85-988 - 14182

COMINCO LTD.

EXPLORATION

WESTERN DISTRICT

NTS: 92 F/4E

# ASSESSMENT REPORT

# GEOLOGY, GEOCHEMISTRY, TRENCHING

# ON THE

# NICKEL 1,2,3, THE LORNE AND THE SUPER 1,2,3 CLAIMS

ALBERNI MINING DIVISION

LATITUDE: 49°12', LONGITUDE: 125°37'

OWNER: P.C. BUCKLAND

OPERATOR: COMINCO LTD.



P.C. LECOUTEUR

DECEMBER 1985

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COMINCO LTD.

EXPLORATION | WESTERN DISTRICT

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# ASSESSMENT REPORT

# GEOLOGY, GEOCHEMISTRY, TRENCHING ON THE THE NICKEL 1,2,3, THE LORNE AND THE SUPER 1,2,3 CLAIMS

## I. INTRODUCTION

### (a) Location and Access

The Nickel 1,2,3, the Lorne and the Super 1,2 and 3 form a group of adjacent claims on Deer Bay, Tofino Inlet, Vancouver Island (Figure 1). This property is about 25 km ENE of the town of Tofino, and may be reached by air (helicopter or floatplane) or by boat from Tofino or several other points along Tofino Inlet.

The ground is steep, heavily forested and ranges from sea level to 950 m. There are good exposures on the coast line and also in numerous bluffy outcrops, especially at higher elevations. A cabin on the property was repaired and used as a base for the work reported here, carried out intermittently over the period May 26-October 24 by P.C. LeCouteur, S.B. Noakes, I.J. Talbot and M.J. Gray.

### (b) Property Definition and History

The property is shown on Figure 2, and details of the claims are given in Table 1.

TABLE 1

DETAILS OF CLAIMS

| CLAIM | UNITS | RECORD NO. | RECORDING DATE | DUE DATE |
|---|---|---|---|---|
| NICKEL 1 | 4 | 1048 | October 24, 1980 | October 24, 1985 |
| 2 | 8 | 1338 | November 12, 1981 | November 12,1985 |
| 3 | 8 | 1339 | November 12, 1981 | November 12,1985 |
| LORNE | 12 | 1341 | November 12, 1981 | November 12,1985 |
| SUPER 1 | 16 | 2150 | May 10, 1984 | May 10, 1987 |
| 2 | 16 | 2151 | May 10, 1984 | May 10, 1987 |
| 3 | 10 | 2152 | May 10, 1984 | May 10, 1987 |

Super 1,2,3 were grouped on May 7, 1985
Nickel 1,2,3 and Lorne were grouped October 3, 1983.

The property has been explored intermittently since about 1898 and a number of showings of several types have received some work, mostly in the 1960's. These showings include Au quartz-veins, Mo-Cu skarns, and Ni-Cu-PGM mineralization in amphibolite. They are best described in the B.C. Dept. Mines Annual Report for 1963 (pp. 115-117) with additional information in the 1966 (p. 74) and 1967 (p. 75) BCDM Annual Reports.

The ground covered by the Nickel 1,2,3 and Lorne claims was owned by Lorne Hanson, a Tofino prospector, from the 1950's until his death in 1984 when they were acquired by his associate, P.C. Buckland of Vancouver. In 1984 Cominco (R.J. Sharp, I.M. Mason) examined the property and a brief geochemical, geological and geophysical program was carried out (See Assessment report by I.M. Mason). The adjoining Super 1,2 and 3 claims were purchased by Buckland and the combined claims wereoptioned to Cominco in 1985.

In the 1963 BCDM Annual report (P. 116) it was reported that a small Ni-Cu mineralized zone, on the NW side of the inlet opposite Similar Island, contained platinum-group metals. This showing ("Tofino Nickle") and this style of mineralization have been the main focus of the geological and geochemical work reported here.

(c) Summary of Work Done

The work done on the claims is summarized in Table 2.

TABLE 2

SUMMARY OF WORK DONE

| | NICKEL 1,2,3 and LORNE GROUP | SUPER 1,2,3 GROUP |
|---|---|---|
| GEOCHEMICAL SURVEY | | |
| Soils | 51 | 97 |
| Silts | 2 | 1 |
| Rocks | 31 | 20 |
| Trench Rock Chip Samples | | 7 |
| Total Length Trenched | | 11.1 m |
| GEOLOGICAL SURVEY | | |
| Scale of Map | 1:5,000 | 1:5,000 |
| Area Surveyed | 2.5 $km^2$ | 0.5 $km^2$ |

## II. GEOLOGY

(a) Objectives

The objectives of the geological work were to understand the regional setting and controls of mineralization at the main Cu-Ni-PGM showing, and to prospect the surrounding area for mineralization of similar style. Examination of the showing required drilling and blasting trenches, mapping and chip sampling.

## (b) Results and Interpretations

### Regional Setting

Regional mapping by Muller and Carson (GSC Paper 68-50, 1968) indicates the property lies within a belt of rocks assigned to the Palaeozoic Sicker Group, or their metamorphosed equivalents. The metamorphism, thought to be coeval with emplacement of the mid to Upper Jurassic Island Intrusives, resulted in a number of enigmatic gneiss units, collectively termed the "West Coast Crystalline Complex" by Muller and Carson.

### Gneisses

In that part of the claims shown in Plate 1 the principal rock-type is fine to medium-grained pale grey, brownish weathering, poorly foliated gneiss. It consists essentially of plagioclase and quartz with 5-20% ragged aligned laths of chlorite. These rocks are thought to be metamorphosed equivalents of Sicker Group lithologies, possibly silicified intermediate to acid volanics or volcaniclastics. No textural evidence bearing on their origin was found, but whole rock analyses of typical gneiss (LR530, LR552, LR563 in Table 4) are notable for their high silica levels. A thin band of coarse garnet-diopside marble was seen in one locality.

During prospecting pyrite was noted in gneiss in several areas, usually in minor amounts, and some of these were analysed for trace elements (Table 3, Plate 1). The area indicated by samples LR613-621 is particularly notable for the presence of laminated pyritic bands up to several cm wide in zones up to 3 m widths, that may contain up to 10% pyrite in gneiss. Analyses of all these rocks were unencouraging.

### Amphibolites

In many exposures, particularly well-seen along the coast, the pale gneisses contain numerous dark grey to green amphibolite bands. These lie more or less parallel to the foliation of the gneiss, also possess a weak foliation, range from a few cm to several metres in thickness, and locally make up to 50% of large outcrop areas. They are thought to represent a swarm of basic sills probably related to the Upper Triassic Karmutsen volcanic episode.

In thin section the amphibolites are fine to medium grained, poorly foliated, and consist of about 70% green amphibole and 30% plagioclase. Analyses (Table 4) indicate most have basaltic compositions, except for 2 samples (LR537, LR589) from the main showing, which are ultrabasic. Some analyses of Ni, Cu, Pt and Pd (Table 3) indicate the levels of these elements in unmineralized amphibolite. Apart from the main showing no other significant mineralization was located in amphibolites, although one sample (LR622, Table 3) does contain minor Cu in chalcopyrite.

### Main Showing

The main Cu-Ni-PGM showing is located beside a small creek at 275 m ASL on the SW-facing slope above the small bay 1/2 km north of Similar Island (Plate 1). It may be reached by a rough track from the cabin at water's edge on the west side of the bay.

At the showing, an outcrop some 10x30 m, several bands of dark grey to green amphibolite are interlayered somewhat irregularly in leucocratic gneiss. The setting is thus not unlike that seen elsewhere on the claims, except for the pale colour of some gneisses, which gives them an anorthositic aspect, and for the ultrabasic composition of the amphibolitised sills (analyses LR537, LR589 in Table 4). Sample LR530 (Table 4) is representative of gneiss from the showing.

There is some pyrite disseminated in the gneiss, particularly close to the amphibolite, but the important sulphide concentrations, generally 10-50% sulphide, are in the amphibolite. The principal sulphide is pyrite but chalcopyrite may locally be dominant and form 50% or more of a hand specimen. Accessory minerals include pyrrhotite, magnetite, violarite, millerite and pentlandite. A detailed petrographic study of some 23 rocks from the main showing is included as Appendix C. In this study a palladium antimono-telluride was identified, possibly merenskyite, but no platinum carrier was found.

A geological map of the main showing with sample locations and trenches is shown as Plate 2, and sketches of the trenches as plate 3. Analytical results of rock samples and chip samples are given in Table 5. Two select samples with high Pt and Pd were analysed at two different laboratories for all the PGM plus Re and Au, with the results shown in Table 6. Fair agreement is indicated, except for Re, and these values generally confirm the Pt and Pd levels reported earlier by the cheaper Pb-collection method of analysis. The dominance of Pd over Pt and the much lesser amounts of other PGM are of note.

Although deformation and low grade metamorphism have obscured evidence of a magmatic origin of the mineralization it is possible that the sulphides were introduced as an immiscible sulphide liquid component of an ultrabasic magma at the time of sill injection. The high Pd/Pt ratio may indicate preferential remobilization of PGM (see Appendix C) during metamorphism.

## III. GEOCHEMISTRY

### (a) Objectives

An orientation soil survey in the immediate area of the main showing was intended to test the usefulness of Cu and Ni analyses of soils in detecting mineralized amphibolite bands.

A soil survey was carried out over a wider area centred on the showing to locate any Cu and Ni anomalies.

### (b) Methods

A grid was set out using topofil and compass for control. Five lines spaced at a slope-corrected 100 m apart were laid out from a base line through the showing. The base line connects the 300 m stations. Lines were run at 225° with a nominal 30 m sample interval. Three silts and 148 soils were collected over 3990 m of line.

Samples were obtained by soil auger or spade, mostly of the B horizon. This horizon was light to dark brown and varied from gravelly to clayey. Stations were tagged with flagging and soils transferred to Kraft envelopes. Details noted at each site were recorded and are given in Table 8, along with the Cu and Ni analyses.

Bedrock in the area of the grid was identified in numerous outcrops as leucocratic gneiss with bands of amphibolite. Slopes are steep and the presence of large blocks in some areas suggests that downslope movement must have been considerable. This will affect the usefulness of soil surveys.

Methods of analysis for all results in this report are given in Table 7. Except where indicated by the notation "analyses by an outside laboratory" under each table of results, all analyses were done in Cominco's Vancouver Exploration Lab. The outside laboratory, used for Pd, Pt and some Au analyses, was X-Ray Assay Labs Ltd. of Toronto, except for 3 analyses of PGM by ICI Laboratories of England (Table 6). All analyses were by standard, well known methods.

(c) Results and Interpretations

Results of the orientation soil survey are shown on Plate 4 and Table 8 (Lines C+15m and C-30m). Above the showing only one weak anomaly is present. Below the showing all samples from 290 to 305 m show coincident high Cu and Ni values. It appears that soil geochemistry is useful, although anmalies may be subtle. Some of the high values on line C-30 may be due to development work on the showing above.

Results of the main grid survey are shown in Plate 1 and Table 8 (Lines A,B,C, D,E). Values are also shown in histogram form for Cu in Figure 3 and for Ni in Figure 4. Threshold values are estimated to be about 12 ppm Ni and 20 ppm Cu by inspection of these figures. On Plate 1 there are 16 stations above this level for Cu and 9 for Ni. Five stations show coincident above-threshold Cu and Ni values: B 270m, C 0m, C 120m, D 0m and E 270m. All of these are subtle anomalies, far below the values downslope from the known showing, and knowledge of their significance will require prospecting, fill-in soil sampling and geophysical surveying. The concentration of the "anomalies" in the NE end of the grid and the similarity of values to those above the known showing are encouraging.

## IV. CONCLUSIONS

1. Geology - Those parts of the property examined consist of Sicker Group rocks intruded by a swarm of sub-parallel ?Karmutsen basic and ?rare ultrabasic sills. These rocks have been metamorphosed to leucocratic gneiss and amphibolite respectively.

2. Prospecting - Away from the main Cu-Ni-PGM showing some heavily pyritic zones were found during prospecting in the gneiss, but these appear barren. One amphibolite band showed weak Cu mineralization.

3. Main Showing - On the showing trenching and chip sampling over 11.1m in 4 trenches gave values up to 1.5% Ni, 4.2% Cu, 1.4 ppm Pt and 4 ppm Pd in sulphide-rich amphibolite. Selected character samples gave considerably

higher values. A palladium antimono-telluride has been identified but the Pt carrier is not yet known. It is speculated that mineralization may be due to injection of ultramafic magma containing immiscible Fe-Cu-Ni sulphide liquid during an early phase of the sill swarm formation.

4. Orientation Geochemistry - Soil geochemistry over the showing gives strong Cu and Ni responses below the showing (partly man-made?) and a weak response above.

5. Soil Geochemistry - Soil geochemistry on 5 lines with 100 m line spacing and 30 m stations (3.9 km, 151 samples) showed 5 weak Cu and Ni anomalies, mostly in the NE end of the grid.

6. Further Work - Considerable prospecting, soil, silt and heavy mineral geochemistry, and geophysical surveying remain to be done to locate extensions of the mineralized sill or similar parallel sills.

