mollie M.C.'s (Figure 3). Weathered surfaces are medium to dark green, fresh surfaces are dark green. Mafic volcanics are plagioclase +/- clinopyroxene-phyric chlorite schists, interpreted to be deformed tuffs and possible flows.

(iii) Intermediate Volcanics (Unit 3)

Intermediate volcanics occur in three belts in the north, central and southern part of the Yankee M.C. Intermediate volcanics are interbedded with mafic and felsic volcanics and sediments.

Weathered surfaces are light to medium green, fresh surfaces are light to dark green. Most intermediate volcanics are non-descript, fine-grained volcanics which are interpreted to be mainly tuffs with possible interbedded flows. However, well-exposed lapilli tuffs outcrop at 2E/3N. These pyroclastics contain highly vesicular, plagioclase-phyric mafic clasts in a matrix of the same composition. The 1 mm diameter vesicles are quartz-filled.

In thin section, intermediate volcanics are composed of fine grained actinolite + chlorite + plagioclase +/- epidote +/- calcite +/- opaques. Plagioclase phenocrysts, up to 2 mm in size and in amounts ranging up to 15%, are variably sericitized and sausseritized.

(iv) Felsic Volcanics (Unit 4)

Felsic volcanics are the main lithology of the McLaughlin Ridge Formation on the MMY claims. Weathered surfaces vary from pale green to pale buff. Fresh surfaces are pale, waxy green to buff. Most felsic volcanics are plagioclase-phyric containing 5-15%, 1-3 mm plagioclase phenocrysts. Rare, small (1-2 mm) quartz phenocrysts are present locally. The homogeneous nature of the felsic volcanics and the lack of discernable bedding or clasts suggests that most felsic volcanics are flows or subvolcanic intrusions.

The distinction between pyroclastics and flows or sills can be determined in thin section. Pyroclastics are characterized by a wide range in crystal size. Flows and sills contain a more restricted range of crystal size with a marked size difference between phenocrysts and groundmass. Groundmass is composed of a very fine grained homogeneous granoblastic intergrowth of quartz and plagioclase, with minor sericite and with or without tiny (<.1 mm long) plagioclase microlites. Phenocrysts are euhedral and seldom are angular or broken. Quartz phenocrysts are invariably embayed in both pyroclastics and flows.

(v) Sedimentary Rocks (Unit 5)

Within the McLaughlin Ridge Formation, sediments occur in a minor, thin (<10 m thick) unit of argillite, siliceous argillite, and chert in the southern part of the Yankee M.C. Argillite and siliceous argillite are black; green argillites also occur. Cherts are buff to green. Where discernable, bedding is 1-20 mm thick.

(vi) Stratigraphy

The dearth of discernable bedding, combined with the lack of reliable facing indicators has greatly hindered attempts at documenting the stratigraphy of the McLaughlin Ridge Formation on the MMY claims. Reference to regional studies (Massey and Friday 1988) or previous property work (Deighton, 1977; Ronning, 1980; Sorbara, 1983) does not aid the picture.

Suffice to say that the MMY claims are dominated by felsic volcanics, interpreted to be mainly flows. These flows are either under- or overlain by mafic and intermediate volcanics and sediments, which outcrop in the southwestern part of the property.

Triassic
Karmutsen Formation

(i) Mafic Intrusive Rocks (Unit 7)

Mafic intrusive rocks, related to Late Triassic Karmutsen volcanism, are ubiquitous throughout the property. Individual intrusions vary from several cm to 200 m wide and have been traced across the entire claim group (1.5 km). Attitudes are difficult to discern. Weathered surfaces are medium to dark green; fresh surfaces are dark green. Colour indices average 40-60. Both porphyritic and equigranular varieties are present. Porphyritic gabbros contain 1-15%, 0.2-0.6 mm plagioclase phenocrysts in a fine grained equigranular groundmass. Equigranular varieties are medium to coarse grained. Porphyritic varieties with fine grained groundmass are most common in narrow sills or near the margins of larger intrusions. Medium and coarse-grained equigranular varieties are most common in the interior of larger intrusions. Mafic intrusions range from massive, non- foliated to mylonitic; fabric parallels that of surrounding volcanics.

Cretaceous

Comox, Haslam Formations (Nanaimo Group)

(i) Sedimentary Rocks (Unit 11)

Clastic sediments of the Nanaimo Group unconformably overlie or are in fault contact with older volcanic, sedimentary and intrusive rocks on the MMY claim group. In the MMY claims, conglomerates and sandstones of the Comox Formation and argillite and siltstone of the Haslam Formation (Muller and Jeletzky, 1970) are present. Conglomerates include little-transported lithified talus and well transported boulder and cobble conglomerates. Clast types include Karmutsen and McLaughlin Ridge lithologies exposed on the claim group. Conglomerate matrix and overlying sandstone units are mainly arenaceous.

Contacts between Nanaimo sediments and older rocks may be either unconformable, as at 8E/1+90N where Nanimo conglomerate rests unconformably on Karmutsen gabbro, or faulted, as at 12+50E/1+75S, where Nanaimo arenite and argillite are in fault contact with Karmutsen gabbro. The inferred linear distribution of Nanaimo sediments may be fault-controlled (Ronning, 1980).

Metamorphism

With the exception of Nanaimo sediments, all lithologies have been metamorphosed. The presence of actinolitic amphibole and chlorite in mafic volcanics indicate that peak metamorphic conditions reached greenschist facies.

GEOCHEMISTRY

Introduction

A total of 41 rocks from the MMY claims have been analysed for major and selected trace elements (Tables 2,3). 30 of these were sampled during the 1989 field season, the remaining 11 were sampled during a reconnaisance visit to the property in 1988.

McLaughlin Ridge Formation

Thirty-seven rocks from the McLaughlin Ridge Formation were analysed for major and trace elements (Table 3). Lithologies range in composition from basalt to rhyolite with a distinct compositional gap from 60 to 67% SiO_2 (Figure 5a-i) allowing subdivision into low-and high-SiO_2 suites. This compositional gap is also displayed by gaps in TiO_2 (.4 to .6%), Al_2O_3 (15 to 16%) and Fe_2O_3 (4 to 6%) (Figure 5a,5c,5g). CaO and P_2O_5 trends are displaced to higher SiO_2 contents in the high-SiO_2 suite (Figure 5b,5h). K_2O contents in the high-SiO_2 suite decrease steeply with increasing SiO_2, from maximum values of >7% (Figure 5f). Very low values of CaO (0.09%) and Na_2O (0.5%) characterize only one sample of a volcanic rock (VA11144). Other low Na_2O values are associated with siliceous (cherty) sediments in the southern part of the Yankee and Mollie M.C.'s. This unit of sediments and associated felsic volcanics have high Ba contents (3010-3770 ppm). Note that Ba increases with decreasing Na_2O and increasing Isikawa alteration index (Figure 6,7).

Karmutsen Formation

Four samples of Karmutsen gabbros were analysed for major and trace elements (Table 4). Harker variation diagrams are presented in Figures 8a-i. TiO_2 contents are >1.4% (Figure 8g).

Summary of Whole Rock Geochemistry

Volcanics of the McLaughlin Ridge Formation can be subdivided, on the basis of SiO_2 and Fe_2O_3, into a low-SiO_2 suite (SiO_2<60%) and a high-SiO_2 suite (SiO_2>67%). This bimodality is similar to that documented for volcanics of the Nitinat and McLaughlin Ridge Formations on the West property (Morrice, 1989), indicating a similar evolution of volcanics on the two properties.

The high K_2O contents of the high-SiO_2 suite indicate that potassium metasomatism has affected these rocks. The presence of high Ba sediments and felsic volcanics in the south part of the Yankee and Mollie M.C.'s and the correlation of Ba with decreasing Na_2O and increasing Ishikawa index is important in terms of base metal exploration.

STRUCTURAL GEOLOGY

Bedding

Within the McLaughlin Ridge Formation, bedding was observed only in the sediments in the south part of the Yankee M.C. There, bedding trends west-northwest with steep dips (Figure 9). The lack of bedding over most of the MMY claims and the complete absence of facing indicators has imposed severe constraints on the interpretation of structure and volcanic stratigraphy on the property.

Bedding within the Cretaceous Nanaimo Group is shallow dipping (Figure 4).

Foliations

Virtually all lithologies of the McLaughlin Ridge Formation have a well developed planar penetrative fabric. Strain within the Karmutsen gabbros is generally manifest as discrete zones of shearing and/or mylonitization. These high strain zones are generally <1 metre wide and are oriented parallel to the schistosity in the neighbouring volcanics. Many of these shear zones contain discontinuous quartz +/- calcite +/- pyrite +/- chalcopyrite veins. Wider (up to 20 m) well-foliated zones characterize the gabbro that underlies the central part of the Yankee and Mollie M.C.'s.

The dominant west-northwest trending, steeply south dipping foliation (Figure 10) is variably developed and defined by the planar alignment of platey minerals, principally sheet silicates (muscovite, sericite, chlorite). This fabric is the earliest preserved foliation in the McLaughlin Ridge Formation. This fabric has been locally folded (Figure 4,10).

Lineations

Two types of lineations have been noted on the property. Minor, and local kink bands have steeply plunging fold axes. They are best developed within felsic volcanics which underlie the central part of the Mollie M.C. The most common type of lineation is due to the preferred orientation of elongate phenocrysts (quartz, uralitized clinopyroxene). These lineations, which represent the direction of tectonic transport, have shallow plunges (<20 degrees) to the northwest or southeast (Figure 11).

Shear Zones and Faults

High strain zones have been documented within Karmutsen gabbros. These shear zones are <1-3 m wide, and invariably contain discontinuous quartz veins. A northwest-trending, steeply dipping fault, near the east end of the property has brought Karmutsen gabbro into contact with Nanaimo sediments. This fault has been interpreted to extend to the northwest (Ronning, 1980).

Small-Scale Brittle Features

Small-scale brittle deformational features are ubiquitous throughout the property. Two types are recognized: brittle faults and kink bands.

Brittle faults occur as hairline fractures of variable orientation and attitude. Offsets across those faults are minor. Kink bands are locally well developed on the property. They are particularly well developed within felsic volcanics that underlie the central part of the Mollie M.C. These kinks have steep plunges.

Structural Synthesis

As with other occurrences of Sicker volcanics in the Cowichan-Horne Lake uplift, lithologies within the MMY claim group have undergone a protracted history of deformation. The earliest deformation, which is not evident on the property, is a Late Devonian (syn-Sicker) deformation (D1) that produced large-scale open folds in the Nitinat and McLaughlin Ridge Formation volcanics (Massey and Friday, 1987). The oldest documented deformation on the property (D2) produced the dominant west-northwest trending, steeply dipping schistosity (S2) which is particularly well developed in McLaughlin Ridge Formation lithologies. S2 is apparently axial planar to a series of west-northwest-trending, southwest-verging, asymmetric folds which developed post-Lower Permian to pre-Middle Triassic (Massey and Friday, 1987). The ubiquitous, shallowly plunging mineral and stretch lineation (L2) developed on S2 planes during D2. L2 is oriented parallel to the minimum compressive stress direction. The small-scale brittle features which are common throughout the property may have developed towards the end of D2 as the stress field was relaxed and/or strain rates were increased. In the Late Triassic, extensive crustal dilation provided avenues for emplacement of the Karmutsen gabbros. No small scale structures have been attributed to this deformation. Prior to the deposition of the Nanaimo Group, regional-scale warping of Vancouver Island produced the major geanticlinal uplifts cored by Sicker Group rocks. During the Late Cretaceous, large-scale westnorthwest trending thrust faults cut the Cowichan-Horne Lake uplift into several slices. Where exposed in drill core on the Chemainus JV, these thrusts dip vertically to about 65 degrees to the north-northeast and trend parallel to S2. They become listric at mid-crustal depths (Sutherland Brown and Yorath, 1985). On the MMY claim group the northwest trending fault which juxtaposes Karmutsen and Nanaimo lithologies is interpreted to have developed at this time. Displacements along these thrusts are unknown but are estimated to be in the order of 1-10 km (Massey and Friday, 1987). Similarly, direction of movement is unknown. However, the regional map pattern suggests movement directed to the west-southwest; the latest movement was horizontal and westerly directed as indicated by slickensides (Massey and Friday, 1987). The last deformational event which has affected the Sicker Group is manifest as a series of Tertiary(?) north-northeast crossfaults, with subvertical downthrows to the west (Massey and Friday, 1987).

ECONOMIC GEOLOGY

Alteration

Most lithologies on the MMY claims do not appear to have been affected by sustained and/or widespread hydrothermal alteration.

Mineralization

Mineralization on the property is restricted to quartz + pyrite +/- chalcopyrite veins which occur within shear zones in Karmutsen gabbros. One old shaft was found on the property, at 6+50E/0+25N. This shaft had been excavated in order to exploit this type of mineralization. This style of mineralization is ubiquitous to Karmutsen gabbros and is considered to be of no further interest due to the discontinuous nature of the quartz veins and low metal contents.

Of interest in terms of massive sulphide exploration are the Ba-rich sediments that outcrop along the south margin of the Yankee and Mollie M.C.'s. In addition to high Ba contents (up to 3770 ppm Ba) these sediments are quite SiO_2-rich (up to 89% SiO_2) and may have an exhalative component. These sediments are associated with felsic volcanics which are similarly Ba-rich (up to 3410 ppm Ba). While no mineralization or base metal type alteration has been identified in this area, the high Ba contents and possible exhalative activity uprade the base metal-hosting potential of this area.

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Appendix A

Major and Trace Element Geochemistry

LITHOGEOCHEMICAL RECORD
(MAJOR ELEMENTS)

SAMPLE NUMBER	%SIO2	%AL2O3	%CAO	%MGO	%NA2O	%K2O	%FE2O3	%TIO2	%P2O5	%MNO	%LOI	SUM	ROCK	ALT	MIN
VA07107	45.90	13.20	9.99	5.39	1.58	0.83	13.20	2.53	0.23	0.20	7.08	100.13	VMAW*		
VA07108	70.10	13.90	2.46	0.91	2.75	5.31	2.43	0.36	0.10	0.05	1.16	99.53	TFAD*	PEW	
VA07109	71.50	13.90	1.16	2.26	2.96	1.85	3.16	0.35	0.08	0.08	2.39	99.69	TFAD*		
VA07111	72.00	13.40	0.89	0.61	3.26	4.61	3.31	0.37	0.09	0.07	1.23	99.84	TFAD*		
VA07112	84.50	6.16	0.28	1.73	1.00	0.75	2.83	0.28	0.05	0.03	1.47	99.08	SHTB*		
VA07113	46.70	18.30	6.01	6.17	4.51	0.49	10.90	1.11	0.32	0.24	4.85	99.60	VMAFW*		
VA07114	51.40	18.80	6.63	2.90	5.30	0.77	10.20	1.15	0.31	0.19	2.54	100.19	IMAF*	PEW	
VA07115	72.10	14.20	0.45	1.57	4.01	2.79	2.48	0.34	0.08	0.05	1.77	99.84	TFAD*		
VA07116	71.90	15.10	0.97	1.05	4.82	2.89	1.40	0.30	0.06	0.03	1.47	99.99	TFA*		
VA11137	70.70	14.60	0.47	0.82	4.90	3.48	2.76	0.37	0.13	0.08	1.77	100.08	TIAF		
VA11138	69.50	14.70	2.35	0.72	3.50	4.70	2.75	0.38	0.11	0.07	1.16	99.94	VIAF		
VA11139	70.40	13.90	1.33	0.71	3.49	4.64	2.84	0.35	0.12	0.11	1.31	99.20	VIAF		
VA11140	69.90	13.60	2.79	1.01	3.48	2.84	3.09	0.32	0.09	0.12	2.39	99.63	VIAF		
VA11141	70.40	14.00	1.66	1.04	3.41	4.23	3.37	0.34	0.11	0.08	1.54	100.18	VIAF		
VA11142	71.00	14.40	1.06	0.98	4.54	3.82	2.87	0.36	0.10	0.03	1.08	100.24	VIAF		
VA11143	70.80	13.80	0.52	1.02	1.91	6.48	3.48	0.34	0.11	0.05	1.62	100.13	VIAF		
VA11144	72.60	14.50	0.09	0.86	0.50	6.45	2.07	0.33	0.08	0.02	2.16	99.66	TFA		
VA11145	70.00	15.20	0.74	2.62	1.88	2.83	3.33	0.35	0.08	0.10	2.85	99.98	VFAF		
VA11146	69.80	14.30	1.18	1.01	3.91	3.97	3.75	0.37	0.14	0.04	1.77	100.24	VFAF		
VA11147	70.50	14.50	1.69	0.61	4.01	3.94	3.22	0.37	0.11	0.06	1.16	100.17	VFAF		
VA11148	69.30	14.90	1.90	0.81	4.30	3.78	2.97	0.38	0.12	0.04	1.39	99.89	VFAF		
VA11149	72.00	12.10	3.74	0.93	3.99	1.32	3.34	0.27	0.09	0.15	1.85	99.78	VIAF		
VA11151	74.50	13.70	0.37	1.83	3.44	2.23	1.88	0.25	0.06	0.06	1.62	99.94	VIA		

