GEOLOGICAL AND GEOPHYSICAL ASSESSMENT REPORT

VICTORIA OPTION : BLUFF 1,2,4, AND PERCY 1 CLAIMS

AND

BABIY OPTION : RUST 1,2,3,4 CLAIMS

BIRK CREEK AREA

KAMLOOPS MINING DIVISION

BRITISH COLUMBIA

NTS 82M/05W

51°21'00"N, 119°55'00"W

FALCONBRIDGE LIMITED
202-856 HOMER STREET
VANCOUVER, B.C.
V6B 2W2

NOVEMBER, 1989

Stan Clemmer

SUMMARY AND CONCLUSIONS

The Babiy and Victoria Options were acquired in 1988 by Falconbridge Limited to explore for volcanogenic massive sulphide deposits in the Eagle Bay Formation. The Birk Creek area is underlain by felsic to mafic volcanics and sediments of the Devono-Mississippian Eagle Bay Formation. The Eagle Bay formation is host to the Samatosum vein deposit within mafic volcanics that contains 634,984 tonnes of 1,035 g/t Ag, 1.9 g/t Au, 1.2% Cu, 3.6% Zn and 1.7% Pb and is located 25 kilometres to the southeast.

Structurally the Eagle Bay rocks at Birk Creek form a homoclinal sequence that dips 20 to 30 degree to the southwest and strike northeast. The homocline appears to be the southern limb of an anticlinal structure draped over the Baldy Batholith to the north.

Stratigraphically the Eagle Bay volcanics and sediments at Birk Creek can be divided into four units. The oldest is the Epiclastic Unit that is located along the eastern edge of the property and is composed of dacitic epiclastic tuff and lapilli tuff, mafic tuff, quartz-eye rhyolite crystal tuff, argillite, wacke and limestone. Next is the Lower Volcanic Unit which is composed of dacite, andesite, and rhyolite quartz and quartz-feldspar crystal tuff and lapilli tuff, and 10% sediments that include graphitic argillite, argillite and minor limestone. The overlying Upper Volcanic Unit is composed mafic-feldspar, feldspar, and quartz-feldspar crystal tuff and lapilli tuff. Finally the youngest rocks exposed are the Grey Phyllite Unit that consist of argillite, siltstone, wacke and quartzite. Contacts between the units appear to be conformable. All units are intruded by the Cretaceous granodioritic Baldy Batholith to the north.

Significant syngenetic mineralization occurs within the Epiclastic Unit and the Lower Volcanic Unit. Massive pyrrhotite lenses up to 9 metres thick, grading 0.2 to 0.5% Cu occur in the sediments and mafic tuffs of the Epiclastic Unit. Unfortunately, the pyrrhotite horizons do not contains economic quantities of base metals and appear to be of limited size. The Lower Volcanic Unit contains hydrothermally altered dacite tuffs and lapilli tuff that are frequently enriched in zinc and lead. Near the base of the Lower Volcanic Unit the UKE showing exposes a lens of base metal mineralization 2 X 10 metres within a sedimentary horizon enclosed in altered dacite tuff that assays 4.15% Zn, 5.27% Pb, 0.62% Cu, 35 g/t Ag and 1.0 g/t Au over a width of 2 metres. Although drilling by Noranda was unable to trace this mineralization to depth, the occurrence of this stratiform base metal mineralization is very encouraging. Toward the top of the Lower Volcanic Unit significant thickness (50 to 100 metres) of dacite tuff are altered, contain up to 2% combined Pb+Zn over 1 to 2 metres, and have been traced for over 1000 metres along strike.

The Upper Volcanic Unit is unaltered and contains no showings of stratiform mineralization.

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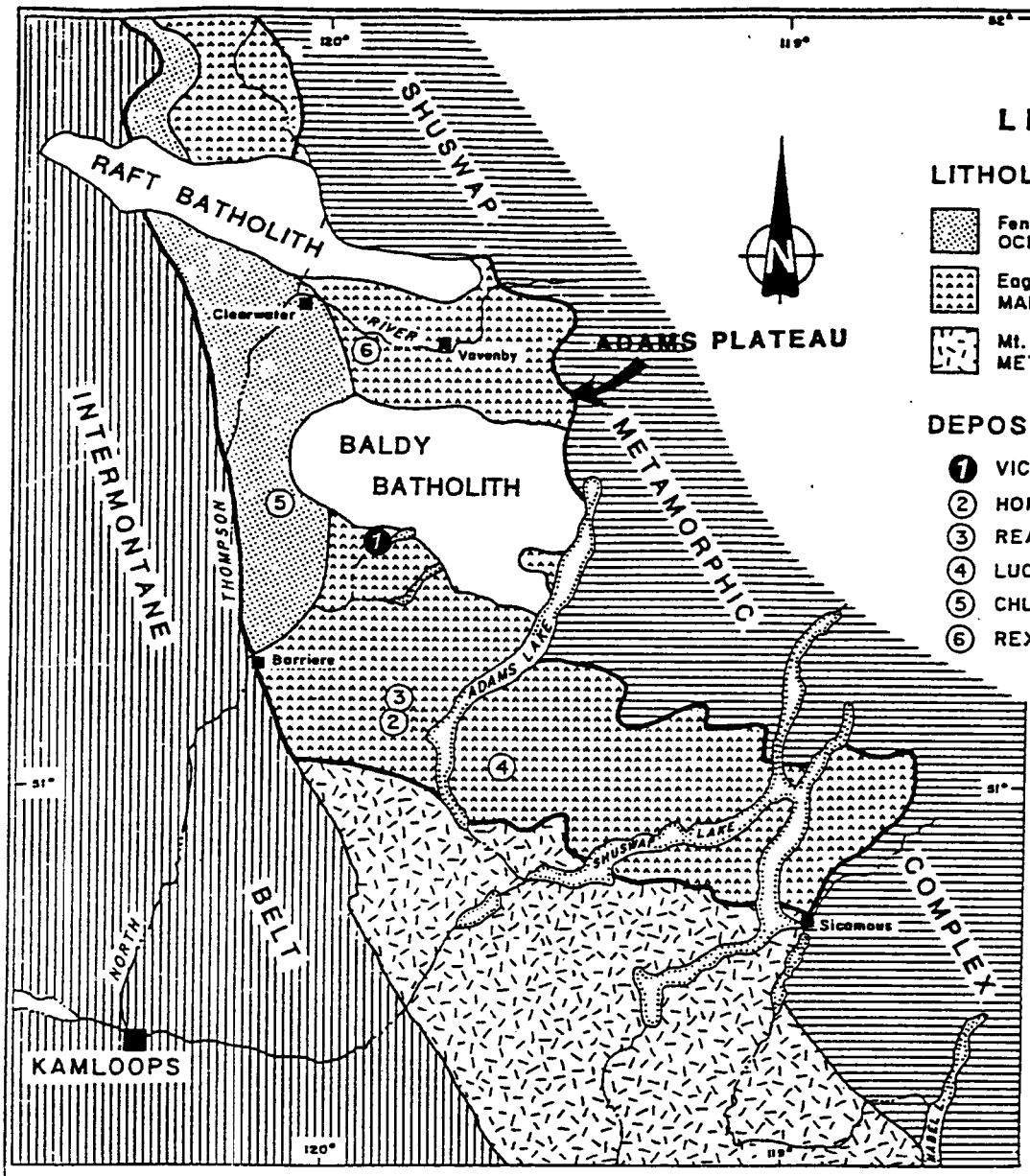
INTRODUCTION

LOCATION AND ACCESS

The Babiy and Victoria options are located 80 kilometres north-northeast of Kamloops, British Columbia. They lie just northeast of Birk Creek and east of Harper Creek on NTS 82M/05W, centred at approximately 51° 21' 00"N latitude and 119° 55' 30"W longitude (see figure 1).

Road access to the property is good and it may reached as follows: from Kamloops, north along the Yellowhead Highway #5 to Barriere (63km), then east along the East Barriere Lake road to the North Barriere Lake turn-off (16km), then north along the North Barriere Lake road for 9 km to the Mabel Creek logging road which provides access to most of the claim area.

Relief on the property varies from 640 to 1550 metres above sea level. Approximately 30% of the property has been logged in the last 10 years and the remainder is covered by mature stands of fir, spruce, balsam and cedar.



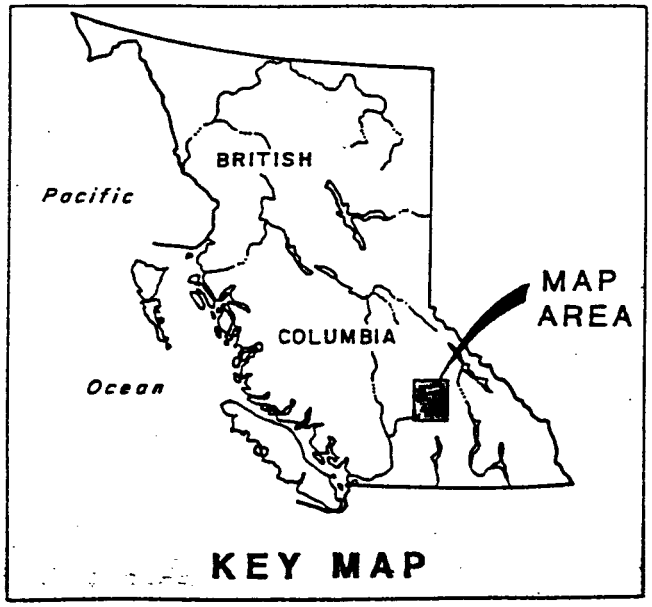
LEGEND

LITHOLOGY

- Fennel Formation: OCEANIC BASALTS
- Eagle Bay Group: MAFIC & FELSIC VOLCANICS
- Mt. Ida Group: METAMORPHIC COMPLEX

DEPOSITS/SHOWINGS

1. VICTORIA & BABIY OPTIONS
2. HOMESTAKE
3. REA / SAMATOSUM
4. LUCKY COON
5. CHU CHUA
6. REXSPAR



KEY MAP

FALCONBRIDGE LIMITED

ADAMS PLATEAU

VICTORIA AND BABIY OPTIONS

LOCATION MAP

WORK BY	DRAWN BY	DATE:
JB	VJG	

km 0 10 20 30 40 50 km

1 : 1,000,000

Figure: 1

CLAIM STATUS

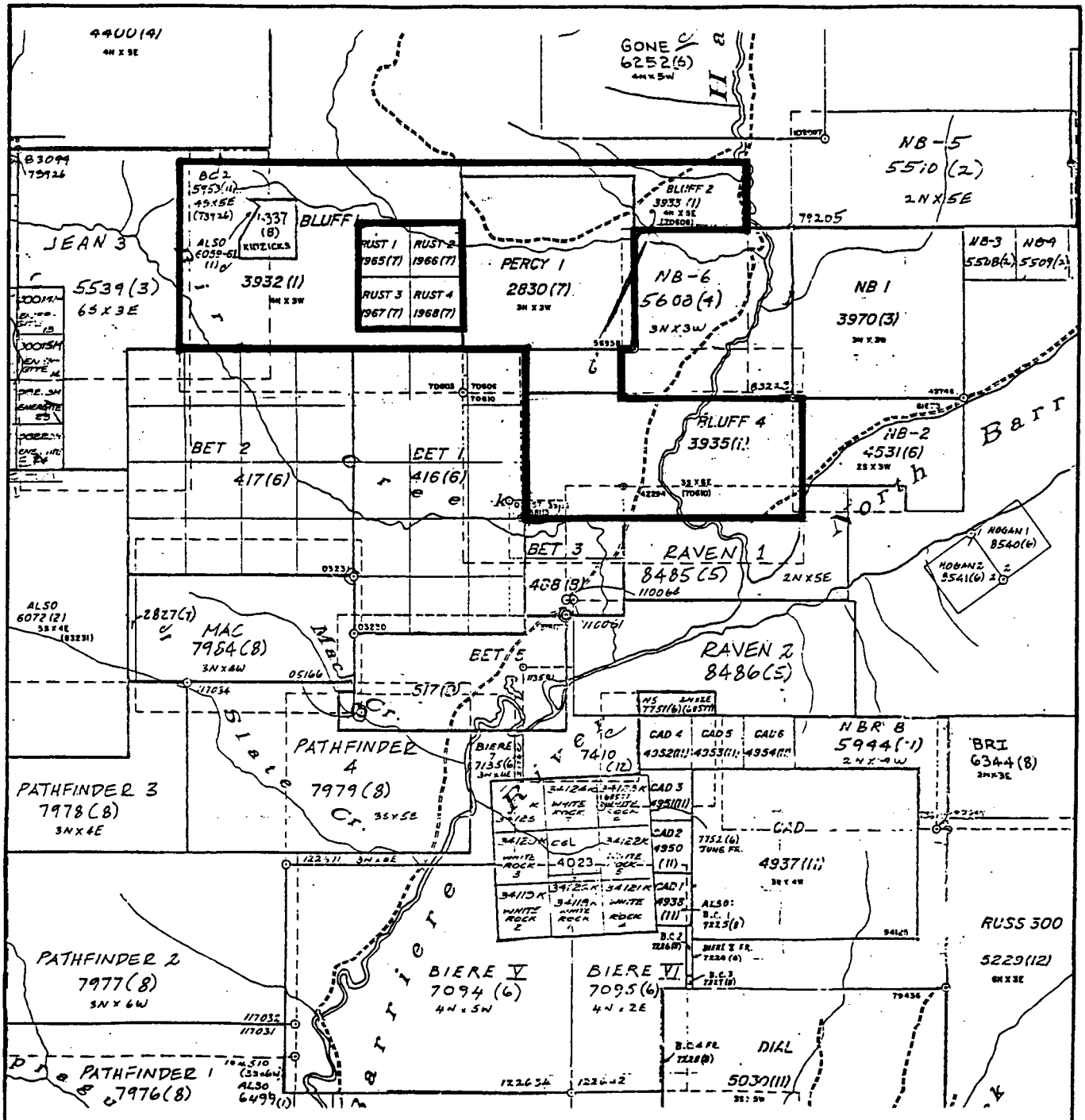
The Victoria Option area comprises 4 MGS mineral claims, totalling 67 units, grouped in the VIC89 group. The claims and their status is summarized below. The location of the claims are shown in figure 2.

CLAIM	UNITS	RECORD NO.	RECORD DATE	ASSESSMENT DATE
BLUFF 1	20	3932	Jan 25, 1982	Jan 25, 1997
BLUFF 2	20	3933	Jan 25, 1982	Jan 25, 1997
BLUFF 4	18	3935	Jan 22, 1982	Jan 22, 1997
PERCY 1	9	2830	Jul 21, 1980	Jul 21, 1997

The Babiy Option area comprises four 2-post mineral claims, grouped in the RUST89 group. The claims and their status is summarized below. The location of the claims are shown in figure 2.

CLAIM	UNITS	RECORD NO.	RECORD DATE	ASSESSMENT DATE
RUST 1	1	1965	Jul 27, 1979	Jul 27, 1999
RUST 2	1	1966	Jul 27, 1979	Jul 27, 1999
RUST 3	1	1967	Jul 27, 1979	Jul 27, 1999
RUST 4	1	1968	Jul 27, 1979	Jul 27, 1999

NOTE: All expiry dates are subject to approval by the Gold Commissioner.



VICTORIA OPTION: BLUFF 1, 2, 4, PERCY 1 CLAIMS.

BABIY OPTION: RUST 1-4 CLAIMS.

FALCONBRIDGE LIMITED

VICTORIA AND BABIY OPTIONS

CLAIM MAP

WORK BY	DRAWN BY	DATE
SC	VJG	Nov 1989

0 1000 2000

SCALE IN METRES 1 : 50 000

Project No. 146/145

NTS: 82M/05W

Figure: 2

PREVIOUS WORK

Activity in the Birk Creek area goes back to the early 1900's when showings of massive sulphides were located along Birk Creek and east of Harper Creek; several adits were driven. Modern exploration of the area is first recorded in 1952-51 when Kennco drilled 7 holes (550m) on the adjacent Bet claims of Cominco. The near-by NB claim area to the east was explored in the 1960's by Barriere Lake Mines who drilled 5 holes (198m) and Scurry Rainbow who drilled 12 holes (1000m).

The Victoria and Babiy option areas northeast of Birk Creek were explored by Cambridge Mines in 1969-70 with limited (80m) power trenching. In the period 1971-72 Ducanex drilled 711m in 7 holes, 3 of which are on the Victoria option and the remainder on the Bet claims. In 1977 Kennco re-sampled the Cambridge trenches and in 1980 J. Payne carried out a geological and magnetic survey over the Percy claim. In 1982-83 Preussag Canada Limited optioned the property and carried out geological mapping, horizontal loop EM, and drilled 962m in six holes.

In the period 1985 to 1987 Noranda optioned the Bluff and Percy claims from Semco and the Rust 1 to 4 claims from A. Babiy. Noranda carried out linecutting, a horizontal loop EM survey, magnetometer survey, gravity survey, soil survey (2813 samples), trenching (2,257 m), drilled 7 diamond drill holes (704m), and completed 13 reverse circulation holes (1,453m).

1989 WORK PROGRAM

In 1988 Falconbridge Limited optioned the Bluff 1,2,4 and the Percy claims from Victoria Resources Limited and the Rust 1 to 4 claims from Mr. A. Babiy and Mr. M. Bugera. In 1989 Falconbridge carried out geological mapping, a lithogeochemical program, 40km linecutting, 35 km of IP, VLF and magnetometer surveys and sampled the Preussag drill core for lithogeochemical purposes.

REGIONAL GEOLOGY

The property in along the western flank of the Shuswap Metamorphic Complex and is underlain by rocks of the Eagle Bay Formation of Devono-Mississippian and older(?) age. The geology near the property has been mapped and described by Schiarizza and Preto (1984) and the general geology is presented in figure 1.

The Eagle Bay Formation is composed dominantly of volcanic rocks which were complexly deformed during the Jura-Cretaceous Columbian Orogeny. The rocks were metamorphosed to Greenschist Facies and primary features such as pyroclastic fragments, pillows in volcanics and graded bedding in sediments are locally preserved.

The Eagle Bay Formation can be divided into two units: a dominantly intermediate to felsic package and a dominantly mafic package. The Birk Creek area is underlain by the intermediate to felsic package of the Eagle Bay. The volcanics and sediments at Birk Creek are truncated to the southeast by a fault along the North Barriere Lake valley, and intruded by the Baldy Batholith to the north. Schiarizza and Preto (1984) proposed a thrust fault along Birk Creek at the contact between the intermediate to felsic volcanics and the Grey Phyllite Unit, however mapping in the vicinity of Birk indicates a conformable contact.

PROPERTY GEOLOGY

The surface geological mapping was carried out by the author in the period May 1 to Oct. 1,1989 and the geology is shown on figures 3, 5, and 6. Outcrop exposure is poor (less than 5%) and overburden is commonly 4 to 8 metres thick. Rock exposures are confined to logging roads, some of the creeks, old trenches and topographic highs.