Reported by: P.C. LeCouteur
Project Geologist

Endorsed for
Release by: W.J. Wolfe
Manager, Exploration -
Western Canada

PCL/cgs

Distribution

Mining Recorder
Western District
PCL

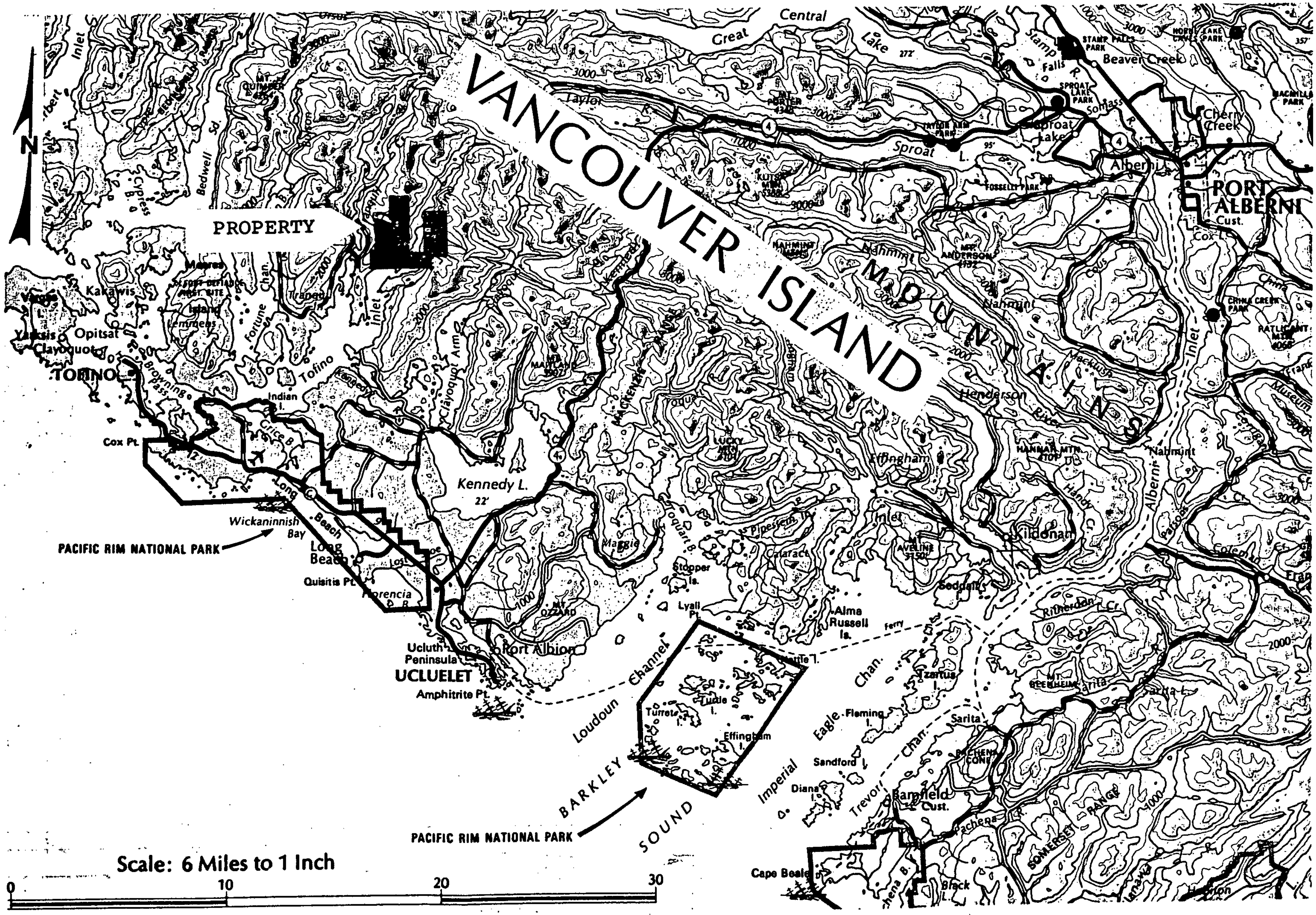
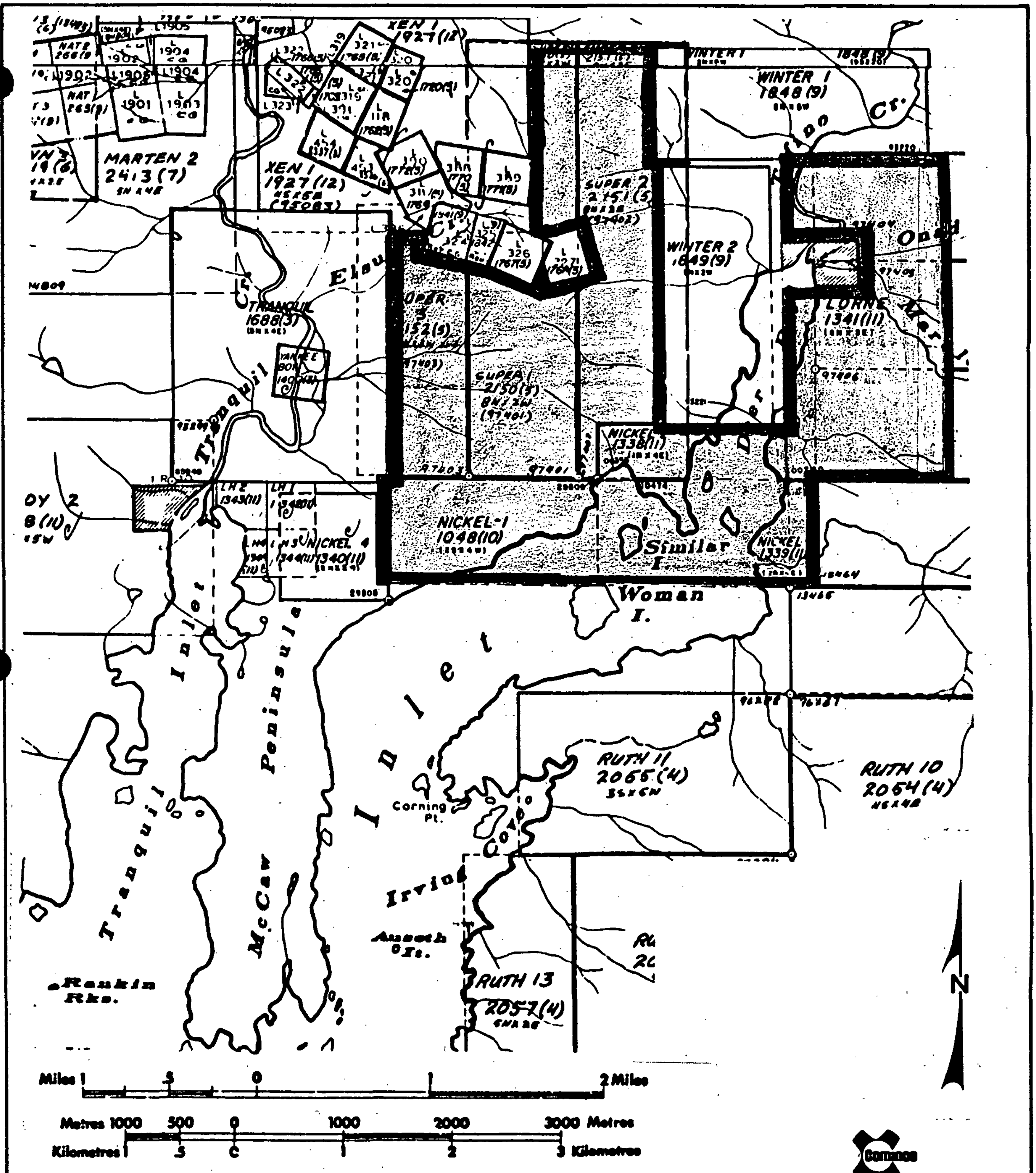



Fig 1. Location of property on Vancouver Island

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|---|---|---|---|
| Revised by | Date | Revised by | Date |

Figure 2. Location of claims
Alberni MD. NTS 94F/4E

Scale: 1:50,000 Date: 15 Dec. 1985 Plate:

Table 3. Analyses of various rocks

| LAB NO | FIELD NUMBER | Ni PPM | Cu PPM | Pt PPB | Pd PPB | Au PPB | Wt Au GRAM | Ag PPM | Pb PPM | Zn PPM |
|---|---|---|---|---|---|---|---|---|---|---|
| R8515738 | LR 543 | 1 | 2 | <10 | <2 | <4 | 20 | | | 36 |
| R8515739 | * LR 544 | 28 | 63 | <15 | <3 | <8 | 20 | | | 32 |
| R8515740 | * LR 548 | 30 | 6 | <10 | 2 | <3 | 20 | | | 24 |
| R8515741 | LR 552 | 1 | 16 | <10 | <2 | <4 | 20 | | | 14 |
| R8515742 | * LR 559 | 28 | 1 | <10 | 4 | <2 | 20 | | | 27 |
| R8515743 | * LR 561 | 20 | 58 | <10 | 3 | <8 | 20 | | | 35 |
| R8515744 | LR 563 | 1 | 2 | <10 | <2 | <7 | 20 | | | 16 |
| R8517359 | LR610 | | | | | <10 | 5 | <.4 | | |
| R8517360 | LR611 | | | | | <10 | 5 | <.4 | | |
| R8517361 | LR612 | | | | | <10 | 5 | <.4 | | |
| R8517362 | LR613 | | | | | <10 | 5 | .4 | <4 | 12 |
| R8517363 | LR614 | | | | | <10 | 5 | <.4 | <4 | 18 |
| R8517364 | LR615 | | | | | <10 | 5 | <.4 | <4 | 21 |
| R8517365 | LR616 | | | | | <10 | 5 | <.4 | <4 | 23 |
| R8517366 | LR617 | | | | | <10 | 5 | <.4 | <4 | 20 |
| R8517369 | LR621 | | | | | <10 | 5 | <.4 | <4 | 20 |
| R8517370 | * LR622 | 46 | 5330 | | | 44 | 5 | 1.8 | | |
| R8517372 | LR628 | <1 | 37 | | | 90 | 5 | <.4 | | |
| R8517373 | LR629 | <1 | 31 | | | 20 | 5 | <.4 | | |
| R8517374 | LR630 | | | | | <10 | 5 | .4 | | |
| R8517375 | LR631 | | | | | <10 | 5 | <.4 | | |
| R8517376 | LR633 | 7 | 38 | | | <10 | 5 | <.4 | <4 | 71 |
| R8517377 | LR634 | 7 | 45 | | | <10 | 5 | <.4 | <4 | 65 |
| R8517379 | TR151 | 2 | 9 | | | <10 | 5 | <.4 | | |
| R8517380 | TR152 | 3 | 90 | | | <10 | 5 | <.4 | | |
| R8517381 | TR154 | <1 | 28 | | | | | | | |

I=Insufficient sample X=Small sample E=Exceeds calibration C=Being checked R=Revised
If requested analyses are not shown ;results are to follow

ANALYTICAL METHODS

- Ni Aqua regia decomposition / AAS
- Cu Aqua regia decomposition / AAS
- Pt Analysis by an outside laboratory
- Pd Analysis by an outside laboratory
- Au Aqua regia decomposition / solvent extraction / AAS
- Wt Au The weight of sample taken to analyse for gold (Geochem)
- Ag Aqua regia decomposition / AAS

* amphibolite
rest are gneisses

Table 4. Major-element analyses of amphibolites and gneisses

| LAB NO | FIELD NUMBER | SIO2 % | TIO2 % | AL2O3 % | FE2O3 % | FEO % | MNO % | MGO % | CAO % | NA2O % | K2O % | P2O5 % | LOI % | TOTAL % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R8516084 | LR 530 | 73.69 | 0.26 | 13.36 | 1.98 | | | 1.07 | 3.18 | 3.46 | 0.98 | | 1.90 | 99.88 |
| R8516085 | LR 537 * | 40.40 | 0.54 | 11.95 | 13.40 | | | 19.78 | 7.36 | 1.23 | 0.09 | | 4.62 | 99.37 |
| R8515737 | LR 534 * | 49.66 | 0.39 | 21.40 | 3.53 | | | 1.98 | 10.34 | 4.98 | 1.61 | | 5.24 | 99.13 |
| R8515739 | LR 544 * | 48.71 | 1.12 | 18.08 | 11.07 | | | 8.10 | 9.41 | 3.18 | 0.46 | | 0.30 | 100.43 |
| R8515741 | LR 552 | 77.03 | 0.25 | 12.53 | 2.64 | | | 0.10 | 1.14 | 6.63 | 0.08 | | 0.42 | 100.82 |
| R8515742 | LR 559 * | 49.59 | 0.66 | 15.16 | 10.57 | | | 9.62 | 9.24 | 3.28 | 0.72 | | 1.54 | 100.38 |
| R8515744 | LR 563 | 75.87 | 0.20 | 13.21 | 1.98 | | | 0.24 | 1.63 | 5.14 | 1.40 | | 0.45 | 100.12 |
| R8515746 | LR 569 * | 46.87 | 0.85 | 16.65 | 10.43 | | | 9.50 | 9.63 | 2.87 | 0.88 | | 2.51 | 100.19 |
| R8516998 | LR589 * | 42.78 | .55 | 11.15 | 9.64 | | | 20.99 | 6.98 | .61 | .07 | | 5.91 | 98.68 |

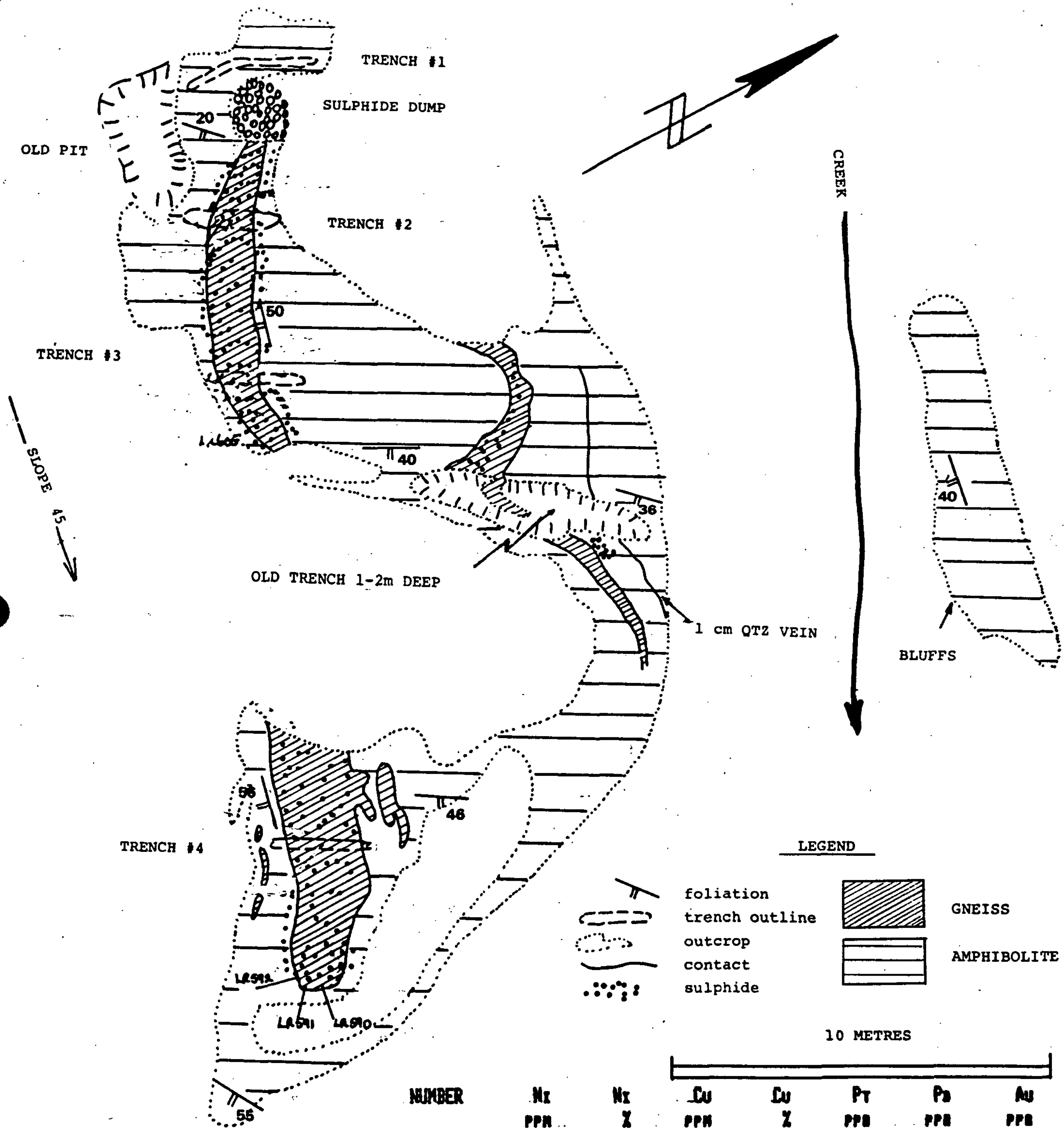
I=INSUFFICIENT SAMPLE X=SMALL SAMPLE E=EXCEEDS CALIBRATION C=BEING CHECKED R=REVISED

ANALYTICAL METHODS

.LOI DETERMINED GRAVIMETRICALLY

OTHER ELEMENTS BY LI BORATE FUSION/XRF .WHERE NO FEO VALUE SHOWN 'FE2O3' IS TOTAL FE AS FE2O3

* amphibolite




| NUMBER | Ni PPM | Ni % | Cu PPM | Cu % | Pt PPB | Pd PPB | Au PPB |
|---|---|---|---|---|---|---|---|
| LR590 | E49800 | 4.60 | 1860 | .20 | 980 | 5700 | 130 |
| LR591 | E46700 | 5.00 | 5230 | .52 | 2700 | 10000 | 240 |
| LR592 | E16100 | 1.60 | 9100 | .93 | 1200 | 5400 | 170 |