Location: MMY OPTION

TABLE 3a - McLaughlin Ridge Formation

LITHOGEOCHEMICAL RECORD
(MAJOR ELEMENTS)

SAMPLE NUMBER	%SIO2	%AL2O3	%CAO	%MGO	%NA2O	%K2O	%FE2O3	%TIO2	%P2O5	%MNO	%LOI	SUM	ROCK	ALT	MIN
VA11152	60.00	16.90	0.64	4.77	3.88	3.00	6.84	0.61	0.13	0.14	3.31	100.22	VIA		
VA11485	55.90	17.60	3.27	3.56	3.84	2.29	9.35	0.97	0.39	0.20	2.77	100.14	TMAF		
VA11486	59.60	17.00	3.20	1.96	1.31	3.11	8.26	1.16	0.54	0.19	3.08	99.41	O		
VA11487	73.80	13.00	1.03	1.20	6.90	0.15	2.68	0.31	0.12	0.08	0.93	100.20	TIA		
VA11489	58.60	17.40	1.89	3.72	5.64	1.74	6.56	0.67	0.23	0.11	3.16	99.72	TMBF		
VA11490	76.00	14.30	0.40	0.59	2.95	3.36	0.69	0.33	0.07	0.06	1.54	100.29	TIA		
VA11491	55.20	16.50	6.71	4.27	4.84	0.72	7.56	0.78	0.18	0.27	2.39	99.42	VMAFW		
VA11492	71.50	14.40	0.60	0.82	2.30	5.88	2.35	0.36	0.11	0.05	1.62	99.99	TIAF		
VA11493	67.70	14.30	2.09	0.98	2.32	7.16	2.10	0.35	0.10	0.14	1.23	98.47	TFAQF		
VA11494	84.40	6.61	0.43	1.23	1.80	0.99	2.24	0.29	0.06	0.03	1.70	99.78	SATB		
VA11495	73.70	9.72	1.40	3.73	0.95	0.88	6.17	0.64	0.11	0.13	2.77	100.20	TIA		
VA11496	88.10	4.12	0.78	1.43	0.08	0.50	2.43	0.19	0.05	0.06	1.16	98.90	TFA		
VA11497	49.40	15.90	4.77	8.26	3.63	0.92	10.50	1.73	0.43	0.20	3.70	99.44	VMAF		
VA11499	71.10	14.10	1.53	1.09	2.55	5.16	2.41	0.36	0.11	0.04	1.39	99.84	TIAF		

Location: MMY OPTION TABLE 3a - McLaughlin Ridge Formation

LITHOGEOCHEMICAL RECORD
(MINOR ELEMENTS)

SAMPLE NUMBER	RB (ppm)	SR (ppm)	BA (ppm)	Y (ppm)	ZR (ppm)	NB (ppm)	CR (ppm)	CU (ppm)	ZN (ppm)	NI (ppm)	ROCK	ALT	MIN
VA07107	37.0	221.0	103.0	15.0	122.0	18.0		169.0	72.0	64.0	VMAW*		
VA07108	47.0	257.0	1730.0	33.0	87.0	<10.0		88.0	29.0	<10.0	TEAD*	PEW	
VA07109	63.0	166.0	1210.0	17.0	137.0	11.0		31.0	42.0	<10.0	TEAD*		
VA07111	42.0	187.0	1010.0	11.0	118.0	<10.0		27.0	27.0	<10.0	TEAD*		
VA07112	25.0	36.0	2290.0	23.0	36.0	18.0		56.0	46.0	10.0	SHTB*		
VA07113	19.0	534.0	519.0	29.0	<10.0	15.0		119.0	81.0	13.0	VMAEW*		
VA07114	34.0	394.0	341.0	33.0	37.0	<10.0		69.0	77.0	<10.0	IMAE*	PEW	
VA07115	55.0	55.0	1120.0	30.0	119.0	18.0		21.0	37.0	<10.0	TEAD*		
VA07116	49.0	111.0	2350.0	28.0	107.0	<10.0		30.0	26.0	<10.0	TEA*		
VA11137	50.0	109.0	1190.0	21.0	127.0	<10.0		<10.0	44.0	<10.0	TIAE		
VA11138	53.0	279.0	1440.0	12.0	135.0	29.0		<10.0	40.0	<10.0	VIAE		
VA11139	52.0	147.0	1320.0	<10.0	114.0	<10.0		<10.0	72.0	<10.0	VIAE		
VA11140	47.0	151.0	1280.0	23.0	121.0	17.0		22.0	44.0	<10.0	VIAE		
VA11141	48.0	251.0	1260.0	<10.0	118.0	<10.0		81.0	50.0	<10.0	VIAE		
VA11142	58.0	108.0	1290.0	14.0	113.0	17.0		<10.0	44.0	<10.0	VIAE		
VA11143	56.0	156.0	2730.0	<10.0	115.0	15.0		<10.0	41.0	<10.0	VIAE		
VA11144	84.0	77.0	2210.0	19.0	134.0	14.0		<10.0	39.0	<10.0	TEA		
VA11145	64.0	184.0	1430.0	19.0	156.0	17.0		<10.0	61.0	<10.0	VEAE		
VA11146	74.0	181.0	1150.0	13.0	111.0	15.0		<10.0	50.0	<10.0	VFAE		
VA11147	43.0	233.0	1210.0	13.0	116.0	16.0		<10.0	50.0	<10.0	VEAE		
VA11148	54.0	264.0	1020.0	23.0	113.0	10.0		<10.0	31.0	<10.0	VEAE		
VA11149	33.0	207.0	494.0	<10.0	60.0	<10.0		184.0	41.0	<10.0	VIAE		
VA11151	49.0	45.0	1230.0	29.0	121.0	21.0		<10.0	49.0	<10.0	VIA		

Location: MMY OPTION

TABLE 3b - McLaughlin Ridge Formation

LITHOGEOCHEMICAL RECORD
(MINOR ELEMENTS)

SAMPLE NUMBER	RB (ppm)	SR (ppm)	BA (ppm)	Y (ppm)	ZR (ppm)	NB (ppm)	CR (ppm)	CU (ppm)	ZN (ppm)	NI (ppm)	ROCK	ALT	MIN
VA11152	49.0	102.0	1070.0	21.0	122.0	<10.0		<10.0	89.0	<10.0	VIA		
VA11485	56.0	205.0	470.0	36.0	106.0	17.0		41.0	105.0	<10.0	IMAF		
VA11486	55.0	115.0	283.0	54.0	144.0	<10.0		<10.0	92.0	<10.0	O		
VA11487	20.0	66.0	135.0	18.0	115.0	20.0		<10.0	34.0	<10.0	TIA		
VA11489	21.0	213.0	1690.0	38.0	116.0	19.0		40.0	87.0	<10.0	TMBF		
VA11490	55.0	156.0	949.0	32.0	138.0	<10.0		<10.0	37.0	3400.0	TIA		
VA11491	15.0	256.0	630.0	25.0	78.0	<10.0		204.0	105.0	20.0	VMAEW		
VA11492	55.0	124.0	1480.0	23.0	113.0	<10.0		<10.0	82.0	<10.0	TIAF		
VA11493	68.0	158.0	1520.0	<10.0	123.0	19.0		12.0	65.0	<10.0	TFAQF		
VA11494	18.0	54.0	3010.0	<10.0	38.0	<10.0		<10.0	46.0	<10.0	SATB		
VA11495	28.0	104.0	1750.0	19.0	47.0	<10.0		<10.0	73.0	<10.0	TIA		
VA11496	16.0	80.0	3770.0	<10.0	55.0	13.0		<10.0	76.0	16.0	TFA		
VA11497	<10.0	334.0	721.0	17.0	167.0	45.0		41.0	97.0	109.0	VMAF		
VA11499	58.0	269.0	3410.0	13.0	124.0	<10.0		18.0	45.0	<10.0	TIAF		

LITHOGEOCHEMICAL RECORD
(MAJOR ELEMENTS)

SAMPLE NUMBER	%SIO2	%AL2O3	%CAO	%MGO	%NA2O	%K2O	%FE2O3	%TIO2	%P2O5	%MNO	%LOI	SUM	ROCK	ALT	MIN
VA07106	48.80	13.40	9.65	5.54	2.18	0.75	14.20	2.72	0.24	0.22	1.85	99.55	IMAE*		
VA07110	52.70	14.70	10.30	3.54	2.71	0.56	11.50	1.56	0.53	0.20	1.93	100.23	VMA*	PEW	
VA11488	57.90	17.60	5.23	2.65	4.31	2.87	7.03	0.87	0.29	0.12	1.23	100.10	TMAE		
VA11498	53.40	17.90	7.78	3.63	4.17	1.66	8.43	0.88	0.26	0.19	2.08	100.38	PMAE		

LITHOGEOCHEMICAL RECORD
(MINOR ELEMENTS)

SAMPLE NUMBER	RB (ppm)	SR (ppm)	BA (ppm)	Y (ppm)	ZR (ppm)	NB (ppm)	CR (ppm)	CU (ppm)	ZN (ppm)	NI (ppm)	ROCK	ALT	MIN
VA07106	31.0	268.0	175.0	34.0	116.0	32.0		127.0	94.0	67.0	IMAF*		
VA07110	13.0	593.0	175.0	41.0	87.0	31.0		100.0	70.0	<10.0	VMA*	PEW	
VA11488	45.0	236.0	790.0	56.0	142.0	23.0		12.0	75.0	<10.0	TMAF		
VA11498	23.0	388.0	396.0	29.0	89.0	21.0		<10.0	76.0	12.0	PMAF		