The volcanic and sedimentary rocks are thought to be Devono-Mississippian in age and this is supported by lead isotope work done by Godwin (1988). The rocks strike northwesterly and dip moderately to the southeast and can be divided into four stratigraphic units, all of which are intruded by the Cretaceous age Baldy Batholith. The four stratigraphic units from oldest to youngest are the Epiclastic Unit, the Lower Volcanic Unit, the Upper Volcanic Unit, and the Grey Phyllite Unit. A stratigraphic column is shown in figure 4 and an interpretive cross section is given in figure 7. The four units are now discussed below.

EPICLASTIC UNIT

The Epiclastic unit is exposed on the eastern edge of the property. It consists interbedded epiclastic andesite to dacite tuff and lapilli tuff, mafic tuff, dacite tuff, quartz-eye rhyolite tuff, calcareous argillite, chert, limestone, and quartzite. The epiclastic intermediate tuff and lapilli tuff is made up of 5 to 30% argillaceous material and contains <5 to 50%, 5 to 50mm fragments of siliceous intermediate tuff and/or chert fragments. The dacite tuff and quartz-eye rhyolite tuff make up less than 10% of the unit and occur as 5 to 25 metre thick beds. Mafic tuff, epiclastic intermediate tuff and sediments make up the majority of the unit.

Tops in the unit indicate the section is right way up. Approximately 300 metres of the unit are exposed on the property and the total thickness is unknown.

The upper part of the Epiclastic unit is marked by grey argillite and limestone that is located just below the Lower Volcanic unit and the contact between the two units appears conformable.

Much of the Epiclastic Unit is located within the contact aureole of the Baldy Batholith and contains 1 to 5% pyrrhotite and biotite.

LOWER VOLCANIC UNIT

The Lower Volcanic Unit is composed of an estimated 600 to 800 metres of intercalated intermediate to felsic quartz and feldspar-quartz crystal tuff and lapilli tuff, and lesser sediments. The volcanics range in composition from rhyolite to andesite and dacites appear to be the most common member of the unit. Resorbed quartz phenocrysts are common in the crystal tuffs. The volcanics compose at least 90% of the unit and the remainder is made up of interbedded argillites and lesser limestone. Sediments appear to be more common in the lower part of the unit and no sediments have been observed in the upper half of the unit. The current data indicate that sediments may be more common to the south. The argillites are commonly siliceous and locally graphitic, occur in beds up to 15 metres thick, and the dacites are cherty and more intensely altered just below the argillites. Adjacent to the Baldy Batholith the volcanics are biotite spotted and contain disseminated pyrrhotite.

The contact between the Upper and Lower Volcanic Units is not sharp but appears to be marked by the appearance of mafic phenocrysts in the crystal tuff, cessation of hydrothermal alteration, higher induced polarization resistivities, and locally stronger magnetic response in the Upper Volcanic Unit. In contrast the Lower Volcanic Unit is sericitized, commonly pyritic, and has lower resistivities.

UPPER VOLCANIC UNIT

The Upper Volcanic Unit is composed of feldspar-mafic and feldspar crystal tuff and lapilli tuff, and lesser quartz-feldspar crystal tuff. The thickness of the unit is estimated to be 200 to 600 metres. It's large outcrop area is in part due to topography and the steep slope on the northeast side of Birk Creek is a dip slope. The unit is very weakly deformed and original textures are well preserved. Fragments up to 20 cm in diameter are present. Two locations contain outcrops of possible sub-volcanic intrusions that were indicated by thin section work; one on the south edge of the Kidzick claim and the other on BL400E at 239+80N.

At the top of the unit argillite fragments occur in feldspar crystal tuffs just below the overlying Grey Phyllite Unit and the contact appears conformable.

GREY PHYLLITE UNIT

The Grey Phyllite Unit is the youngest unit exposed at Birk Creek and outcrops to the southeast of the Victoria Option. It is composed of a sequence of argillite, siltstone, wacke and quartzite that overlie the volcanic rocks. Tops within the unit

indicate it to be right way up.

INTRUSIVE ROCKS

All stratigraphic units are intruded by the Baldy Batholith, a Cretaceous granodiorite and granite body that covers an area 20 by 40 kilometres to the north of the property. Undeformed, fine to medium grained intermediate dykes 3 to 20 metres wide cut the Eagle Bay rocks at a Birk Creek and are believed to be related to the Batholith. The contact of the Baldy Batholith is not well restrained due a paucity of outcrop and may be located 200 to 300 metres north or south of it's currently indicated position.

As noted above possible sub-volcanic intrusives rocks are present in the Upper Volcanic Unit. These rocks are weakly to moderately deformed and are thought to be Devono-Mississippian in age.

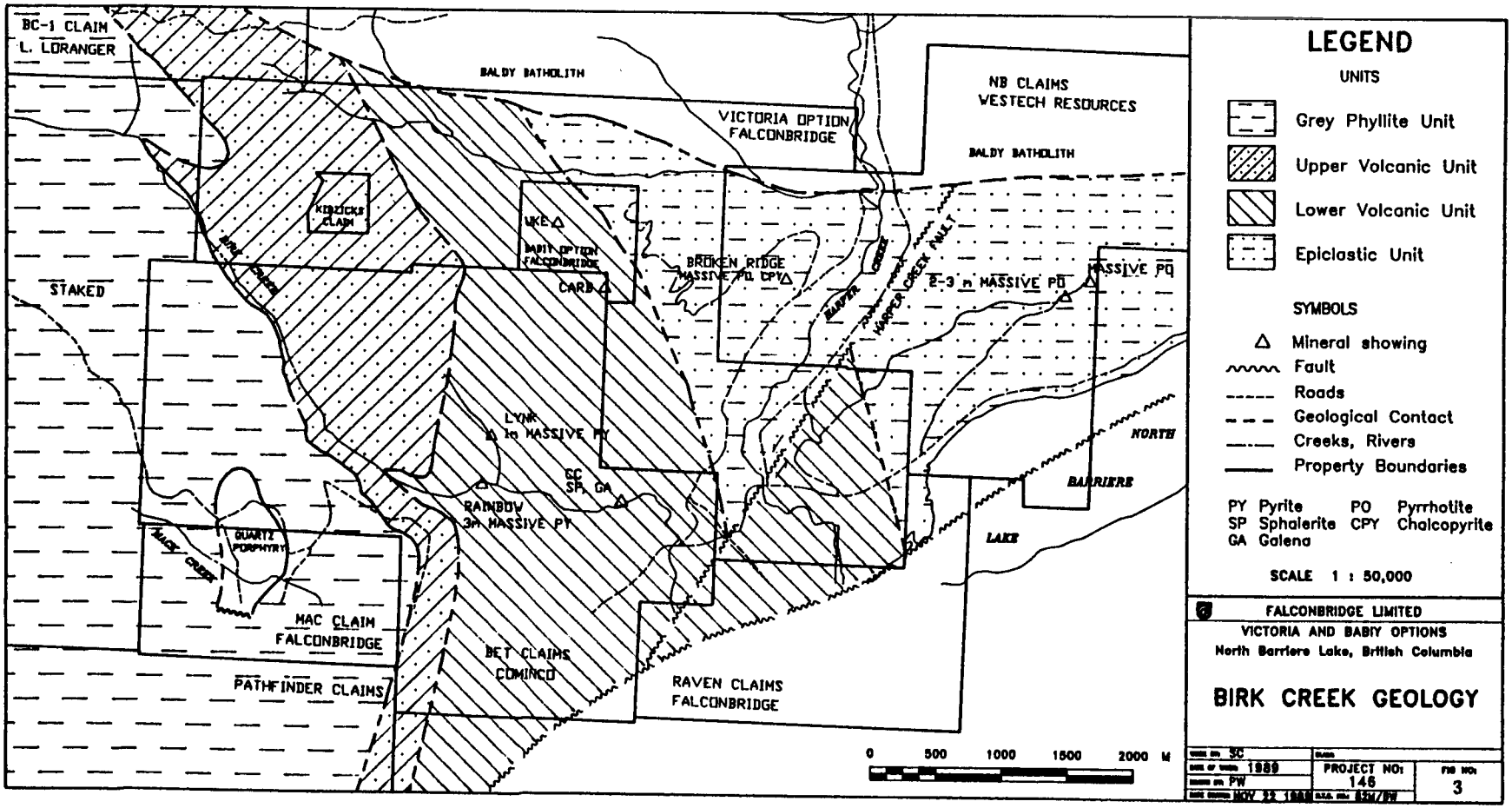
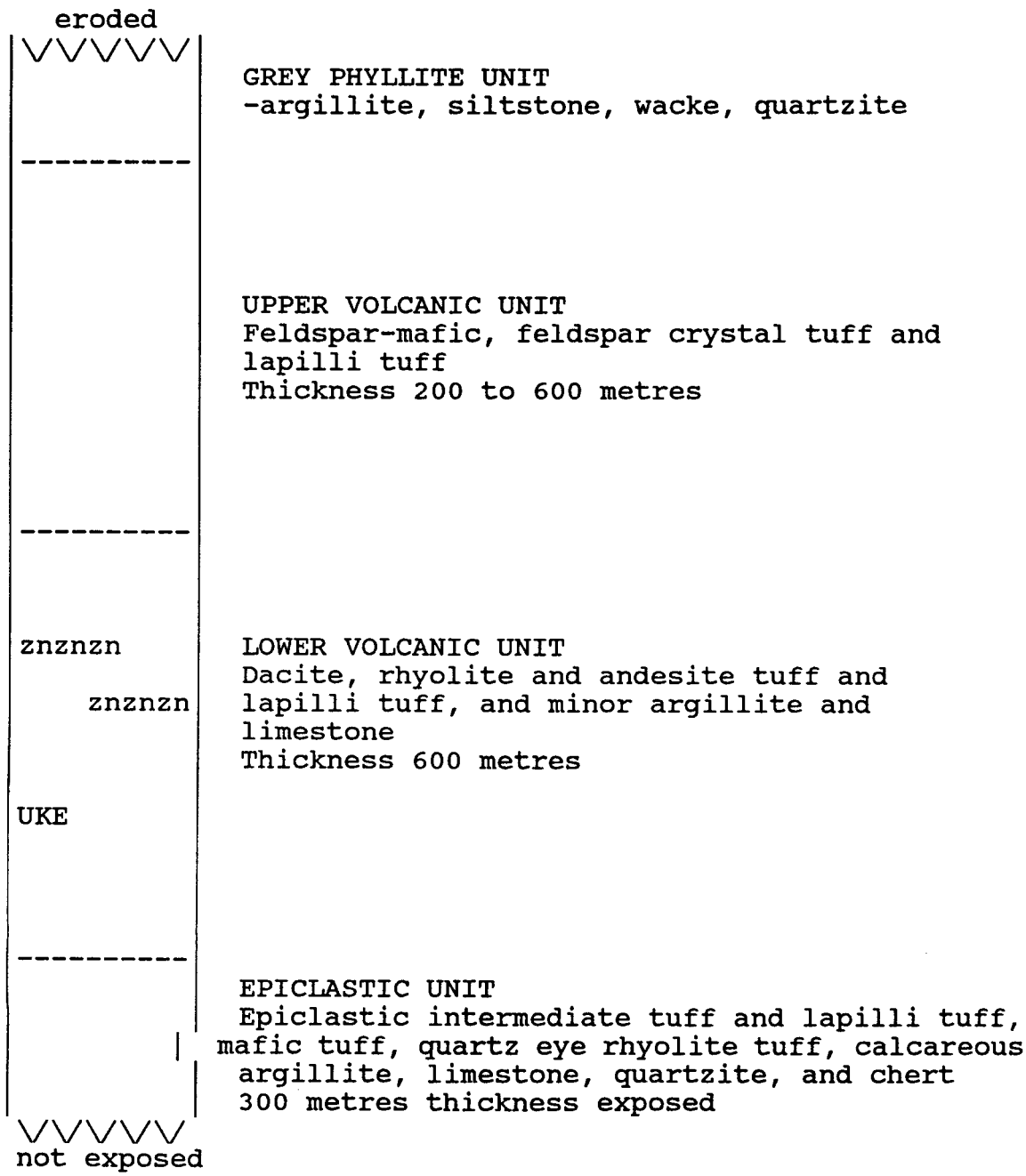

BC-1 CLAIM
L. LORANGER
BALDY BATHOLITH
NB CLAIMS
WESTECH RESOURCES
VICTORIA OPTION
FALCONBRIDGE
BALDY BATHOLITH
KIDDICKS CLAIM
UKE
BABIT OPTION
FALCONBRIDGE
CARB
BROKEN RIDGE
MASSIVE PO CPY
HARPER CREEK FAULT
2-3 m MASSIVE PO
MASSIVE PO
STAKED
LYNX
1m MASSIVE PY
GC
SP GA
RAINBOW
3m MASSIVE PY
NORTH
BARRIERE
LAKE
QUARTZ
PORPHYRY
MAC CLAIM
FALCONBRIDGE
BET CLAIMS
COMINCO
PATHFINDER CLAIMS
RAVEN CLAIMS
FALCONBRIDGE
0 500 1000 1500 2000 M
LEGEND
UNITS
Grey Phyllite Unit
Upper Volcanic Unit
Lower Volcanic Unit
Epiclastic Unit
SYMBOLS
Mineral showing
Fault
Roads
Geological Contact
Creeks, Rivers
Property Boundaries
PY Pyrite PO Pyrrhotite
SP Sphalerite CPY Chalcopyrite
GA Galena
SCALE 1 : 50,000
FALCONBRIDGE LIMITED
VICTORIA AND BABIY OPTIONS
North Barriere Lake, British Columbia
BIRK CREEK GEOLOGY
SC
1989
PW
PROJECT NO:
146
FIG NO:
3
NOV 22 1989

Figure 4 : Stratigraphic Column Birk Creek



STRUCTURAL GEOLOGY

All the sedimentary and volcanic rocks at Birk Creek are cut by a low angle cleavage that strikes predominantly 110° to 140° and dips 20 to 40° to the southwest. Bedding orientations are rare and where seen are commonly parallel to the low angle cleavage. Tops are extremely rare but where observed always indicate that the sequence is right way up. In general dips of bedding and cleavage become steeper as the Baldy Batholith is approached where dips as high as 60° are present; in contrast in the Birk Creek Valley to the southeast bedding and cleavage dip less than 10° to 30° to the southeast. A crenulation cleavage is often present and shows variable strikes with near vertical dips.

Very few minor fold structures were observed during the mapping. The current data suggests that the Eagle Bay rocks are a homoclinal sequence that dips 20 to 30° to the southeast, is not overturned, and forms the south limb of an antiformal structure draped over the Baldy Batholith. Fold structures seen are consistent with this antiformal symmetry. On the slope on the east side of Birk Creek variations in the dip of the S^1 cleavage and the interfingering of the Grey Phyllite Unit and the Upper Volcanic Unit are interpreted as a Z-symmetry fold (300 metre wave length) that has infolded sediments into the Upper Volcanic Unit. The current structural model if correct would therefore suggest that other Z-symmetry folds are present on the property.

Faulting is commonly observed at Birk Creek but little is known of the extent and size of offsets present. Schiarizza and Preto (1984) interpret a major fault to the south of Birk Creek following the North Barriere Valley to explain the truncation of the intermediate to felsic volcanics to the south; mafic volcanics and sediments of the Eagle Bay outcrop south of the valley. A splay off this fault zone is proposed by the author up Harper Creek to account for the large area of Epiclastic Unit exposed to the east on the adjacent NB claims. Offset of pyrrhotite horizons suggest a possible apparent strike-slip offset of 1.7 kilometres along the proposed Harper Creek Fault.

LITHOGEOCHEMISTRY

A lithogeochemical survey of the sediments and volcanics at Birk Creek was carried out in conjunction with the geological mapping. In general every outcrop of Eagle Bay was sampled representatively and analyzed for SiO_2, Al_2O_3, CaO, MgO, Na_2O, K_2O, Fe_2O_3, TiO_2, Ba, Ni, Cu, Zn and loss on ignition by XRF techniques by Xray Assay Laboratories of Don Mills Ontario. Mineralized samples of rock were submitted to Bondar-Clegg & Company Ltd. for analysis Au by fire assay, Ba by XRF technique, and Ag, As, Be, Bi, Cd, Ce, Co, Cr, Cu, Ga, La, Li, Mn, Mo, Nb, Ni, Pb, Rb, Sb, Sc, Sn, Sr, Ta, Te, V, Y, Zn, and Zr by ICP techniques and a hot HNO_3-HCl extraction. The locations of all lithogeochemical samples collected are shown on figures 8 and 9. Samples collected from the Preussag drill core are projected to surface and shown on figures 8 and 9 also.

The Epiclastic Unit contains three chemically and lithologically distinct volcanic rocks. The first is the mafic tuff that generally contains less than 50% SiO_2, greater than 2% TiO_2, and less than 1% K_2O. The second is a quartz-eye rhyolite crystal tuff that contains greater than 70% SiO_2 and commonly contains greater than 1500 ppm barium. The third group is less distinct and includes intermediate tuffs and epiclastic tuffs that have silica contents ranging from 50 to 70%, less than 1% TiO_2, and variable quantities of K_2O. The K_2O content is probably a reflection of the variable sedimentary component in the epiclastic rocks.

The Lower Volcanic Unit is dominated by intermediate rocks varying in composition from dacites to andesites and minor rhyolite. The rhyolites contain greater than 70% SiO_2 and may be silicified equivalents of the dacites and andesites whose silica content varies from 55 to 70%. About half of the volcanics in the Lower Volcanic Unit are moderately to strongly altered with Na_2O contents less than 1.0%.

The Upper Volcanic Unit is predominantly intermediate in composition with silica contents mostly in the 55 to 62% range, often less than 1% K_2O, and high (>3.0%) Na_2O. The unit is generally not altered and contains more andesitic rocks than the Lower Volcanic Unit. Intermediate tuffs toward the top of the Upper Volcanic Unit are frequently enriched in barium with greater than 1000 ppm Ba.

ECONOMIC GEOLOGY

Mineralization is widespread at Birk Creek and showings of varying degrees of significance occur in the lower three stratigraphic units; no mineralization is known in the Grey Phyllite Unit.

The Epiclastic unit is host to massive pyrrhotite mineralization on the Percy claim. Drilling by Preussag Canada Limited (Daley 1983-2) in hole 82-1 intersected 9.3 metres of 0.43% Cu, 2.4 g/t Ag and 40% pyrrhotite in sediments. Subsequent drilling by Preussag was unable to trace this massive sulphide mineralization. Mafic tuffs extending from line 222N to 229N, 300 to 400 metres east of BL414E contains local disseminations of chalcopyrite and lesser sphalerite. Sampling by Kennco in 1977 returned values as high as 1% Cu over one metre in this area. The mineralization appears to be erratic and no economic concentrations have been outlined to date.