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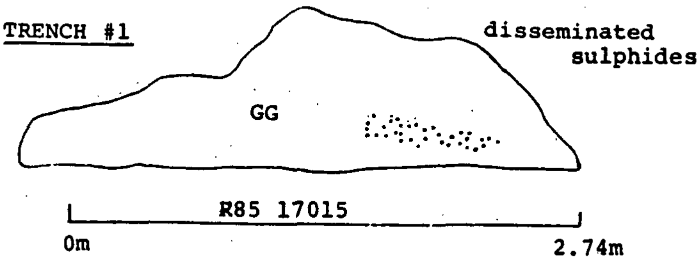
Scale: Date: Plate:

TRENCH #1

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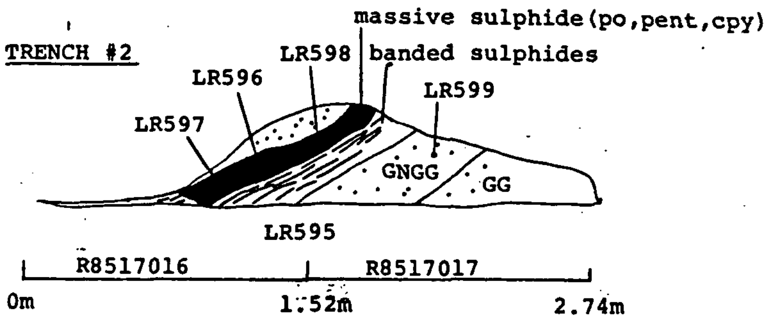


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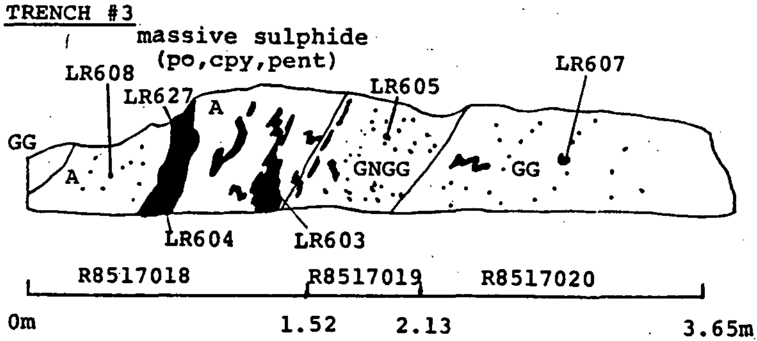


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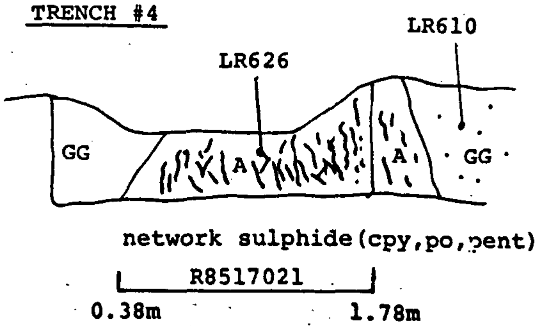


TRENCH DIMENSIONS

| TR | LENGTH | WIDTH | DEPTH |
|---|---|---|---|
| #1 | 3.0 | .76 | .61 |
| #2 | 2.74 | .61 | .76 |
| #3 | 3.8 | .61 | .76 |
| #4 | 1.78 | .61 | .61 |

direction of trenches 040

KEY

GG - grey gneiss

GNGG - green-grey gneiss

A - amphibolite

- sulphide

| LAB NO | FIELD NUMBER | Ni PPM | Ni % | Cu PPM | Cu % | Pt PPB | Pd PPB |
|---|---|---|---|---|---|---|---|
| R8516999 | LR590 | E49800 | 4.60 | 1860 | .20 | 980 | 5700 |
| R8517000 | LR591 | E46700 | 5.00 | 5230 | .52 | 2700 | 10000 |
| R8517001 | * LR592 | E16100 | 1.60 | 9100 | .93 | 1200 | 5400 |
| R8517002 | TR#2 LR595 | 8400 | | 3590 | | 260 | 810 |
| R8517003 | TR#2 LR596 | E142000 | 14.80 | 2050 | .23 | 3600 | E10000 |
| R8517004 | TR#2 LR597 | E64000 | 6.20 | E109000 | 11.20 | 5000 | E10000 |
| R8517005 | TR#2 LR598 | E47500 | 4.20 | E41700 | 4.10 | 3600 | E10000 |
| R8517006 | TR#2 LR599 | 374 | | 207 | | 20 | 65 |
| R8517008 | TR#3 LR603 | 1370 | .14 | E214000 | 23.10 | 5300 | E10000 |
| R8517009 | TR#3 LR604 | E70000 | 6.80 | E15900 | 1.50 | 3600 | E10000 |
| R8517010 | TR#3 LR605 | E49600 | 4.80 | E14300 | 1.48 | 1600 | 3700 |
| R8517011 | TR#3 LR607 | 348 | | 407 | | 20 | 33 |
| R8517012 | TR#3 LR608 | E10400 | 1.03 | 2060 | .21 | 570 | 1600 |
| R8517014 | TR#4 LR610 | 9500 | .89 | E32200 | 3.10 | 950 | 3600 |
| R8517015 | TR#1 0-2.74M | 760 | | 104 | | <10 | 14 |
| R8517016 | TR#2 0-1.52M | E15000 | 1.50 | 9710 | .90 | 640 | 3200 |
| R8517017 | TR#2 1.52-2.74M | 2750 | | 944 | | 590 | 2500 |
| R8517018 | TR#3 0-1.52M | E11500 | 1.14 | E42900 | 4.20 | 1400 | 4000 |
| R8517019 | TR#3 1.52-2.13M | E10200 | 1.03 | E21600 | 2.20 | 960 | 2600 |
| R8517020 | TR#3 2.13-3.65M | 1810 | | 2050 | | 60 | 260 |
| R8517021 | TR#4 0.38-1.78M | E32000 | 3.10 | E19500 | 2.08 | 1600 | 6100 |
| R8517383 | TR#3 LR625 | | 0.41 | | 9.23 | 1400 | 5100 |
| R8517384 | TR#4 LR626 | | 2.59 | | 5.90 | 2000 | 8200 |

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| Revised by | Date | Revised by | Date | GEOLOGY AND SAMPLING OF TRENCHES |

Scale: as noted | Date: 15 Dec. 1985 | Plate: 3

Table 5. Analyses of rocks from the main showing

| LAB NO | FIELD NUMBER | NI PPM | NI % | CU PPM | CU % | PT PPB | PD PPB | AU PPB |
|---|---|---|---|---|---|---|---|---|
| R8516999 | LR590 | E49800 | 4.60 | 1860 | .20 | 980 | 5700 | 130 |
| R8517000 | LR591 | E46700 | 5.00 | 5230 | .52 | 2700 | 10000 | 240 |
| R8517001 | * LR592 | E16100 | 1.60 | 9100 | .93 | 1200 | 5400 | 170 |
| R8517002 | TR#2 LR595 | 8400 | | 3590 | | 260 | 810 | 87 |
| R8517003 | TR#2 LR596 | E142000 | 14.80 | 2050 | .23 | 3600 | E10000 | 160 |
| R8517004 | TR#2 LR597 | E64000 | 6.20 | E109000 | 11.20 | 5000 | E10000 | 700 |
| R8517005 | TR#2 LR598 | E47500 | 4.20 | E41700 | 4.10 | 3600 | E10000 | 370 |
| R8517006 | TR#2 LR599 | 374 | | 207 | | 20 | 65 | 18 |
| R8517008 | TR#3 LR603 | 1370 | .14 | E214000 | 23.10 | 5300 | E10000 | 770 |
| R8517009 | TR#3 LR604 | E70000 | 6.80 | E15900 | 1.50 | 3600 | E10000 | 400 |
| R8517010 | TR#3 LR605 | E49600 | 4.80 | E14300 | 1.48 | 1600 | 3700 | 530 |
| R8517011 | TR#3 LR607 | 348 | | 407 | | 20 | 33 | 63 |
| R8517012 | TR#3 LR608 | E10400 | 1.03 | 2060 | .21 | 570 | 1600 | 43 |
| R8517014 | TR#4 LR610 | 9500 | .89 | E32200 | 3.10 | 950 | 3600 | 170 |
| R8517015 | TR#1 0-2.74M | 760 | | 104 | | <10 | 14 | 3 |
| R8517016 | TR#2 0-1.52M | E15000 | 1.50 | 9710 | .90 | 640 | 3200 | 200 |
| R8517017 | TR#2 1.52-2.74M | 2750 | | 944 | | 590 | 2500 | 38 |
| R8517018 | TR#3 0-1.52M | E11500 | 1.14 | E42900 | 4.20 | 1400 | 4000 | 370 |
| R8517019 | TR#3 1.52-2.13M | E10200 | 1.03 | E21600 | 2.20 | 960 | 2600 | 330 |
| R8517020 | TR#3 2.13-3.65M | 1810 | | 2050 | | 60 | 260 | 52 |
| R8517021 | TR#4 0.38-1.78M | E32000 | 3.10 | E19500 | 2.08 | 1600 | 6100 | 190 |
| R8517383 | TR#3 LR625 | | 0.41 | | 9.23 | 1400 | 5100 | 420 |
| R8517384 | TR#4 LR626 | | 2.59 | | 5.90 | 2000 | 8200 | 470 |

I=INSUFFICIENT SAMPLE X=SMALL SAMPLE E=EXCEEDS CALIBRATION C=BEING CHECKED R=REVISED

ANALYTICAL METHODS

- NI AQUA REGIA DECOMPOSITION / AAS
- CU AQUA REGIA DECOMPOSITION / AAS
- PT ANALYSIS BY AN OUTSIDE LABORATORY
- PD ANALYSIS BY AN OUTSIDE LABORATORY
- AU AQUA REGIA DECOMPOSITION / SOLVENT EXTRACTION / AAS
- WT AU THE WEIGHT OF SAMPLE TAKEN TO ANALYSE FOR GOLD (GEOCHEM)
- AG AQUA REGIA DECOMPOSITION / AAS

* TR# 2 means sample is from trench 2

note: samples R8517015-17021 are chip samples from indicated lengths of trenches

TABLE 6 - Values for all Platinum Group Elements in Two Samples

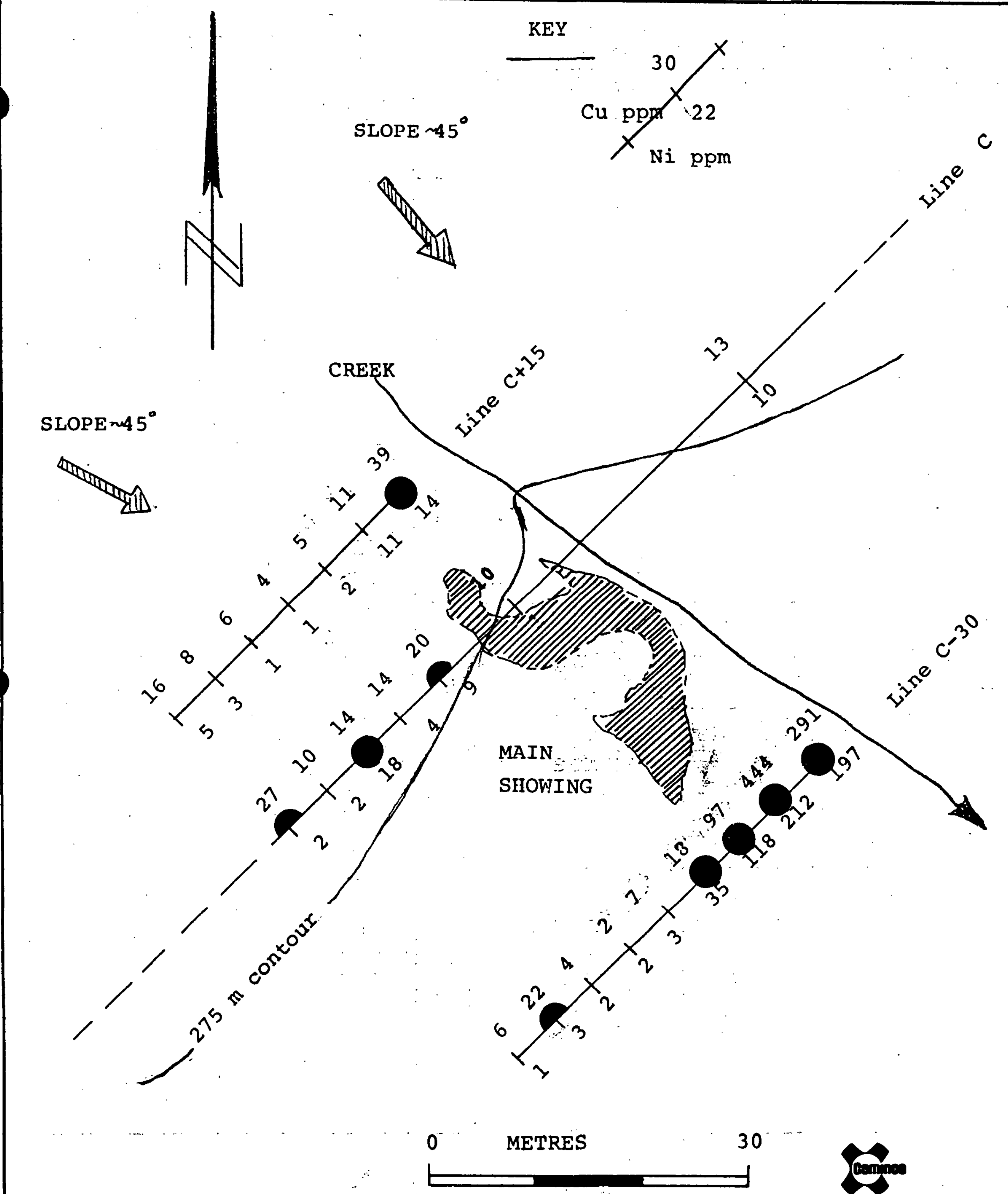
| Element ppb | Sample BcNi6 | | Sample BNi9 | | Standard PTC-1 [c] | | |
|---|---|---|---|---|---|---|---|
| | ICI [a] | XRAL [b] | ICI | XRAL | ICI | XRAL | STD VALUE |
| Pt | 3700 | 3300 | 1700 | 1300 | 2500 | 2000 | 3000 |
| Au | 426 | 470 | 450 | 560 | 478 | 430 | 650 |
| Ir | 102 | 140 | 60 | 120 | 114 | 190 | |
| Os | 316 | 310 | 205 | 240 | 340 | 310 | |
| Ru | 240 | 430 | 240 | 65 | 400 | 440 | |
| Rh | 328 | 300 | 210 | 190 | 547 | 640 | 620 |
| Pd | 16200 | 14500 | 19300 | 18400 | 16000 | 10900 | 12700 |
| Re | 3400 | 140 | 1000 | 35 | 2800 | 90 | |

For Sample Locations See Plate 2.