Location: MMY OPTION

TABLE 4b - Karmutsen Formation

Appendix B

Harker Variation Diagrams

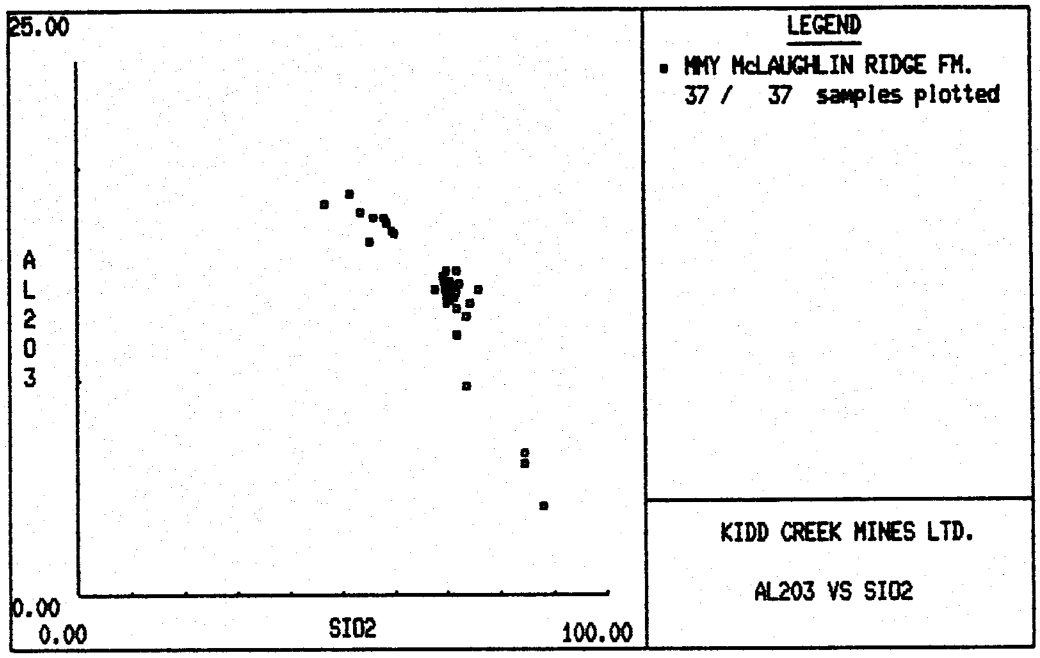


Figure 5a

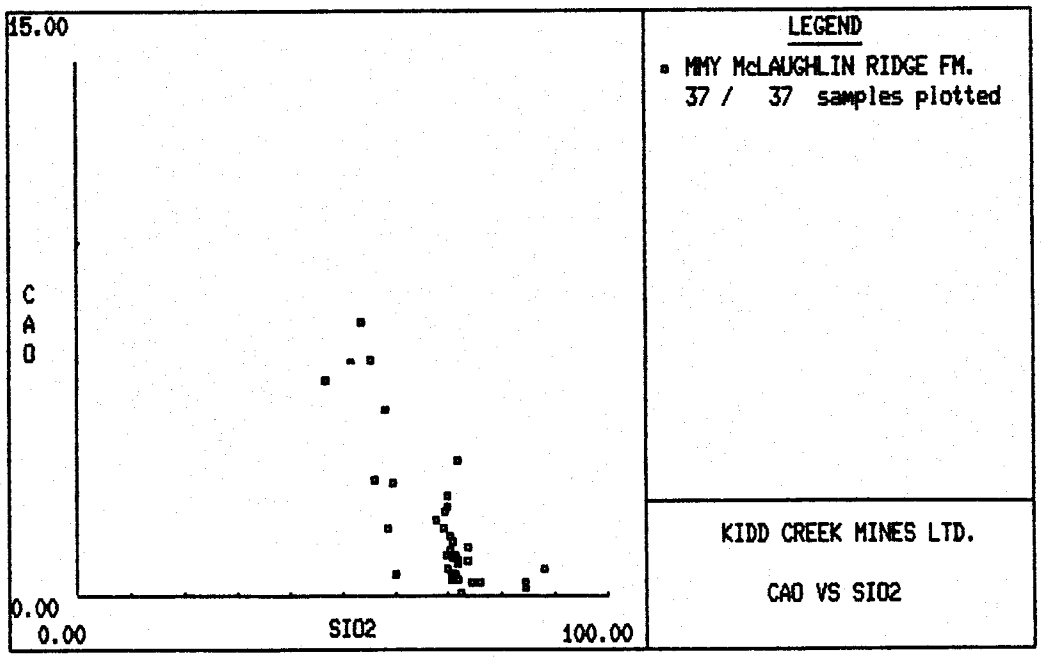


Figure 5b

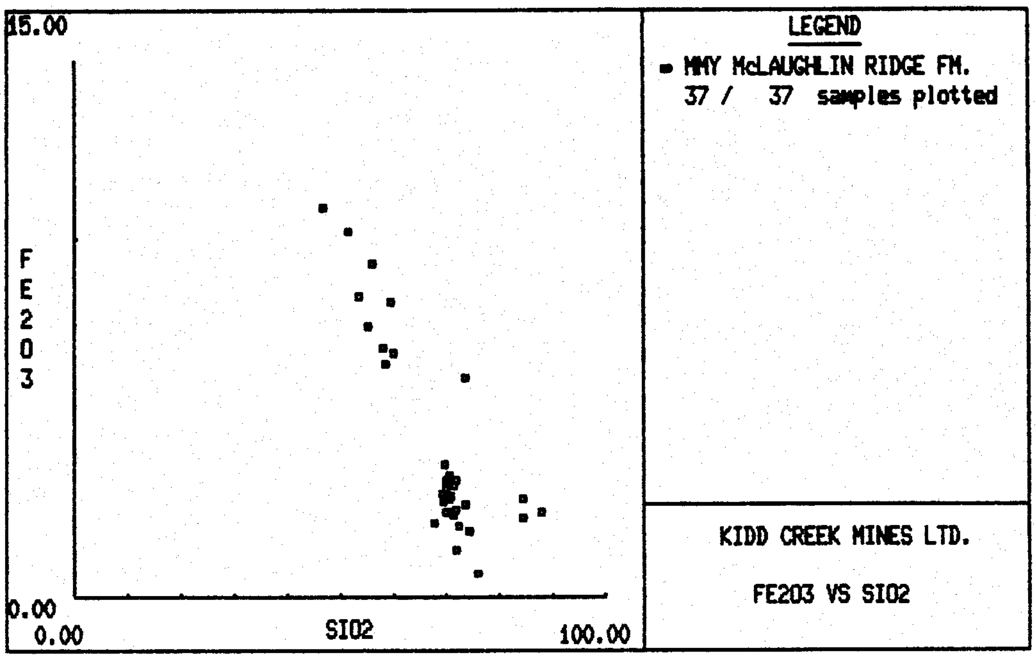


Figure 5c

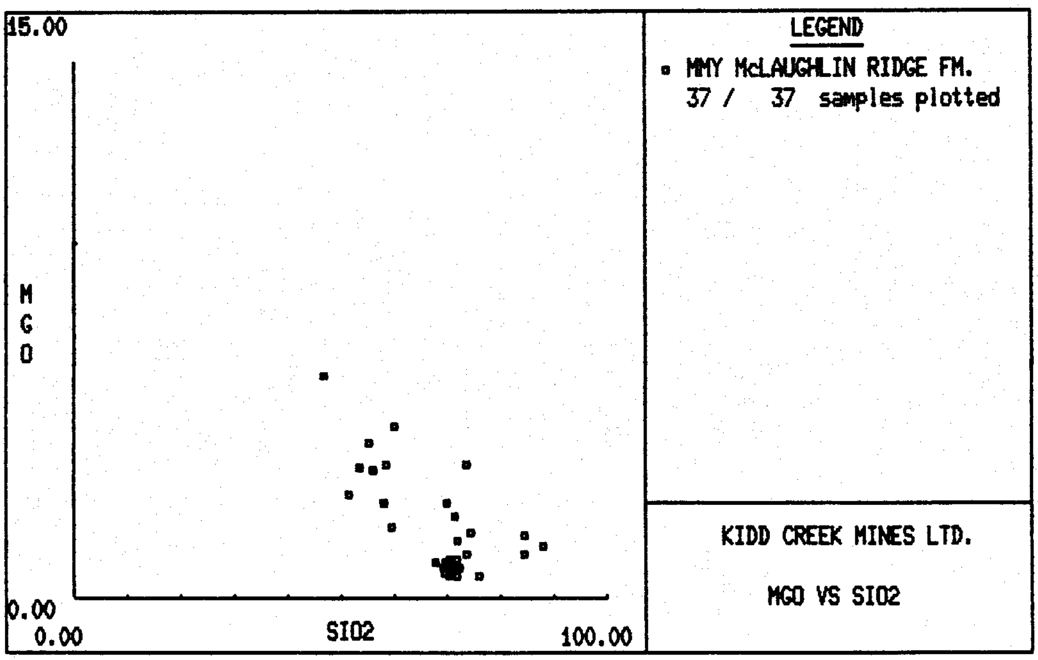


Figure 5d

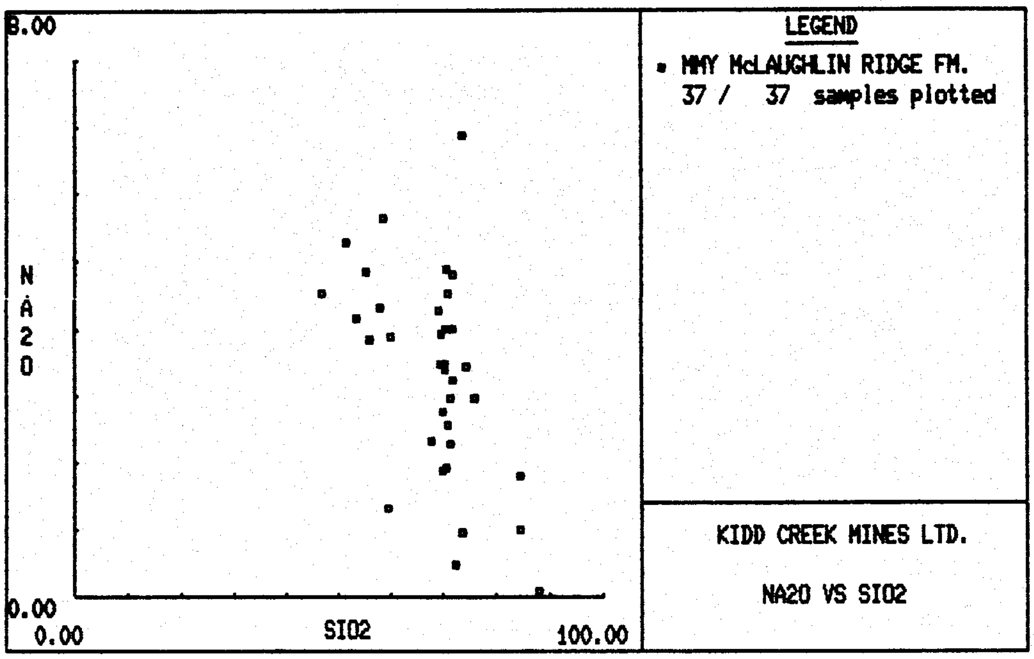


Figure 5e

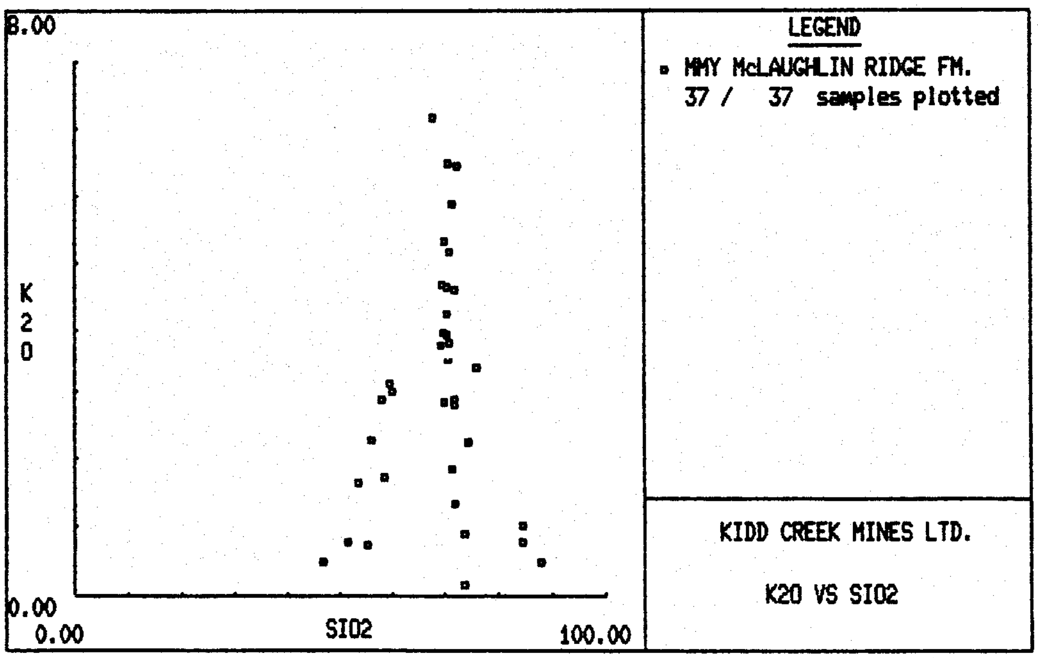


Figure 5f

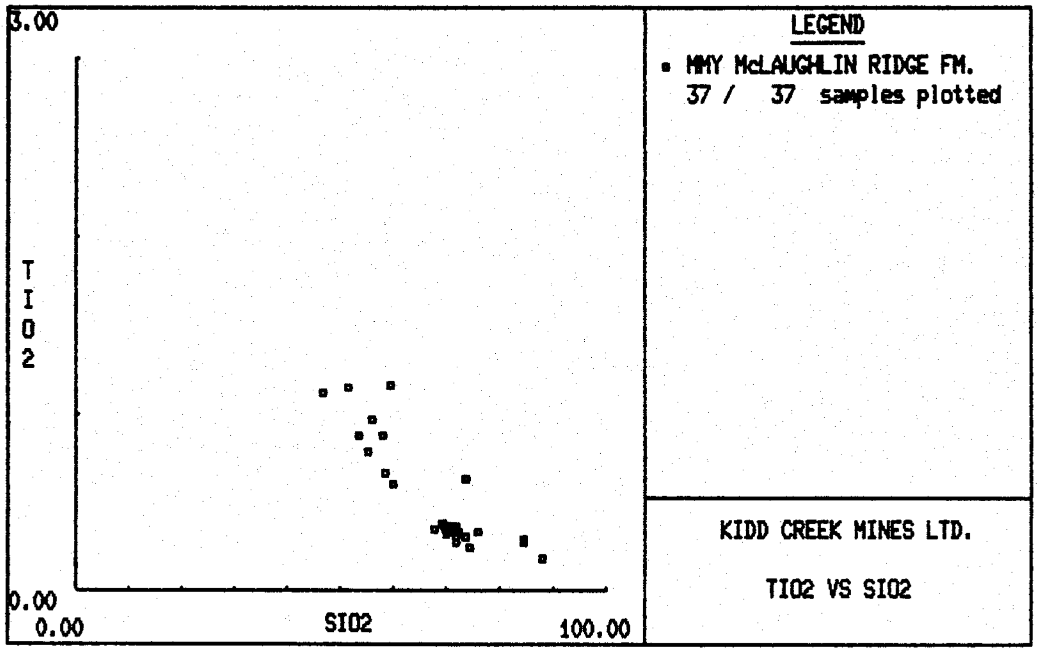


Figure 5g

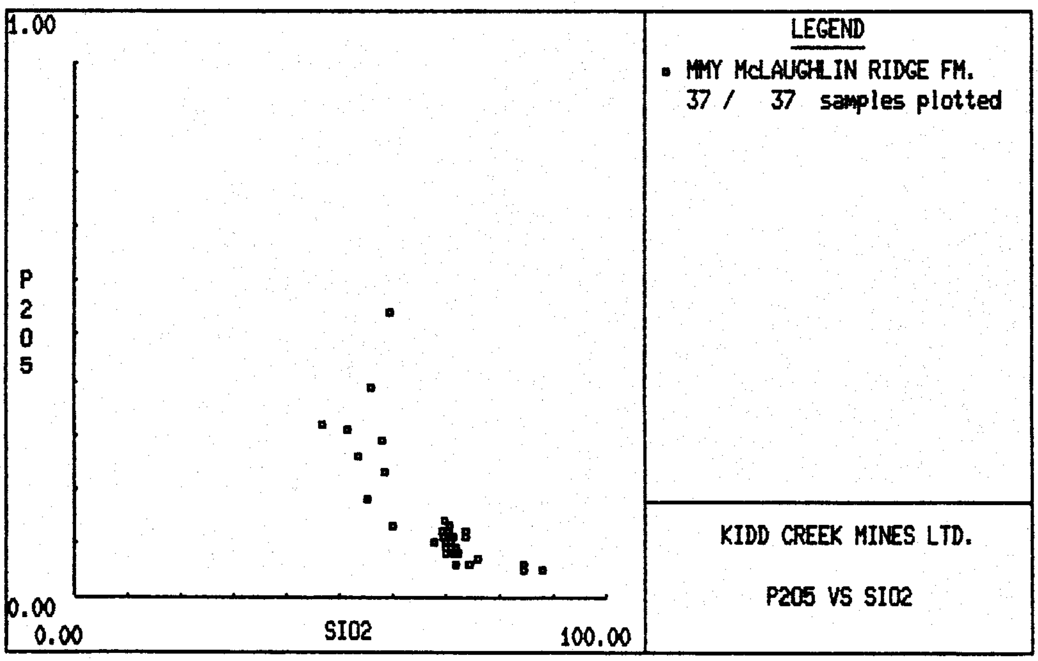


Figure 5h

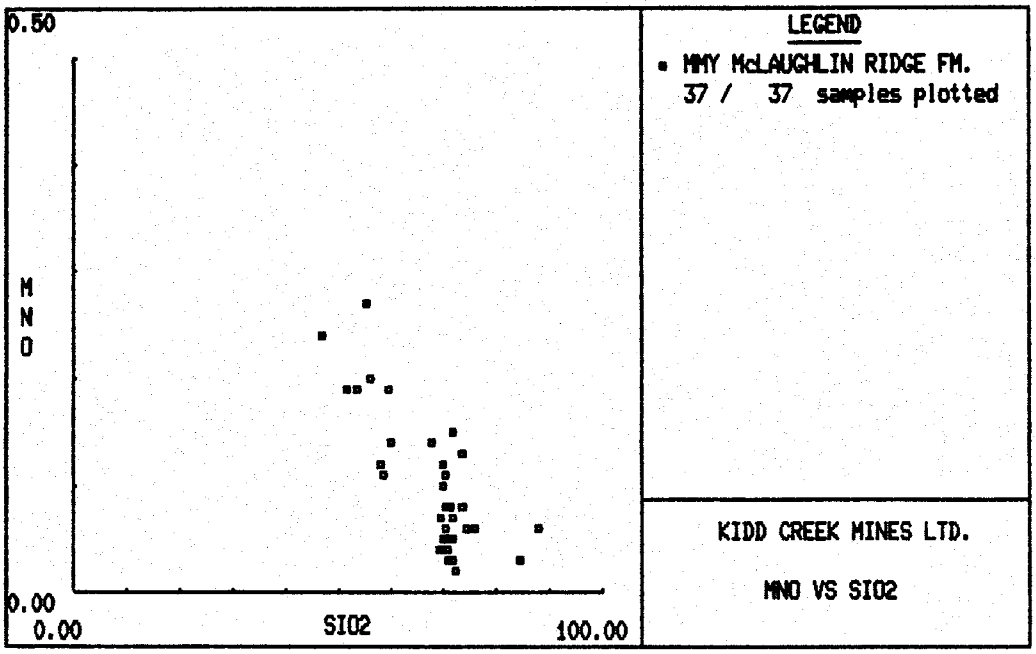

0.50
M
N
O
0.00
0.00
SIO2
100.00
LEGEND
MMY McLAUGHLIN RIDGE FM.
37 / 37 samples plotted
KIDD CREEK MINES LTD.
MNO VS SIO2