The Lower Volcanic Unit is the most heavily mineralized unit at Birk Creek. The dacites, rhyolite and andesites of this unit a commonly sericitized, pyritic or pyrrhotitic (1 to 5%) and altered. The most significant showing is the UKE showing uncovered by Noranda in their trenching program. Channel sampling of the showing returned 4.15% Zn, 5.27% Pb, 0.62% Cu, 35 g/t Ag and 1.0 g/t Au over a width of 2 metres within altered dacites and brecciated and silicified argillites. Unfortunately the strike length of the mineralization is less than 10 metres and drilling beneath the showing failed to return any economic values. The sediments that extend south of the UKE showing and may be related to Noranda's CARB showing near line 220N where up to 12% Zn over 40cm occurs in argillaceous limestone.

The dacites within the upper half of the Lower Volcanic Unit are strongly sericitized and contain anomalous quantities of zinc and lead where drilled by Noranda. Values are not economic but range up to 2% combined Pb+Zn over 2 metres (Shevchenko 1988).

Quartz veins in the Upper Volcanic Unit contain galena and sphalerite around 239N and 397E; grab samples contain up to 76.62 oz/ton Ag. On line 232N around 399E sericitized and pyritic feldspar crystal tuffs in a Noranda trench contain 400 ppb Au over a width of at least 10 metres.

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APPENDIX 1 : STATEMENT OF WORK

Province of British Columbia
Ministry of Energy, Mines and Petroleum Resources
MINERAL RESOURCES DIVISION — TITLES BRANCH

4020, 10, 4030

DOCUMENT No. _____ OFFICE USE ONLY

RECEIVED
NOV 2 1989
M.R. # _____ $_____
VANCOUVER, B.C.
RECORDING STAMP

Mineral Tenure Act
Sections 25, 26 & 27

STATEMENT OF WORK — CASH PAYMENT

Indicate type of title MINERAL (Mineral or Placer)

Mining Division KAMLOOPS

I, STANLEY G. CLEMMER (Name)
202-856 HOMER ST. (Address)
VANCOUVER, B.C.
688-5476 (Telephone) V6B 2W2 (Postal Code)
Valid subsisting FMC No. 285143
FMC Code CLEMSG

Agent for FALCONBRIDGE LIMITED (Name(s))
202-856 HOMER ST. (Address)
VANCOUVER, B.C.
688-5476 (Telephone) V6B 2W2 (Postal Code)
Valid subsisting FMC No. 279927
FMC Code FALLI

STATE THAT: **(NOTE: If only paying cash in lieu, turn to reverse and complete columns G to J and Q to T.)**

1. I have done, or caused to be done, work on the BLUFF 1, BLUFF 2, BLUFF 4, PERCY 1 Claim(s)
Record No(s). 3932, 3933, 3935, 2930
Work was done from MAY 1, 19 89, to OCT. 1, 19 89;
and was done in compliance with Section 50 of the Mineral Tenure Act and
Section 19(3) of the Regulation YES [✓] NO [ ]

I hereby request that the claims listed in Column G on this Statement of Work be Grouped and I confirm that all claims listed are contiguous YES [✓] NO [ ]
FEE — $10.00

TYPE OF WORK

PHYSICAL: Work such as trenches, open cuts, adits, pits, shafts, reclamation, and construction of roads and trails. Details as required under section 13 of the Regulations, including the map and cost statement, must be given on this statement.

PROSPECTING: Details as required under section 9 of the Regulations must be submitted in a technical report. Prospecting work can only be claimed once by the same owner of the ground, and only during the first three years of ownership.

GEOLOGICAL, GEOPHYSICAL, GEOCHEMICAL, DRILLING: Details must be submitted in a technical report conforming to sections 5 through 8 (as appropriate) of the Regulations.

PORTABLE ASSESSMENT CREDIT (PAC) WITHDRAWAL: A maximum of 30% of the approved value of geological, geophysical, geochemical and/or drilling work on this statement may be withdrawn from the owner's or operator's PAC account and added to the work value on this statement.

TYPE OF WORK (Specify Physical (include details), Prospecting, Geological, etc.)	VALUE OF WORK Physical	*Prospecting	*Geological etc.	
GEOLOGICAL, GEOPHYSICAL (REPORT TO FOLLOW)			93,718.25	
TOTALS	A +	B +	C 93,718.25 =	D 93,718.25
PAC WITHDRAWAL — Maximum 30% of Value in Box C Only			E →	E
from account(s) of _____			TOTAL	F 93,718.25

* Who was the operator (provided the financing)? Name FALCONBRIDGE LIMITED
Address 202-856 HOMER ST.
_____ Phone: 688-5476

Transfer amount in Box F to reverse side of form and complete as required.

F 93,718.25 I WISH TO APPLY $ 80,400.00 OF THE TOTAL VALUE FROM BOX F AS FOLLOWS:

Columns G through P inclusive MUST BE COMPLETED before work credits can be granted to claims. Columns G through J and Q through T inclusive MUST BE COMPLETED before a cash payment or rental payment can be credited. Columns not applicable need not be completed.

Cash Payment

CLAIM IDENTIFICATION

APPLICATION OF WORK CREDIT

CASH IN LIEU OF WORK OR LEASE RENTAL

	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
	CLAIM NAME (one claim/lease per line)	RECORD No.	No. OF UNITS*	CURRENT EXPIRY DATE	WORK TO BE APPLIED VALUE	WORK TO BE APPLIED YEARS	Recording Fees	PRIOR EXCESS CREDIT BEING USED	NEW EXPIRY DATE	EXCESS CREDIT REMAINING	C/L	RECORDING FEE	LEASE RENTAL	NEW EXPIRY DATE
1	BLUFF 1	3932	20	JAN 25 '91	24,000.00	6	1200.00		JAN 25 '97					
2	BLUFF 2	3933	20	JAN 25 '91	24,000.00	6	1200.00		JAN 25 '97					
3	BLUFF 4	3935	18	JAN 22 '91	21,600.00	6	1080.00		JAN 22 '97					
4	PERCY 1	2930	9	JUL 21 '91	10,800.00	6	540.00		JUL 21 '97					
5														
6														
7														
8														
9														
10														
11														
12														
13														
14														
15														
16														
17														
18														
					80,400.00 TOTAL OF K		4020.00 TOTAL OF M				TOTAL OF Q	TOTAL OF R	TOTAL OF S	

*2 POST, FRACTION, REV. CROWN GRANT AND PLACER CLAIM ARE 1 UNIT EACH

NOTICE TO GROUP No. _____ RECORDED Nov 29/89

Value of work to be credited to portable assessment credit (PAC) account(s).
[May only be credited from the approved value of Box C not applied to claims.]

Name of owner/operator	Name	Amount
1.	FALCONBRIDGE LIMITED	BALANCE
2.		
3.		

I, the undersigned Free Miner, hereby acknowledge and understand that it is an offence to knowingly make a false statement or provide false information under the Mineral Tenure Act. I further acknowledge and understand that if the statements made, or information given, in this Statement of Work — Cash Payment are found to be false and the exploration and development has not been performed, as alleged in this Statement of Work — Cash Payment, then the work reported on this statement will be cancelled and the subject mineral claim(s) may as a result, forfeit to and vest back to the Province.

Signature of Applicant

STANLEY G. CLEMMER

Province of British Columbia
Ministry of Energy, Mines and Petroleum Resources
MINERAL RESOURCES DIVISION — TITLES BRANCH

DOCUMENT No. _____ OFFICE USE ONLY

320' / 10' / 330'

Mineral Tenure Act
Sections 25, 26 & 27

RECEIVED
NOV 29 1989
M.R. # _____ $ _____
VANCOUVER, B.C.
RECORDING STAMP

STATEMENT OF WORK — CASH PAYMENT

Indicate type of title MINERAL (Mineral or Placer)

Mining Division KAMLOOPS

I, STANLEY G. CLEMMER (Name)
202-856 HOMER ST. (Address)
VANCOUVER, B.C.
688-5476 (Telephone) V6B 2W2 (Postal Code)
Valid subsisting FMC No. 295143
FMC Code CLEMSG

Agent for FALCONBRIDGE LIMITED (Name(s))
202-856 HOMER ST. (Address)
VANCOUVER, B.C.
688-5476 (Telephone) V6B 2W2 (Postal Code)
Valid subsisting FMC No. 279927
FMC Code FALLI

STATE THAT: **(NOTE: If only paying cash in lieu, turn to reverse and complete columns G to J and Q to T.)**

1. I have done, or caused to be done, work on the RUST 1 TO 4 Claim(s),
Record No(s). 1965, 1966, 1967, 1968
Work was done from JULY 27, 1989, to OCT 1, 1989;
and was done in compliance with Section 50 of the Mineral Tenure Act and
Section 19(3) of the Regulation YES [✓] NO [ ]

I hereby request that the claims listed in Column G on this Statement of Work be Grouped and I confirm that all claims listed are contiguous YES [✓] NO [ ]
FEE — $10.00

TYPE OF WORK

PHYSICAL: Work such as trenches, open cuts, adits, pits, shafts, reclamation, and construction of roads and trails. Details as required under section 13 of the Regulations, including the map and cost statement, must be given on this statement.

PROSPECTING: Details as required under section 9 of the Regulations must be submitted in a technical report. Prospecting work can only be claimed once by the same owner of the ground, and only during the first three years of ownership.

GEOLOGICAL, GEOPHYSICAL, GEOCHEMICAL, DRILLING: Details must be submitted in a technical report conforming to sections 5 through 8 (as appropriate) of the Regulations.

PORTABLE ASSESSMENT CREDIT (PAC) WITHDRAWAL: A maximum of 30% of the approved value of geological, geophysical, geochemical and/or drilling work on this statement may be withdrawn from the owner's or operator's PAC account and added to the work value on this statement.

TYPE OF WORK (Specify Physical (include details), Prospecting, Geological, etc.)	VALUE OF WORK Physical	*Prospecting	*Geological etc.	
GEOLOGICAL, GEOPHYSICAL (REPORT TO FOLLOW)			21,400.26	
TOTALS	A +	B +	C 21,400.26	D 21,400.26
PAC WITHDRAWAL — Maximum 30% of Value in Box C Only			E →	E
from account(s) of _____			TOTAL	F 21,400.26

* Who was the operator (provided the financing)? Name FALCONBRIDGE LIMITED
Address 202-856 HOMER ST.
_____ Phone: 688-5476

Transfer amount in Box F to reverse side of form and complete as required.

F 21,400.26 I WISH TO APPLY $ 6,400.00 OF THE TOTAL VALUE FROM BOX F AS FOLLOWS:

Columns G through P inclusive MUST BE COMPLETED before work credits can be granted to claims. Columns G through J and Q through T inclusive MUST BE COMPLETED before a cash payment or rental payment can be credited. Columns not applicable need not be completed.

Cash Payment

CLAIM IDENTIFICATION

	G CLAIM NAME (one claim/lease per line)	H RECORD No.	I No. OF UNITS*	J CURRENT EXPIRY DATE
1	RUST 1	1965	1	JUL 27 '91
2	RUST 2	1966	1	JUL 27 '91
3	RUST 3	1967	1	JUL 27 '91
4	RUST 4	1968	1	JUL 27 '91
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				

APPLICATION OF WORK CREDIT

K WORK TO BE APPLIED VALUE	L WORK TO BE APPLIED YEARS	M Recording Fees	N PRIOR EXCESS CREDIT BEING USED	O NEW EXPIRY DATE	P EXCESS CREDIT REMAINING
1600.00	8	80.00		JUL 27 '99	
1600.00	8	80.00		JUL 27 '99	
1600.00	8	80.00		JUL 27 '99	
1600.00	8	80.00		JUL 27 '99	
6400.00 TOTAL OF K		320.00 TOTAL OF M			

*2 POST, FRACTION, REV CROWN GRANT AND PLACER CLAIM ARE 1 UNIT EACH

CASH IN LIEU OF WORK OR LEASE RENTAL

Q C/L	R RECORDING FEE	S LEASE RENTAL	T NEW EXPIRY DATE
TOTAL OF Q	TOTAL OF R	TOTAL OF S	

NOTICE TO GROUP No. _____ RECORDED NOV 29/89

Value of work to be credited to portable assessment credit (PAC) account(s).
[May only be credited from the approved value of Box C not applied to claims.]

Name of owner/operator	Name	Amount
	1. FALCONBRIDGE LIMITED	BALANCE
	2.	
	3.	

I, the undersigned Free Miner, hereby acknowledge and understand that it is an offence to knowingly make a false statement or provide false information under the Mineral Tenure Act. I further acknowledge and understand that if the statements made, or information given, in this Statement of Work — Cash Payment are found to be false and the exploration and development has not been performed, as alleged in this Statement of Work — Cash Payment, then the work reported on this statement will be cancelled and the subject mineral claim(s) may as a result, forfeit to and vest back to the Province.

STANLEY G. CLEMMER
Signature of Applicant

APPENDIX 2 : STATEMENT OF EXPENDITURE

VICTORIA OPTION : GEOLOGICAL SURVEY

SALARIES

1) Stan Clemmer - Project Geologist
   May 1 to Oct 1, 1989
   61 days @ $180.00/day.....$10,980.00
2) George King - Geologist
   May 1 to May 31, 1989
   13 days @ $125.00/day.....$ 1,625.00
3) Greg McGunigle - Technician
   May 1 to Sep 5, 1989
   41 days @ $100.00/day.....$ 4,100.00
4) Frank Renaudat - Technician
   Aug 20 to Sep 3, 1989
   11 days @ $140.00/day.....$ 1,540.00
5) Glen Bereti - Technician
   Jul 1 to Sep 30, 1989
   13 days @ $90.00/day.....$ 1,170.00
6) Greg Kozoris
   Aug 28 to Aug 31, 1989
   4 days @ $90.00/day.....$ 360.00

TOTAL SALARIES.....$ 19,775.00

ORTHOPHOTO

May 1 to Jul 24, 1989
The Orthoshop
#104-3016 19th St
Calgary, Alta.
2 1:5000 Orhtophotos.....$ 5,479.66

FIELD EXPENSES

Includes vehicle rental, rent, computer rental,
food, materials, etc.
May 1 to Oct 1, 1989 .....$ 11,790.85

ANALYTICAL COSTS

Xray Assay Laboratories
1885 Leslie Street
Don Mills, Ont.
176 samples whole rock @ $20.00/sample.....$ 3,520.00

Bondar-Clegg
130 Pemberton Ave.
North Vancouver, B.C.
22 samples rock geochem @ $20.00/sample.....$ 440.00
10 samples rock assay @ $ 7.00/sample.....$ 70.00

PETROGRAPHIC WORK
Vancouver Petrographics
P.O. Box 39
8080 Glover Road
Fort Langley, B.C.
29 thin section + descriptions.....$ 2,480.10

REPORT COSTS.....$ 1,000.00

TOTAL EXPENDITURES GEOLOGICAL SURVEY VICTORIA OPTION...$ 44,555.61

BABIY OPTION : GEOLOGICAL SURVEY

SALARIES

1) Stan Clemmer - Project Geologist
   May 1 to Oct 1, 1989
   12 days @ $180.00/day.....$ 2,160.00
2) Greg McGunigle - Technician
   May 1 to Sep 5, 1989
   4 days @ $100.00/day.....$ 400.00
3) Frank Renaudat - Technician
   Aug 20 to Sep 3, 1989
   3 days @ $140.00/day.....$ 420.00
4) Glen Bereti - Technician
   Jul 1 to Sep 30, 1989
   3 days @ $90.00/day.....$ 270.00

TOTAL SALARIES.....$ 3,250.00

FIELD EXPENSES

Includes vehicle rental, rent, computer rental, food, fuel, materials, etc.
Aug 1 to Oct 1, 1989 .....$ 6,470.96

ANALYTICAL COSTS

Xray Assay Laboratories
1885 Leslie Street
Don Mills, Ont.
120 samples whole rock @ $20.00/sample.....$ 2,400.00

Bondar-Clegg
130 Pemberton Ave.
North Vancouver, B.C.
11 samples rock geochem @ $20.00/sample.....$ 220.00
10 samples rock assay @ $ 7.00/sample.....$ 70.00

PETROGRAPHIC WORK

Vancouver Petrographics
P.O. Box 39
8080 Glover Road
Fort Langley, B.C.
29 thin section + descriptions.....$ 2,480.10

REPORT COSTS.....$ 1,000.00

TOTAL EXPENDITURES GEOLOGICAL SURVEY BABIY OPTION.....$ 15,891.06

VICTORIA OPTION - GEOPHYSICAL SURVEY

LINECUTTING
Ken Murray
424 Observatory St.
Nelson, B.C.
May 4 to Jun 23, 1989
33 km @$420.00/km.....$ 13,860.00

GEOPHYSICAL SURVEY
Delta Geoscience Ltd.
642 English Bluff Road
Delta, B.C.
Aug 4 to Aug 27, 1989
31.0 km MAG, VLF, IP.....$ 35,302.64

TOTAL EXPENDITURES GEOPHYSICAL SURVEY
VICTORIA OPTION.....$ 49,162.64

BABIY OPTION - GEOPHYSICAL SURVEY

GEOPHYSICAL SURVEY
Delta Geoscience Ltd.
642 English Bluff Road
Delta, B.C.
Aug 4 to Aug 27, 1989
4.5 km MAG, VLF, IP.....$ 5,509.20

TOTAL GEOPHYSICAL EXPENDITURES BABIY OPTION.....$ 5,509.20

TOTAL EXPENDITURE SUMMARY

TOTAL EXPENDITURE BABIY OPTION
RUST 1 TO 4 CLAIMS.....$ 21,400.26

TOTAL EXPENDITURE VICTORIA OPTION
PERCY 1, BLUFF 1,2 AND 4 CLAIMS.....$ 93,718.25

TOTAL EXPENDITURE BIRK CREEK PROPERTY.....$115,118.51

APPENDIX 3 : STATEMENT OF QUALIFICATIONS

I, Stanley Gordon Clemmer, of Burnaby, British Columbia, do hereby certify that:

1. I am employed by Falconbridge Limited, #202-856 Homer Street, Vancouver, British Columbia, as a Project Geologist.

2. I am a graduate of Carleton University of Ottawa with an Honours BSc. degree in Geology (1978).

3. I have been employed in mineral exploration in Canada since 1978.

4. I am a fellow of the Geological Association of Canada.

Dated this 27th day of November, 1989 at Vancouver, B.C.

Stanley G. Clemmer, BSc.