(a) ICI Ltd., Billingham Cleveland, England
(b) X Ray Assay Labs Ltd., Toronto
(c) CANMET Sulphide Standard

TABLE 7 - Methods of Geochemical Analysis Used

| Elements (in rocks except where noted | Mesh | Reagent and Conc. | Analysis Method |
|---|---|---|---|
| Cu Ni (in Soils) | -80 | 20% $HNO_3$ | AA |
| Ag Pb Zn Cu Ni | 200 | Aqua Regia | AA |
| Au | 200 | Aqua Regia/Solvent Extraction | AA |
| Pt + Pd + Au | 200 | Lead Collection | AA |
| PGM + Re + Au | 200 | NiS Collection | NAA |
| CU Ni (assay) | 200 | Aqua Regia | Colorimetric |
| Major Elements | 200 | Li borate fusion | XRF |




| Drawn by: | | Traced by: | |
|---|---|---|---|
| Revised by | Date | Revised by | Date |

SOIL GEOCHEMISTRY NEAR MAIN SHOWING

values from table 8

Scale: 1:500 | Date: 15 Dec 1985 | Plate: 4

NCI - 112A - CL

210-0610

Table 8. Soil geochemistry results

| EXP LAB NUMBER | FIELD NO | MAP ZONE | EAST | NORTH | # | MAT'L | ORIG | SITE | COLOUR | SIZE | ORG | WET | DEPTH cm | WIDTH SLOPE | FLOW HORIZ | PPT | pH | Cu PPM | Ni PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S8511056 | 23290 | | A | +300 | 6 | Soil | Resid | | Dk-brown | Sandy-silt | Med | M'st | 30 | Steep | B | | . | 14 | 3 |
| S8511057 | 23291 | | A | +330 | 6 | Soil | Resid | | Med-brown | Sandy-silt | Med | Wet | 40 | Steep | B | | . | 7 | 1 |
| S8511058 | 23292 | | A | +360 | 6 | Soil | Resid | | Dk-brown | Gravly-silt | Med | Wet | 30 | Steep | B | | . | 12 | 5 |
| S8511059 | 23293 | | A | +390 | 6 | Soil | Resid | | Med-brown | Sandy-silt | Low | Wet | 30 | Steep | B | | . | 7 | 1 |
| S8511060 | 23294 | | A | +420 | 6 | Soil | Resid | | Med-brown | Silty-clay | Low | Wet | 45 | Steep | B | | . | 15 | 10 |
| S8511061 | 23295 | | A | +480 | 6 | Soil | Resid | | Dk-brown | Sandy-silt | Med | Wet | 30 | Steep | B | | . | 7 | 2 |
| S8511062 | 23296 | | A | +510 | 6 | Soil | Resid | | Dk-brown | Sandy-silt | Low | Wet | 30 | Steep | B | | . | 12 | 1 |
| S8511063 | 23297 | | A | +540 | 6 | Soil | Resid | | Med-brown | Sandy-silt | Med | Wet | 35 | Steep | B | | . | 11 | <1 |
| S8511064 | 23298 | | A | +560 | 6 | Soil | Resid | | Med-brown | Sandy-silt | Low | M'st | 30 | Steep | B | | . | 4 | <1 |
| S8511065 | 23299 | | A | +570 | 6 | Soil | Resid | | Med-brown | Sandy-silt | Low | M'st | 30 | Steep | B | | . | 11 | 2 |
| S8511066 | 23300 | | A | +630 | 6 | Soil | Resid | | Med-brown | sand | Low | M'st | 30 | Steep | B | | . | 4 | <1 |
| S8511067 | 23301 | | A | +690 | 6 | Soil | Resid | | Dk-brown | silt | Med | Wet | 30 | Steep | B | | . | 11 | 5 |
| S8511068 | 23302 | | A | +720 | 6 | Soil | Resid | | Med-brown | Sandy-silt | Med | Dry | 35 | Steep | B | | . | 11 | 1 |
| S8511069 | 23303 | | A | +750 | 6 | Soil | Resid | | Med-brown | Sandy-silt | Med | Wet | 30 | Steep | B | | . | 5 | 11 |
| S8511070 | 23304 | | A | +780 | 6 | Soil | Resid | | Med-brown | Sandy-silt | Low | Dry | 40 | Steep | B | | . | 7 | 1 |
| S8511071 | 23305 | | A | +840 | 6 | Soil | Resid | | Med-brown | Sandy-silt | Low | M'st | 35 | Steep | B | | . | 19 | 4 |
| S8511072 | 23306 | | A | +870 | 6 | Soil | Resid | | Med-brown | Sandy-silt | Low | Wet | 40 | Steep | B | | . | 11 | 4 |
| S8511073 | 23307 | | A | +900 | 6 | Soil | Resid | | Dk-brown | Sandy-silt | Med | Wet | 30 | Med | B | | . | 26 | 4 |
| S8511074 | 23308 | | A | +930 | 6 | Soil | Resid | | brown | Sandy-silt | Low | Wet | 30 | Med | B | | . | 6 | 3 |
| S8511075 | 23309 | | A | +960 | 6 | Soil | Resid | | Dk-grey | Sandy-clay | Med | M'st | 65 | Steep | C | | . | 3 | 2 |
| S8511076 | 23310 | | A | +990 | 6 | Soil | Resid | | Med-brown | Sandy-silt | Low | Wet | 40 | Steep | B | | . | 7 | 2 |
| S8511077 | 23311 | | A | +1020 | 6 | Soil | Resid | | Med-brown | Sandy-clay | Low | M'st | 30 | Med | B | | . | 10 | 4 |
| S8511078 | 23312 | | B | +30 | 2 | Soil | Resid | | Dk-brown | silt | High | M'st | 40 | Steep | A | | . | 5 | 3 |
| S8511079 | 23313 | | B | +60 | 2 | Soil | Collu | | Med-brown | sand | Med | | 30 | Steep | B | | . | 6 | 7 |
| S8511080 | 23314 | | B | +90 | 2 | Soil | Collu | | Med-brown | Gravly-sand | Low | | 10 | Steep | C | | . | 17 | 4 |
| S8511081 | 23315 | | B | +120 | 2 | Soil | Collu | | Lt-brown | Gravly-sand | Low | | 20 | Steep | B | | . | 18 | 4 |
| S8511082 | 23316 | | B | +150 | 2 | Soil | Collu | | Dk-brown | Gravly-sand | High | | 15 | Steep | A | | . | 7 | 2 |
| S8511083 | 23317 | | B | +180 | 2 | Soil | Resid | | Dk-brown | Sandy-silt | High | | 50 | Steep | A | | . | 18 | 4 |
| S8511084 | 23318 | | B | +210 | 2 | Soil | Collu | | Med-brown | Gravly-sand | Med | | 35 | Steep | B | | . | 20 | 2 |
| S8511085 | 23319 | | B | +240 | 2 | Soil | Talus | | Med-brown | Gravly-sand | Low | | 10 | Steep | C | | . | 28 | 8 |
| S8511086 | 23320 | | B | +270 | 2 | Soil | Collu | | Med-brown | Gravly-sand | Med | | 15 | Steep | B | | . | 35 | 18 |
| S8511087 | 23321 | | B | +330 | 2 | Soil | Collu | | Med-brown | Gravly-sand | Med | | 20 | Steep | A | | . | 4 | 1 |
| S8511088 | 23322 | | B | +360 | 2 | Soil | Collu | | Med-brown | sand | Low | | 30 | Steep | B | | . | 27 | 5 |

| EXP LAB NUMBER | FIELD NO | MAP ZONE | EAST | NORTH | # | MAT'L | ORIG | SITE | COLOUR | SIZE | ORG | WET | DEPTH CM | WIDTH SLOPE | FLOW HORIZ | PPT | PH | CU PPM | NI PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S8511089 | | | B | +390 | 2 | SILT | ALLUV | ACTIVE | DK -BROWN | SANDY -SILT | HIGH | WET | | STEEP | SLOW | | . | 19 | 4 |
| S8511090 | | | B | +420 | 2 | SOIL | RESID | | DK -BROWN | SAND | HIGH | | 25 | STEEP | B | | . | 3 | 1 |
| S8511091 | | | B | +450 | 2 | SOIL | COLLU | | MED-BROWN | SAND | MED | | 30 | STEEP | A | | . | 10 | 2 |
| S8511092 | | | B | +480 | 2 | SOIL | COLLU | | MED-BROWN | GRAVLY-SAND | HIGH | | 20 | | B | | . | 13 | <1 |
| S8511093 | | | B | +510 | 2 | SOIL | COLLU | | LT -GREY | GRAVLY-SAND | LOW | | 20 | STEEP | B | | . | 5 | 1 |
| S8511094 | | | B | +540 | 2 | SOIL | COLLU | | MED-BROWN | GRAVLY-SAND | MED | | 45 | STEEP | B | | . | 6 | 1 |
| S8511095 | | | B | +570 | 2 | SOIL | COLLU | | LT -BROWN | SANDY -SILT | MED | | 35 | STEEP | B | | . | 4 | <1 |
| S8511096 | | | B | +600 | 2 | SOIL | COLLU | | MED-BROWN | GRAVLY-SAND | MED | | 30 | STEEP | B | | . | 4 | <1 |
| S8511097 | | | B | +630 | 2 | SOIL | RESID | | LT -BROWN | SILT | MED | | 25 | STEEP | B | | . | 6 | 2 |
| S8511098 | | | B | +660 | 2 | SOIL | RESID | | MED-BROWN | SANDY -SILT | MED | | 25 | STEEP | B | | . | 17 | 5 |
| S8511099 | | | B | +670 | 2 | SILT | ALLUV | ACTIVE | DK -BROWN | SILT | HIGH | WET | 25 | STEEP | SLOW | | . | 22 | 7 |
| S8511100 | | | B | +690 | 2 | SOIL | COLLU | | MED-BROWN | SAND | LOW | | 20 | STEEP | B | | . | 18 | 8 |
| S8511101 | | | B | +720 | 2 | SOIL | COLLU | | MED-BROWN | SAND | LOW | | 25 | STEEP | B | | . | 16 | 1 |
| S8511102 | | | B | +750 | 2 | SOIL | RESID | | DK -BLACK | SANDY -SILT | HIGH | WET | 35 | STEEP | A | | . | 17 | 4 |
| S8511103 | | | B | +780 | 2 | SOIL | COLLU | | LT -GREY | GRAVLY-SAND | LOW | | 20 | STEEP | B | | . | 4 | 3 |
| S8511104 | | | B | +810 | 2 | SOIL | COLLU | | DK -BROWN | GRAVLY-SAND | MED | | 15 | STEEP | B | | . | 16 | 1 |
| S8511105 | | | B | +840 | 2 | SOIL | COLLU | | MED-BROWN | SANDY -SILT | MED | | 15 | STEEP | B | | . | 12 | 2 |
| S8511106 | | | B | +870 | 2 | SOIL | COLLU | | LT -BROWN | GRAVLY-SAND | MED | | 25 | STEEP | B | | . | 10 | 1 |
| S8511107 | | | B | +900 | 2 | SOIL | RESID | | LT -GREY | SILTY -CLAY | MED | | 40 | STEEP | C | | . | 2 | <1 |
| S8511108 | | | C | +0 | 1 | SOIL | RESID | | MED-BROWN | GRAVLY-CLAY | MED | M'ST | 10 | STEEP | B | | . | 23 | 14 |
| S8511109 | | | C | +30 | 1 | SOIL | RESID | | MED-BROWN | SANDY -CLAY | MED | M'ST | 10 | STEEP | B | | . | 16 | 6 |
| S8511110 | | | C | +60 | 1 | SOIL | RESID | | MED-BROWN | SANDY -CLAY | MED | M'ST | 30 | STEEP | B | | . | 16 | 13 |
| S8511111 | | | C | +90 | 1 | SOIL | RESID | | DK -BROWN | SANDY -CLAY | MED | M'ST | 30 | STEEP | B | | . | 4 | <1 |
| S8511112 | | | C | +120 | 1 | SOIL | RESID | | DK -BROWN | GRAVLY-CLAY | MED | M'ST | 25 | STEEP | B | | . | 33 | 15 |
| S8511113 | | | C | +150 | 1 | SOIL | RESID | | LT -GREY | GRAVLY-CLAY | MED | M'ST | 30 | STEEP | B | | . | 12 | 2 |
| S8511114 | | | C | +180 | 1 | SOIL | RESID | | MED-BROWN | SANDY -CLAY | MED | M'ST | 40 | STEEP | B | | . | 13 | 2 |
| S8511115 | | | C | +210 | 1 | SOIL | RESID | | LT -BROWN | SANDY -CLAY | MED | M'ST | | STEEP | B | | . | 6 | 3 |
| S8511116 | | | C | +240 | 1 | SOIL | RESID | | MED-BROWN | SANDY -CLAY | MED | M'ST | 30 | STEEP | B | | . | 12 | 4 |
| S8511117 | | | C | +270 | 1 | SOIL | RESID | | MED-BROWN | GRAVLY-CLAY | MED | M'ST | 35 | STEEP | B | | . | 13 | 10 |
| S8511118 | | | C | +300 | 1 | SOIL | RESID | | MED-BROWN | SAND | MED | M'ST | 30 | STEEP | B | | . | 10 | 1 |
| S8511119 | | | C | +310 | 1 | SOIL | RESID | | MED-BROWN | GRAVLY-CLAY | MED | M'ST | 40 | STEEP | B | | . | 20 | 9 |
| S8511120 | | | C | +315 | 1 | SOIL | RESID | | LT -BROWN | GRAVLY-SAND | MED | M'ST | 25 | STEEP | B | | . | 14 | 4 |
| S8511121 | | | C | +320 | 2 | SOIL | RESID | | MED-BROWN | SAND | LOW | | 25 | STEEP | B | | . | 14 | 18 |
| S8511122 | | | C | +325 | 1 | SOIL | RESID | | MED-BROWN | SANDY -CLAY | MED | M'ST | 20 | STEEP | B | | . | 10 | 2 |
| S8511123 | | | C | +330 | 1 | SOIL | RESID | | LT -BROWN | SANDY -CLAY | MED | M'ST | 15 | STEEP | B | | . | 27 | 2 |
| S8511124 | | | C | +360 | 1 | SOIL | RESID | | MED-GREY | SANDY -CLAY | MED | M'ST | 15 | STEEP | B | | . | 6 | 1 |