Figure 5i

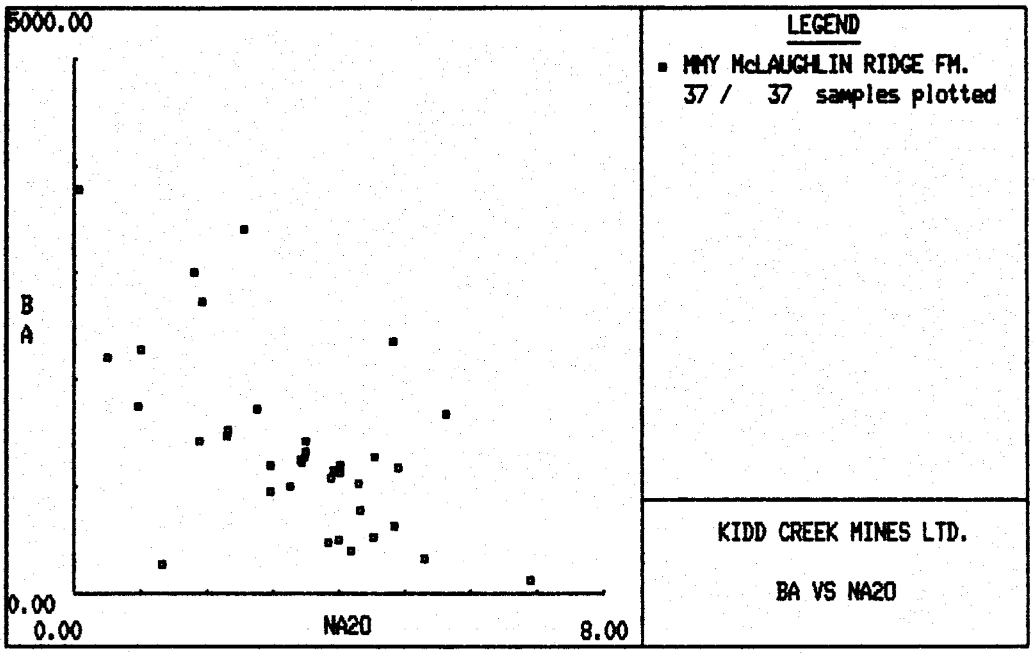

5000.00
B
A
0.00
0.00
NA2O
8.00
LEGEND
MMY McLAUGHLIN RIDGE FM.
37 / 37 samples plotted
KIDD CREEK MINES LTD.
BA VS NA2O

Figure 6

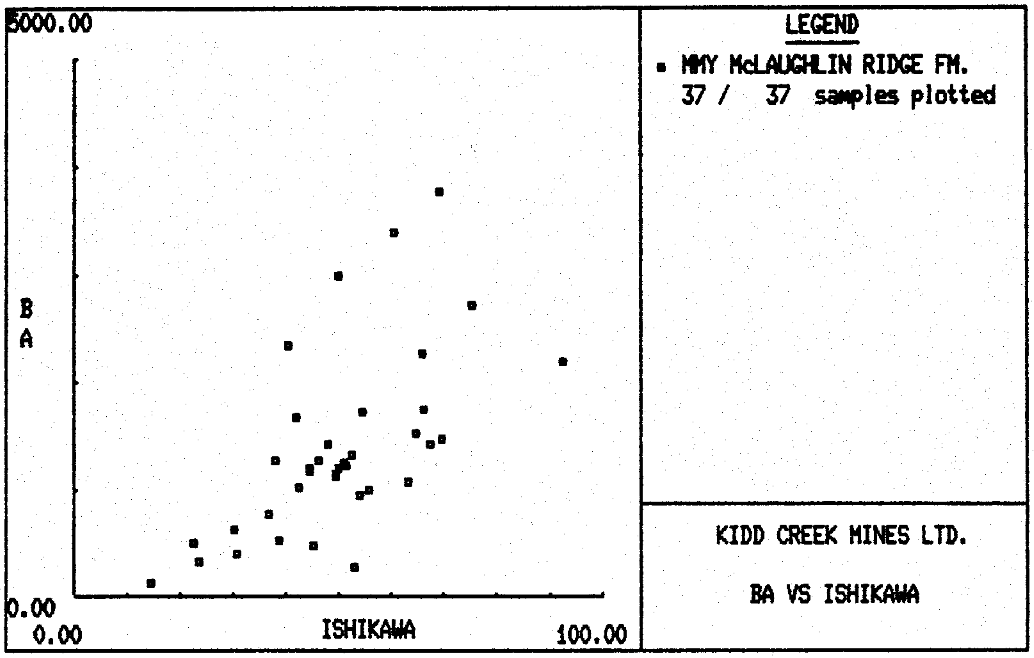

5000.00
B
A
0.00
0.00
ISHIKAWA
100.00
LEGEND
■ MMY McLAUGHLIN RIDGE FM.
37 / 37 samples plotted
KIDD CREEK MINES LTD.
BA VS ISHIKAWA