APPENDIX 4 : ANALYTICAL RESULTS AND PREUSSAG DRILL LOGS

Bondar-Clegg & Company Ltd.
130 Pemberton Ave.
North Vancouver, B.C.
V7P 2R5
(604) 985-0681 Telex 04-352667

BONDAR-CLEGG

in computer July 14/89

Geochemical Lab Report

REPORT: V89-02467.0 (COMPLETE)

REFERENCE INFO:

CLIENT: FALCONBRIDGE LIMITED
PROJECT: 601-146

SUBMITTED BY: S. CLEMMER
DATE PRINTED: 7-JUN-89

ORDER	ELEMENT		NUMBER OF ANALYSES	LOWER DETECTION LIMIT	EXTRACTION	METHOD
1	Au	Gold - Fire Assay	16	5 PPB	FIRE-ASSAY	Fire Assay AA
2	Ag	Silver	16	0.2 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
3	As	Arsenic	16	5 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
4	Ba	Barium	16	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
5	Be	Beryllium	16	1.0 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
6	Bi	Bismuth	16	2 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
7	Cd	Cadmium	16	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
8	Ce	Cerium	16	5 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
9	Co	Cobalt	16	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
10	Cr	Chromium	16	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
11	Cu	Copper	16	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
12	Ga	Gallium	16	2 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
13	La	Lanthanum	16	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
14	Li	Lithium	16	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
15	Mn	Manganese	16	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
16	Mo	Molybdenum	16	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
17	Nb	Niobium	16	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
18	Ni	Nickel	16	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
19	Pb	Lead	16	5 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
20	Rb	Rubidium	16	20 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
21	Sb	Antimony	16	5 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
22	Sc	Scandium	16	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
23	Sn	Tin	16	20 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
24	Sr	Strontium	16	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
25	Ta	Tantalum	16	10 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
26	Te	Tellurium	16	10 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
27	V	Vanadium	16	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
28	Y	Yttrium	16	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
29	Zn	Zinc	16	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
30	Zr	Zirconium	16	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
31	Ba	Barium	16	20 PPM		X-Ray Fluorescence

HEADER VA12251 - VA12266 ✓

Bondar-Clegg & Company Ltd.
130 Pemberton Ave.
North Vancouver, B.C.
V7P 2R5
4) 985-0681 Telex 04-352667

BONDAR-CLEGG

Geochemical Lab Report

REPORT: V89-02467.0 (COMPLETE)

REFERENCE INFO:

CLIENT: FALCONBRIDGE LIMITED
PROJECT: 601-146

SUBMITTED BY: S. CLEMMER
DATE PRINTED: 7-JUN-89

SAMPLE TYPES	NUMBER	SIZE FRACTIONS	NUMBER	SAMPLE PREPARATIONS	NUMBER
R ROCK OR BED ROCK	16	2 -150	16 *	CRUSH,PULVERIZE -150	14
				ASSAY PREP	2

NOTES: = indicates SEE REMARKS

REMARKS: = Ba - INTERFERENCE NOTED DUE TO Zn

Assay of Pb and Zn >3000 ppm to follow on V89-02467.6.

REPORT COPIES TO: MR. N. VON FERSEN
~~MS. PAT WHITING~~
MR. STAN CLEMMER

INVOICE TO: MR. N. VON FERSEN

Bondar-Clegg & Company Ltd.
130 Pemberton Ave.
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Geochemical Lab Report

REPORT: V89-02467.0 | PROJECT: 601-146 | PAGE 1A

SAMPLE NUMBER	ELEMENT UNITS	Au PPB	Ag PPM	As PPM	Ba PPM	Be PPM	Bi PPM	Cd PPM	Ce PPM	Co PPM	Cr PPM	Cu PPM
R2 VA12251		10	5.6	12	8	<1.0	<2	2	<5	3	262	65
R2 VA12252		109	0.2	<5	17	<1.0	9	<1	10	14	74	271
R2 VA12253		<5	2.9	21	30	<1.0	26	2	7	6	119	114
R2 VA12254		7	0.6	14	64	<1.0	3	<1	14	3	101	43
R2 VA12255		43	7.8	89	70	<1.0	12	25	14	8	128	91
R2 VA12256		34	3.4	35	67	<1.0	6	<1	36	3	78	113
R2 VA12257		6	0.2	<5	142	<1.0	12	<1	21	7	84	52
R2 VA12258		<5	0.2	9	62	<1.0	11	<1	19	4	102	18
R2 VA12259		6	1.4	44	61	<1.0	8	3	12	3	141	93
R2 VA12260		183	30.7	208	38	<1.0	147	559	214	77	61	5115
R2 VA12261		12	0.3	215	227	<1.0	25	3	16	8	96	106
R2 VA12262		22	1.7	136	132	<1.0	33	16	9	9	87	358
R2 VA12263		14	0.7	28	46	<1.0	52	1	6	55	80	670
R2 VA12264		20	1.1	32	65	<1.0	52	<1	6	21	87	563
R2 VA12265		<5	0.4	<5	11	<1.0	39	<1	6	37	78	1452
R2 VA12266		13	0.9	20	191	<1.0	112	166	<5	53	200	617

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Geochemical Lab Report

REPORT: V89-02467.0 | PROJECT: 601-146 | PAGE 18

SAMPLE NUMBER	ELEMENT UNITS	Ga PPM	La PPM	Li PPM	Mn PPM	Mo PPM	Nb PPM	Ni PPM	Pb PPM	Rb PPM	Sb PPM	Sc PPM
R2 VA12251		<2	<1	<1	147	2	<1	11	6576	<20	<5	<1
R2 VA12252		<2	<1	6	1308	<1	6	17	42	38	17	2
R2 VA12253		21	3	12	458	20	2	15	1137	53	34	4
R2 VA12254		<2	7	<1	51	21	<1	7	213	<20	<5	<1
R2 VA12255		<2	7	1	50	8	<1	16	>10000	<20	17	<1
R2 VA12256		<2	19	1	23	10	<1	8	4874	<20	8	<1
R2 VA12257		10	11	6	354	<1	1	18	94	<20	23	4
R2 VA12258		12	10	4	251	9	3	17	90	33	22	3
R2 VA12259		6	6	2	160	18	<1	7	607	<20	11	<1
R2 VA12260		205	22	21	1971	<1	67	12	>10000	5548	354	9
R2 VA12261		27	8	22	1007	3	2	27	451	<20	42	4
R2 VA12262		32	4	29	735	2	3	28	2349	<20	55	4
R2 VA12263		39	1	27	1031	3	<1	44	160	<20	65	4
R2 VA12264		40	<1	26	1032	3	<1	22	276	<20	64	5
R2 VA12265		29	<1	21	502	<1	<1	31	56	<20	48	7
R2 VA12266		31	<1	8	2145	<1	18	128	72	<20	130	10

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Geochemical Lab Report

REPORT: V89-02467.0 | PROJECT: 601-146 | PAGE 1C

SAMPLE NUMBER	ELEMENT UNITS	Sn PPM	Sr PPM	Ta PPM	Te PPM	V PPM	Y PPM	Zn PPM	Zr PPM	Ba PPM
R2 VA12251		<20	5	<10	<10	2	<1	329	<1	<20
R2 VA12252		<20	41	<10	<10	18	3	82	10	<20
R2 VA12253		<20	3	<10	<10	74	<1	521	4	310
R2 VA12254		<20	4	<10	<10	16	<1	56	6	860
R2 VA12255		<20	8	<10	<10	13	1	5130	7	1100
R2 VA12256		<20	38	<10	<10	25	<1	211	7	790
R2 VA12257		<20	52	<10	<10	22	2	72	3	840
R2 VA12258		<20	26	<10	<10	56	2	96	6	470
R2 VA12259		<20	6	<10	<10	34	1	640	8	740
R2 VA12260		<20	13	<10	97	60	5	>20000	20	260=
R2 VA12261		<20	20	<10	<10	39	2	684	9	1500
R2 VA12262		<20	16	<10	<10	42	2	3707	4	790
R2 VA12263		<20	5	<10	<10	48	<1	459	7	720
R2 VA12264		<20	4	<10	<10	59	<1	291	10	730
R2 VA12265		<20	9	<10	<10	61	1	98	3	90
R2 VA12266		40	83	<10	<10	116	<1	>20000	4	750=

Bondar-Clegg & Company Ltd.
130 Pemberton Ave.
North Vancouver, B.C.
V7P 2R5
(604) 985-0681 Telex 04-352667

BONDAR-CLEGG

in computa July 14/89.

Certificate of Analysis

REPORT: V89-02467.4 (COMPLETE)

REFERENCE INFO:

CLIENT: FALCONBRIDGE LIMITED
PROJECT: 601-146

SUBMITTED BY: S. CLEMMER
DATE PRINTED: 6-JUN-89

ORDER		ELEMENT	NUMBER OF ANALYSES	LOWER DETECTION LIMIT	EXTRACTION	METHOD
1	Au	Gold	1	0.002 OPT		Fire Assay
2	Ag	Silver	1	0.02 OPT		Fire Assay
3	Cu	Copper	1	0.01 PCT		Atomic Absorption
4	Pb	Lead	1	0.01 PCT		Atomic Absorption
5	Zn	Zinc	2	0.01 PCT		Atomic Absorption

SAMPLE TYPES	NUMBER	SIZE FRACTIONS	NUMBER	SAMPLE PREPARATIONS	NUMBER
R ROCK OR BED ROCK	2	2 -150	2	CRUSH,PULVERIZE -150	2

REPORT COPIES TO: MR. N. VON FERSEN
MS. PAT WHITING
MR. STAN CLEMMER

INVOICE TO: MR. N. VON FERSEN

Follow up ✓

Bondar-Clegg & Company Ltd.
130 Pemberton Ave.
North Vancouver, B.C.
V7P 2R5
(604) 985-0681 Telex 04-352667

BONDAR-CLEGG

Certificate of Analysis

REPORT: V89-02467.4

PROJECT: 601-146 PAGE 1

SAMPLE NUMBER	ELEMENT UNITS	Au OPT	Ag OPT	Cu PCT	Pb PCT	Zn PCT
R2 VA12260		0.007	0.77	0.66	4.33	15.00→150000
R2 VA12266		240.0 PPB	26.4 PPM	6000 PPM	43300 PPM	4.18 41800

Registered Assayer, Province of British Columbia

Bondar-Clegg & Company Ltd.
130 Pemberton Ave.
North Vancouver, B.C.
V7P 2R5
(604) 985-0681 Telex 04-352667

BONDAR-CLEGG

In computer July 14/89

Certificate of Analysis

A DIVISION OF INCHCAPE INSPECTION & TESTING SERVICES

REPORT: V89-02467.6 (COMPLETE)

REFERENCE INFO:

CLIENT: FALCONBRIDGE LIMITED
PROJECT: 601-146

SUBMITTED BY: S. CLEMMER
DATE PRINTED: 12-JUN-89

ORDER	ELEMENT		NUMBER OF ANALYSES	LOWER DETECTION LIMIT	EXTRACTION	METHOD
1	Pb	Lead	3	0.01 PCT		Atomic Absorption
2	Zn	Zinc	2	0.01 PCT		Atomic Absorption

SAMPLE TYPES	NUMBER	SIZE FRACTIONS	NUMBER	SAMPLE PREPARATIONS	NUMBER
R ROCK OR BED ROCK	4	2 -150	4	AS RECEIVED, NO SP	4

REPORT COPIES TO: MR. N. VON FERSEN
MS. PAT WHITING
MR. STAN CLEMMER

INVOICE TO: MR. N. VON FERSEN

Followup ✓

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Certificate of Analysis

A DIVISION OF INCHCAPE INSPECTION & TESTING SERVICES

REPORT: V89-02467.6

PROJECT: 601-146 PAGE 1

SAMPLE NUMBER	ELEMENT UNITS	Pb PCT	Pb PPM	Zn PCT	Zn PPM
R2 VA12251		0.69	6900		
R2 VA12255		1.12	11200	0.48	4800
R2 VA12256		0.46	4600		
R2 VA12262				0.38	3800

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in Computer July 14/89

Geochemical Lab Report

A DIVISION OF INCHCAPE INSPECTION & TESTING SERVICES

REPORT: V89-02935.0 (COMPLETE)

REFERENCE INFO:

CLIENT: FALCONBRIDGE LIMITED
PROJECT: 601-146

SUBMITTED BY: S. CLEMMER
DATE PRINTED: 26-JUN-89

ORDER		ELEMENT	NUMBER OF ANALYSES	LOWER DETECTION LIMIT	EXTRACTION	METHOD
1	Au	Gold - Fire Assay	18	5 PPB	FIRE-ASSAY	Fire Assay AA
2	Ag	Silver	18	0.2 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
3	As	Arsenic	18	5 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
4	Ba	Barium	18	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
5	Be	Beryllium	18	0.5 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
6	Bi	Bismuth	18	2 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
7	Cd	Cadmium	18	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
8	Ce	Cerium	18	5 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
9	Co	Cobalt	18	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
10	Cr	Chromium	18	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
11	Cu	Copper	18	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
12	Ga	Gallium	18	2 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
13	La	Lanthanum	18	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
14	Li	Lithium	18	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
15	Mn	Manganese	18	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
16	Mo	Molybdenum	18	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
17	Nb	Niobium	18	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
18	Ni	Nickel	18	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
19	Pb	Lead	18	2 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
20	Rb	Rubidium	18	20 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
21	Sb	Antimony	18	5 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
22	Sc	Scandium	18	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
23	Sn	Tin	18	20 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
24	Sr	Strontium	18	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
25	Ta	Tantalum	18	10 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
26	Te	Tellurium	18	10 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
27	V	Vanadium	18	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
28	Y	Yttrium	18	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
29	Zn	Zinc	18	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
30	Zr	Zirconium	18	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
31	Ba	Barium	18	20 PPM		X-Ray Fluorescence

Header. VA12267 - 12284 ✓

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A DIVISION OF INCHCAPE INSPECTION & TESTING SERVICES

Geochemical Lab Report

REPORT: V89-02935.0 (COMPLETE)

REFERENCE INFO:

CLIENT: FALCONBRIDGE LIMITED
PROJECT: 601-146

SUBMITTED BY: S. CLEMMER
DATE PRINTED: 26-JUN-89

SAMPLE TYPES	NUMBER	SIZE FRACTIONS	NUMBER	SAMPLE PREPARATIONS	NUMBER
R ROCK OR BED ROCK	18	2 -150	18	CRUSH,PULVERIZE -150	18

NOTES: = indicates SEE REMARKS
* indicates INTERFERENCE NOTED

REMARKS: = Ba - interference noted due to Zn
* Ba - interference noted due to Fe
Assay of Au >1000 ppb, Ag >30 ppm, and Cu, Pb,
Zn >3000 ppm to follow on V89-02935.6.

** ERRATIC GOLD RESULTS NOTED:
SAMPLE VA12278 CHECKS = 1118 & 258 PPB Au

REPORT COPIES TO: MR. N. VON FERSEN
MS. PAT WHITING
MR. STAN CLEMMER

INVOICE TO: MR. N. VON FERSEN

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Geochemical Lab Report

REPORT: V89-02935.0

DATE PRINTED: 26-JUN-89
PROJECT: 601-146 PAGE 1A

SAMPLE NUMBER	ELEMENT UNITS	Au PPB	Ag PPM	As PPM	Ba PPM	Be PPM	Bi PPM	Cd PPM	Ce PPM	Co PPM	Cr PPM	Cu PPM
R2 VA12267		13	1.0	71	25	24.9	38	2	15	19	102	863
R2 VA12268		21	1.2	132	22	31.9	65	5	15	44	397	1212
R2 VA12269		19	0.2	46	71	2.7	4	<1	14	<1	168	14
R2 VA12270		19	0.3	33	84	2.2	3	<1	17	<1	161	8
R2 VA12271		40	0.4	45	88	2.6	<2	<1	15	<1	163	14
R2 VA12272		35	0.4	88	137	4.1	4	<1	13	<1	246	14
R2 VA12273		15	4.3	103	39	15.2	27	9	7	18	140	225
R2 VA12274		<5	0.4	51	121	4.1	11	<1	19	3	228	46
R2 VA12275		<5	<0.2	71	390	8.1	24	<1	15	4	204	29
R2 VA12276		90	1.4	482	15	46.7	62	<1	<5	110	274	1434
R2 VA12277		295	4.5	398	12	50.2	44	<1	<5	20	153	1886
R2 VA12278		2624	16.2	178	14	19.6	47	85	<5	3	244	8760
R2 VA12279		36	1.7	318	11	46.4	35	<1	<5	48	27	4103
R2 VA12280		140	5.1	499	19	36.6	78	<1	<5	77	89	3767
R2 VA12281		153	40.5	348	20	25.8	125	247	<5	36	87	2929
R2 VA12282		182	5.5	85	38	25.9	37	9	<5	105	156	570
R2 VA12283		455	23.8	221	34	6.8	50	111	<5	18	170	1276
R2 VA12284		49	46.0	48	25	3.8	33	34	<5	3	399	142

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Geochemical Lab Report

REPORT: V89-02935.0

DATE PRINTED: 26 JUN 89
PROJECT: 601-146 PAGE 1B

SAMPLE NUMBER	ELEMENT UNITS	Ga PPM	La PPM	Li PPM	Mn PPM	Mo PPM	Nb PPM	Ni PPM	Pb PPM	Rb PPM	Sb PPM	Sc PPM
R2 VA12267		28	2	17	431	3	<1	40	92	57	51	12
R2 VA12268		41	<1	32	607	<1	5	161	91	326	92	10
R2 VA12269		<2	8	1	24	11	<1	6	43	36	7	<1
R2 VA12270		<2	10	1	18	11	<1	4	100	43	7	<1
R2 VA12271		<2	9	<1	45	12	<1	3	84	<20	<5	<1
R2 VA12272		<2	8	<1	68	13	<1	5	125	32	6	<1
R2 VA12273		6	<1	3	134	7	<1	37	1808	<20	30	2
R2 VA12274		11	10	3	176	21	<1	13	42	39	19	2
R2 VA12275		25	8	18	568	19	<1	21	29	30	39	6
R2 VA12276		27	<1	7	511	4	<1	81	63	63	66	6
R2 VA12277		<2	<1	2	126	5	<1	11	124	24	34	<1
R2 VA12278		28	<1	10	465	3	3	24	1430	91	75	2
R2 VA12279		<2	<1	2	382	9	<1	58	76	53	35	1
R2 VA12280		29	<1	19	611	4	<1	5	699	28	68	3
R2 VA12281		25	<1	10	475	1	3	<1	>10000	<20	138	2
R2 VA12282		9	<1	6	347	2	<1	13	2239	<20	37	3
R2 VA12283		10	<1	1	285	2	<1	10	>10000	<20	80	1
R2 VA12284		<2	<1	<1	63	1	<1	6	>10000	<20	35	<1

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Geochemical Lab Report

REPORT: V89-02935.0

DATE PRINTED: 26-JUN-89
PROJECT: 601-146 PAGE 1C

SAMPLE NUMBER	ELEMENT UNITS	Sn PPM	Sr PPM	Ta PPM	Te PPM	V PPM	Y PPM	Zn PPM	Zr PPM	Ba PPM
R2 VA12267		<20	23	<10	<10	206	3	514	3	20
R2 VA12268		<20	78	<10	25	156	5	1003	2	40
R2 VA12269		<20	5	<10	<10	20	1	48	4	530
R2 VA12270		<20	4	<10	<10	16	<1	25	4	760
R2 VA12271		<20	4	<10	<10	16	<1	53	4	710
R2 VA12272		<20	7	<10	<10	20	<1	29	4	700
R2 VA12273		<20	6	<10	<10	21	1	2549	7	880
R2 VA12274		<20	3	<10	<10	29	1	90	7	590
R2 VA12275		<20	5	<10	<10	76	1	72	7	650
R2 VA12276		<20	18	<10	<10	89	2	95	<1	40
R2 VA12277		<20	5	<10	<10	6	1	36	<1	80
R2 VA12278		<20	4	<10	22	19	2	17791	1	<20=
R2 VA12279		<20	4	<10	<10	3	3	101	<1	<20=
R2 VA12280		<20	13	<10	<10	31	<1	505	4	300
R2 VA12281		<20	17	<10	<10	13	1	>20000	5	190=
R2 VA12282		<20	2	<10	<10	15	<1	1673	4	510
R2 VA12283		<20	2	<10	<10	7	<1	>20000	5	300=
R2 VA12284		<20	9	<10	12	2	<1	6099	<1	190

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in computer July 14/89.