| EXP LAB NUMBER | FIELD NO | MAP ZONE | EAST | NORTH | # | MAT'L | ORIG | SITE | COLOUR | SIZE | ORG | WET | DEPTH cm | WIDTH SLOPE | FLOW HORIZ | PPT | pH | Cu PPM | Ni PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S8511125 | | | C | +390 | 1 | Soil | Resid | | Lt -grey | Sandy -clay | Med | M'st | 15 | Steep | B | | . | 5 | 2 |
| S8511126 | | | C | +420 | 1 | Soil | Resid | | Med-grey | Sandy -clay | Med | M'st | 20 | Steep | B | | . | 2 | <1 |
| S8511127 | | | C | +450 | 1 | Soil | Resid | | Med-brown | Sandy -clay | Med | M'st | 20 | Steep | B | | . | 2 | <1 |
| S8511128 | | | C | +480 | 1 | Soil | Resid | | Dk -brown | Sandy -clay | High | M'st | 15 | Steep | A | | . | 3 | 2 |
| S8511129 | | | C | +510 | 1 | Soil | Resid | | Med-brown | Sandy -clay | Med | M'st | 10 | Steep | B | | . | 8 | 2 |
| S8511130 | | | C | +540 | 1 | Soil | Resid | | Dk -grey | | High | Wet | 15 | Steep | A | | . | 8 | 2 |
| S8511131 | | | C | +570 | 1 | Soil | Resid | | Lt -brown | Sandy -clay | Med | M'st | 15 | Steep | B | | . | 6 | 2 |
| S8511132 | | | C | +600 | 1 | Soil | Resid | | Lt -brown | Sandy -clay | Med | M'st | 30 | Steep | B | | . | 5 | <1 |
| S8511133 | | | C | +630 | 1 | Soil | Resid | | Lt -brown | Sandy -clay | Med | M'st | 30 | Steep | B | | . | 9 | 26 |
| S8511134 | | | C | +660 | 1 | Soil | Resid | | black | Sandy -clay | High | M'st | 20 | Steep | A | | . | 7 | 9 |
| S8511135 | | | C | +690 | 1 | Soil | Resid | | Med-brown | Sandy -clay | Med | M'st | 25 | Steep | B | | . | 12 | 5 |
| S8511136 | | | C | +720 | 1 | Soil | Resid | | Dk -brown | | High | | 10 | Steep | A | | . | 17 | 22 |
| S8511137 | | | C | +750 | 1 | Soil | Resid | | Med-black | Gravly-clay | Med | M'st | 20 | Steep | B | | . | 10 | 6 |
| S8511138 | | | C | +780 | 1 | Soil | Resid | | Lt -grey | Sandy -clay | High | M'st | 35 | Steep | B | | . | 1 | <1 |
| S8511139 | | | C | +810 | 1 | Soil | Resid | | Med-brown | Sandy -clay | Med | M'st | 40 | Steep | B | | . | 4 | 1 |
| S8511140 | | | C-30 | +290 | 1 | Soil | Resid | | Med-brown | sand | Med | M'st | 25 | Steep | B | | . | 291 | 197 |
| S8511141 | | | C-30 | +295 | 1 | Soil | Resid | | Med-brown | sand | Med | M'st | 20 | Steep | B | | . | 444 | 212 |
| S8511142 | | | C-30 | +300 | 1 | Soil | Resid | | Med-brown | Sandy -clay | Med | M'st | 25 | Steep | B | | . | 97 | 118 |
| S8511143 | | | C-30 | +305 | 1 | Soil | Resid | | Dk -brown | | High | | 20 | Steep | A | | . | 18 | 35 |
| S8511144 | | | C-30 | +310 | 1 | Soil | Resid | | Med-brown | Sandy -clay | Med | M'st | 30 | Steep | B | | . | 7 | 3 |
| S8511145 | | | C-30 | +315 | 1 | Soil | Resid | | Lt -grey | sand | Med | | 15 | Steep | B | | . | 2 | 2 |
| S8511146 | | | C-30 | +320 | 1 | Soil | Resid | | Lt -brown | sand | Low | | 25 | Steep | B | | . | 4 | 2 |
| S8511147 | | | C-30 | +325 | 1 | Soil | Resid | | Med-brown | Sandy -clay | Med | M'st | 15 | Steep | B | | . | 22 | 3 |
| S8511148 | | | C-30 | +330 | 1 | Soil | Resid | | Med-brown | sand | Med | | 20 | Steep | B | | . | 6 | 1 |
| S8511149 | | | C+15 | +300 | 1 | Soil | Resid | | Med-brown | Gravly-sand | Med | | 30 | Steep | B | | . | 39 | 14 |
| S8511150 | | | C+15 | +305 | 1 | Soil | Resid | | Med-brown | Gravly-sand | Med | | 20 | Steep | B | | . | 11 | 11 |
| S8511151 | | | C+15 | +310 | 1 | Soil | Resid | | Med-brown | Sandy -clay | Med | M'st | 20 | Steep | B | | . | 5 | 2 |
| S8511152 | | | C+15 | +315 | 1 | Soil | Resid | | Med-brown | Sandy -clay | Med | M'st | 60 | Steep | B | | . | 4 | <1 |
| S8511153 | | | C+15 | +320 | 1 | Soil | Resid | | Med-brown | Gravly-sand | Med | | 30 | Steep | B | | . | 6 | 1 |
| S8511154 | | | C+15 | +325 | 1 | Soil | Resid | | Med-brown | Sandy -clay | Med | M'st | 20 | Steep | B | | . | 8 | 3 |
| S8511155 | | | C+15 | +330 | 1 | Soil | Resid | | Med-brown | Sandy -clay | Med | Wet | 30 | Steep | B | | . | 16 | 5 |
| S8511156 | | | D | +0 | 3 | Soil | Resid | | Dk -brown | Sandy -clay | Med | M'st | 20 | Steep | B | | . | 60 | 12 |
| S8511157 | | | D | +30 | 3 | Soil | Resid | | Med-brown | Gravly-silt | Med | M'st | 20 | Steep | B | | . | 15 | 16 |
| S8511158 | | | D | +60 | 3 | Soil | Resid | | Med-brown | Gravly-silt | Med | M'st | 20 | Steep | B | | . | 11 | 11 |
| S8511159 | | | D | +90 | 3 | Soil | Resid | | Dk -brown | Gravly-silt | Med | M'st | 20 | Steep | B | | . | 10 | 4 |
| S8511160 | | | D | +120 | 3 | Soil | Resid | | Med-brown | Silty -clay | Med | M'st | 40 | Steep | B | | . | 18 | 9 |

| EXP LAB NUMBER | FIELD NO | MAP ZONE | EAST | NORTH | # | MAT'L | ORIG | SITE | COLOUR | SIZE | ORG | DEPTH WET | cm | WIDTH SLOPE | FLOW HORIZ | PPT | pH | Cu PPM | Ni PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S8511161 | | | D | +150 | 3 | SOIL | RESID | | MED-BROWN | SANDY -CLAY | MED | M'ST | 30 | STEEP | B | | . | 10 | 4 |
| S8511162 | | | D | +180 | 3 | SOIL | RESID | | MED-BROWN | GRAVLY-SILT | MED | M'ST | 15 | STEEP | B | | . | 36 | 9 |
| S8511163 | | | D | +210 | 3 | SOIL | RESID | | MED-BROWN | GRAVLY-CLAY | MED | M'ST | 20 | STEEP | B | | . | 8 | 3 |
| S8511164 | | | D | +240 | 3 | SOIL | RESID | | DK -BROWN | GRAVLY-CLAY | MED | M'ST | 20 | STEEP | B | | . | 32 | 3 |
| S8511165 | | | D | +270 | 3 | SOIL | RESID | | DK -BROWN | GRAVLY-CLAY | MED | M'ST | 30 | STEEP | B | | . | 13 | 5 |
| S8511166 | | | D | +300 | 3 | SOIL | RESID | | MED-BROWN | SANDY -CLAY | MED | M'ST | 20 | STEEP | B | | . | 11 | 1 |
| S8511167 | | | D | +330 | 3 | SOIL | RESID | | MED-BROWN | GRAVLY-SILT | MED | M'ST | 30 | STEEP | B | | . | 15 | 1 |
| S8511168 | | | D | +360 | 3 | SOIL | RESID | | DK -BROWN | SILTY -CLAY | HIGH | WET | 30 | STEEP | B | | . | 23 | 2 |
| S8511169 | | | D | +390 | 3 | SOIL | RESID | | MED-BROWN | GRAVLY-CLAY | MED | M'ST | 40 | STEEP | B | | . | 19 | 3 |
| S8511170 | | | D | +420 | 3 | SOIL | RESID | | MED-BROWN | GRAVLY-SILT | MED | WET | 40 | STEEP | B | | . | 6 | 1 |
| S8511171 | | | D | +450 | 3 | SOIL | RESID | | MED-BROWN | GRAVLY-SILT | MED | DRY | 20 | STEEP | B | | . | 3 | 1 |
| S8511172 | | | D | +480 | 3 | SOIL | RESID | | DK -BROWN | SANDY -CLAY | MED | M'ST | 20 | STEEP | B | | . | 6 | 1 |
| S8511173 | | | D | +510 | 3 | SOIL | RESID | | MED-BROWN | SANDY -SILT | HIGH | WET | 30 | STEEP | B | | . | 5 | 1 |
| S8511174 | | | D | +540 | 3 | SOIL | RESID | | LT -GREY | SANDY -SILT | MED | M'ST | 40 | STEEP | B | | . | 2 | (1 |
| S8511175 | | | D | +570 | 3 | SOIL | RESID | | DK -BROWN | SANDY -SILT | HIGH | M'ST | 30 | STEEP | B | | . | 5 | 1 |
| S8511176 | | | D | +600 | 3 | SOIL | RESID | | LT -GREY | SANDY -SILT | MED | M'ST | 30 | STEEP | C | | . | 2 | 1 |
| S8511177 | | | D | +630 | 3 | SOIL | RESID | | MED-GREY | SANDY -CLAY | MED | WET | 40 | MED | B | | . | 3 | 1 |
| S8511178 | | | D | +660 | 3 | SILT | RESID | | LT -GREY | SANDY -CLAY | MED | M'ST | 30 | MED | B | | . | 3 | 7 |
| S8511179 | | | D | +690 | 3 | SILT | RESID | | MED-BROWN | SANDY -CLAY | MED | M'ST | 40 | MED | B | | . | 4 | 1 |
| S8511180 | | | D | +720 | 3 | SOIL | RESID | | LT -GREY | SANDY -CLAY | MED | M'ST | 30 | STEEP | B | | . | 1 | (1 |
| S8511181 | | | D | +750 | 3 | SOIL | RESID | | MED-BROWN | SAND | LOW | M'ST | 15 | STEEP | B | | . | 9 | 2 |
| S8511182 | | | D | +780 | 3 | SOIL | RESID | | MED-BROWN | SANDY -CLAY | MED | WET | 40 | MED | B | | . | 4 | 1 |
| S8511183 | | | E | +0 | 6 | SOIL | RESID | | MED-BROWN | SANDY -SILT | MED | M'ST | 50 | STEEP | B | | . | 15 | 11 |
| S8511184 | | | E | +60 | 6 | SOIL | RESID | | MED-BROWN | SANDY -SILT | MED | WET | 30 | STEEP | B | | . | 2 | 1 |
| S8511185 | | | E | +90 | 3 | SOIL | RESID | | BLACK | SILTY -CLAY | HIGH | M'ST | 40 | STEEP | A | | . | 2 | 2 |
| S8511186 | | | E | +120 | 3 | SOIL | RESID | | LT -BROWN | GRAVLY-CLAY | MED | M'ST | 10 | STEEP | B | | . | 18 | 8 |
| S8511187 | | | E | +150 | 3 | SOIL | RESID | | LT -BROWN | GRAVLY-CLAY | MED | M'ST | 40 | STEEP | B | | . | 4 | 1 |
| S8511188 | | | E | +180 | 3 | SOIL | RESID | | DK -BROWN | GRAVLY-CLAY | MED | M'ST | 30 | MED | B | | . | 10 | 4 |
| S8511189 | | | E | +210 | 3 | SOIL | RESID | | MED-BROWN | GRAVLY-CLAY | MED | M'ST | 40 | STEEP | B | | . | 6 | 1 |
| S8511190 | | | E | +240 | 3 | SOIL | RESID | | MED-BROWN | GRAVLY-CLAY | MED | M'ST | 30 | STEEP | B | | . | 12 | 2 |
| S8511191 | | | E | +270 | 3 | SOIL | RESID | | MED-BROWN | GRAVLY-CLAY | MED | WET | 40 | STEEP | B | | . | 57 | 23 |
| S8511192 | | | E | +300 | 6 | SOIL | RESID | | MED-BROWN | SANDY -SILT | MED | WET | 30 | STEEP | B | | . | 15 | 4 |
| S8511193 | | | E | +330 | 6 | SOIL | RESID | | MED-BROWN | SANDY -SILT | MED | DRY | 30 | STEEP | B | | . | 22 | 7 |
| S8511194 | | | E | +360 | 6 | SOIL | RESID | | MED-BROWN | SANDY -SILT | LOW | M'ST | 35 | STEEP | B | | . | 10 | 3 |
| S8511195 | | | E | +390 | 6 | SOIL | RESID | | MED-BROWN | SANDY -SILT | MED | M'ST | 30 | STEEP | B | | . | 6 | 1 |
| S8511196 | | | E | +420 | 6 | SOIL | RESID | | MED-BROWN | SANDY -SILT | LOW | M'ST | 25 | STEEP | B | | . | 22 | 5 |

| EXP LAB NUMBER | FIELD NO | MAP ZONE | EAST | NORTH | # | MAT'L | ORIG | SITE | COLOUR | SIZE | ORG | DEPTH WET | CM | WIDTH SLOPE | FLOW HORIZ | PPT | PH | Cu PPM | Ni PPM |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| S8511197 | | | E | +450 | 6 | SILT | ALLUV | | MED-BROWN | SILTY -CLAY | LOW | | 05 | STEEP | FAST | | . | 10 | 3 |
| S8511198 | | | E | +480 | 6 | SOIL | RESID | | DK.-BROWN | SANDY -SILT | LOW | M'ST | 40 | STEEP | B | | . | 11 | 1 |
| S8511199 | | | E | +510 | 6 | SOIL | RESID | | MED-BROWN | SANDY -SILT | MED | WET | 35 | STEEP | B | | . | 7 | 1 |
| S8511200 | | | E | +560 | 6 | SOIL | RESID | | MED-BROWN | SANDY -SILT | MED | WET | 35 | STEEP | B | | . | 8 | 2 |
| S8511201 | | | E | +600 | 6 | SOIL | RESID | | MED-GREY | SILT | LOW | M'ST | 30 | STEEP | B | | . | 2 | 1 |
| S8511202 | | | E | +630 | 6 | SOIL | RESID | | BROWN | SILTY -CLAY | HIGH | WET | 30 | STEEP | A | | . | 8 | 1 |
| S8511203 | | | E | +720 | 6 | SOIL | RESID | | MED-BROWN | SANDY -SILT | MED | DRY | 15 | STEEP | B | | . | 7 | 2 |
| S8511204 | | | E | +750 | 6 | SOIL | RESID | | BROWN | SANDY -SILT | MED | WET | 35 | STEEP | B | | . | 2 | 1 |
| S8511205 | | | E | +780 | 6 | SOIL | RESID | | DK -BROWN | SANDY -SILT | MED | WET | 30 | STEEP | B | | . | 3 | <1 |
| S8511206 | | | E | +810 | 6 | SOIL | RESID | | MED-BROWN | SANDY -CLAY | LOW | WET | 30 | STEEP | B | | . | 17 | 11 |