Figure 7

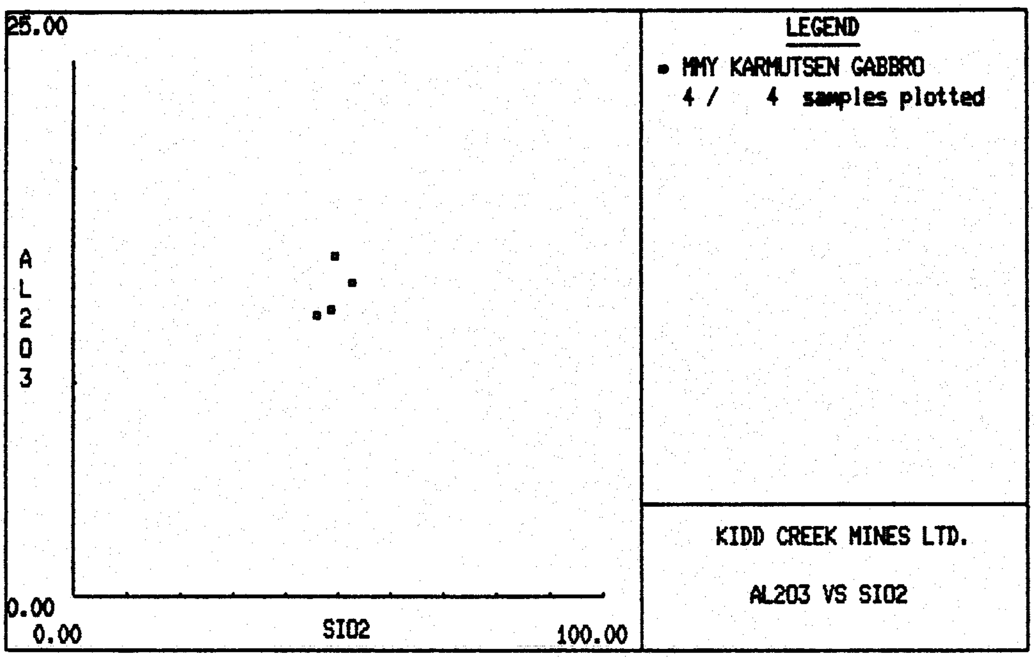


Figure 8a

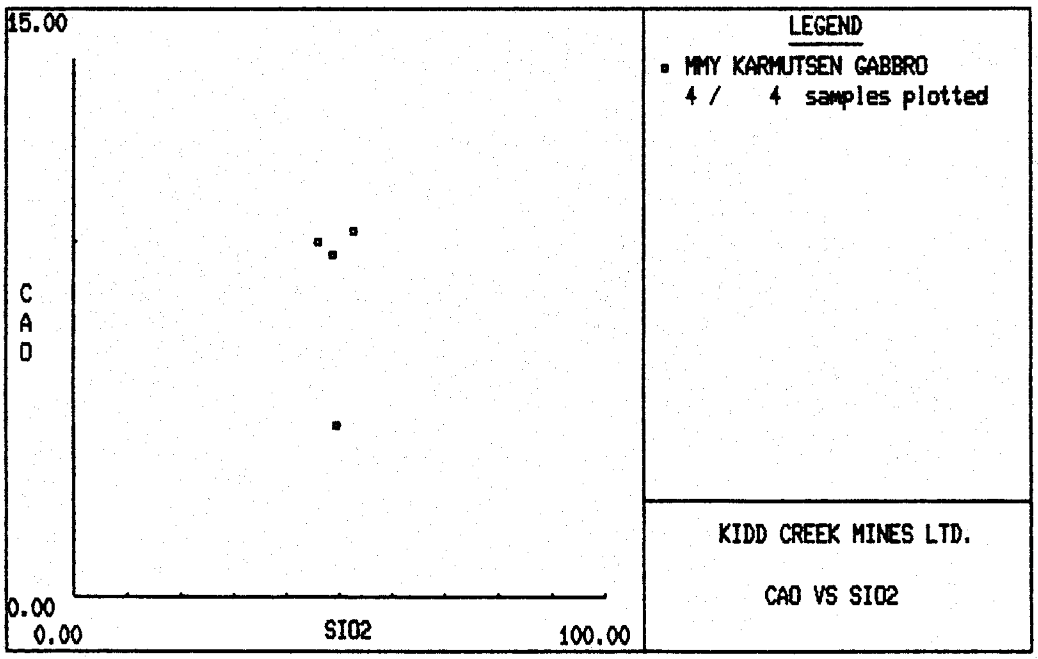


Figure 8b

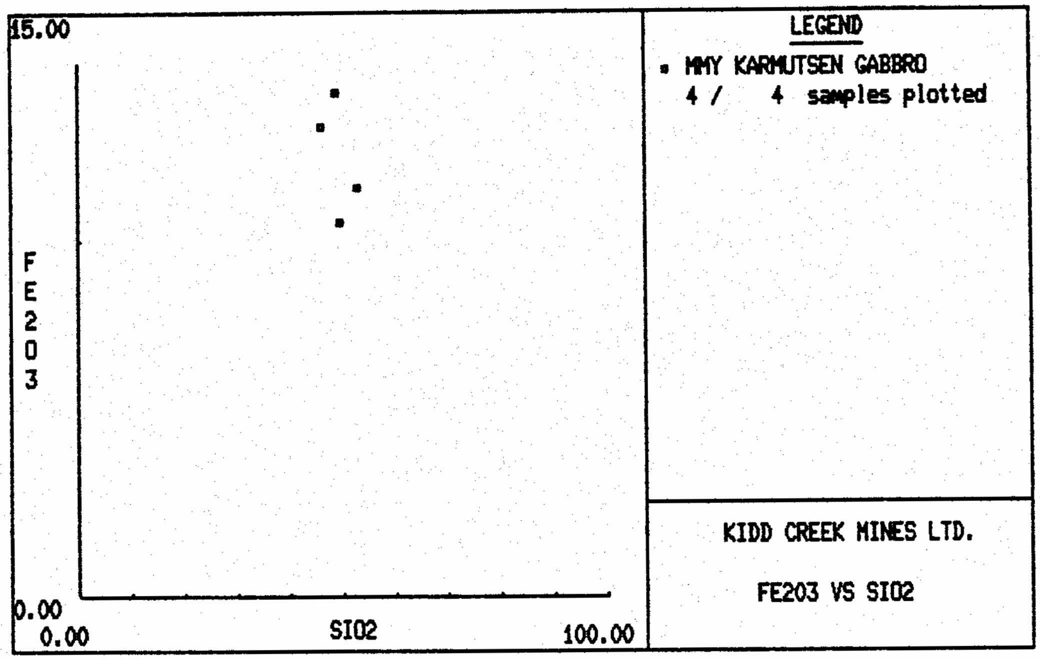


Figure 8c

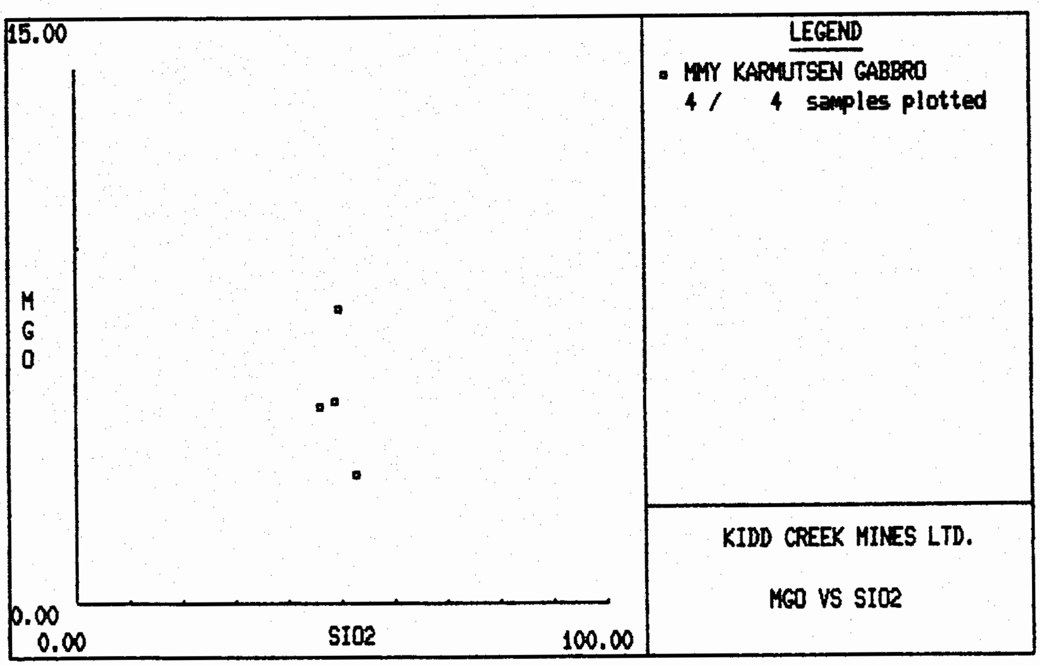


Figure 8d

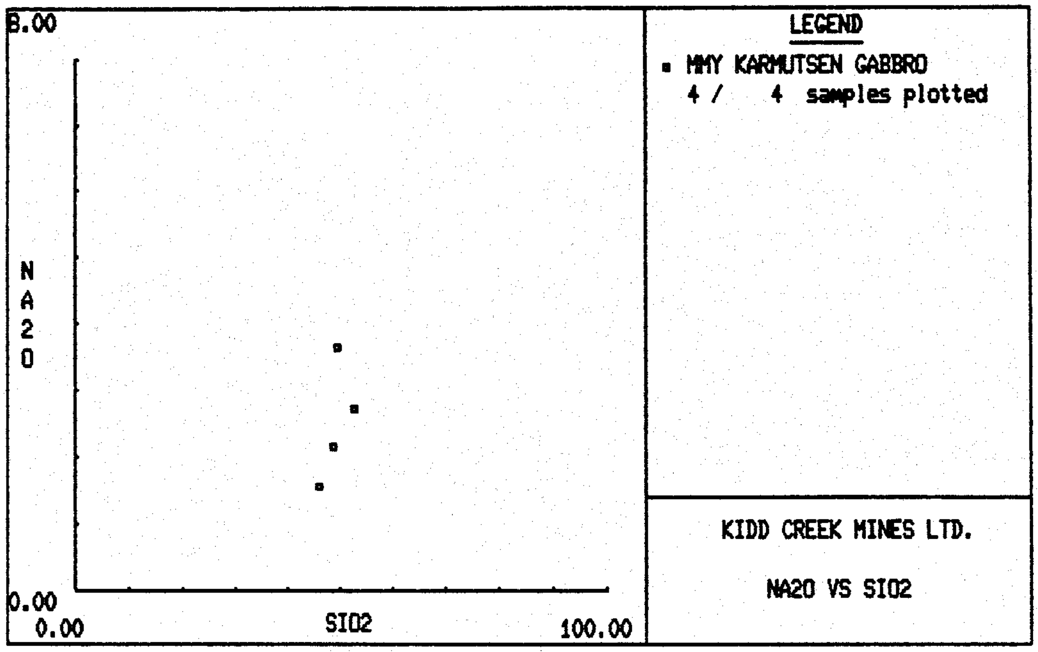


Figure 8e

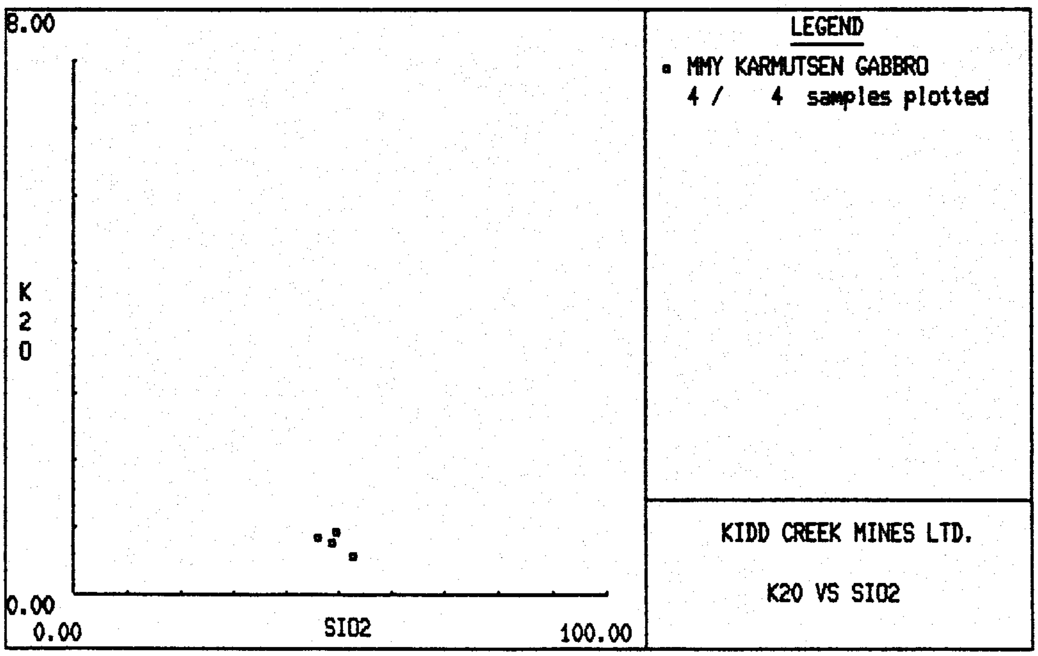


Figure 8f

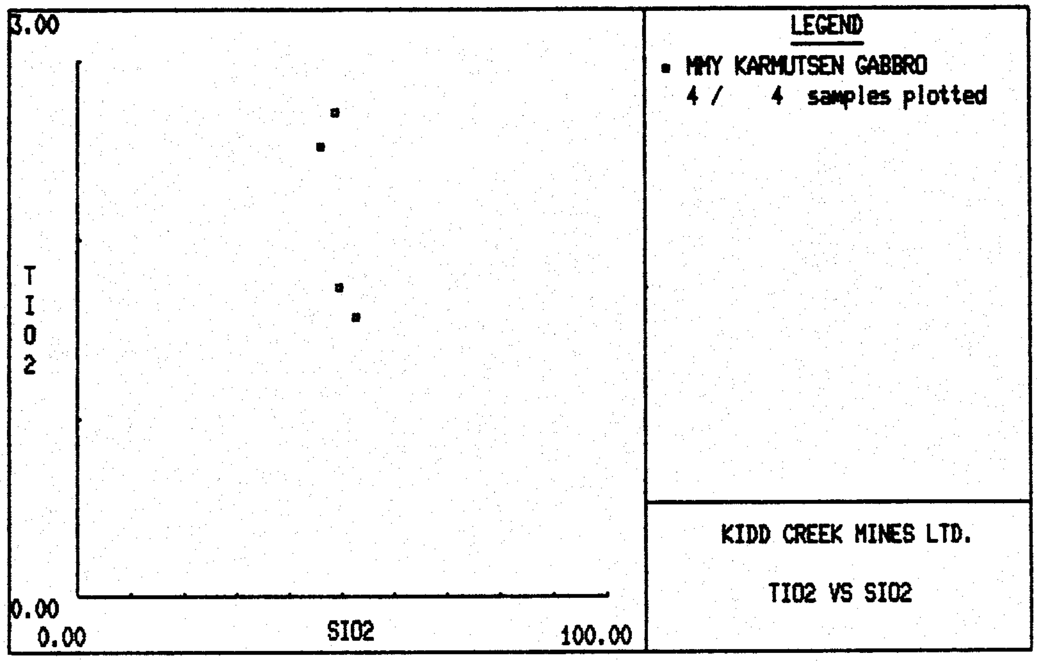


Figure 8g

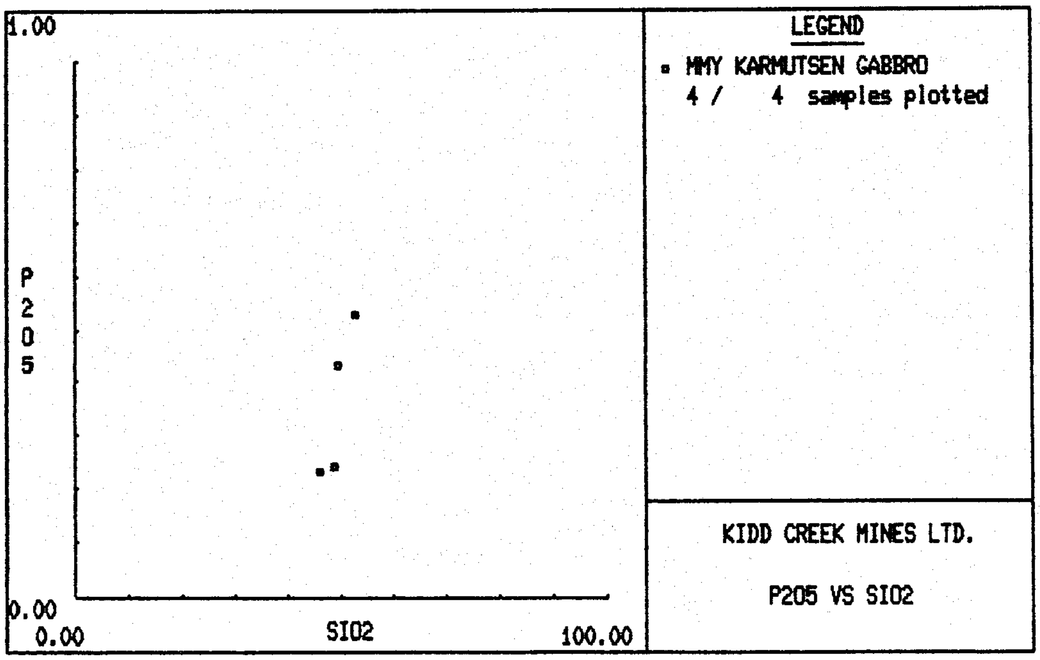


Figure 8h

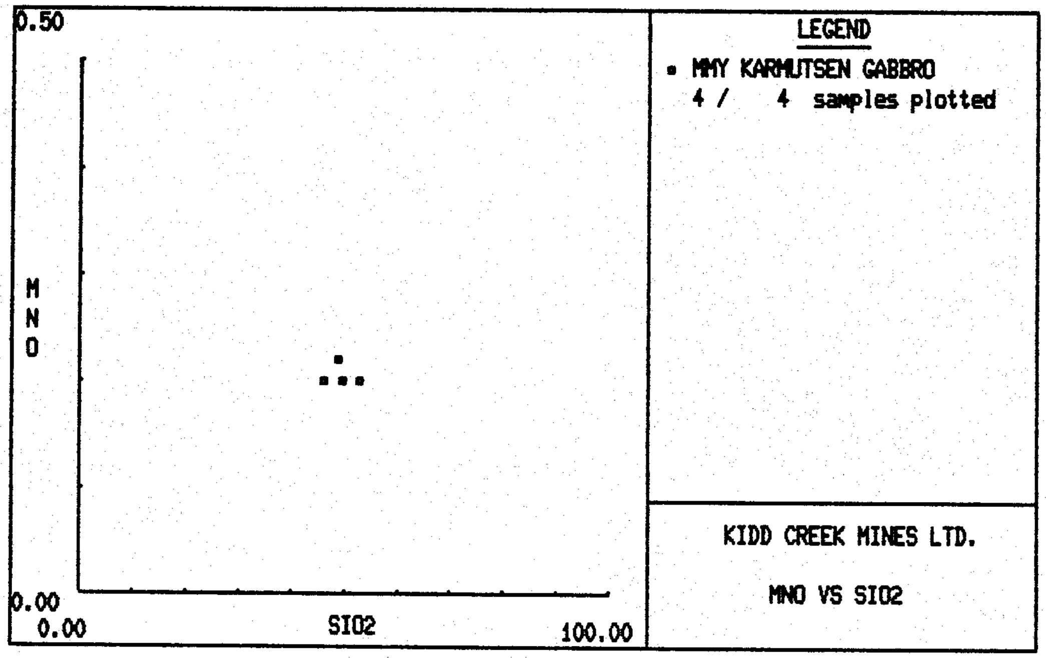

0.50
M
N
O
0.00
0.00
SIO2
100.00
LEGEND
MMY KARMUTSEN GABBRO
4 / 4 samples plotted
KIDD CREEK MINES LTD.
MNO VS SIO2

Figure 8i

Appendix C

Structural Sterographic Projection Plots

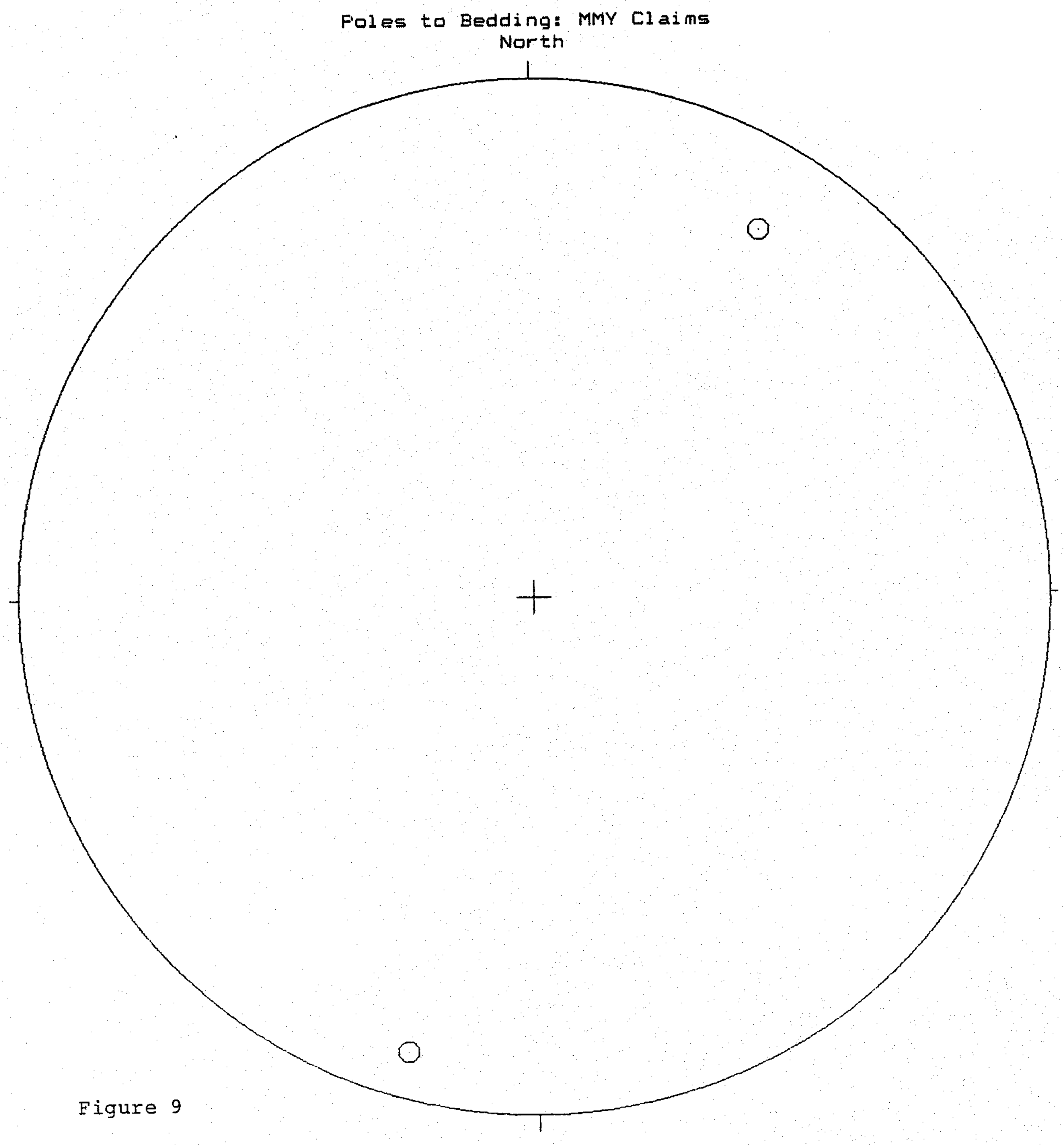


Figure 9

EQUAL AREA PROJECTION

Poles to Bedding: MMY Claims

SPLOT by Darton Software

	Symbol
2 Points	O
2 Points Total	

Poles to Foliation: MMY Claims

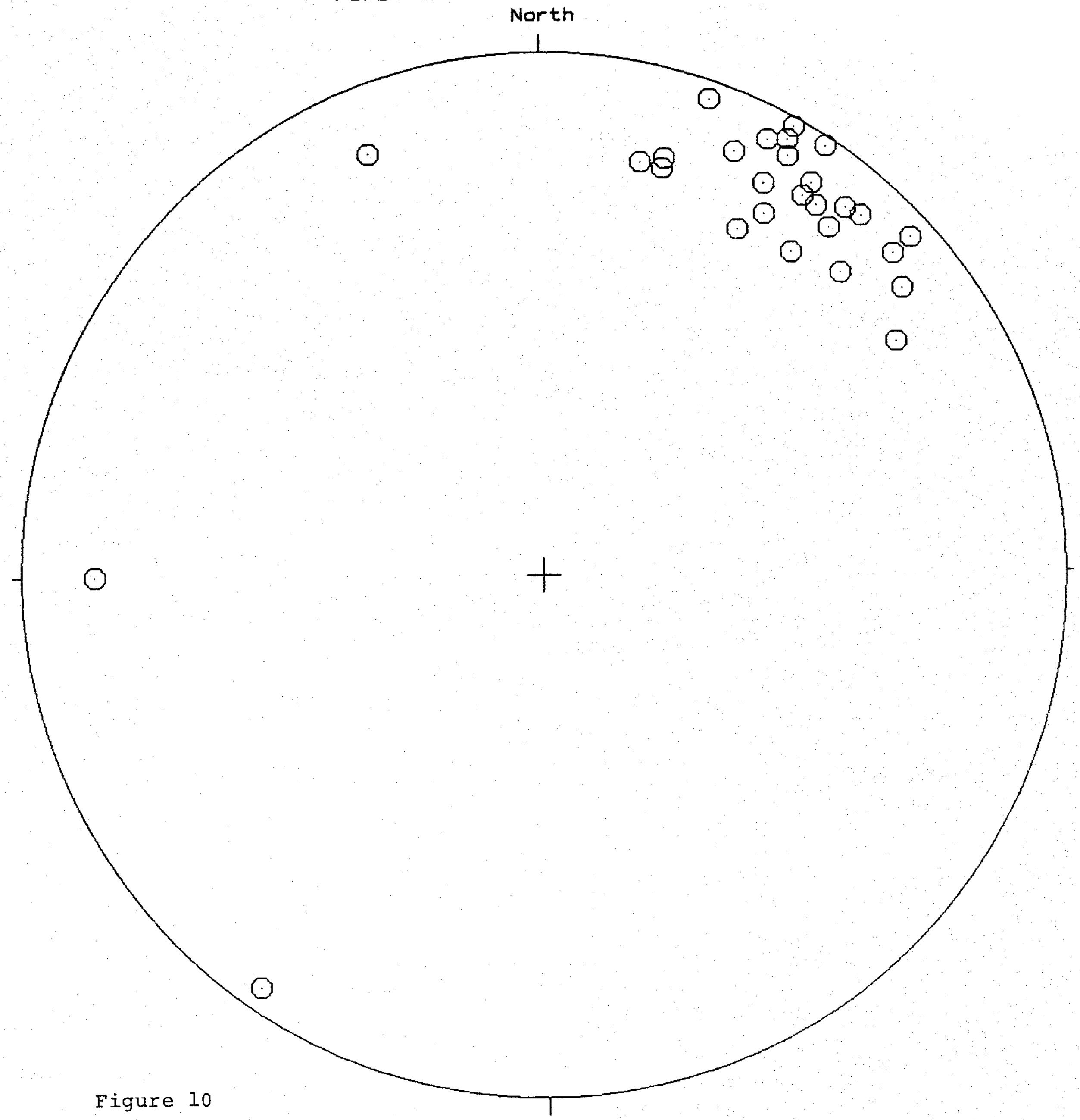


Figure 10

EQUAL AREA PROJECTION

Poles to Foliation: MMY Claims

	Symbol
28 Points	O
28 Points Total	

SPLOT by Darton Software

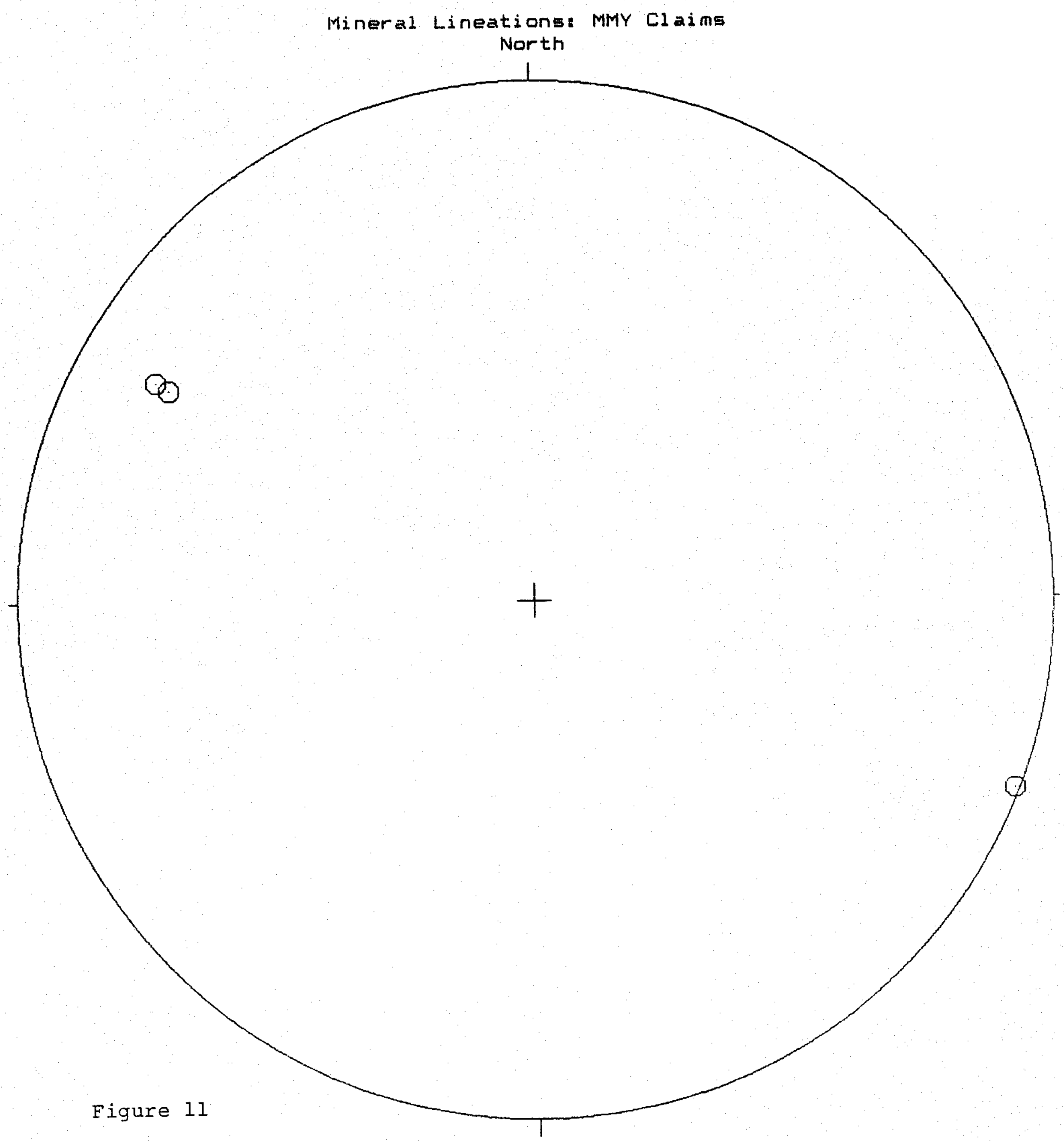


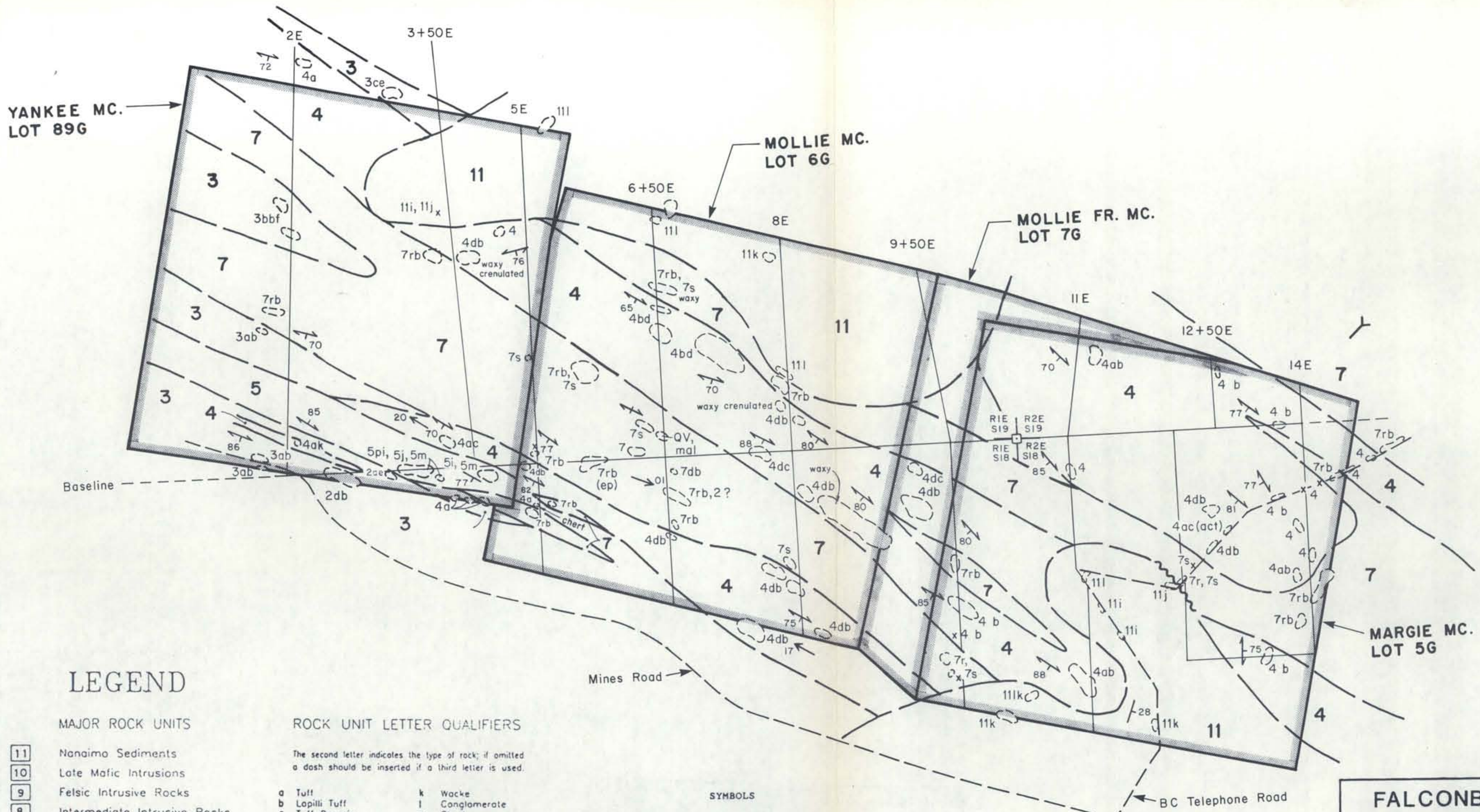
Figure 11

EQUAL AREA PROJECTION

Mineral Lineations: MMY Claims

SPLOT by Darton Software

	Symbol
3 Points	O
3 Points Total	



LEGEND

MAJOR ROCK UNITS

11	Nanaimo Sediments
10	Late Mafic Intrusions
9	Felsic Intrusive Rocks
8	Intermediate Intrusive Rocks
7	Mafic Intrusive Rocks
6	Ultramafic Intrusive Rocks
5	Sedimentary Rocks
4	Felsic Volcanic Rocks
3	Intermediate Volcanic Rocks
2	Mafic Volcanic Rocks
1	Ultramafic Volcanic Rocks

ROCK UNIT LETTER QUALIFIERS

The second letter indicates the type of rock; if omitted a dash should be inserted if a third letter is used.

a	Tuff	k	Wacke
b	Lapilli Tuff	l	Conglomerate
c	Tuff Breccia	m	Chert
d	Massive Flow	n	Iron Formation
e	Pillowed Flow	o	Limestone
f	Flow Breccia	p	Exhalite/Sulphides
g	Pillow Breccia	q	Tuffaceous Sediments
h	Intrusive	r	Fine Grained
i	Argillite	s	Medium Grained
j	Siltstone	t	Coarse Grained
		u	Chlorite Schist

The third and fourth letters are placed in alphabetical order; they are optional and further define the rock.

a	Quartz Phyric	j	Melanocratic