Certificate of Analysis

A DIVISION OF INCHCAPE INSPECTION & TESTING SERVICES

REPORT: V89-02935.6 (COMPLETE)

REFERENCE INFO:

CLIENT: FALCONBRIDGE LIMITED
PROJECT: 601-146

SUBMITTED BY: S. CLEMMER
DATE PRINTED: 26-JUN-89

ORDER		ELEMENT	NUMBER OF ANALYSES	LOWER DETECTION LIMIT	EXTRACTION	METHOD
1	Au	Gold	1	0.002 OPT		Fire Assay
2	Ag	Silver	2	0.02 OPT	HF-HNO3-HClO4-HCl	Atomic Absorption
3	Cu	Copper	3	0.01 PCT		Atomic Absorption
4	Pb	Lead	3	0.01 PCT		Atomic Absorption
5	Zn	Zinc	4	0.01 PCT		Atomic Absorption

SAMPLE TYPES	NUMBER	SIZE FRACTIONS	NUMBER	SAMPLE PREPARATIONS	NUMBER
R ROCK OR BED ROCK	6	2 -150	6	AS RECEIVED, NO SP	6

NOTES: # indicates ERRATIC RESULTS

REPORT COPIES TO: MR. N. VON FERSEN
MS. PAT WHITING
MR. STAN CLEMMER

INVOICE TO: MR. N. VON FERSEN

Follow up ✓

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Certificate of Analysis

REPORT: V89-02935.6

~~DATE PRINTED: 26-JUN-89~~
PROJECT: 601-146 PAGE 1

SAMPLE NUMBER	ELEMENT UNITS	Au PPB OPT	Ag PPM OPT	Cu PCT PPM	Pb PCT PPM	Zn PCT PPM
R2 VA12278		0.012		0.71 7100		1.49 14900
R2 VA12279		411.42		0.37 3700		
R2 VA12280				0.36 3600		
R2 VA12281			1.14	2.72 27200		4.98 49800
R2 VA12283			39.08	1.40 14000		2.16 21600
R2 VA12284			1.21	2.68 26800		0.55 5500
			41.48			

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A DIVISION OF INCHCAPE INSPECTION & TESTING SERVICES

in computer Oct. 23/89

Geochemical Lab Report

REPORT: V89-06196.0 (COMPLETE)

REFERENCE INFO:

CLIENT: FALCONBRIDGE LIMITED
PROJECT: 605-145

SUBMITTED BY: S. CLEMMER
DATE PRINTED: 29-SEP-89

ORDER		ELEMENT	NUMBER OF ANALYSES	LOWER DETECTION LIMIT	EXTRACTION	METHOD
1	Au	Gold - Fire Assay	10	5 PPB	FIRE-ASSAY	Fire Assay AA
2	Ag	Silver	10	0.2 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
3	As	Arsenic	10	5 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
delete → 4	Ba	Barium	10	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
5	Be	Beryllium	10	0.5 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
6	Bi	Bismuth	10	2 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
7	Cd	Cadmium	10	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
8	Ce	Cerium	10	5 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
9	Co	Cobalt	10	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
10	Cr	Chromium	10	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
11	Cu	Copper	10	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
12	Ga	Gallium	10	2 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
13	La	Lanthanum	10	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
14	Li	Lithium	10	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
15	Mn	Manganese	10	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
16	Mo	Molybdenum	10	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
17	Nb	Niobium	10	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
18	Ni	Nickel	10	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
19	Pb	Lead	10	2 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
20	Rb	Rubidium	10	20 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
21	Sb	Antimony	10	5 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
22	Sc	Scandium	10	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
23	Sn	Tin	10	20 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
24	Sr	Strontium	10	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
25	Ta	Tantalum	10	10 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
26	Te	Tellurium	10	10 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
27	V	Vanadium	10	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
28	Y	Yttrium	10	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
29	Zn	Zinc	10	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
30	Zr	Zirconium	10	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
31	Ba	Barium	10	20 PPM		X-Ray Fluorescence

HEADER : VA12285 - ~~VA12294~~ VA12294

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A DIVISION OF INCHCAPE INSPECTION & TESTING SERVICES

Geochemical Lab Report

REPORT: V89-06196.0 (COMPLETE)

REFERENCE INFO:

CLIENT: FALCONBRIDGE LIMITED
PROJECT: 605-145

SUBMITTED BY: S. CLEMMER
DATE PRINTED: 29-SEP-89

SAMPLE TYPES	NUMBER	SIZE FRACTIONS	NUMBER	SAMPLE PREPARATIONS	NUMBER
R ROCK OR BED ROCK	10	2 -150	10	CRUSH,PULVERIZE -150	10

NOTES: = indicates SEE REMARKS
* indicates INTERFERENCE NOTED

REMARKS: =Ba- interference noted due to Fe.
*Ba- interference noted due to Zn.

Assay of high Ag, Cu, Pb, & Zn > 3000 ppb to follow on V89-06196.6

REPORT COPIES TO: MR. W. VON ERSEN
MS. PAT WHITING
MR. STAN CLEMMER

INVOICE TO: MR. W. VON ERSEN

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Geochemical Lab Report

REPORT: V89-06196.0

DATE PRINTED: 29-SEP-89
PROJECT: 605-145 PAGE 1A

SAMPLE NUMBER	ELEMENT UNITS	Au PPB	Ag PPM	As PPM	Ba PPM	Be PPM	Bi PPM	Cd PPM	Ce PPM	Co PPM	Cr PPM	Cu PPM
R2 VA12285		<5	<0.2	61	20	<0.5	2	<1	15	14	164	18
R2 VA12286		76	>50.0	117	30	<0.5	3	43	9	6	92	236
R2 VA12287		629	15.9	123	141	<0.5	<2	<1	19	10	63	20
R2 VA12288		102	16.4	411	28	<0.5	12	4	<5	26	174	403
R2 VA12289		12	1.0	282	197	<0.5	<2	2	12	<1	81	77
R2 VA12290		22	3.1	52	69	<0.5	6	23	<5	17	126	309
R2 VA12291		10	5.2	<5	52	<0.5	31	67	8	7	23	481
R2 VA12292		8	4.5	<5	13	<0.5	<2	1	20	122	155	1351
R2 VA12293		75	3.1	214	9	<0.5	9	<1	8	9	153	765
R2 VA12294		22	3.4	112	6	<0.5	11	2	7	5	58	3162

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Geochemical Lab Report

REPORT: V89-06196.0

DATE PRINTED: 29-SEP-89
PROJECT: 605-145 PAGE 1B

SAMPLE NUMBER	ELEMENT UNITS	Ga PPM	La PPM	Li PPM	Mn PPM	Mo PPM	Nb PPM	Ni PPM	Pb PPM	Rb PPM	Sb PPM	Sc PPM
R2 VA12285		13	5	3	1865	11	13	59	11	22	<5	5
R2 VA12286		2	4	1	22	<1	1	4	>10000	101	>2000	<1
R2 VA12287		<2	7	2	14	<1	<1	6	1782	78	19	2
R2 VA12288		<2	1	7	237	5	<1	6	3049	72	5	2
R2 VA12289		<2	8	4	111	12	1	5	508	113	<5	3
R2 VA12290		8	2	5	709	3	6	8	3132	<20	6	4
R2 VA12291		<2	3	12	4638	<1	32	12	1771	136	19	4
R2 VA12292		13	2	26	1638	2	9	62	1020	1159	<5	9
R2 VA12293		<2	3	20	131	6	<1	25	195	130	<5	3
R2 VA12294		<2	9	5	786	5	<1	15	141	156	<5	4

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Geochemical Lab Report

REPORT: V89-06196.0

DATE PRINTED: 29 SEP 89
PROJECT: 605-145 PAGE 1C

SAMPLE NUMBER	ELEMENT UNITS	Sn PPM	Sr PPM	Ta PPM	Te PPM	V PPM	Y PPM	Zn PPM	Zr PPM	Ba PPM
R2 VA12285		<20	651	<10	<10	6	6	44	5	40
R2 VA12286		<20	7	<10	<10	3	<1	450	2	200
R2 VA12287		<20	9	<10	<10	8	<1	6	10	2900
R2 VA12288		<20	6	<10	<10	13	<1	845	6	410
R2 VA12289		<20	36	<10	<10	77	1	336	8	370=
R2 VA12290		<20	35	<10	<10	20	2	6353	5	850
R2 VA12291		<20	475	<10	11	25	12	11913	2	80*
R2 VA12292		22	26	<10	<10	92	2	453	2	40
R2 VA12293		<20	3	<10	<10	28	1	365	9	70
R2 VA12294		<20	25	<10	<10	35	2	402	9	<20=

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BONDAR-CLEGG

Certificate of Analysis

in computer Oct 23/89.

REPORT: V89-06196.6 (COMPLETE)

REFERENCE INFO:

CLIENT: FALCONBRIDGE LIMITED
PROJECT: 605

SUBMITTED BY: S. CLEMMER
DATE PRINTED: 13-OCT-89

ORDER	ELEMENT		NUMBER OF ANALYSES	LOWER DETECTION LIMIT	EXTRACTION	METHOD
1	Ag	Silver	1	0.02 OPT		Fire Assay
2	Cu	Copper	1	0.01 PCT		Atomic Absorption
3	Pb	Lead	3	0.01 PCT		Atomic Absorption
4	Zn	Zinc	2	0.01 PCT		Atomic Absorption

SAMPLE TYPES	NUMBER	SIZE FRACTIONS	NUMBER	SAMPLE PREPARATIONS	NUMBER
R ROCK OR BED ROCK	5	2 -150	5	AS RECEIVED, NO SP	5

REPORT COPIES TO: MR. N. VON FERSEN
MS. PAT WHITING
MR. STAN CLEMMER

INVOICE TO: MR. N. VON FERSEN

Follow up.

Bondar-Clegg & Company Ltd.
130 Pemberton Ave.
North Vancouver, B.C.
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(604) 985-0681 Telex 04-352667

BONDAR-CLEGG

Certificate of Analysis

DATE PRINTED: 13-OCT-89

REPORT: V89-06196.6 | PROJECT: 605-145 | PAGE 1

SAMPLE NUMBER	ELEMENT UNITS	Ag OPT	Cu PCT	Pb PCT	Zn PCT
R2 VA12286		76.62		39.30	
R2 VA12288				0.31	
R2 VA12290				0.29	0.64
R2 VA12291					1.24
R2 VA12294			0.27		

Registered Assayer, Province of British Col

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130 Pemberton Ave.
North Vancouver, B.C.
V7P 2R5
(604) 985-0681 Telex 04-352667

BONDAR-CLEGG

in computa Oct 23/89

Geochemical Lab Report

A DIVISION OF INCHCAPE INSPECTION & TESTING SERVICES

REPORT: V89-06942.0 (COMPLETE)

REFERENCE INFO:

CLIENT: FALCONBRIDGE LIMITED
PROJECT: 601-[redacted]

SUBMITTED BY: S. CLEMMER
DATE PRINTED: 18-OCT-89

ORDER		ELEMENT	NUMBER OF ANALYSES	LOWER DETECTION LIMIT	EXTRACTION	METHOD
1	Au	Gold - Fire Assay	3	5 PPB	FIRE-ASSAY	Fire Assay AA
2	Ag	Silver	3	0.2 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
3	As	Arsenic	3	5 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
(4)	Ba	Barium	3	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
5	Be	Beryllium	3	0.5 PPM	HNO3-HCl HOT EXTR	Ind. Coupled Plasma
6	Bi	Bismuth	3	2 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
7	Cd	Cadmium	3	1 PPM	HNO3-HCl HOT EXTR	Ind. Coupled Plasma
8	Ce	Cerium	3	5 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
9	Co	Cobalt	3	1 PPM	HNO3-HCl HOT EXTR	Ind. Coupled Plasma
10	Cr	Chromium	3	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
11	Cu	Copper	3	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
12	Ga	Gallium	3	2 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
13	La	Lanthanum	3	1 PPM	HNO3-HCl HOT EXTR	Ind. Coupled Plasma
14	Li	Lithium	3	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
15	Mn	Manganese	3	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
16	Mo	Molybdenum	3	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
17	Nb	Niobium	3	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
18	Ni	Nickel	3	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
19	Pb	Lead	3	2 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
20	Rb	Rubidium	3	20 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
21	Sb	Antimony	3	5 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
22	Sc	Scandium	3	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
23	Sn	Tin	3	20 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
24	Sr	Strontium	3	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
25	Ta	Tantalum	3	10 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
26	Te	Tellurium	3	10 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
27	V	Vanadium	3	1 PPM	HNO3-HCl HOT EXTR	Ind. Coupled Plasma
28	Y	Yttrium	3	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
29	Zn	Zinc	3	1 PPM	HNO3-HCl HOT EXTR	Ind. Coupled Plasma
30	Zr	Zirconium	3	1 PPM	HNO3-HCL HOT EXTR	Ind. Coupled Plasma
31	(Ba)	Barium	3	20 PPM		X-Ray Fluorescence

delete

HEADER VA12295 - VA12297 ✓

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BONDAR-CLEGG

A DIVISION OF INCHCAPE INSPECTION & TESTING SERVICES

Geochemical Lab Report

REPORT: V89-06942.0 (COMPLETE)

REFERENCE INFO:

CLIENT: FALCONBRIDGE LIMITED
PROJECT: 601-146

SUBMITTED BY: S. CLEMMER
DATE PRINTED: 18-OCT-89

SAMPLE TYPES	NUMBER	SIZE FRACTIONS	NUMBER	SAMPLE PREPARATIONS	NUMBER
R ROCK OR BED ROCK	3	2 -150	3	CRUSH,PULVERIZE -150	3

NOTES: = indicates SEE REMARKS

REMARKS: =Ba - interference noted due to Fe.

Assay of Cu > 30000 ppm to follow on V89-06942.6

REPORT COPIES TO: MR. STAN CLEMMER
MR. N. VON FERSEN
MS. PAT WHITING

INVOICE TO: MR. STAN CLEMMER
MR. N. VON FERSEN

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Geochemical Lab Report

DATE PRINTED: 18-OCT-89

REPORT: V89-06942.0

PROJECT: 601-146 PAGE 1A

SAMPLE NUMBER	ELEMENT UNITS	Au PPB	Ag PPM	As PPM	Ba PPM	Be PPM	Bi PPM	Cd PPM	Ce PPM	Co PPM	Cr PPM	Cu PPM
R2 VA12295		58	2.2	13	50	<0.5	<2	4	<5	3	39	4927
R2 VA12296		234	3.6	386	17	<0.5	<2	<1	<5	35	130	478
R2 VA12297		<5	0.5	27	11	<0.5	<2	<1	13	4	74	2106

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Geochemical Lab Report

DATE PRINTED: 18-OCT-89

REPORT: V89-06942.0 | PROJECT: 601-146 | PAGE 1B

SAMPLE NUMBER	ELEMENT UNITS	Ga PPM	La PPM	Li PPM	Mn PPM	Mo PPM	Nb PPM	Ni PPM	Pb PPM	Rb PPM	Sb PPM	Sc PPM
R2 VA12295		7	<1	7	1164	9	3	39	<2	<20	<5	5
R2 VA12296		<2	<1	2	126	7	<1	12	233	<20	5	<1
R2 VA12297		6	<1	5	505	6	2	12	<2	<20	<5	2

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A DIVISION OF INCHCAPE INSPECTION & TESTING SERVICES

Geochemical Lab Report

DATE PRINTED: 18-OCT-89

REPORT: V89-06942.0 | PROJECT: 601-146 | PAGE 1C

SAMPLE NUMBER	ELEMENT UNITS	Sn PPM	Sr PPM	Ta PPM	Te PPM	V PPM	Y PPM	Zn PPM	Zr PPM	Ba PPM
R2 VA12295		<20	27	<10	<10	30	4	705	1	90=
R2 VA12296		<20	2	<10	<10	<1	<1	60	3	220
R2 VA12297		<20	13	<10	<10	7	4	39	<1	50

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A DIVISION OF INCHCAPE INSPECTION & TESTING SERVICES

Certificate of Analysis

In computer Oct 23/89

REPORT: V89-06942.6 (COMPLETE)

REFERENCE INFO:

CLIENT: FALCONBRIDGE LIMITED
PROJECT: 601-146

SUBMITTED BY: S. CLEMMER
DATE PRINTED: 18-OCT-89

ORDER	ELEMENT	NUMBER OF ANALYSES	LOWER DETECTION LIMIT	EXTRACTION	METHOD
1	Cu Copper	1	0.01 PCT		Atomic Absorption

SAMPLE TYPES	NUMBER	SIZE FRACTIONS	NUMBER	SAMPLE PREPARATIONS	NUMBER
R ROCK OR BED ROCK	1	2 -150	1	AS RECEIVED, NO SP	1

REPORT COPIES TO: MR. SIAN CLEMMER
MR. N. VON FERSEN
MS. PAT WHITING

INVOICE TO: MR. SIAN CLEMMER
MR. N. VON FERSEN

Follow up

Bondar-Clegg & Company Ltd.
130 Pemberton Ave.
North Vancouver, B.C.
V7P 2R5
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A DIVISION OF INCHCAPE INSPECTION & TESTING SERVICES

Certificate of Analysis

REPORT: V89-06942.6

DATE PRINTED: 18-OCT-89
PROJECT: 601-146 PAGE 1

SAMPLE NUMBER	ELEMENT UNITS	Cu PCT	
R2 VA12295		0.46	4600

Registered Assayer, Province of British Columbia

XRAL

X-RAY ASSAY LABORATORIES

A DIVISION OF SGS SUPERVISION SERVICES INC.
1885 LESLIE STREET • DON MILLS, ONTARIO M3B 3J4 • CANADA
TEL: (416)445-5755 TELEX: 06-986947 FAX: (416)445-4152

CERTIFICATE OF ANALYSIS

REPORT 8729

in computer July 16/89.