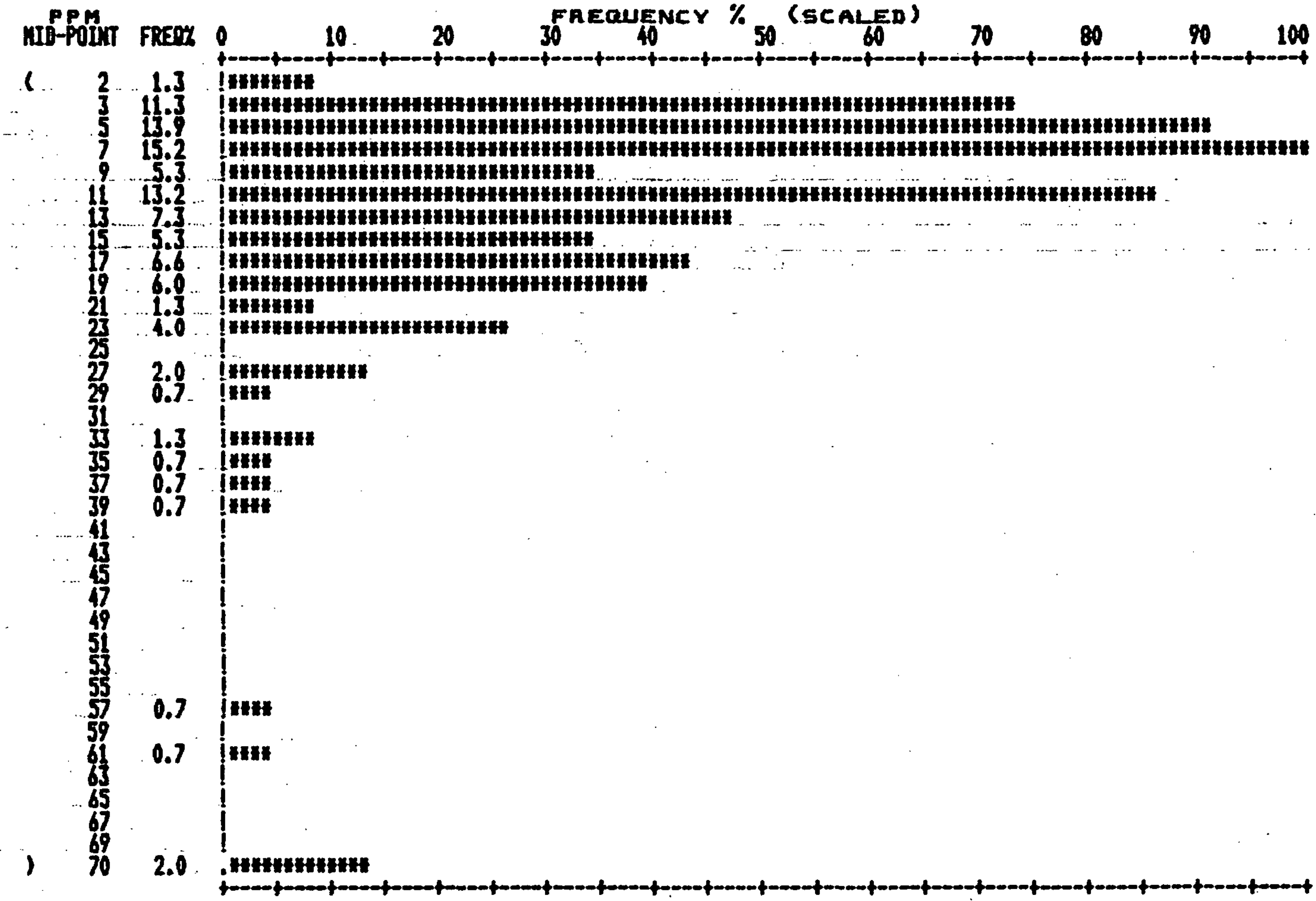
I=INSUFFICIENT SAMPLE X=SMALL SAMPLE E=EXCEEDS CALIBRATION C=BEING CHECKED R=REVISED

ANALYTICAL METHODS

- Cu 20% HNO3 DECOMPOSITION / AAS
- Ni 20% HNO3 DECOMPOSITION / AAS

Figure 3. Cu in soils

ARITHMETIC HISTOGRAM FOR COPPER




CONC SCALE IS ARITHMETIC (INTERVAL= 2 PPM ),FREQUENCY SCALE IS ARITHMETIC AND SCALED TO LARGEST CLASS=100

SOIL GEOCHEMISTRY BEER BAY

| ELEMENT NAME | NO OF ANALYSES | RANGE OF VALUES MAX | MIN UNITS | ARITH MEAN (MEAN+2STD DEV) | GEO MEAN (MEAN+2STD DEV) |
|---|---|---|---|---|---|
| COPPER | 151 | 444 TO | 1 PPM | 16.9 ( 103) | 9.2 ( 57) |

Figure 4. Ni in soils

ARITHMETIC HISTOGRAM FOR NICKEL

```
   PPM                                       FREQUENCY %   (SCALED)
MID-POINT  FREQ%  0        10        20        30        40        50        60        70        80        90       100
                  +----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+
(       2   35.1  !####################################################################################################
        3   26.5  !###########################################################################
        5   15.2  !###########################################
        7    4.0  !###########
        9    4.6  !#############
       11    4.6  !#############
       13    1.3  !###
       15    2.0  !#####
       17    0.7  !#
       19    1.3  !###
       21         !
       23    1.3  !###
       25         !
       27    0.7  !#
       29         !
       31         !
       33         !
       35    0.7  !#
       37         !
       39         !
       41         !
       43         !
       45         !
       47         !
       49         !
       51         !
       53         !
       55         !
       57         !
       59         !
       61         !
       63         !
       65         !
       67         !
       69         !
)      70    2.0  .#####
                  +----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+----+
```

CONC SCALE IS ARITHMETIC (INTERVAL= 2 PPM ),FREQUENCY SCALE IS ARITHMETIC AND SCALED TO LARGEST CLASS=100

SOIL GEOCHEMISTRY DEER BAY

| ELEMENT NAME | NO OF ANALYSES | RANGE OF VALUES MAX | MIN UNITS | ARITH MEAN (MEAN+2STD DEV) | GEO MEAN (MEAN+2STD DEV) |
|---|---|---|---|---|---|
| NICKEL | 151 | 212 TO | <1 PPM | 7.7 ( 58) | 2.6 ( 29) |

## APPENDIX A

## EXPENDITURES

Work was conducted on the two claim groups more or less simultaneously and a fair apportionment of costs has been made as detailed below. Work was done on the following dates: May 26-27, Oct. 1-4, Oct. 15-18, Oct. 21-25.

| | | SUPER GROUP | NICKEL AND LORNE GROUP |
|---|---|---|---|
| **Wages** | | | |
| P. LeCouteur (16 field, 6 office) @ $233=$5126 | | $2,096 | $3,030 |
| I.J. Talbot (16 field, 4 office) @ $129=$2580 | | 1,010 | 1,570 |
| S.B. Noakes (9 field, 2 office) @ $124=$1364 | | 682 | 682 |
| M.J. Gray (5 field) @ $129=$645 | | 322.50 | 322.50 |
| **Accomodation** 11 man days (motel) @ $30=$330 | | 165 | 165 |
| **Food** 46 man days @ $20=$920 | | 460 | 460 |
| **Transportation** | | | |
| Ferry 12 trips (2 trucks) @ $23 | $276 | 138 | 138 |
| Gas (boat & truck, total) | $330 | 165 | 165 |
| Boat and Motor Rental 1 week @ $349 | $349 | 174.50 | 174.50 |
| Truck Rental 21 days (2 trucks) @ $30 | $630 | 315 | 315 |
| Car Rental 3 days @ $26 | $ 78 | 39 | 39 |
| Boat Rental 9 days @ $40 | $360 | 180 | 180 |
| **Analyses** | | | |
| 9 rocks for whole rock analysis @ $30.00=$270 | | 90 | 180 |
| 5 rocks for Pt+Pd+Au+Cu+Ni @ $14.90=$74.50 | | | 74.50 |
| 23 rocks for Pt+Pd+Au @ $12.00=$276 | | 276 | |
| 18 rocks for Au+Ag @ $10.50=$189 | | | 189 |
| 8 rocks for Cu+Ni @ $ 5.90=$47.20 | | | 47.20 |
| 8 rocks for Pb+Zn @ $ 5.90=$47.20 | | | 47.20 |
| 151 rocks for Cu+Ni @ $ 3.65=$551.15 | | 354 | 197.15 |
| 2 rocks for total PGM @ $80.00=$160 | | 160 | |
| 17 rocks for Cu+Ni assay @ $14.50=$246.50 | | 246.50 | |
| **Incidental** | | | |
| Maps, reproductions | =$200 | 100 | 100 |
| Lumber, camp supplies, heating fuel | =$300 | 150 | 150 |
| Explosives, day box rental | =$286.69 | 286.69 | |
| Topofil, flagging, bags etc. | =$ 44 | 22 | 22 |
| 11 thin sections @ $7 | =$ 77 | | 77 |
| 7 polished thin sections @ $18 | =$126 | 126 | |
| | TOTALS | $8,308.19 | $8,325.05 |

**Trenching Costs**

Trenching costs on the Super 1 claims are included in the above figures for the Super Group. This work was done on Oct. 15-18 and details of costs are given below:

| | |
|---|---|
| Wages | $1,304.22 |
| Food | 100.00 |
| Accomodation | 64.52 |
| Transportation | 370.51 |
| Analyses | 710.50 |
| TOTAL | $2,549.75 |

## APPENDIX B

## STATEMENT OF AUTHOR'S QUALIFICATIONS

I, Peter C. LeCouteur of the District of North Vancouver in the Province of British Columbia, hereby certify:

1. THAT I am a Geologist residing at 4900 Skyline Drive, North Vancouver, British Columbia with a business address at 700-409 Granville Street, Vancouver, British Columbia.

2. THAT I graduated with a Ph.D. in Geology from the University of British Columbia in 1973.

3. THAT I have practised Geology with Cominco Ltd. from 1975 to the present.

4. THAT I am a Fellow of the Geological Association of Canada and a Professional Engineer (Geological, 1977) in the Association of Professional Engineers of British Columbia.

Signed: P. LeCouteur

Peter C. LeCouteur, P.Eng.,
Project Geologist,
Cominco Ltd.

18 December 1985

# APPENDIX C

# REPORT ON THE MICROSCOPIC STUDY OF THE FE-CU-NI-(PGE) SULFIDES WITH THE ASSOCIATED ULTRAMAFIC ROCKS FROM TOFINO, VANCOUVER ISLAND, B.C.

By

Justinian R. Ikingura
(in consultation with Dr. D.H. Watkinson)
Geology Department, Carleton University
20/ March/ 1985

**Report on the microscopic study of the Fe-Cu-Ni-(PGE) sulfides with the associated ultramafic rocks from Tofino, Vancouver Island, B.C.**

## Introduction

A total of twenty three polished thin sections have been petrographically examined using reflected and transmitted light. In addition, several thin sections have been microprobed to identify any peculiar sulfide mineral phases suspected to belong to the platinum-group minerals (PGM). Ten of the studied sections are rich in sulfides ( 15 % to 50 %); the rest either consist disseminated sulfides ( < 1 % to 5 %) or have sulfides concentrated in thin laminae. The sulfide content in the rocks appears to vary with rock composition. With progressive change in rock composition from mafic to felsic, the sulfides vary in texture and concentration from massive sulfides through dispersed sulfides to disseminated sulfides in the silicate mineral matrix. Alternate layering of silicate and sulfide minerals in the rocks possibly suggests changes in the physio-chemical conditions during crystallization. Post-crystallization deuteric alteration, metamorphism and supergene alteration have modified considerably the sulfide mineralogy and the silicate mineral assemblage.

## Sulfide mineralogy

The sulfide minerals and their relative abundance in the rocks are given in Table 1 below.

## CONTENTS

Table 1:

| Mineral | Very abundant | Abundant | Less abundant | Trace |
|---|---|---|---|---|
| Pyrite | x | | | |
| Chalcopyrite | | x | | |
| Violarite | | | x | |
| Millerite | | | x | |
| Pentlandite | | | | x |
| Pyrrhotite | | | | x |
| Siegenite ? $(CoNi)_3S_4$ | | | | x |

**Texture**

Pyrite : Commonly constitutes about 75 % to 95 % of the total sulfides in the rocks. It occurs in coarse-grained subhedral crystals or in massive anhedral aggregates. Fine-grained disseminated pyrite occurs in disseminated-type sulfide ores. Rarely pyrite forms myrmekitic intergrowth with chalcopyrite. Whether most of the pyrite owes its origin from primary magmatic crystallization or from post-magmatic modification of pyrrhotite is hard to establish. Late mobilization of pyrite, however, is indicated by the formation of pyrite veins and shoots along cracks and cleavage traces in the mafic minerals (Plate 1).

Chalcopyrite : Commonly constitutes about 2 % to 5 % of the total sulfides. Thin sulfide laminae (1-2 mm) containing about 85 % to 99 % chalcopyrite are locally found in the felsic rocks. Chalcopyrite occurs in anhedral grains in association with pyrite. Less commonly is intergrown with pyrite or encloses rounded tiny pyrite grains. Chalcopyrite often exhibits strongly grooved or pitted texture and contains a lot of gangue inclusions. Clear uniformly textured chalcopyrite is generally rare. Chalcopyrite-rich sulfides tend to be enriched in nickel-bearing minerals.

Violarite : Is found as a secondary mineral from the alteration of pentlandite. Constitutes about 2 % to 3 % of the total sulfides with which it is associated. Only one thin section contained up to 15 % violarite (R8412601). Violarite commonly occurs along or between pyrite grain boundaries. The alteration with which violarite is associated has imparted to it a distinctive cracked texture (Plate 2).

Millerite : Millerite is the common primary nickel-bearing mineral in the sulfides. Constitutes about 2 % to 5 % of the total sulfides. A few thin sections contain 10 % to 15 % millerite (e.g. R8412581, R8412583). Millerite occurs in large crystals rarely intergrown with chalcopyrite or pyrite. Commonly contains subrounded inclusions of pyrrhotite or pyrite. Unlike pentlandite which is strongly altered, millerite appears to be unaffected by supergene alteration.

Pentlandite : Occurs in minor amounts (less than 1 %) in the ore. This is because most of the original pentlandite has been almost completely replaced by violarite. Pentlandite is either found between pyrite grains or in association with chalcopyrite.

Pyrrhotite : Pyrrhotite is found only in trace amounts. It occurs mainly as subrounded inclusions in millerite. Rarely forms separate grains closely associated with chalcopyrite.

Siegenite? : One grain of this mineral was observed in one thin section (R848770). Microprobe EDS analysis indicated the mineral to be Ni-Co-Fe sulfide with Ni>Co>Fe. The mineral is isotropic and has been tentatively identified to be possibly siegenite.

**Iron-oxides**

Normal magnetite and chromium-bearing magnetite (Plate 3) are the primary iron-oxide minerals observed in thin sections. They generally constitute less than 0.5 % of the ore minerals (i.e oxides and sulfides). Both occurs in subrounded or subhedral grains with pitted texture. Secondary magnetite is found locally filling cracks and cleavage traces within the mafic minerals.

**Platinum-group elements (PGE) and mineralogy**

Chemical analytical data for two platinum-group elements (Pt, Pd) and four other trace elements (Au, Ni, Cu, Co) (courtesy of COMINCO) was available from 15 samples. These analytical data are given in Table 3 in the Appendix and plotted in Figures 1 to 3. The Pt content in the samples varies from 0.02 ppm to 4.30 ppm whereas the Pd content varies from 0.30 ppm to 15.40 ppm. The Pt/(Pd+Pt) ratio ranges from 0.03 to 0.35. The data indicate that the rocks are generally more enriched in Pd than Pt. Although the chemical data show considerable scatter, the variation of Pd in the rocks is positively correlated with Pt

(Figure 1). However, Pt varies within a very narrow range (0.02-4.30 ppm) whereas Pd exhibits wide variation (0.02-15.40 ppm). Both Pt and Pd are poorly correlated with Au, although samples enriched in Pd appear also to be enriched in Au (Figure 2).