b	Feldspar Phyric	k	Bedded
c	Quartz-Felspar Phyric	l	Chloritic
d	Mafic Phyric	m	Graphitic
e	Mafic-Feldspar Phyric	n	Calcareous
f	Amygdaloidal	o	Argillaceous
g	Spherulitic	p	Siliceous/Cherty
h	Variolitic	q	Sheared
l	Leucocratic	r	Massive
		s	Lithic

SYMBOLS

- x Small bedrock outcrop
- Area of bedrock outcrop
- 45 Bedding, top unknown; (inclined, vertical)
- 50 / 80 Bedding, top(arrow); (inclined, overturned)
- 75 Schistosity; (inclined, vertical)
- 20 Mineral/stretch lineation
- Geological boundary, position interpreted
- Geological boundary, fault contact
- Adit

ABBREVIATIONS

py	pyrite
po	pyrrhotite
sph	sphalerite
jsp	jasper
cpy	chalcopyrite
mt	magnetite
ep	epidotized
carb	carbonatized
sil	silicified
ser	sericitized
chl	chloritized
hem	hematitized
Fe-carb	iron carbonate alteration
QV	quartz vein
mag	magnetic
mag'c	magnetic

FALCONBRIDGE LIMITED

MMY CROWN GRANTS

GEOLOGY

WORK BY	DRAWN BY	DATE. June 1989
M G M	V J G	

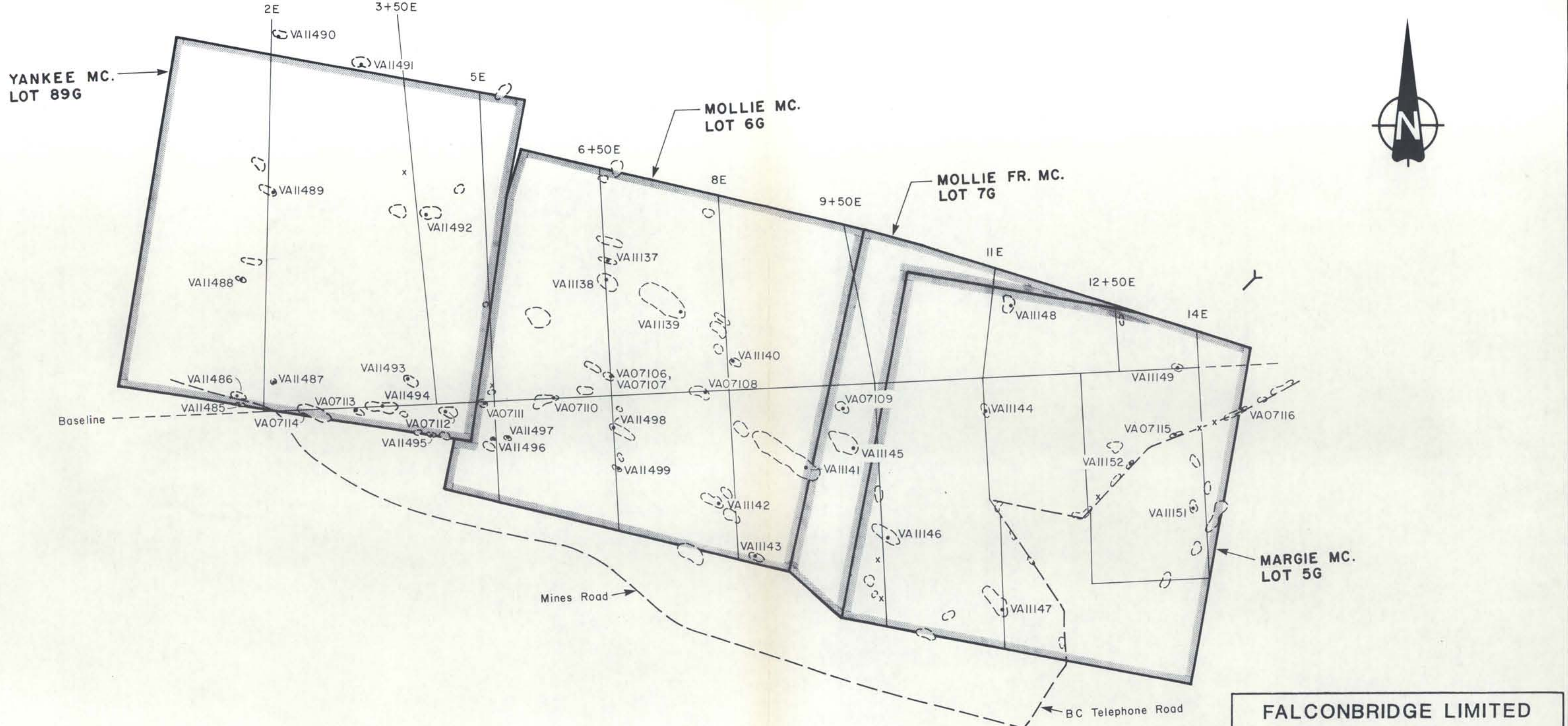
100 0 100 200

SCALE IN METRES 1 : 5000

Project No. 143

NTS: 92 B/ 13

Figure: 3



LEGEND

• VA11490	Sample location : WHOLE ROCK GEOCHEMISTRY
(dashed outline)	Area of bedrock outcrop
x	Small bedrock outcrop
(symbol)	Adit

FALCONBRIDGE LIMITED

MMY CROWN GRANTS

SAMPLE LOCATIONS

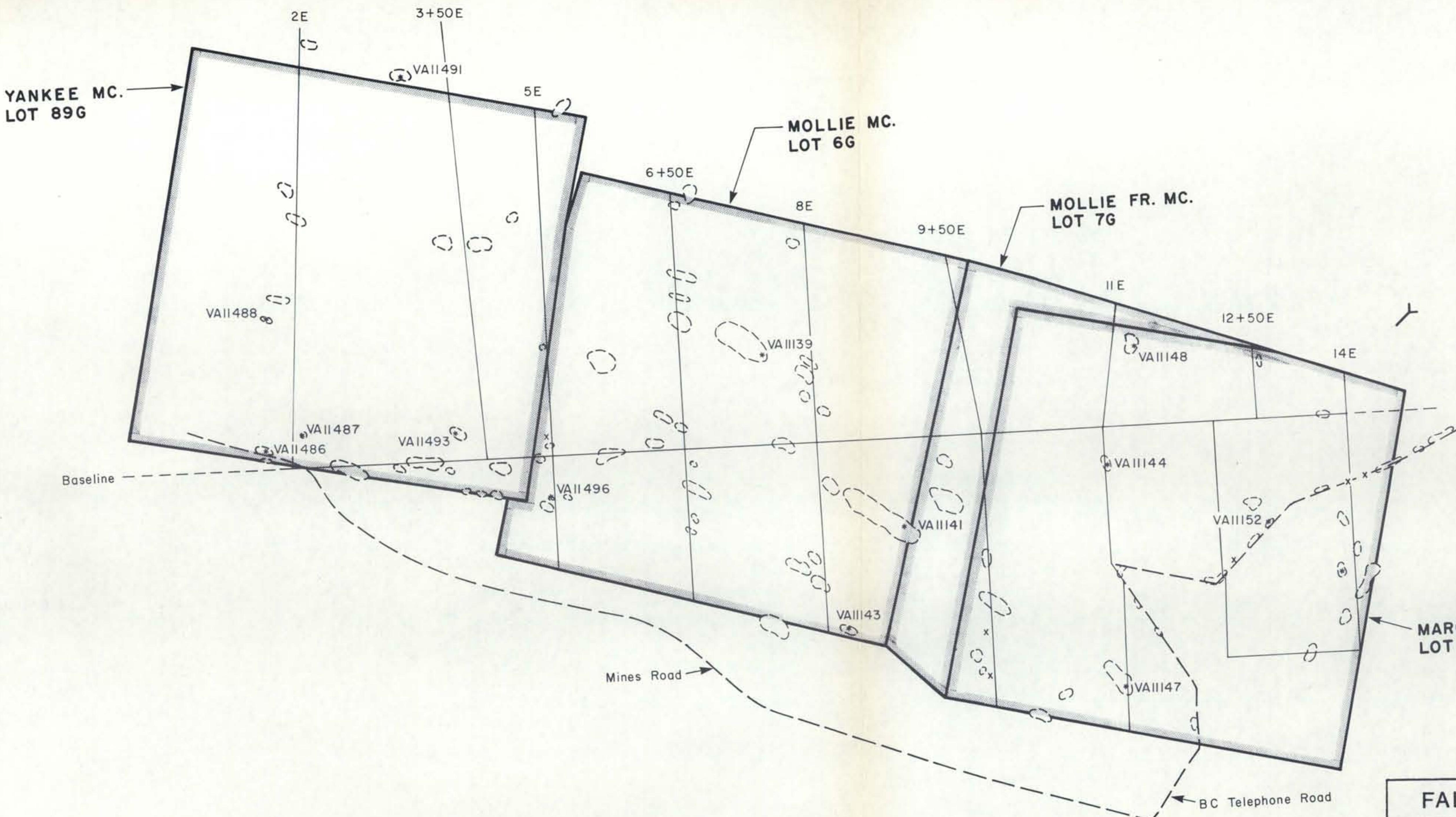
WHOLE ROCK GEOCHEMISTRY

WORK BY	DRAWN BY	
M G M	V J G	DATE: June 1989

100 0 100 200
SCALE IN METRES 1 : 5000

Project No. 143
NTS: 92B/13

Figure: 12



LEGEND

• VA11147	Sample location : THIN SECTION
(dashed outline)	Area of bedrock outcrop
x	Small bedrock outcrop
—<	Adit

FALCONBRIDGE LIMITED

MMY CROWN GRANTS

SAMPLE LOCATIONS
THIN SECTIONS

WORK BY	DRAWN BY	DATE: June 1989
MGM	VJG	

100 0 100 200
SCALE IN METRES 1 : 5000

Project No. 143
NTS: 92B/13

Figure: 13

[10, 373] MMY89.PRP

MMY OPTION (P.N. 143) BRITISH COLUMBIA

COMMODITIES: Cu, Zn, (Pb, Au, Ag)

DEPOSIT TYPE : Volcanogenic Massive Sulphide

LOCATION: 7 km south-southwest of Chemainus,
Vancouver Island
NTS 92B/13 Lat. 48° 52′ N ; Long. 123° 46′ W
Victoria Mining Division

PROPERTY: 4 reverted Crown Grant claims (one is a fraction). Total area is 5.6 hectares.