TO: FALCONBRIDGE LIMITED
ATTN: N. VON FERSEN
202-856 HOMER STREET
VANCOUVER, BRITISH COLUMBIA
V6B 2W2

CUSTOMER No. 1282

DATE SUBMITTED
1-Jun-89

REF. FILE 4784-V2

Total Pages 2

30 ROCKS Proj. 601-146

	METHOD	DETECTION LIMIT
WRMAJ %	WR	0.01
WRMIN PPM	WR	10.

*** UNLESS INSTRUCTED OTHERWISE WE WILL DISCARD PULPS 180 DAYS ***
AND REJECTS 30 DAYS FROM DATE OF THIS REPORT

HEADER
VA12011 - 12040 ✓

DATE 19-JUN-89

CERTIFIED BY

Jean H.L. Opdebeeck, Vice President Operations

SAMPLE \ %	SIO2	AL2O3	CAO	MGO	NA2O	K2O	FE2O3	TIO2	LOI	SUM
VA12011	59.8	16.0	3.73	4.27	3.44	1.46	6.82	0.53	3.70	99.8
VA12012	65.0	15.8	0.66	4.84	0.39	3.28	4.89	0.47	3.93	99.4
VA12013	59.2	14.7	1.34	6.80	0.11	2.07	8.53	1.25	5.31	99.5
VA12014	60.3	10.4	1.43	7.03	0.02	0.89	11.0	0.86	6.93	99.1
VA12015	86.4	6.46	0.24	0.45	0.10	1.66	1.03	0.25	2.70	99.4
VA12016	60.5	16.8	1.70	3.31	1.29	3.21	6.21	0.61	4.23	98.0
VA12017	69.2	14.7	0.46	3.83	0.21	2.98	3.13	0.72	3.39	98.8
VA12018	66.4	16.1	0.31	2.08	1.11	3.17	5.41	0.54	4.31	99.6
VA12019	61.8	15.5	1.76	4.62	0.33	3.63	6.43	0.54	4.85	99.6
VA12020	71.8	11.8	0.20	1.45	0.21	3.04	5.13	0.58	4.39	98.8
VA12021	79.2	12.1	0.12	0.41	0.17	3.49	0.56	0.23	2.23	98.6
VA12022	21.1	16.6	0.66	17.3	0.66	0.14	15.8	0.82	12.5	92.2
VA12023	62.1	14.0	1.15	7.89	0.09	1.83	6.47	0.78	4.93	99.4
VA12024	59.5	15.3	0.75	9.14	0.34	1.82	6.84	0.53	5.23	99.6
VA12025	53.0	14.8	0.22	5.90	0.15	2.22	14.5	0.71	8.62	100.4
VA12026	62.3	14.9	0.61	5.48	0.31	2.72	6.70	0.74	4.54	98.5
VA12027	64.6	15.1	0.70	3.18	1.24	2.92	7.57	0.50	3.16	99.2
VA12028	58.6	15.5	1.40	3.79	3.04	0.65	11.4	0.77	4.08	99.3
VA12029	57.6	18.7	0.79	3.36	2.56	1.24	10.4	0.96	3.70	99.4
VA12030	69.9	11.3	2.27	2.53	1.50	1.98	6.82	0.67	2.62	99.7
VA12031	72.7	13.8	0.96	1.40	0.32	3.39	3.84	0.27	2.54	99.6
VA12032	58.6	17.9	0.82	3.73	0.26	3.65	9.03	0.88	3.31	98.5
VA12033	51.2	14.6	3.55	6.19	0.82	1.51	14.1	2.55	4.08	98.8
VA12034	71.0	13.4	0.45	2.34	0.61	3.30	5.28	0.26	2.23	99.2
VA12035	53.5	11.0	0.68	7.98	0.11	0.43	15.5	2.51	6.08	98.3
VA12036	45.6	8.10	10.7	4.52	0.39	1.94	14.0	2.64	3.47	92.3
VA12037	82.4	7.08	1.29	1.60	0.62	1.34	4.04	0.50	1.00	100.0
VA12038	52.6	12.8	1.09	6.12	2.45	0.13	16.6	2.12	5.62	99.7
VA12039	72.0	13.4	0.32	1.57	1.53	2.81	5.03	0.26	2.62	100.0
VA12040	70.4	14.1	0.50	1.76	0.63	3.71	4.42	0.27	2.39	98.7

XRF W.R.A. SUMS INCLUDE ALL ELEMENTS DETERMINED. FOR SUMMATION, ELEMENTS ARE CALCULATED AS OXIDES

SAMPLE \ PPM	BA	NI	CU	ZN
VA12011	619	<10	35	81
VA12012	814	<10	<10	72
VA12013	771	18	92	367
VA12014	336	27	273	1600
VA12015	752	<10	30	367
VA12016	842	<10	32	245
VA12017	1070	35	<10	219
VA12018	1050	<10	15	77
VA12019	638	12	38	187
VA12020	1020	16	232	293
VA12021	1030	<10	<10	29
VA12022	217	53	5930	47000
VA12023	1020	28	118	607
VA12024	1010	<10	80	517
VA12025	1130	50	640	551
VA12026	1360	32	136	202
VA12027	1890	11	88	67
VA12028	318	25	345	79
VA12029	461	18	318	65
VA12030	590	26	265	124
VA12031	2950	<10	152	91
VA12032	2680	43	139	341
VA12033	817	73	149	555
VA12034	3080	<10	62	117
VA12035	285	162	542	2800
VA12036	664	122	522	6290
VA12037	583	15	166	572
VA12038	161	100	389	571
VA12039	3360	<10	421	92
VA12040	4740	<10	88	84

XRAL

X-RAY ASSAY LABORATORIES

A DIVISION OF SGS SUPERVISION SERVICES INC.
1885 LESLIE STREET • DON MILLS, ONTARIO M3B 3J4 • CANADA
TEL: (416)445-5755 TELEX: 06-986947 FAX: (416)445-4152

CERTIFICATE OF ANALYSIS

REPORT 8757

computer in July 16/89.

TO: FALCONBRIDGE LIMITED
ATTN: N. VON FERSEN
202-856 HOMER STREET
VANCOUVER, BRITISH COLUMBIA
V6B 2W2

CUSTOMER No. 1282

DATE SUBMITTED
9-Jun-89

REF. FILE 4840-N2

Total Pages 2

44 ROCKS Proj. 601-146

	METHOD	DETECTION LIMIT
WRMAJ %	WR	0.01
WRMIN PPM	WR	10.

*** UNLESS INSTRUCTED OTHERWISE WE WILL DISCARD PULPS 180 DAYS ***
AND REJECTS 30 DAYS FROM DATE OF THIS REPORT

HEADER VA 12041 - 12084 ✓

DATE 22-JUN-89

CERTIFIED BY .....

Jean H.L. Opdebeeck, Vice President Operations

SAMPLE \ %	SIO2	AL2O3	CAO	MGO	NA2O	K2O	FE2O3	TIO2	LOI	SUM
VA12041	63.5	10.4	0.64	3.44	3.17	0.14	13.4	0.84	4.16	99.8
VA12042	42.7	12.6	11.6	10.2	0.68	0.08	14.7	3.79	1.85	98.3
VA12043	44.0	11.3	12.5	6.04	1.56	0.16	15.2	3.26	2.77	97.2
VA12044	64.1	15.5	2.81	2.94	2.92	2.51	6.32	0.41	2.08	99.8
VA12045	44.6	13.8	11.0	6.89	2.20	0.30	12.7	3.76	1.85	97.2
VA12046	45.2	13.3	2.99	8.33	0.18	0.09	18.1	4.15	6.00	98.4
VA12047	47.3	10.5	3.08	6.58	0.35	0.05	20.8	3.16	6.93	99.0
VA12048	85.3	6.51	0.11	0.29	0.03	1.96	0.90	0.34	4.00	99.5
VA12049	85.6	7.80	0.12	0.26	0.05	2.26	1.13	0.37	1.77	99.5
VA12050	78.8	12.5	0.07	0.44	0.23	3.45	1.56	0.39	2.39	100.0
VA12051	76.9	13.8	0.09	0.42	1.11	3.65	1.19	0.42	2.16	99.9
VA12052	77.1	12.5	0.13	0.42	0.65	3.32	2.11	0.42	2.47	99.2
VA12053	60.8	15.5	1.29	7.03	2.35	2.02	6.07	0.46	3.70	99.3
VA12054	75.7	11.4	0.43	2.48	0.42	3.08	2.73	0.21	2.62	99.2
VA12055	72.7	12.1	0.87	3.37	1.01	2.72	3.49	0.22	2.47	99.1
VA12056	71.8	12.0	0.69	3.42	1.34	2.04	3.99	0.29	3.31	99.0
VA12057	77.6	12.8	0.26	1.03	0.83	3.32	0.94	0.38	2.23	99.6
VA12058	69.8	12.5	0.78	4.90	1.33	2.04	4.39	0.38	2.23	98.5
VA12059	70.3	14.6	0.41	3.54	2.06	2.54	3.47	0.25	2.54	100.0
VA12060	59.8	16.2	0.86	6.91	2.05	1.61	6.79	0.74	4.39	99.5
VA12061	42.5	15.6	1.00	7.90	2.29	0.10	20.2	2.70	5.39	97.7
VA12062	55.4	18.9	1.38	4.44	2.42	3.06	10.2	0.98	3.23	100.2
VA12063	54.7	13.5	10.1	5.13	0.79	3.90	8.23	0.68	2.47	99.6
VA12064	59.6	17.0	1.14	4.31	1.48	2.79	9.09	0.81	3.31	99.6
VA12065	56.8	10.6	0.53	4.71	0.56	1.02	15.6	0.74	8.70	99.9
VA12066	66.4	16.2	0.33	3.34	2.52	2.23	4.41	0.77	3.23	99.5
VA12067	69.5	10.7	0.93	3.07	0.25	1.96	6.38	0.53	5.39	98.9
VA12068	49.3	15.7	4.75	5.76	2.97	0.12	14.2	2.31	4.00	99.3
VA12069	73.6	12.5	0.55	1.59	3.48	1.57	4.61	0.20	2.00	100.3
VA12070	58.3	14.3	4.82	3.02	3.74	0.63	8.59	2.03	2.23	97.8
VA12071	59.9	14.0	2.23	4.86	2.59	1.21	8.29	1.76	3.47	98.4
VA12072	59.7	14.8	0.27	5.78	0.21	3.28	7.82	0.56	5.93	98.5
VA12073	48.5	14.7	1.33	7.58	1.64	1.45	14.5	0.56	8.23	98.8
VA12074	63.6	15.1	1.97	3.61	0.62	3.36	4.30	0.43	5.77	98.9
VA12075	62.1	13.0	2.75	5.05	0.19	2.88	5.02	0.38	5.31	96.8
VA12076	68.7	13.3	1.06	2.88	0.27	3.35	4.52	0.38	4.47	99.0
VA12077	67.7	5.19	1.14	2.20	0.26	1.15	11.3	0.17	7.85	98.2
VA12078	71.1	14.1	1.00	2.33	1.18	3.11	4.27	0.23	2.31	99.9
VA12079	57.4	17.8	1.66	6.52	2.82	1.76	7.36	1.06	2.39	98.9
VA12080	63.4	15.7	0.41	5.70	0.22	2.82	5.91	0.51	4.47	99.3
VA12081	62.9	16.1	0.41	4.67	0.20	3.73	6.43	0.57	4.77	99.9
VA12082	76.1	12.7	0.23	0.57	0.23	3.56	3.16	0.45	3.16	100.3
VA12083	60.0	15.7	3.92	4.36	3.49	1.16	6.36	0.52	4.08	99.7
VA12084	66.1	15.6	0.55	2.43	7.38	0.58	5.40	0.49	1.70	100.3

XRF W.R.A. SUMS INCLUDE ALL ELEMENTS DETERMINED. FOR SUMMATION, ELEMENTS ARE CALCULATED AS OXIDES

SAMPLE \ PPM	BA	CU	ZN
VA12041	174	322	778
VA12042	82	58	389
VA12043	165	710	2230
VA12044	1710	118	84
VA12045	113	171	421
VA12046	84	193	295
VA12047	89	992	546
VA12048	945	<10	35
VA12049	757	95	280
VA12050	1040	<10	37
VA12051	1230	<10	40
VA12052	946	20	121
VA12053	769	<10	135
VA12054	1290	16	91
VA12055	1080	16	119
VA12056	955	<10	97
VA12057	2130	<10	28
VA12058	1630	<10	119
VA12059	2310	<10	91
VA12060	1450	<10	259
VA12061	121	205	189
VA12062	850	398	109
VA12063	636	188	161
VA12064	727	188	85
VA12065	255	1300	3590
VA12066	423	158	96
VA12067	523	423	406
VA12068	190	975	258
VA12069	1340	127	55
VA12070	600	317	91
VA12071	614	138	115
VA12072	926	138	312
VA12073	461	1820	250
VA12074	773	<10	97
VA12075	588	14	174
VA12076	655	27	225
VA12077	335	1640	7790
VA12078	1890	13	84
VA12079	1220	<10	123
VA12080	845	23	317
VA12081	1020	30	307
VA12082	1020	<10	222
VA12083	541	25	74
VA12084	435	12	217

XRAL

X-RAY ASSAY LABORATORIES

A DIVISION OF SGS SUPERVISION SERVICES INC.
1885 LESLIE STREET • DON MILLS, ONTARIO M3B 3J4 • CANADA
TEL: (416)445-5755 TELEX: 06-986947 FAX: (416)445-4152

CERTIFICATE OF ANALYSIS

REPORT 9356

in computer Sept 18/89

TO: FALCONBRIDGE LIMITED
ATTN: N. VON FERSEN
202-856 HOMER STREET
VANCOUVER, BRITISH COLUMBIA
V6B 2W2

CUSTOMER No. 1282

DATE SUBMITTED
11-Aug-89

REF. FILE 5454-I3

Total Pages 4

74 ROCKS Proj. 601-145

	METHOD	DETECTION LIMIT
WRMAJ %	WR	0.01
WRMIN PPM	WR	10.

*** UNLESS INSTRUCTED OTHERWISE WE WILL DISCARD PULPS 180 DAYS ***
AND REJECTS 30 DAYS FROM DATE OF THIS REPORT

HEADER: VA12116 - VA12189 V

DATE 31-AUG-89

CERTIFIED BY .....
Jean H.L. Opdebeeck, Vice President Operations

SAMPLE \ %	SIO2	AL2O3	CAO	MGO	NA2O	K2O	FE2O3	TIO2	LOI	SUM
VA12116	45.5	13.7	8.09	6.09	3.44	0.12	10.2	1.71	10.2	99.1
VA12117	70.3	14.4	1.15	2.51	2.66	2.60	2.99	0.25	2.39	99.4
VA12118	55.5	17.5	2.75	6.15	1.49	2.99	7.57	1.04	4.00	99.2
VA12119	76.3	7.77	0.88	2.49	0.12	1.88	3.56	0.40	5.23	98.9
VA12120	67.4	13.9	0.40	4.17	3.35	1.67	4.29	0.44	3.39	99.3
VA12121	64.0	15.2	0.71	4.55	2.75	2.40	4.87	0.45	3.62	98.8
VA12122	54.5	14.7	6.41	4.14	0.41	4.00	7.64	0.67	5.62	98.4
VA12123	52.0	15.6	6.32	4.23	0.36	4.34	8.19	0.75	6.77	98.7
VA12124	39.0	12.7	19.3	2.54	0.56	2.87	5.08	0.65	14.7	97.5
VA12125	59.8	15.7	4.21	3.45	1.54	3.51	6.08	0.61	4.70	99.7
VA12126	55.8	16.0	5.94	3.94	1.11	3.65	6.82	0.74	5.47	99.6
VA12127	61.7	16.7	1.97	3.82	2.17	2.69	6.53	0.66	3.70	100.1
VA12128	54.0	16.9	5.98	3.59	1.86	3.47	6.76	0.85	5.39	98.9
VA12129	56.0	15.8	4.72	4.43	0.80	3.77	8.25	0.77	4.23	98.9
VA12130	53.8	16.8	5.41	3.98	0.41	4.54	7.79	0.88	4.62	98.4
VA12131	47.9	14.3	8.78	4.17	1.74	3.09	8.20	0.73	8.08	97.1
VA12132	14.9	4.87	42.4	1.92	0.17	1.04	2.71	0.26	31.3	99.6
VA12133	52.8	15.6	7.75	3.83	2.19	2.25	7.59	0.76	6.00	98.9
VA12134	55.0	15.5	3.54	3.80	2.99	1.57	12.2	0.88	4.00	99.7
VA12135	59.9	16.8	2.08	3.97	1.62	2.34	9.19	0.80	2.77	99.7
VA12136	42.2	12.4	8.87	11.2	0.64	0.31	15.2	3.56	4.08	99.0
VA12137	66.5	13.2	0.47	4.87	2.21	1.73	5.20	0.42	3.62	98.5
VA12138	49.8	16.4	6.37	4.00	0.43	4.84	7.66	0.81	8.23	98.8
VA12139	71.6	12.7	1.85	1.20	4.80	1.07	3.41	0.21	2.70	99.7
VA12140	69.0	13.8	1.79	1.42	3.42	2.26	3.34	0.27	4.00	99.5
VA12141	43.1	13.1	9.31	10.5	1.14	0.27	14.7	3.88	3.08	99.2
VA12142	59.7	18.0	1.28	3.79	0.51	3.37	9.16	0.89	2.39	99.5
VA12143	64.1	13.5	0.52	3.56	0.92	2.25	10.7	0.43	4.23	100.7
VA12144	58.4	16.3	0.53	4.56	0.83	3.21	9.72	0.78	3.54	98.1
VA12145	69.9	13.6	0.89	2.11	1.57	2.75	5.49	0.28	3.08	99.9
VA12146	37.8	14.3	12.4	5.49	2.10	2.61	10.3	2.49	7.16	94.8
VA12147	52.9	16.3	7.66	3.57	0.62	3.97	7.16	0.79	5.77	98.9
VA12148	54.4	16.4	7.43	3.53	0.54	3.47	6.78	0.77	5.93	99.3
VA12149	54.3	18.6	5.41	3.50	0.97	3.98	7.53	0.80	4.00	99.2
VA12150	60.8	12.2	5.36	3.11	0.59	3.41	9.81	0.72	3.31	99.5
VA12151	70.1	12.0	0.63	2.87	0.69	3.03	5.39	0.19	4.00	99.1
VA12152	47.2	13.3	5.84	8.32	2.06	0.49	15.5	2.42	4.23	99.5
VA12153	43.6	13.2	8.71	10.3	1.87	1.21	13.3	3.65	3.39	99.3
VA12154	50.2	15.5	10.1	3.53	0.84	3.87	6.33	0.75	6.63	97.9
VA12155	53.4	15.7	6.37	3.86	0.44	4.20	7.89	0.76	5.70	98.5
VA12156	56.5	15.3	6.69	3.50	0.45	4.20	6.96	0.76	4.85	99.3
VA12157	59.4	15.6	1.42	4.09	1.64	3.24	8.86	0.80	3.08	98.4
VA12158	46.8	15.9	1.03	7.07	1.25	1.15	18.6	0.92	5.62	98.5
VA12159	57.7	16.4	1.42	4.35	1.65	2.40	9.74	0.81	3.31	98.0
VA12160	59.8	14.0	1.37	3.92	0.63	3.05	11.8	0.68	3.23	98.7
VA12161	56.8	18.1	2.24	3.90	1.88	3.01	8.37	0.88	2.70	98.2
VA12162	57.4	16.4	3.02	4.06	1.64	2.90	8.85	0.91	2.77	98.3
VA12163	53.7	15.1	5.83	4.45	0.56	3.58	8.74	0.83	4.85	97.8
VA12164	53.6	15.4	5.92	4.77	0.83	3.59	8.21	0.77	5.08	98.3
VA12165	62.7	16.6	2.86	2.49	1.78	3.34	5.54	0.63	2.62	98.7