In order to assess the variation of PGE with respect to Ni and Cu content in the rocks, Pt and Pd were plotted against Ni and Cu. The results are shown in Figure 3. Rocks enriched in Ni or Cu are generally also enriched in Pd. Platinum exhibits nearly flat distribution pattern with respect to Cu and Ni. The primary distribution of Pt and Pd in the rocks has been possibly modified by secondary processes especially deuteric, metamorphic and supergene alteration to yield the present distribution. Studies of PGE in the Lac-Des-Iles Complex in Northwestern Ontario by Dunning et al. (1981) and Talkington and Watkinson (1984) have shown that secondary processes such as hydrothermal alteration, are active in the mobilization of PGE and could lead to secondary concentration of these elements in the rocks.

A detailed microscopic examination of the ore minerals coupled with microprobe analysis of various mineral phases for PGE has revealed the presence of a palladium mineral phase [$Pd(Sb,Te)_2$, Te>Sb] in the sulfides. This mineral was found in polished thin section R8412593 of the rock sample that had the highest concentration of both Pd (>10 ppm) and Pt (1.15 ppm). The chemical composition indicates the mineral to belong possibly into the merensyikite ($PdTe_2$)-group of the platinum-group minerals. The mineral is very weakly anisotropic and occurs as a white elliptical bleb (25 microns) enclosed in chalcopyrite (Plate 4). The reflectance value of the above mineral is almost equal to that of pyrite and this makes it difficult to distinguish from pyrite under the microscope. No individual Pt minerals were observed in the sulfides during the present study. It is possible that platinum is dispersed within Cu-Ni sulfides or occurs in some palladium mineral(s).

**Silicate mineralogy**

The silicate minerals and their relative abundance in the rocks are given in Table 2 below.

Table 2 :

| Mineral | Very abundant | Abundant | Less abundant | Accessory |
|---|---|---|---|---|
| Hornblende | x | | | |
| Mg-chlorite | | x | | |
| Plagioclase | | x | | |
| Orthoclase | | | x | |
| Quartz | | | x | |
| Sericite | | | | x |
| Epidote | | | | x |
| Biotite | | | | x |
| Muscovite | | | | x |
| Calcite | | | | x |

**Rock types**

The rocks could be divided into two main groups on the basis of their major minerals. The two groups are :

(i) ultramafic rocks (ii) felsic rocks

Ultramafic rocks : These consist of almost 100 % amphibolites.

The clinoamphiboles in the amphibolites are generally still well-preserved whereas magnesium-rich amphiboles have been completely replaced by magnesium-chlorite (Plate 5). These amphibolites are possibly products of deuteric alteration or metamorphism of cumulus pyroxenites. In addition to the amphibolites, rocks of anorthositic composition (95 % plagioclase) are also found. Layered sulfide concentrations are found in the ultramafic rocks and also along the interface separating the ultramafics from rocks of anorthositic composition (Plate 6).

Felsic rocks : These comprise of rocks of granodioritic composition. Plagioclase (mainly oligoclase) and quartz are the major minerals. Orthoclase is rarely found. These rocks possibly represent felsic derivatives/differentiates of the ultramafic suite. Most of the felsic rocks examined in thin section contain minor amounts of sulfides in disseminated form. A few felsic rocks, however, contain thin sulfide laminae (1-2 mm) enriched in chalcopyrite.

**Deuteric and metamorphic alteration**

The distribution of various secondary minerals in the rocks and their texture allow the distinction of alteration effects due metasomatism from those due to regional low-grade greenschist metamorphism. The secondary minerals found in the rocks include amphiboles, chlorite, epidote, calcite, muscovite, sericite and rarely biotite. Because the rocks have undergone only low-grade greenschist metamorphism most of the amphiboles in the ultramafics have possibly resulted from deuteric alteration or autometamorphism of cumulus pyroxenes and less likely from regional metamorphism. The occurrence of epidote alteration confined around sulfides (Plate 7) indicates epidote to be also possibly due to hydrothermal alteration. Calcite and muscovite are less commonly found with epidote in the alteration haloes around the sulfides. Whereas epidote could be attributed to deuteric alteration most of the sericite and chlorite in the rocks appear to be due to metamorphic alteration. Sericite is commonly found as an incipient alteration product of feldspar and usually exhibits texture ranging from finely disseminated to coarse-grained "rosettes". Chlorite with distinctive fibrous habit and anomalous bluish-gray interference colour is abundant in some of the amphibolites (Plate 5). This magnesium-chlorite (Mg:Fe = 3.37) appears to have formed by selective replacement of magnesium-rich amphiboles while the clinoamphiboles remained almost unaffected. Local shearing and deformation in the rocks is indicated by the bending of the micas and fibrous chlorite. Undalutory extinction in quartz also indicates strain in the rocks.

**Supergene alteration**

Supergene alteration is very pronounced in rocks penetrated by fractures. The alteration is mainly indicated by the breakdown of pyrite to goethite and pentlandite to violarite (Plate 2). Chalcopyrite is rarely altered to cuprite. Supergene alteration has also locally intensified the alteration of feldspar and mafic minerals to sericite and chlorite.

## Summary and conclusion

The petrographical study of the Tofino ultramafics and the associated felsic rocks has indicated that concetrations of Fe-Cu-Ni-(PGE) sulfides occur within the ultramafic cumulus rocks and also along the interface separating ultramafic and anorthositic rocks. The sulfide minerals observed in the rocks are pyrite, chalcopyrite, violarite, millerite, pentlandite, pyrrhotite and Siegenite (?) in that order of decreasing abundance. The last three minerals are found only in trace amounts. Violarite is found as a secondary mineral derived from the alteration of pentlandite. Pyrite is altered to goethite especially along fractures. Local alteration of chalcopyrite to secondary copper minerals such as cuprite is also evident in the sulfides. Normal and chromium-bearing magnetite are found disseminated in the ultramafics.

Microprobe analysis of various mineral phases has revealed the presence of a palladium mineral phase [$Pd(SbTe)_2$, Te>Sb] in the sulfides. The occurrence of this mineral in rocks rich in Pd (>10 ppm) suggests that palladium in these rocks is probably concentrated in palladium minerals. Petrographical identification of palladium mineral phases of the type identified above is, however, rendered difficult by their resemblance to pyrite in optical characteristics (Plate 4). No individual Pt minerals were found during the present study. Platinum is possibly dispersed in Cu-Ni sulfides or occurs in palladium mineral(s).

Supergene alteration of Fe-Ni-Cu sulfides in the rocks tends to mask the subtle optical features of small mineral grains. Samples showing least supergene alteration would be useful for further microscope/microprobe search for platinum-group minerals in the sulfides associated with the Tofino ultramafics.

## References


Dunning, G.R., Watkinson, D.H. and Mainwaring, P.R., 1981. Correlation of platinum-group elements, copper and nickel with lithology in the Lac-des-Iles complex, Canada. In Proceedings of the International Symposium on Metallogeny of Layered Mafic-Ultramafic Intrusions, Athens, Greece. Int. Geol. Correl. Program, Project 169, pp. 83-102.

Talkington, R.W. and Watkinson D.H., 1984. Trends in the distribution of the precious metals in the Lac-des_Iles complex, Northwestern Ontario. Canadian Mineralogist v. 22, pp. 125-136.


## Appendix

Table 3 : Analyses of samples from Tofino Showing

| Lab No. | Pd g/t | Pt g/t | Au g/t | Ni % | Cu % | Co % | Pt/ Pd+Pt |
|---|---|---|---|---|---|---|---|
| 8768 | 4.70 | 1.65 | 0.36 | 0.25 | 3.57 | - | 0.25 |
| 8771 | 1.80 | 0.85 | 0.14 | 0.61 | 0.20 | - | 0.32 |
| 8773 | 15.40 | 3.80 | 0.62 | 8.50 | 0.43 | - | 0.20 |
| 8763 | - | 3.30 | 0.03 | 14.00 | - | 0.14 | - |
| 8762 | - | 4.30 | 0.24 | 0.50 | - | 0.16 | - |
| 12586 | 4.70 | 1.70 | 0.13 | 1.46 | 0.98 | 0.17 | 0.27 |
| 12589 | 0.30 | 0.10 | 0.11 | 0.08 | 0.36 | 0.002 | 0.25 |
| 12592 | 0.50 | 0.02 | 0.03 | 0.48 | 0.19 | 0.01 | 0.03 |
| 12593 | > 10 | 1.15 | 0.60 | 1.45 | 5.40 | 0.05 | 0.10 |
| 12597 | 2.10 | 1.15 | 0.08 | 0.55 | 0.23 | 0.08 | 0.35 |
| 12601 | 5.60 | 1.25 | 0.01 | 1.64 | 0.86 | 0.07 | 0.18 |
| 84174 | 6.10 | 2.30 | - | 0.35 | 2.97 | - | 0.27 |
| 84180 | 7.30 | 2.30 | - | 3.80 | 1.26 | - | 0.24 |
| 84181 | 1.07 | 0.30 | - | 0.58 | 0.46 | - | 0.30 |
| 84182 | 3.55 | 1.15 | - | 2.88 | 0.51 | - | 0.25 |

(Courtesy of COMINCO)

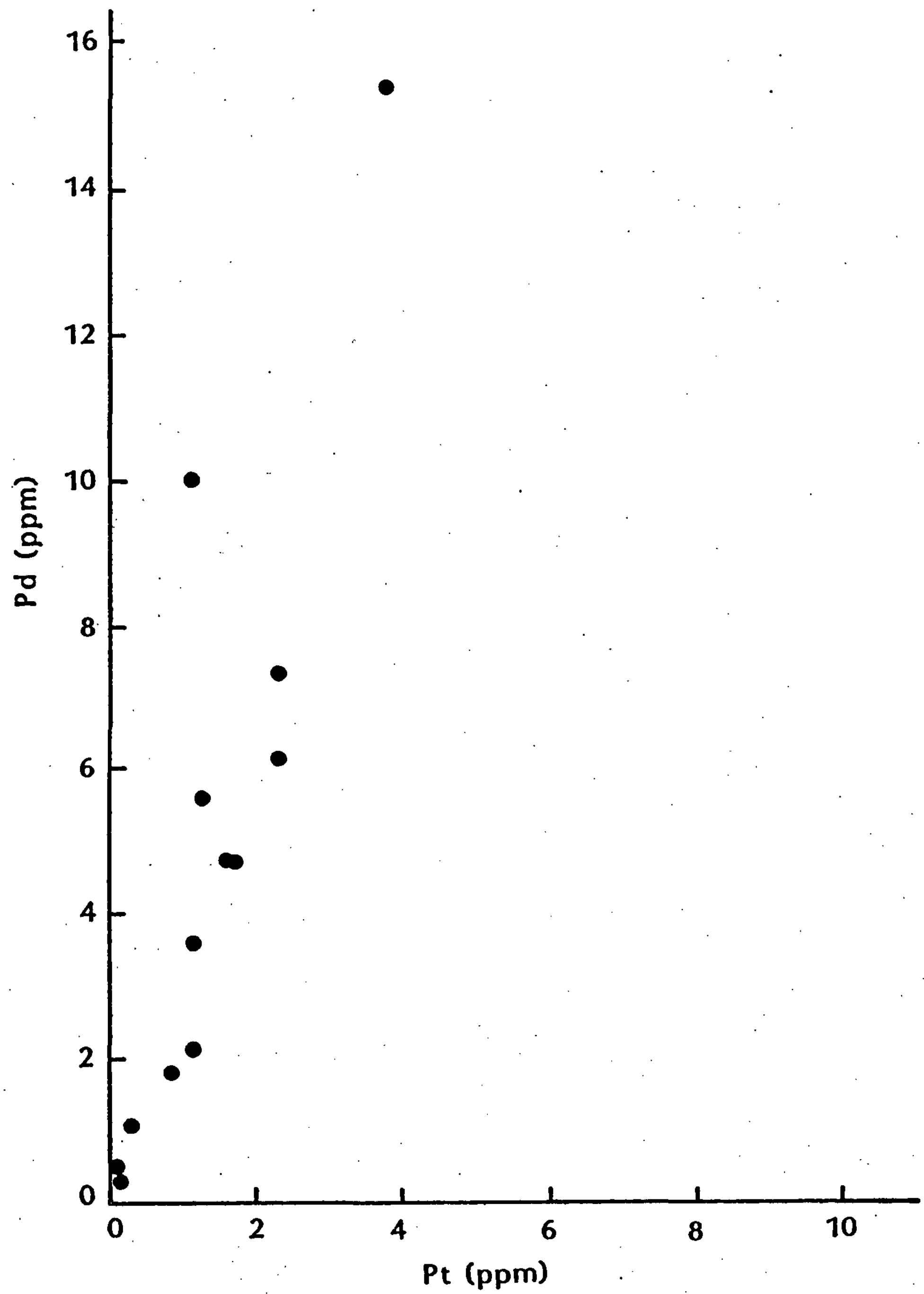



Fig. 1. Plot of Pd vs Pt for rock samples from Tofino. Pd is moderately positively correlated with Pt in the rocks.