PROPERTY STATUS: Claims expire December 16, 1993.

OWNERSHIP: Base metal and precious metal rights are 100% owned by Cominco Ltd. Falconbridge Limited can earn a 51% interest in the MMY claims by drilling 200m before 1990. Surface rights are owned by Canadian Pacific Forest Products Ltd. and by the Municipality of North Cowichan.

MINERAL INVENTORY: None established.

EXPENDITURES:

	Nominal $	Constant 1988 $
Falconbridge:	$ 5,718	$ 5,745

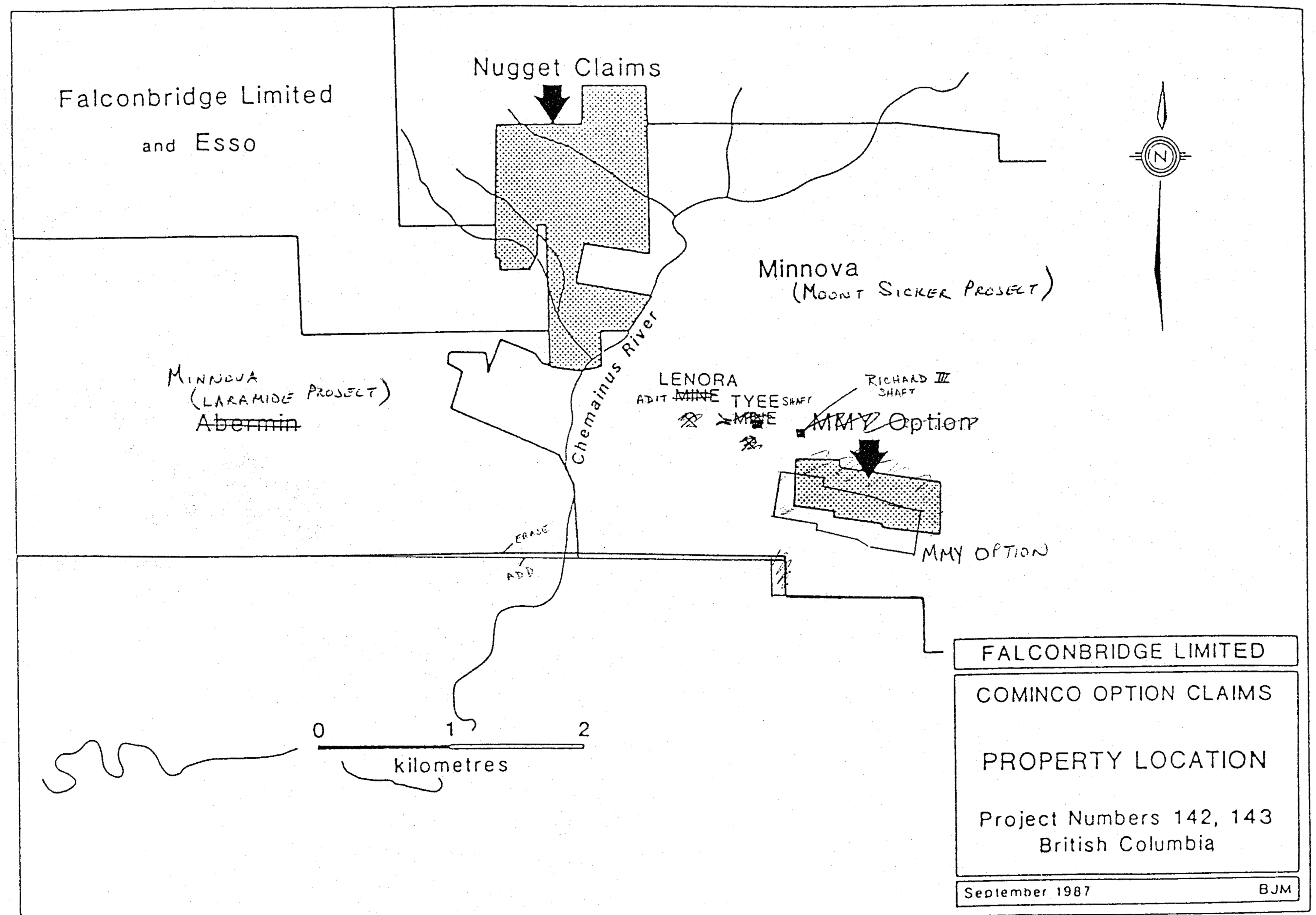
INTRODUCTION: These claims are excluded from the Chemainus Joint Venture and are located on the south flank of Big Sicker Mountain within Minnova's Sicker Project. The Mount Sicker deposits (305,790 tons averaging 3.35% Cu, 7.5% Zn, 94.29 g/t Ag and 4.46 g/t Au) were located about 400 metres north of the northwest corner of the claims.

WORK DONE: 1988 - The claims were located and the boundary was marked. A very brief geological survey was completed.

RESULTS: Limited mapping indicates that the MMY claims are underlain by Sicker Group felsic and mafic volcanics, and cherty sediments intruded by gabbro. Minor copper mineralization in a quartz vein was observed beside a very old 10 metre deep shaft that was sunk near a gabbro in contact with mafic volcanics.

CONCLUSIONS AND PLANS: Field work will begin after execution of the option agreement . It will include cutting about 5 km of grid, then completing Mag/VLF/IP surveys and geological mapping coupled with lithogeochemical sampling. A 200m diamond drill hole required under the option agreement would test the favourable stratigraphy.

December 31, 1988



Falconbridge Limited
and Esso
Nugget Claims
N
Minnova
(Mount Sicker Prosect)
Minnova
(Laramide Prosect)
Abermin
Chemainus River
LENORA
ADIT MINE
TYEE SHAFT
MINE
RICHARD III
SHAFT
MMY Option
MMY OPTION
ERASE
ADD
0 1 2
kilometres
FALCONBRIDGE LIMITED
COMINCO OPTION CLAIMS
PROPERTY LOCATION
Project Numbers 142, 143
British Columbia
September 1987
BJM

~~1989 BUDGET PROPOSAL~~

MMY OPTION (P.N. 143) BRITISH COLUMBIA

~~BUDGET: $40,000~~

COMMODITIES: Cu, Zn, (Pb, Au, Ag)

DEPOSIT TYPE : Volcanogenic Massive Sulphide

LOCATION: 7 km south-southwest of Chemainus, Vancouver Island
NTS 92B/13 Lat. 48 51' N ; Long. 123 49' W
Victoria Mining Division

PROPERTY: 4 Reverted Crown Grant claims (one is a fraction) AREA

PROPERTY STATUS: Claims expire December 16, 1993. Annually taxable

OWNERSHIP: Base metal and precious metal rights are 100% owned by Cominco Ltd. Falconbridge ~~Ltd.~~ Limited can earn a 51% interest in the MMY claims by drilling 200m before 1990. Surface rights are owned by CPFP Ltd and the Municipality of North Cowichan.

* CHECK REG'S NOTES Re: BASE Metals

MINERAL INVENTORY: None established.

EXPENDITURES:

	Nominal $	Constant 1988 $
Falconbridge:	$ ~~5,751~~ 751 4967 5718	$ ~~5,778~~ 778 4967 5745

INTRODUCTION: These claims are excluded from the Chemainus JV and are located on the south flank of Big Sicker Mtn. within Minnova's Sicker Project. The Mt. Sicker deposits which produced 305,790 tons averaging 3.35% Cu, 7.5% Zn, 94.29 g/t Ag and 4.46 g/t Au are located within 2 km of the claims.

WORK DONE: 1988 – TITLE SEARCH – The claims were located by a legal survey, the boundary was marked, and a very brief survey of the geology was completed.

RESULTS: Limited mapping indicates that the MMY claims are underlain by felsic and mafic volcanics, and cherty sediments of the Sicker Group which are intruded by gabbro. Minor quartz vein-hosted copper mineralization was observed beside a very old 10 metre deep shaft that was sunk near a gabbro in contact with mafic volcanics.

SPECIFIC PROPOSALS:

Plans for 1989 are:

1) Linecutting over claims. (km)
2) Geophysics over grid(IP, VLF and MAG)
3) Geological and lithogeochemical survey of claims.
4) 200 metres diamond drilling

TENTATIVE SCHEDULE:

Drilling November, 1989
Surveys May - June, 1989

PROJECT SUPERVISOR:

Robert Stewart

Exploration Forecast/1989

			MMY Option (Project 143)
Salaries		$6,000	
Travelling and Expenses		$250	
Linecutting		$0	
Contract Payments		$0	
Field Expenses		$1,750	
Assays		$2,000	
Total General and Geology			$10,000
Salaries		$0	
Travel and Expenses		$0	
Linecutting		$3,000	
Contract Payments		$7,000	
Field Expenses		$0	
Total Geophysics			$10,000
Salaries		$0	
Travelling and Expenses		$0	
Linecutting		$0	
Contract Payments		$0	
Field Expenses		$0	
Assays		$0	
Total Geochemistry			$0
Salaries		$2,000	
Travelling and Expenses		$500	
Metres of Drilling	200		
Contract Payments		$14,500	
Field Expenses		$500	
Assays		$2,500	
Total Diamond Drilling			$20,000
Metallurgy and Mineralogy		$0	
Option Payments		$0	
Property Maintenance		$0	
Sub Total			$40,000
Participants Share			
Regional Office Recovery			
Project Total			$40,000

MMY OPTION P.N. 143 BRITISH COLUMBIA

COMMODITIES: Cu, Zn, (Pb, Ag, Au)

DEPOSIT TYPE: Volcanogenic ~~Volcanic hosted, polymetallic~~ massive sulphides

LOCATION: N.T.S. 92 B/13 Victoria Mining Division
Lat. 48° 51' ; Long. 123° 49'
7 km south-southwest of Chemainus, on Vancouver Island.

PROPERTY: 4 Reverted Crown Grant claims (one is a fraction)
#'s

PROPERTY STATUS: Annually taxable and in good standing.

OWNERSHIP: 100% owned by Cominco.

MINERAL INVENTORY: None Established.

EXPENDITURE BY YEARS: 1987 $751.

INTRODUCTION: These claims are excluded from the Esso JV and are located on the south flank of Big Sicker Mtn. within Minnova's Sicker project. Former Cu-Ag-Au producers Lenora and Tyee are within 2 km of these claims. The final deal with Cominco has not been signed yet.

WORK DONE: None, pending signing of the agreement.

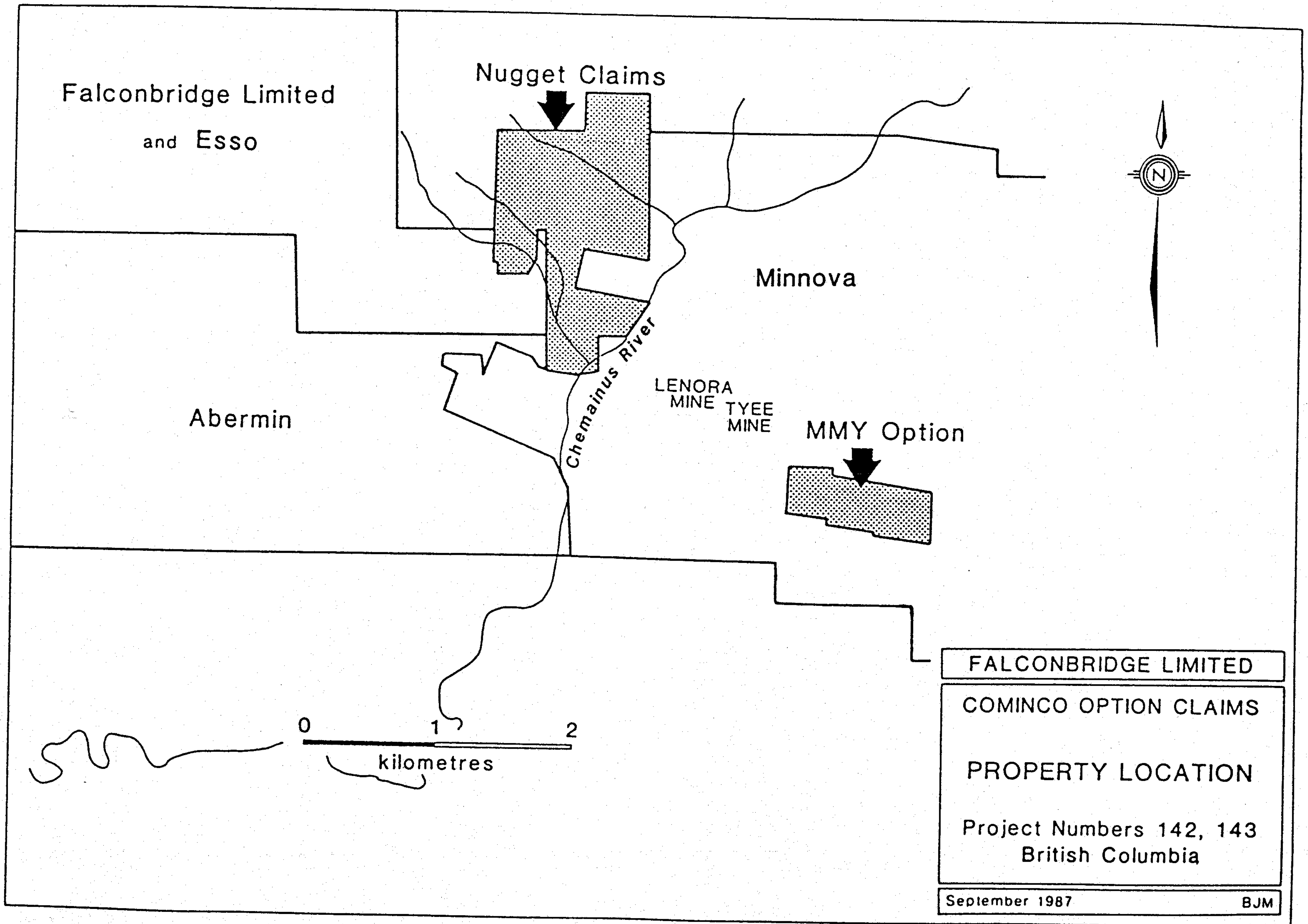
RESULTS: The geology underlying the claims is unknown at present.