XRF W.R.A. SUMS INCLUDE ALL ELEMENTS DETERMINED. FOR SUMMATION, ELEMENTS ARE CALCULATED AS OXIDES

SAMPLE \ %	SIO2	AL2O3	CAO	MGO	NA2O	K2O	FE2O3	TIO2	LOI	SUM
VA12166	49.1	17.6	7.51	4.08	0.41	4.63	7.17	0.87	6.16	97.7
VA12167	51.9	17.7	6.75	3.46	0.71	4.58	6.58	0.78	5.39	97.9
VA12168	50.9	13.9	10.9	3.18	0.84	2.96	6.52	0.66	7.93	97.9
VA12169	47.1	10.7	0.99	4.43	0.85	0.41	27.4	0.70	6.00	98.9
VA12170	56.7	16.7	2.24	4.31	3.31	1.69	9.54	0.82	3.31	98.8
VA12171	56.9	15.7	2.17	4.59	1.05	2.69	10.9	0.74	3.23	98.1
VA12172	74.4	13.5	0.38	1.16	0.96	2.90	3.41	0.24	2.00	99.2
VA12173	60.4	15.6	0.67	3.70	0.52	3.18	7.23	0.67	5.16	97.4
VA12174	74.7	10.9	0.35	0.71	0.06	3.03	3.42	0.44	4.85	98.6
VA12175	59.5	13.4	1.80	6.55	0.30	2.11	7.70	0.93	5.47	98.1
VA12176	68.6	14.5	0.90	1.91	0.22	3.71	4.47	0.45	4.16	99.1
VA12177	81.8	6.61	0.75	0.84	0.02	1.66	3.39	0.29	3.62	99.3
VA12178	56.2	15.3	2.12	6.71	0.17	2.71	8.07	1.11	5.70	98.4
VA12179	74.8	8.95	1.52	1.00	0.13	2.13	3.61	0.42	5.62	98.5
VA12180	56.6	15.5	6.59	3.04	2.20	2.01	6.85	1.03	5.08	99.0
VA12181	71.4	10.1	1.29	1.52	0.33	2.48	5.04	0.51	5.31	98.2
VA12182	63.4	15.6	1.84	4.26	1.88	2.89	5.36	0.47	2.85	98.7
VA12183	62.0	15.8	2.05	5.61	2.07	2.25	5.66	0.46	3.16	99.2
VA12184	69.9	14.6	1.73	1.78	1.80	3.26	2.81	0.27	2.39	98.7
VA12185	70.5	13.5	1.44	1.50	1.61	3.36	2.88	0.23	3.00	98.2
VA12186	68.9	14.7	1.97	1.25	3.69	2.67	3.11	0.25	2.47	99.1
VA12187	67.4	14.2	2.27	2.24	1.98	3.21	3.62	0.23	3.16	98.5
VA12188	53.4	18.0	2.15	6.78	2.08	2.81	8.40	1.08	3.93	98.8
VA12189	76.8	7.59	0.41	1.84	0.03	1.97	4.36	0.42	4.54	98.3

XRF W.R.A. SUMS INCLUDE ALL ELEMENTS DETERMINED. FOR SUMMATION, ELEMENTS ARE CALCULATED AS OXIDES

SAMPLE \ PPM	BA	NI	CU	ZN
VA12116	131	85	69	103
VA12117	1110	<10	37	98
VA12118	1340	<10	33	126
VA12119	1540	61	84	409
VA12120	2370	<10	16	96
VA12121	1840	<10	54	108
VA12122	793	34	115	1410
VA12123	799	39	153	68
VA12124	440	25	51	67
VA12125	978	12	87	120
VA12126	898	26	116	172
VA12127	1010	<10	210	117
VA12128	891	33	97	148
VA12129	805	27	174	175
VA12130	934	37	98	74
VA12131	813	28	260	69
VA12132	53	<10	<10	36
VA12133	502	34	170	104
VA12134	553	32	761	126
VA12135	984	35	395	146
VA12136	186	243	3730	446
VA12137	2480	<10	50	254
VA12138	1470	34	90	577
VA12139	1120	<10	169	54
VA12140	1850	<10	171	93
VA12141	148	203	166	380
VA12142	2200	41	275	639
VA12143	901	<10	1950	839
VA12144	1190	40	482	430
VA12145	1930	<10	248	252
VA12146	612	54	246	101
VA12147	685	37	157	115
VA12148	594	30	67	117
VA12149	779	44	132	169
VA12150	848	38	578	115
VA12151	1390	<10	74	97
VA12152	195	186	468	253
VA12153	399	187	96	159
VA12154	641	28	135	126
VA12155	778	40	239	86
VA12156	707	26	88	74
VA12157	1310	31	516	189
VA12158	658	32	754	239
VA12159	1270	26	682	160
VA12160	1300	28	611	180
VA12161	1910	41	252	299
VA12162	1210	47	244	1130
VA12163	970	28	307	169
VA12164	930	43	142	249
VA12165	1050	18	156	109

SAMPLE \ PPM	BA	NI	CU	ZN
VA12166	999	37	143	72
VA12167	630	38	98	64
VA12168	462	27	71	50
VA12169	279	<10	1870	254
VA12170	770	28	462	188
VA12171	1060	27	330	128
VA12172	1820	<10	81	59
VA12173	950	17	215	1230
VA12174	1010	62	132	410
VA12175	757	14	71	2020
VA12176	1460	<10	114	373
VA12177	818	31	197	1570
VA12178	2180	17	137	282
VA12179	2130	38	66	438
VA12180	898	<10	37	128
VA12181	1130	34	71	338
VA12182	1020	<10	64	231
VA12183	817	<10	46	121
VA12184	1360	<10	92	87
VA12185	1280	<10	89	215
VA12186	1070	<10	60	75
VA12187	1400	<10	55	104
VA12188	1510	<10	21	171
VA12189	1610	122	131	847

XRAL

X-RAY ASSAY LABORATORIES

A DIVISION OF SGS SUPERVISION SERVICES INC.

1885 LESLIE STREET • DON MILLS, ONTARIO M3B 3J4 • CANADA

TEL: (416)445-5755 TELEX: 06-986947 FAX: (416)445-4152

CERTIFICATE OF ANALYSIS

REPORT 9554

in computer. Oct 3/89.

TO: FALCONBRIDGE LIMITED
ATTN: N. VON FERSEN
202-856 HOMER STREET
VANCOUVER, BRITISH COLUMBIA
V6B 2W2

CUSTOMER No. 1282

DATE SUBMITTED
24-Aug-89

REF. FILE 5613-FL

Total Pages 2

47 ROCKS Proj. 601-145

	METHOD	DETECTION LIMIT
WRMAJ %	WR	0.01
WRMIN PPM	WR	10.

*** UNLESS INSTRUCTED OTHERWISE WE WILL DISCARD PULPS 180 DAYS ***
AND REJECTS 30 DAYS FROM DATE OF THIS REPORT

Header: VA12190 - VA12236 ✓

DATE 20-SEP-89

CERTIFIED BY .....

Jean H.L. Opdebeeck, Vice President Operations

SAMPLE \ %	SIO2	AL2O3	CAO	MGO	NA2O	K2O	FE2O3	TIO2	LOI	SUM
VA12190	55.4	14.8	6.03	4.41	0.92	3.22	8.55	0.82	5.00	99.3
VA12191	58.5	14.1	6.72	4.01	1.20	2.43	7.49	0.91	3.85	99.3
VA12192	64.8	14.9	3.77	2.97	3.61	1.91	4.66	0.42	2.70	99.8
VA12193	62.6	13.1	3.51	4.17	1.81	2.19	7.74	0.66	2.93	98.8
VA12194	55.7	17.6	1.44	3.85	3.52	2.35	9.73	0.93	3.62	98.9
VA12195	54.3	15.4	1.37	5.16	0.80	2.69	12.7	0.83	4.85	98.4
VA12196	62.3	15.3	3.80	3.32	3.46	1.87	5.47	0.48	3.39	99.5
VA12197	56.5	18.5	0.47	3.41	0.67	4.50	9.11	0.81	4.16	98.3
VA12198	62.3	15.4	3.59	3.22	3.52	2.25	5.44	0.48	2.31	98.6
VA12199	58.8	15.6	4.07	3.74	0.56	4.05	7.07	0.74	3.62	98.4
VA12200	60.9	16.4	1.84	3.47	1.09	3.82	7.46	0.82	3.08	99.0
VA12201	51.1	21.7	2.64	3.25	0.76	5.86	7.39	1.01	4.31	98.2
VA12202	55.6	16.4	4.81	3.23	1.97	3.83	6.73	0.77	5.16	98.6
VA12203	70.1	14.2	0.89	1.02	5.01	1.71	3.77	0.34	2.31	99.5
VA12204	60.4	13.3	2.44	3.41	1.47	2.06	10.8	0.80	4.08	99.0
VA12205	13.9	3.98	41.8	2.02	0.29	0.76	2.41	0.24	31.5	96.9
VA12206	46.3	15.9	12.1	3.51	1.15	2.90	6.84	0.73	6.54	96.1
VA12207	56.7	18.6	1.69	2.93	0.65	4.57	7.70	0.88	5.00	98.8
VA12208	54.0	16.1	1.21	6.22	0.81	2.12	12.2	0.91	4.85	98.5
VA12209	55.8	16.2	2.41	4.23	2.03	1.32	11.1	0.79	4.93	99.0
VA12210	58.0	14.6	2.78	3.38	2.10	1.58	9.98	0.74	5.16	98.5
VA12211	83.6	5.44	1.08	0.60	0.13	0.94	2.07	0.27	4.00	98.3
VA12212	66.2	13.3	1.56	4.48	1.84	2.22	4.50	0.42	3.62	98.4
VA12213	62.5	13.1	4.87	2.95	0.64	3.11	5.89	0.76	4.16	98.1
VA12214	53.1	13.2	7.68	5.03	0.70	3.18	8.21	0.65	6.93	98.8
VA12215	63.0	15.1	4.19	3.11	3.26	1.98	5.52	0.46	2.00	98.7
VA12216	55.4	16.8	3.09	3.93	0.88	3.57	8.87	0.78	4.39	97.9
VA12217	53.3	16.9	2.81	4.29	0.66	4.79	9.98	0.81	4.70	98.5
VA12218	70.4	13.0	1.55	1.35	4.08	1.82	4.20	0.24	2.31	99.1
VA12219	56.4	16.9	3.22	4.12	0.73	3.72	9.33	0.79	2.77	98.2
VA12220	51.2	15.0	10.7	3.06	0.57	3.95	6.63	0.78	5.77	97.9
VA12221	58.7	13.8	2.23	3.23	0.08	1.57	8.08	0.71	9.85	98.4
VA12222	56.8	15.3	2.23	5.35	0.18	3.64	9.26	0.78	4.39	98.2
VA12223	59.8	14.9	2.64	3.98	1.98	2.66	9.08	0.79	3.23	99.2
VA12224	58.0	17.0	2.67	4.00	5.38	1.27	6.95	0.58	2.85	98.8
VA12225	57.2	16.8	1.13	4.15	6.67	0.74	8.01	0.57	3.00	98.3
VA12226	57.7	16.6	1.73	4.02	7.18	0.14	7.52	0.60	3.54	99.1
VA12227	62.5	16.2	0.69	2.74	7.37	0.58	5.80	0.54	2.31	98.8
VA12228	57.5	16.6	1.43	5.55	5.82	0.44	6.87	0.59	4.39	99.3
VA12229	60.0	15.7	0.45	5.18	5.51	0.91	7.13	0.49	3.16	98.6
VA12230	63.8	16.9	2.74	1.76	0.71	3.47	4.66	0.54	5.16	99.9
VA12231	78.5	12.7	0.30	0.24	0.30	3.33	1.21	0.25	2.16	99.1
VA12232	73.8	13.7	1.10	0.64	1.80	2.72	1.76	0.14	2.93	98.7
VA12233	61.4	16.1	1.38	3.06	7.94	0.36	5.13	0.49	3.00	99.0
VA12234	59.6	17.8	0.98	3.58	8.38	0.43	6.07	0.58	2.08	99.6
VA12235	59.4	16.8	1.83	2.76	4.50	2.17	6.56	0.56	3.62	98.3
VA12236	60.0	22.0	0.02	0.47	4.21	4.47	3.23	0.72	3.85	99.3

XRF W.R.A. SUMS INCLUDE ALL ELEMENTS DETERMINED. FOR SUMMATION, ELEMENTS ARE CALCULATED AS OXIDES

SAMPLE \ PPM	BA	NI	CU	ZN
VA12190	594	45	402	158
VA12191	653	33	129	171
VA12192	699	<10	25	73
VA12193	523	35	149	164
VA12194	582	44	204	148
VA12195	842	20	1020	292
VA12196	902	<10	21	74
VA12197	1340	51	251	109
VA12198	978	<10	37	83
VA12199	887	32	74	107
VA12200	829	35	112	139
VA12201	1350	38	186	87
VA12202	929	34	116	116
VA12203	809	<10	155	62
VA12204	659	26	485	1000
VA12205	123	<10	75	38
VA12206	471	25	277	151
VA12207	809	38	93	127
VA12208	515	69	115	143
VA12209	501	27	867	193
VA12210	650	29	478	97
VA12211	979	24	167	504
VA12212	1980	<10	<10	425
VA12213	826	27	152	184
VA12214	505	34	242	257
VA12215	822	<10	<10	65
VA12216	881	28	479	467
VA12217	1190	37	423	193
VA12218	1010	<10	246	64
VA12219	1750	32	254	192
VA12220	1820	32	141	186
VA12221	963	36	201	235
VA12222	2370	36	113	194
VA12223	739	35	198	275
VA12224	885	<10	41	81
VA12225	366	<10	18	103
VA12226	269	<10	20	105
VA12227	538	<10	25	93
VA12228	463	<10	29	74
VA12229	639	<10	14	79
VA12230	1030	<10	<10	67
VA12231	945	<10	<10	99
VA12232	569	<10	<10	47
VA12233	721	<10	48	83
VA12234	404	<10	<10	96
VA12235	934	<10	<10	94
VA12236	3130	<10	<10	26

XRAL

X-RAY ASSAY LABORATORIES

A DIVISION OF SGS SUPERVISION SERVICES INC.
1885 LESLIE STREET • DON MILLS, ONTARIO M3B 3J4 • CANADA
TEL: (416)445-5755 TELEX: 06-986947 FAX: (416)445-4152

CERTIFICATE OF ANALYSIS

REPORT 9634

in computer Oct 3/89

TO: FALCONBRIDGE LIMITED
ATTN: N. VON FERSEN
202-856 HOMER STREET
VANCOUVER, BRITISH COLUMBIA
V6B 2W2

CUSTOMER No. 1282

DATE SUBMITTED
5-Sep-89

REF. FILE 5698-Q6

Total Pages 2

43 ROCKS Proj. 601-145

	METHOD	DETECTION LIMIT
WRMAJ %	WR	0.01
WRMIN PPM	WR	10.