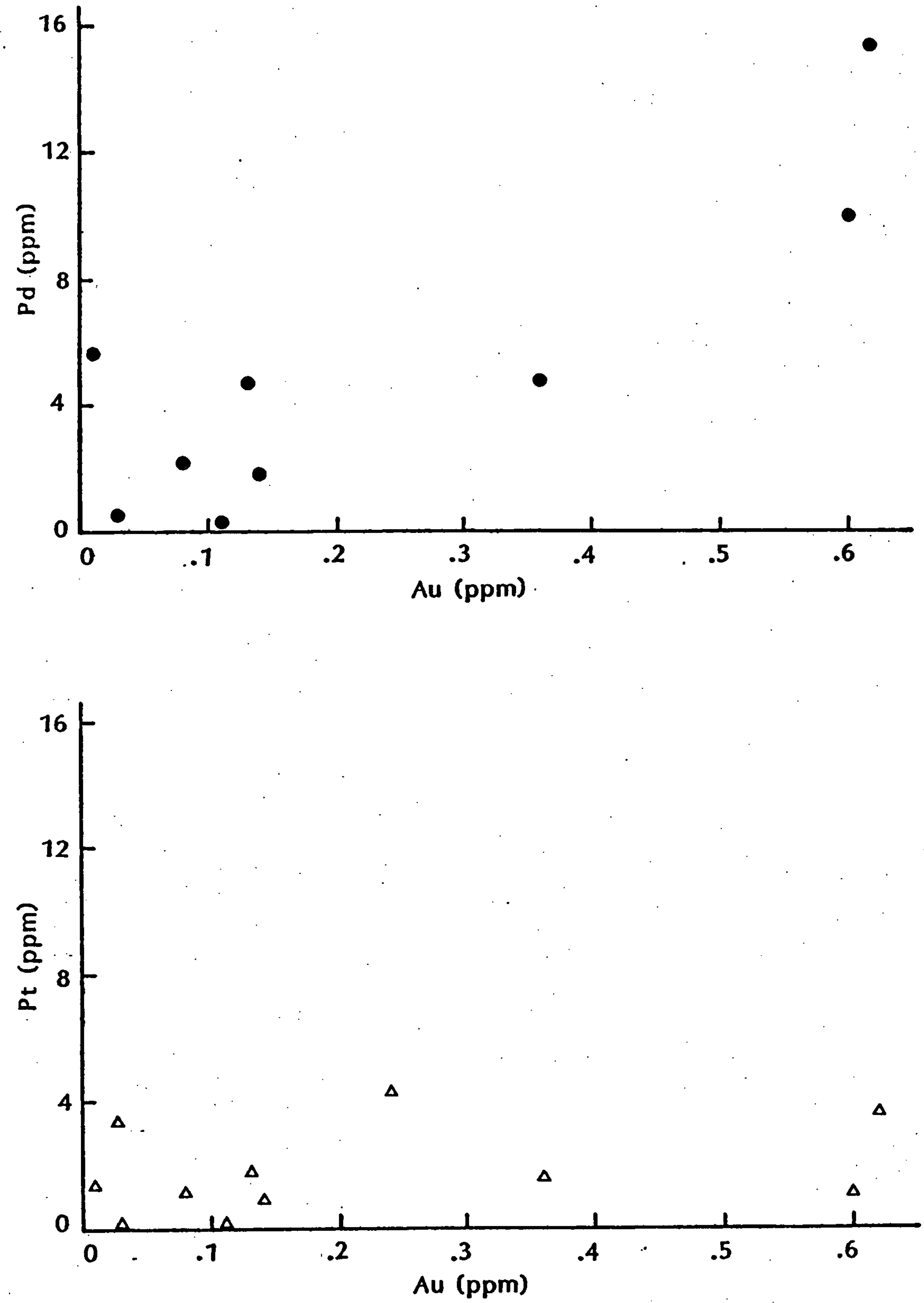
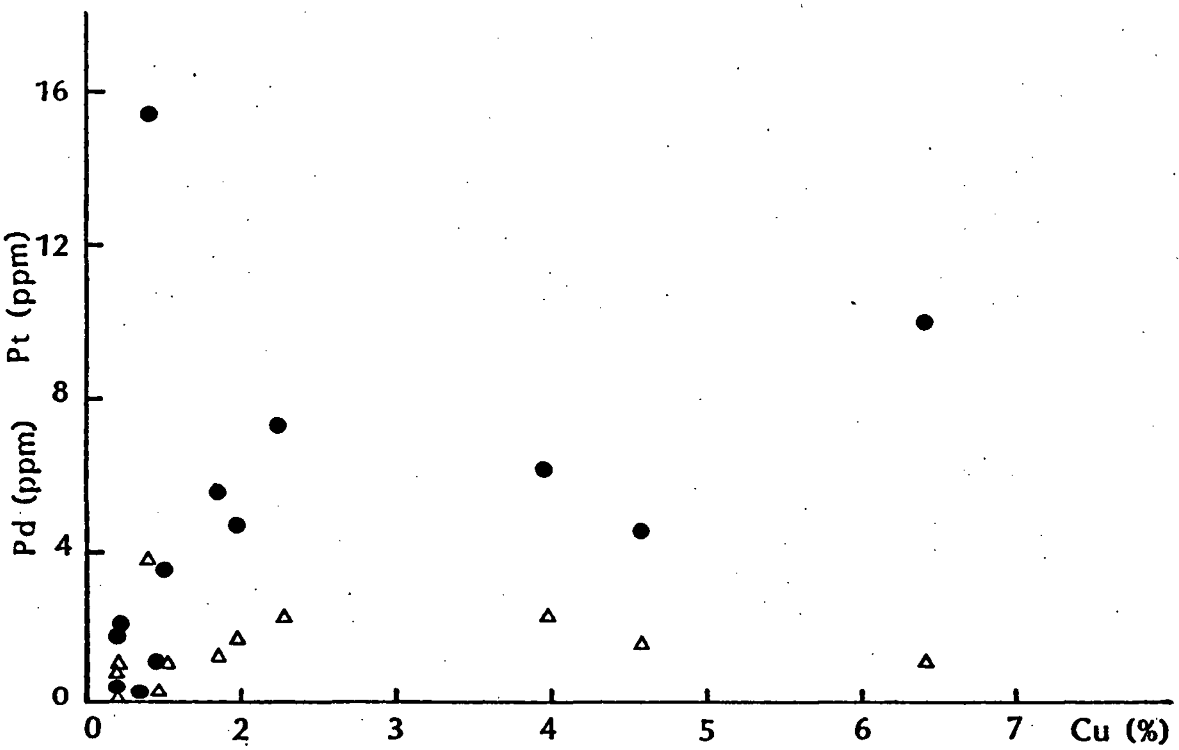



Fig. 2. Plot of Pd, Pt vs Au for rock samples from Tofino. Samples enriched in Au are also enriched in Pd.



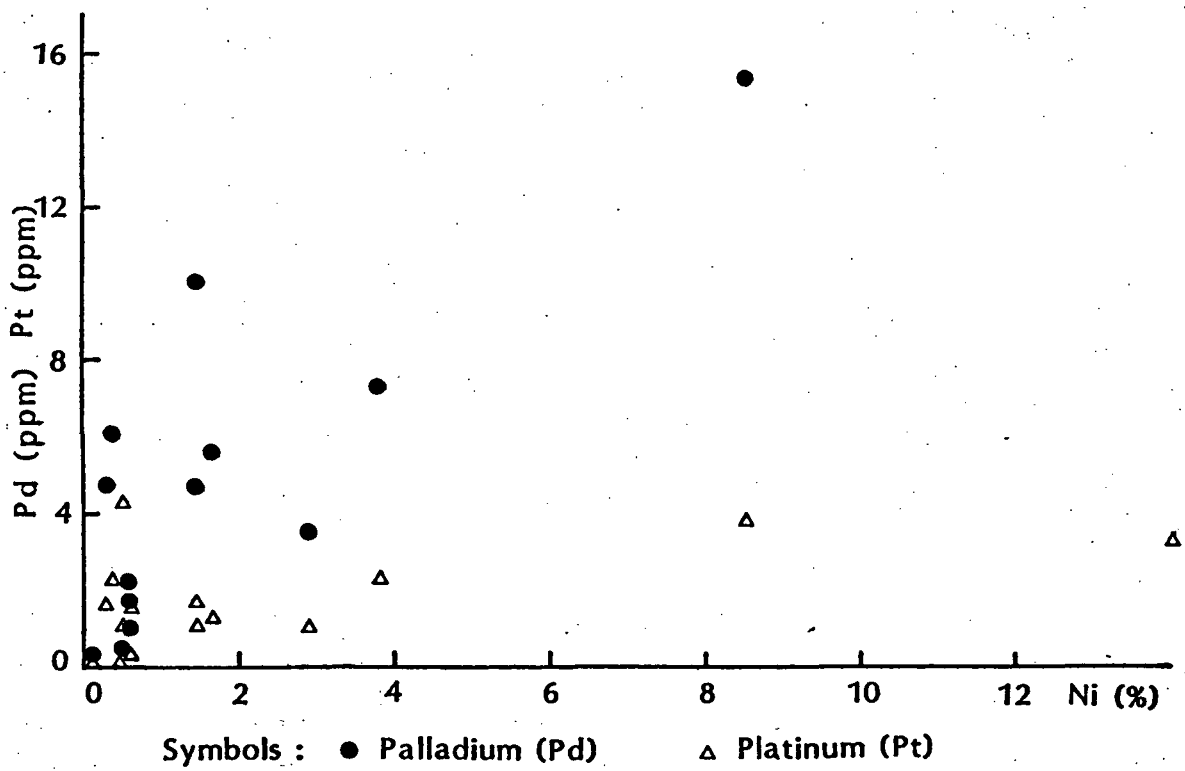
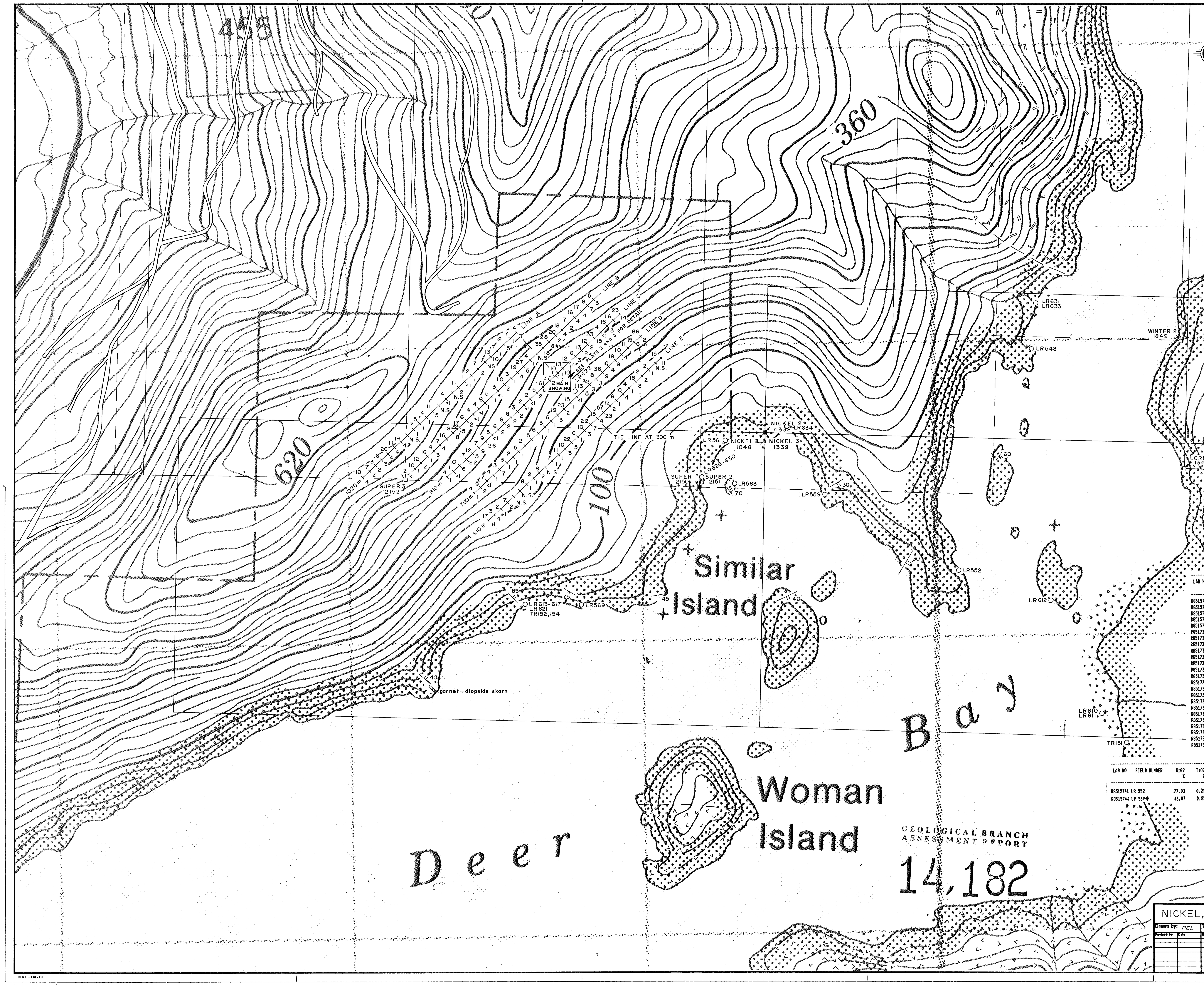




Fig. 3. Plot of Pd, Pt vs Cu, Ni for rock samples from Tofino. Samples enriched in Cu or Ni are also enriched in Pd. Pt exhibits nearly flat distribution pattern with respect to Cu and Ni.

List of polished thin sections examined:

1. R848768
2. R848769
3. R848770
4. R848771
5. R848772
6. R848777
7. R848779
8. R8412578
9. R8412579
10. R8412580
11. R8412581
12. R8412582
13. R8412583
14. R8412584
15. R8412585
16. R8412586
17. R8412589
18. R8412590
19. R8412592
20. R8412593
21. R8412597
22. R8412598
23. R8412601




LEGEND

- SICKER GROUP: quartzofeldspathic gneiss. Abundant amphibolitised basic sills
- Diorite
- TOFINO INLET PLUTON: hornblende-biotite quartz diorite, granodiorite
- gneissic foliation
- approximate geological contact
- O LR611 rock sample; sample number
- soil geochem grid with Cu, Ni values in ppm (Table 8)
- claim lines, established on topographic maps and air photos
- legal corner post: actual location
- " " " : assumed location
- logging road

| LAB NO | FIELD NUMBER | Ni PPM | Cu PPM. | Pt PPB | Pd PPB | Au PPB | Wt Au GRAM | Ag PPM | Pb PPM | Zn PPM |
|---|---|---|---|---|---|---|---|---|---|---|
| R8515740 | LR 548 | 30 | 6 | <10 | 2 | <3 | 20 | | | 24 |
| R8515741 | LR 552 | 1 | 16 | <10 | <2 | <4 | 20 | | | 14 |
| R8515742 | LR 559 | 28 | 1 | <10 | 4 | <2 | 20 | | | 27 |
| R8515743 | LR 561 | 20 | 58 | <10 | 3 | <8 | 20 | | | 35 |
| R8515744 | LR 563 | 1 | 2 | <10 | <2 | <7 | 20 | | | 16 |
| R8517359 | LR610 | | | | | <10 | 5 | <.4 | | |
| R8517360 | LR611 | | | | | <10 | 5 | <.4 | | |
| R8517361 | LR612 | | | | | <10 | 5 | <.4 | | |
| R8517362 | LR613 | | | | | <10 | 5 | .4 | <4 | 12 |
| R8517363 | LR614 | | | | | <10 | 5 | <.4 | <4 | 18 |
| R8517364 | LR615 | | | | | <10 | 5 | <.4 | <4 | 21 |
| R8517365 | LR616 | | | | | <10 | 5 | <.4 | <4 | 23 |
| R8517366 | LR617 | | | | | <10 | 5 | <.4 | <4 | 20 |
| R8517369 | LR621 | | | | | <10 | 5 | <.4 | <4 | 20 |
| R8517370 | LR622 | 46 | 5330 | | | 44 | 5 | 1.8 | | |
| R8517372 | LR628 | <1 | 37 | | | 90 | 5 | <.4 | | |
| R8517373 | LR629 | <1 | 31 | | | 20 | 5 | <.4 | | |
| R8517374 | LR630 | | | | | <10 | 5 | .4 | | |
| R8517375 | LR631 | | | | | <10 | 5 | <.4 | | |
| R8517376 | LR633 | 7 | 38 | | | <10 | 5 | <.4 | <4 | 71 |
| R8517377 | LR634 | 7 | 45 | | | <10 | 5 | <.4 | <4 | 65 |
| R8517379 | TR151 | 2 | 9 | | | <10 | 5 | <.4 | | |
| R8517380 | TR152 | 3 | 90 | | | <10 | 5 | <.4 | | |
| R8517381 | TR154 | <1 | 28 | | | | | | | |

| LAB NO | FIELD NUMBER | SiO2 % | TiO2 % | Al2O3 % | Fe2O3 % | FeO % | MnO % | MgO % | CaO % | Na2O % | K2O % | P2O5 % | LOI % | TOTAL % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| R8515741 | LR 552 | 77.03 | 0.25 | 12.53 | 2.64 | | | 0.10 | 1.14 | 6.63 | 0.08 | | 0.42 | 100.82 |
| R8515746 | LR 569* | 46.87 | 0.85 | 16.65 | 10.43 | | | 9.50 | 9.63 | 2.87 | 0.88 | | 2.51 | 100.19 |

0 50 100 200 300 400 500
METRES
ELEVATIONS IN METRES

NICKEL, SUPER, LORNE CLAIMS

Drawn by: PCL | Traced by: SBN

GEOLOGY, SOIL GEOCHEMISTRY, SAMPLE LOCATIONS
On parts of the Nickel 1, 2, 3,
Super 1, 2, 3 and Lorne claims

N.T.S: 92 F/4 ALBERNI MIN. DIV.

Scale: 1:5000 | Date: 8 DEC. 1985 | Plate: 1