CONCLUSIONS AND PLANS: The position of the claims suggests that they lie on volcanic stratigraphy with potential for hosting ore. The claims will be mapped and sampled to determine whether prospective stratigraphy is present.

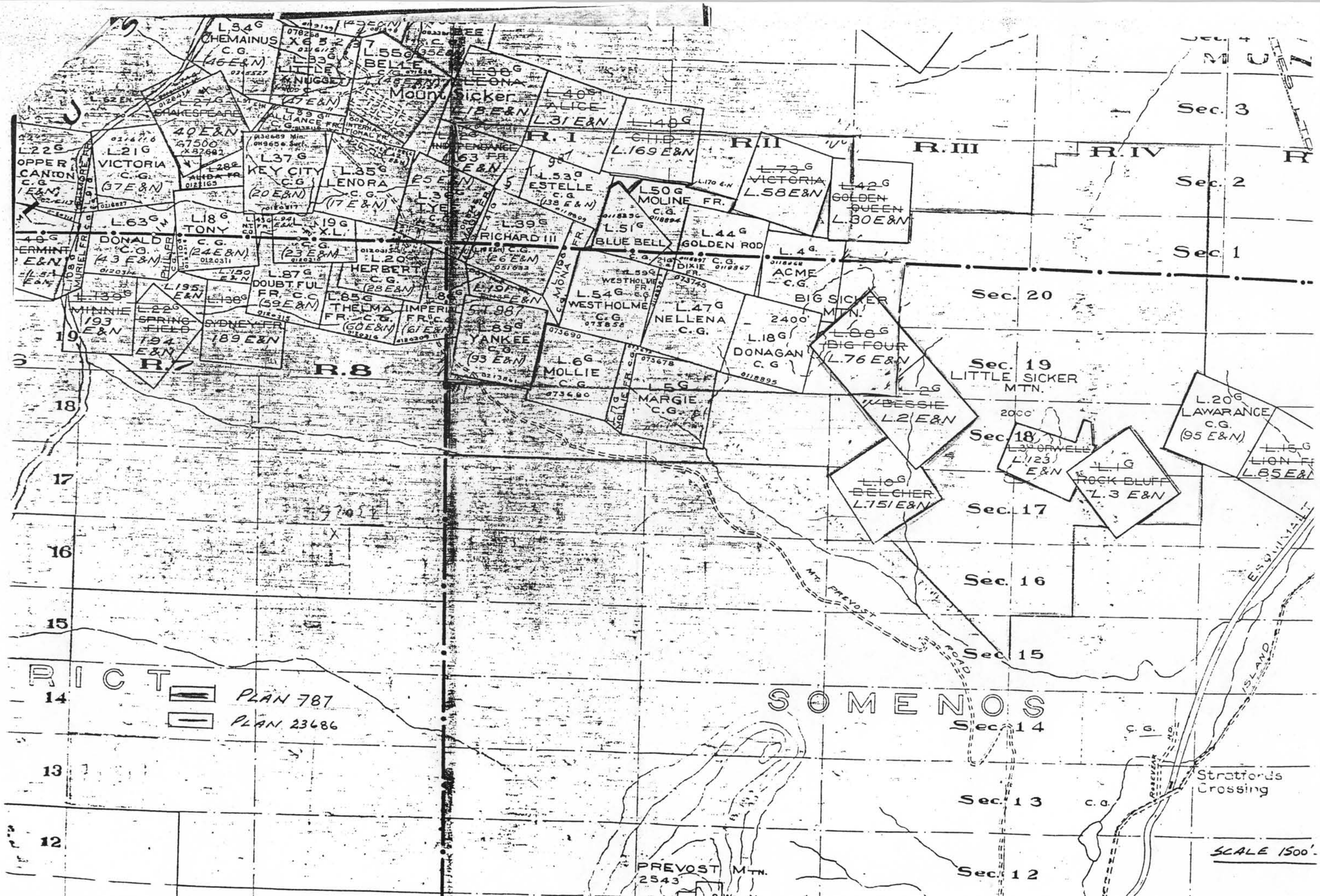
December 31, 1987

Exploration Expenditures
1987

		MMY Option (Project 143)	
Salaries		$0	
Travelling and Expenses		$0	
Linecutting		$0	
Contract Payments		$0	
Field Expenses		$0	
Assays		$0	
Total General and Geology			$0
Salaries		$0	
Travel and Expenses		$0	
Linecutting		$0	
Contract Payments		$0	
Field Expenses		$0	
Total Geophysics			$0
Salaries		$0	
Travelling and Expenses		$0	
Linecutting		$0	
Contract Payments		$0	
Field Expenses		$0	
Assays		$0	
Total Geochemistry			$0
Salaries		$0	
Travelling and Expenses		$0	
Metres of Drilling	0		
Contract Payments		$0	
Field Expenses		$0	
Assays		$0	
Total Diamond Drilling			$0
Metallurgy and Mineralogy		$0	
Option Payments		$0	
Property Maintenance		$750	
Sub Total			$750
Participants Share			
Regional Office Recovery			
Project Total			$750

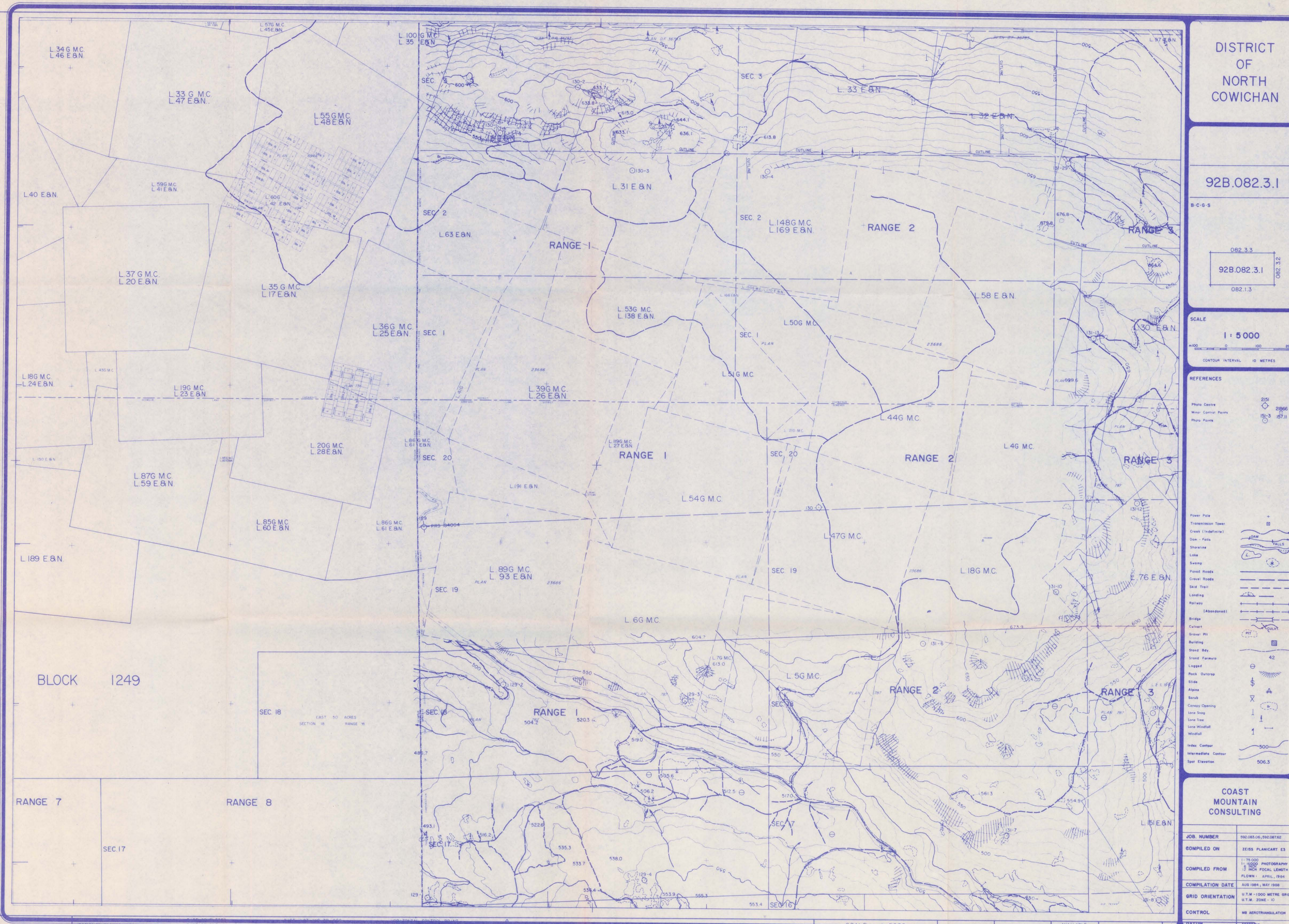

Falconbridge Limited
and Esso
Nugget Claims
Minnova
Abermin
Chemainus River
LENORA
MINE
TYEE
MINE
MMY Option
N
0
1
2
kilometres
FALCONBRIDGE LIMITED
COMINCO OPTION CLAIMS
PROPERTY LOCATION
Project Numbers 142, 143
British Columbia
September 1987
BJM

V-32



L.34G CHEMAINUS C.G. (46 E&N)
L.55G BELLE C.G. (49 E&N)
L.33G LITTLE NUGGET
L.38G LEONA
Mount Sicker
18 E&N
L.40G ALICE
L.31 E&N
L.148G CHILD
L.169 E&N
L.27G SHAKESPEARE
40 E&N
L.62 E.N.
L.22G COPPER CANON C.G. 1 E&N
L.21G VICTORIA C.G. (37 E&N)
L.28G ALIDA FR.
L.37G KEY CITY C.G. (20 E&N)
L.35G LENORA C.G. (17 E&N)
L.89G ALLIANCE FR. C.G.
INTERNATIONAL FR.
INDEPENDENCE 63 FR. E&N
25 E&N
L.3G TYEE
L.53G ESTELLE C.G. (138 E&N)
R.1
R.II
R.III
R.IV
L.73G VICTORIA L.58 E&N
L.42G GOLDEN QUEEN L.30 E&N
L.50G MOLINE FR.
L.51G BLUE BELL
L.44G GOLDEN ROD
L.4G ACME C.G.
L.170 E.N
L.63G DONALD C.G. (43 E&N)
L.18G TONY C.G. (24 E&N)
L.19G X.L. C.G. (23 E&N)
L.20G HERBERT C.G. (28 E&N)
L.39G RICHARD III C.G. (26 E&N)
MONA FR.
L.59G WESTHOLME FR.
L.54G WESTHOLME C.G.
L.21G DIXIE FR.
L.47G NELLENA C.G.
BIG SICKER MTN.
2400'
L.18G DONAGAN C.G.
L.88G BIG FOUR L.76 E&N
LITTLE SICKER MTN.
L.2G BESSIE L.2 E&N
2000'
L.20G LAWARANCE C.G. (95 E&N)
L.15G LION FR. L.85 E&N
L.3G ORWELL L.123 E&N
L.1G ROCK BLUFF L.3 E&N
L.10G BELCHER L.751 E&N
MURIEL FR.
PHILLIP FR.
L.150 E&N
L.195 E&N
L.139G MINNIE 193 E&N
L.22G SPRING FIELD 194 E&N
L.138G
SYDNEY FR. 189 E&N
L.87G DOUBTFUL FR. C.C. (59 E&N)
L.85G THELMA FR. C.G. (60 E&N)
IMPERIAL FR. C.G. (61 E&N)
L.191 E&N
ST. 987
L.89G YANKEE C.G. (93 E&N)
L.6G MOLLIE C.G.
L.5G MARGIE C.G.
MOLLIE FR.
R.7
R.8
Sec. 1
Sec. 2
Sec. 3
Sec. 4
Sec. 12
Sec. 13
Sec. 14
Sec. 15
Sec. 16
Sec. 17
Sec. 18
Sec. 19
Sec. 20
12
13
14
15
16
17
18
19
RICT
SOMENOS
PLAN 787
PLAN 23686
MT. PREVOST ROAD
PREVOST MTN. 2543
Stratfords Crossing
ESQUIMALT & ... ISLAND
SCALE 1500'

DISTRICT OF NORTH COWICHAN
92B.082.3.1
B·C·G·S
082.3.3
082.3.2
082.1.3
SCALE
1 : 5000
CONTOUR INTERVAL : 10 METRES
REFERENCES
COAST MOUNTAIN CONSULTING
JOB. NUMBER 592.083.06; 592.087.62
COMPILED ON ZEISS PLANICART E3
COMPILED FROM 1:75 000 1:16000 PHOTOGRAPHY 6 INCH 12 INCH FOCAL LENGTH FLOWN: APRIL, 1984
COMPILATION DATE AUG 1984; MAY 1988
GRID ORIENTATION U.T.M - 1000 METRE GRID U.T.M. ZONE: 10
CONTROL MB AEROTRIANGULATION
DATUM GEODETIC
RANGE 1
RANGE 2
RANGE 3
RANGE 7
RANGE 8
BLOCK 1249
SEC. 1
SEC. 2
SEC. 3
SEC. 17
SEC. 18
SEC. 19
SEC. 20
L. 33 E.&N.
L. 32 E.&N.
L. 31 E.&N.
L. 63 E.&N.
L. 58 E.&N.
L. 30 E.&N.
L. 76 E.&N.
L. 151 E.&N.
L. 189 E.&N.
L. 191 E.&N.
L. 54G M.C.
L. 47G M.C.
L. 44G M.C.
L. 4G M.C.
L. 18G M.C.
L. 6G M.C.
L. 5G M.C.
L. 51G M.C.
L. 50G M.C.
L. 148G M.C. L. 169 E.&N.
L. 53G M.C. L. 138 E.&N.
L. 39G M.C. L. 26 E.&N.
L. 89G M.C. L. 93 E.&N.
L. 36G M.C. L. 25 E.&N.
L. 35G M.C. L. 17 E.&N.
L. 37G M.C. L. 20 E.&N.
L. 55G M.C. L. 48 E.&N.
L. 33G M.C. L. 47 E.&N.
L. 34G M.C. L. 46 E.&N.
L. 19G M.C. L. 23 E.&N.
L. 20G M.C. L. 28 E.&N.
L. 18G M.C. L. 24 E.&N.
L. 87G M.C. L. 59 E.&N.
L. 85G M.C. L. 60 E.&N.
L. 86G M.C. L. 61 E.&N.
L. 40 E.&N.
Hughes McConnell
EAST 50 ACRES SECTION 18 RANGE 8
PROVINCE OF BRITISH COLUMBIA
MINISTRY OF ENVIRONMENT
DATUM OF ELEVATIONS
AIR PHOTOGRAPHY
DATE OF PHOTOGRAPHY
U.T.M. GRID ZONE (1975)
SHORELINE APPARENT HIGH WATER MARK
BASE SOURCE
REVISION DATE
LATEST PLAN No.
LAND DISTRICTS
LAND TITLE DIST.
SUBDIVISION LOT
HORIZONTAL CONTROL POINT
VERTICAL CONTROL POINT
AIR PHOTO CENTRE
SURVEYED CADASTRAL TIE
CONTOUR INTERVAL METRES
PLANIMETRIC
CONTOUR
CADASTRAL
ORTHOPHOTO
92B.082.3.1



PROVINCE OF BRITISH COLUMBIA — MINISTRY OF ENVIRONMENT

DATUM OF ELEVATIONS
AIR PHOTOGRAPHY
DATE OF PHOTOGRAPHY
U.T.M. GRID ZONE (1975)
SHORELINE APPARENT HIGH WATER MARK

BASE SOURCE
REVISION DATE
LATEST PLAN No.
LAND DISTRICTS

SUBDIVISION LOT

VERTICAL CONTROL POINT
AIR PHOTO CENTRE
SURVEYED CADASTRAL TIE

METRES
CONTOUR INTERVAL METRES

AVAILABLE
PLANIMETRIC
CONTOUR
CADASTRAL
ORTHOPHOTO

92B.082.3.1