*** UNLESS INSTRUCTED OTHERWISE WE WILL DISCARD PULPS 180 DAYS ***
AND REJECTS 30 DAYS FROM DATE OF THIS REPORT

Header: VA12237 - VA12250 ✓
VA12501 - VA12529 ✓

DATE 27-SEP-89

CERTIFIED BY .....
Jean H.L. Opdebeeck, Vice President Operations

SAMPLE \ %	SIO2	AL2O3	CAO	MGO	NA2O	K2O	FE2O3	TIO2	LOI	SUM
VA12237	58.0	12.9	0.05	4.81	0.53	2.61	8.92	0.42	7.39	96.8
VA12238	57.4	17.5	1.20	4.18	6.81	0.31	7.05	0.60	3.23	98.3
VA12239	62.4	17.9	1.54	0.84	4.91	2.99	4.64	0.58	2.93	99.0
VA12240	62.4	15.7	0.12	4.96	0.65	3.18	5.16	0.54	5.85	98.7
VA12241	57.4	16.8	2.56	4.02	6.64	0.46	6.03	0.60	3.93	98.5
VA12242	50.6	18.6	1.81	6.32	5.57	0.30	10.2	0.68	4.08	98.2
VA12243	60.1	15.6	3.07	2.80	3.54	2.85	4.81	0.53	4.85	98.3
VA12244	59.0	14.8	4.65	2.95	2.66	2.94	4.92	0.49	6.08	98.6
VA12245	67.4	13.2	0.46	3.38	0.33	2.81	6.32	0.46	4.39	99.0
VA12246	63.5	15.6	2.01	4.12	2.03	2.71	5.18	0.50	2.77	98.5
VA12247	61.9	16.1	0.87	6.05	1.30	3.15	6.04	0.55	3.77	99.8
VA12248	61.2	15.4	1.63	6.11	0.54	2.75	5.91	0.50	3.93	98.2
VA12249	54.3	17.2	5.49	5.76	3.20	2.17	5.59	0.62	4.39	98.8
VA12250	55.5	18.4	4.17	3.74	0.94	4.78	6.12	0.87	3.39	98.1
VA12501	63.5	14.5	0.53	6.01	0.96	2.08	5.88	0.49	4.31	98.4
VA12502	60.8	15.1	0.23	5.36	0.15	2.76	5.85	0.71	7.00	98.2
VA12503	61.7	15.4	3.82	2.17	3.30	2.23	6.63	0.75	3.31	99.4
VA12504	70.4	14.1	1.15	1.63	2.13	2.59	3.41	0.45	2.54	98.5
VA12505	79.7	6.72	0.03	1.84	0.19	1.43	2.89	0.36	5.16	98.4
VA12506	88.6	5.80	<0.01	0.23	0.20	1.59	0.58	0.27	2.47	99.8
VA12507	41.3	11.6	8.88	13.3	0.44	0.11	14.7	4.37	3.93	98.8
VA12508	40.7	13.8	5.36	8.41	1.35	0.20	18.7	4.52	4.85	98.3
VA12509	44.4	13.4	4.25	7.13	2.46	0.26	17.0	3.11	5.23	97.3
VA12510	45.4	12.9	7.93	12.1	0.29	0.87	13.6	1.49	2.77	97.5
VA12511	69.8	14.3	1.68	1.60	2.32	2.81	3.58	0.27	1.85	98.4
VA12512	60.6	15.2	2.74	4.34	1.58	2.67	6.72	1.04	2.77	97.9
VA12513	56.5	16.0	6.96	3.60	1.13	4.12	7.29	0.76	2.93	99.4
VA12514	69.6	14.2	0.92	1.93	0.78	3.85	2.65	0.50	3.39	98.0
VA12515	82.4	6.86	0.42	2.07	0.71	1.44	2.24	0.39	3.16	99.8
VA12516	69.5	12.2	2.25	3.02	1.90	2.04	4.23	0.45	1.85	97.7
VA12517	59.9	15.5	6.46	3.68	1.09	3.89	5.71	0.58	1.70	98.6
VA12518	58.4	15.6	2.43	3.96	1.61	3.92	7.51	1.29	3.47	98.3
VA12519	65.7	13.1	1.82	5.55	0.52	1.98	6.25	0.58	3.00	98.6
VA12520	57.0	12.5	7.61	6.06	0.70	1.91	7.19	0.76	3.85	97.7
VA12521	42.0	12.5	7.23	12.0	0.29	0.36	16.2	4.32	3.47	98.5
VA12522	67.4	14.8	1.72	2.50	2.29	2.82	4.61	0.45	2.39	99.2
VA12523	44.1	13.5	3.14	8.57	0.34	0.71	18.3	3.57	5.54	97.8
VA12524	73.2	13.2	0.91	1.25	3.60	2.48	2.66	0.20	1.62	99.5
VA12525	38.4	16.0	2.58	8.87	2.30	0.17	19.3	5.24	5.70	98.7
VA12526	43.5	14.1	11.2	7.61	1.61	0.26	13.8	4.01	2.47	98.7
VA12527	73.5	12.2	0.75	1.88	2.80	2.05	4.56	0.21	1.70	100.0
VA12528	50.0	15.5	5.15	5.82	3.55	0.49	11.3	2.76	2.77	97.5
VA12529	58.1	15.9	6.66	3.90	0.79	4.13	6.88	0.73	2.85	100.1

XRF W.R.A. SUMS INCLUDE ALL ELEMENTS DETERMINED. FOR SUMMATION, ELEMENTS ARE CALCULATED AS OXIDES

SAMPLE \ PPM	BA	NI	CU	ZN
VA12237	818	<10	763	8250
VA12238	244	<10	<10	109
VA12239	1860	<10	50	122
VA12240	747	<10	11	97
VA12241	267	<10	44	77
VA12242	255	11	42	118
VA12243	1100	<10	<10	126
VA12244	733	<10	31	66
VA12245	1050	<10	94	580
VA12246	603	<10	16	151
VA12247	674	<10	34	235
VA12248	740	<10	118	1230
VA12249	837	<10	41	141
VA12250	1620	33	63	80
VA12501	797	<10	66	389
VA12502	1590	32	136	319
VA12503	883	<10	<10	91
VA12504	997	<10	25	99
VA12505	516	43	<10	137
VA12506	651	<10	<10	25
VA12507	55	417	118	437
VA12508	124	120	1470	1590
VA12509	83	10	253	540
VA12510	177	402	143	476
VA12511	1590	<10	298	108
VA12512	1250	22	156	415
VA12513	703	34	123	128
VA12514	1430	<10	46	92
VA12515	773	27	<10	128
VA12516	2020	<10	61	273
VA12517	680	<10	30	73
VA12518	712	20	86	216
VA12519	618	<10	203	261
VA12520	546	25	175	298
VA12521	56	291	243	632
VA12522	1300	<10	112	213
VA12523	211	<10	211	66
VA12524	1320	65	1210	461
VA12525	93	96	506	232
VA12526	160	62	138	440
VA12527	2080	<10	518	62
VA12528	137	33	174	825
VA12529	1320	33	93	115

XRAL

X-RAY ASSAY LABORATORIES

A DIVISION OF SGS SUPERVISION SERVICES INC.
1885 LESLIE STREET • DON MILLS, ONTARIO M3B 3J4 • CANADA
TEL: (416)445-5755 TELEX: 06-986947 FAX: (416)445-4152

CERTIFICATE OF ANALYSIS

REPORT 9856

in computer Oct. 23/89

TO: FALCONBRIDGE LIMITED
ATTN: N. VON FERSEN
202-856 HOMER STREET
VANCOUVER, BRITISH COLUMBIA
V6B 2W2

CUSTOMER No. 1282

DATE SUBMITTED
26-Sep-89

REF. FILE 5930-L4

Total Pages 2

49 ROCKS Proj. 601-145

	METHOD	DETECTION LIMIT
WRMAJ %	WR	0.01
WRMIN PPM	WR	10.

HEADER: VA12530 -VA12578

DATE 16-OCT-89

CERTIFIED BY .....

Jean H.L. Opdebeeck, Vice President Operations

SAMPLE \ %	SIO2	AL2O3	CAO	MGO	NA2O	K2O	FE2O3	TIO2	LOI	SUM
VA12530	58.7	17.0	2.08	4.13	4.71	1.16	6.72	0.58	4.31	99.5
VA12531	56.5	19.8	0.80	3.67	6.58	1.45	6.62	0.72	2.93	99.2
VA12532	55.2	18.8	3.68	1.58	3.87	2.36	5.82	0.60	6.39	98.4
VA12533	55.8	18.1	2.88	3.10	3.88	2.56	6.22	0.60	5.47	98.8
VA12534	59.2	17.8	0.79	3.89	6.99	0.41	6.53	0.55	3.62	99.8
VA12535	62.6	15.3	1.20	3.24	6.21	0.31	5.71	0.49	3.70	98.8
VA12536	57.9	17.7	0.49	4.38	6.83	0.61	6.85	0.66	3.39	98.9
VA12537	55.4	17.3	2.56	3.56	4.76	2.25	7.39	0.57	5.31	99.3
VA12538	49.8	17.6	4.73	3.14	2.45	4.01	7.03	0.70	9.47	99.2
VA12539	62.6	16.1	4.73	0.38	3.12	3.38	2.62	0.45	5.77	99.3
VA12540	47.2	15.0	8.42	2.80	1.53	3.99	6.47	0.64	12.5	98.7
VA12541	89.6	3.01	0.33	1.84	0.02	0.29	2.56	0.16	1.54	99.4
VA12542	89.3	3.56	0.28	1.25	0.09	0.52	1.18	0.21	1.93	98.4
VA12543	57.9	14.7	0.28	7.76	0.16	1.85	8.94	1.31	5.39	98.4
VA12544	64.9	12.0	0.91	4.50	0.32	3.17	6.88	0.67	5.23	98.7
VA12545	53.0	18.6	0.34	8.56	0.67	3.10	7.66	1.16	5.85	99.1
VA12546	68.3	13.1	0.04	4.88	1.74	2.02	4.46	0.40	4.31	99.3
VA12547	6.11	1.21	50.3	0.63	0.12	0.24	0.86	0.06	40.3	99.9
VA12548	56.3	15.8	4.76	3.26	1.47	3.14	5.78	0.57	8.39	99.6
VA12549	64.3	16.5	0.22	3.95	0.79	4.18	4.77	0.60	4.54	100.0
VA12550	55.7	18.3	5.53	3.69	1.50	3.22	6.63	0.83	3.54	99.1
VA12551	15.0	2.66	43.3	1.33	0.31	0.29	1.94	0.14	34.8	99.8
VA12552	58.8	13.7	2.68	6.14	0.58	1.82	8.98	1.08	4.93	99.0
VA12553	54.5	16.9	2.53	3.98	0.86	2.55	8.97	0.89	8.39	99.8
VA12554	73.0	16.0	<0.01	0.96	0.40	4.56	1.28	0.65	2.93	100.0
VA12555	91.9	3.35	0.01	0.17	0.04	1.06	0.72	0.23	2.31	99.9
VA12556	69.8	15.4	1.40	1.89	2.62	2.96	2.53	0.50	2.16	99.4
VA12557	67.1	12.0	1.96	6.17	0.26	1.60	5.95	0.43	3.70	99.3
VA12558	54.4	14.8	0.70	11.0	0.19	0.74	8.69	0.73	7.31	98.7
VA12559	71.7	13.2	1.83	0.56	2.96	3.28	2.42	0.28	3.00	99.4
VA12560	72.3	13.5	1.06	0.94	5.71	1.67	2.49	0.29	1.85	100.0
VA12561	59.1	15.0	7.90	1.66	1.73	2.16	4.81	0.44	6.16	99.0
VA12562	59.1	16.0	1.92	3.66	7.42	0.39	6.46	0.54	3.47	99.0
VA12563	60.3	15.2	2.97	3.08	6.55	0.82	5.51	0.48	4.39	99.4
VA12564	60.2	16.7	0.97	3.34	7.88	0.43	6.38	0.53	3.23	99.8
VA12565	61.4	18.3	0.24	2.40	9.61	0.28	4.68	0.55	1.62	99.1
VA12566	54.7	12.9	5.22	2.99	0.66	3.85	6.99	0.67	10.5	98.7
VA12567	58.2	15.4	3.86	1.67	2.24	3.80	5.37	0.62	7.16	98.5
VA12568	60.8	17.4	0.49	1.99	0.44	5.10	6.32	1.00	4.54	98.3
VA12569	61.2	15.6	1.82	2.38	0.85	4.29	5.91	0.77	6.62	99.6
VA12570	51.4	14.6	0.14	9.15	0.13	1.23	13.1	0.77	7.47	98.1
VA12571	48.0	17.6	<0.01	2.40	0.57	4.03	18.6	1.08	7.54	100.0
VA12572	56.5	12.1	0.14	5.01	0.15	0.66	17.5	0.89	5.47	98.5
VA12573	60.4	14.4	4.73	2.28	1.14	2.91	5.21	0.40	8.23	99.8
VA12574	65.8	14.5	0.10	4.36	0.28	2.53	7.24	0.57	4.47	100.0
VA12575	60.2	19.2	0.19	1.77	0.84	4.12	7.73	0.88	4.77	99.9
VA12576	70.5	15.7	<0.01	0.91	0.43	4.13	4.49	0.70	3.00	100.1
VA12577	70.3	15.0	0.30	2.94	0.51	3.22	3.13	0.62	3.54	99.8
VA12578	72.7	15.9	0.15	1.10	0.48	4.04	1.75	0.58	3.00	99.9

XRF W.R.A. SUMS INCLUDE ALL ELEMENTS DETERMINED. FOR SUMMATION, ELEMENTS ARE CALCULATED AS OXIDES

SAMPLE \ PPM	BA	NI	CU	ZN
VA12530	420	<10	79	124
VA12531	602	<10	35	110
VA12532	1030	<10	44	82
VA12533	1260	<10	<10	90
VA12534	415	<10	33	94
VA12535	298	<10	<10	82
VA12536	478	<10	20	106
VA12537	1270	<10	62	94
VA12538	2220	<10	<10	116
VA12539	948	<10	14	62
VA12540	1150	21	49	93
VA12541	156	12	<10	272
VA12542	276	<10	<10	68
VA12543	733	10	15	301
VA12544	715	<10	45	397
VA12545	892	<10	<10	136
VA12546	625	<10	<10	72
VA12547	52	<10	107	37
VA12548	696	<10	21	96
VA12549	1040	<10	78	248
VA12550	781	43	99	169
VA12551	25	<10	44	217
VA12552	439	47	229	1370
VA12553	792	66	161	969
VA12554	2180	<10	<10	46
VA12555	556	<10	<10	37
VA12556	1070	<10	35	84
VA12557	561	<10	59	255
VA12558	355	41	93	373
VA12559	1180	<10	<10	55
VA12560	1360	<10	13	47
VA12561	655	<10	<10	62
VA12562	659	<10	<10	67
VA12563	514	<10	46	79
VA12564	696	<10	18	89
VA12565	422	<10	<10	84
VA12566	1490	47	57	96
VA12567	1350	<10	78	85
VA12568	1800	79	69	114
VA12569	1620	53	74	89
VA12570	427	22	230	361
VA12571	1080	15	437	346
VA12572	347	28	243	295
VA12573	524	<10	<10	55
VA12574	1090	<10	177	265
VA12575	1370	44	43	195
VA12576	1760	<10	344	351
VA12577	1080	36	349	471
VA12578	1510	<10	48	444

XRAL

X-RAY ASSAY LABORATORIES

A DIVISION OF SGS SUPERVISION SERVICES INC.
1885 LESLIE STREET • DON MILLS, ONTARIO M3B 3J4 • CANADA
TEL: (416)445-5755 TELEX: 06-986947 FAX: (416)445-4152

CERTIFICATE OF ANALYSIS

REPORT 9977

in computer Oct 30/89

TO: FALCONBRIDGE LIMITED
ATTN: N. VON FERSEN
202-856 HOMER STREET
VANCOUVER, BRITISH COLUMBIA
V6B 2W2

CUSTOMER No. 1282

DATE SUBMITTED
11-Oct-89

REF. FILE 6035-N4

Total Pages 2

44 ROCKS Proj. 601-146

	METHOD	DETECTION LIMIT
WRMAJ %	WR	0.01
WRMIN PPM	WR	10.

HEADER. VA11509 - 510
VA12579 - VA12620

DATE 25-OCT-89

CERTIFIED BY

Jean H.L. Opdebeeck, Vice President Operations

SAMPLE \ %	SIO2	AL2O3	CAO	MGO	NA2O	K2O	FE2O3	TIO2	LOI	SUM
VA11509	70.6	13.2	1.59	1.10	2.81	4.25	2.62	0.34	2.70	99.4
VA11510	38.0	15.1	6.24	5.46	0.47	3.13	11.3	1.98	13.9	96.5
VA12579	63.2	16.3	5.02	3.86	0.71	3.26	5.11	0.50	2.23	100.3
VA12580	59.4	17.3	4.78	3.45	4.89	0.68	6.67	0.59	2.16	100.0
VA12581	59.8	15.7	8.22	3.25	1.86	2.79	5.73	0.45	1.23	99.2
VA12582	54.1	17.7	5.55	3.60	1.66	2.32	10.4	0.61	4.16	100.2
VA12583	59.9	16.5	5.98	2.34	2.91	1.99	6.60	0.60	2.93	100.0
VA12584	59.6	16.7	4.02	3.49	4.91	0.67	6.63	0.70	2.77	99.5
VA12585	61.2	16.6	2.43	4.49	5.83	0.71	5.83	0.60	2.00	99.7
VA12586	60.4	15.3	4.54	3.21	0.79	3.48	7.22	0.51	4.23	99.8
VA12587	64.1	15.5	0.28	6.19	0.24	2.11	7.17	0.52	2.47	98.7
VA12588	63.3	16.2	0.50	5.19	0.24	2.92	7.22	0.55	3.47	99.8
VA12589	69.6	14.8	<0.01	0.51	0.33	4.04	4.89	0.51	4.62	99.5
VA12590	51.1	14.2	0.96	8.36	0.09	1.85	10.8	0.50	10.8	98.8
VA12591	62.9	12.4	0.03	8.08	0.05	1.20	8.48	0.46	5.39	99.1
VA12592	56.3	15.0	<0.01	10.8	0.08	0.86	9.29	0.55	6.77	99.7
VA12593	59.0	16.1	0.91	9.37	1.10	1.59	5.76	0.48	3.77	98.1
VA12594	57.0	15.2	10.6	1.87	0.53	4.19	3.49	0.47	4.77	98.3
VA12595	59.3	17.9	1.42	2.57	0.27	5.01	7.29	0.94	3.85	98.7
VA12596	57.9	18.0	1.27	3.96	6.30	1.68	6.96	0.56	2.23	99.1
VA12597	60.9	16.8	0.59	2.65	0.45	4.48	6.78	0.89	4.54	98.3
VA12598	53.4	18.2	3.16	3.12	4.69	3.69	5.49	0.63	4.85	97.5
VA12599	57.8	20.8	1.31	1.61	5.73	4.05	3.24	0.41	3.31	98.6
VA12600	59.2	22.4	0.58	1.41	0.65	4.94	5.29	0.79	4.23	99.7
VA12601	79.0	8.04	1.38	0.92	1.22	1.78	2.77	0.46	2.93	98.6
VA12602	78.9	10.7	0.06	0.79	0.70	1.44	3.80	0.62	2.39	99.6
VA12603	87.0	6.68	<0.01	0.11	0.53	1.17	1.78	0.35	1.39	99.1
VA12604	67.2	16.4	1.25	0.89	5.03	2.72	2.79	0.46	2.08	99.0
VA12605	60.6	15.6	6.22	4.44	3.90	0.09	6.86	0.49	0.93	99.2
VA12606	67.3	15.9	1.31	1.47	5.81	1.55	3.26	0.42	2.39	99.8
VA12607	56.9	19.2	3.51	3.25	3.08	4.35	4.95	0.51	1.08	97.8
VA12608	59.8	17.6	0.46	3.85	0.22	4.47	7.29	0.95	3.23	98.8
VA12609	57.3	19.3	1.09	3.47	0.73	5.32	7.72	0.97	3.39	99.6
VA12610	63.1	15.9	2.18	2.14	3.90	3.23	5.31	0.46	2.85	99.2
VA12611	54.4	15.9	6.42	4.76	1.39	2.26	5.55	0.57	7.54	98.9
VA12612	74.4	12.1	0.18	1.29	0.36	3.23	3.40	0.43	3.39	99.0
VA12613	83.0	6.09	0.72	0.92	0.10	1.60	1.21	0.28	3.93	98.0
VA12614	64.8	15.4	3.85	2.98	1.56	3.02	4.77	0.51	2.00	99.1
VA12615	39.5	12.5	0.63	8.70	0.09	0.35	20.3	3.97	11.3	97.5
VA12616	39.2	13.7	1.04	5.84	1.24	0.44	25.0	4.30	7.54	98.5
VA12617	44.9	14.9	3.06	7.44	0.71	2.81	15.4	3.94	5.39	98.7
VA12618	51.8	13.2	4.29	8.25	0.39	0.21	16.3	0.62	4.70	99.8
VA12619	79.7	8.49	0.48	1.62	2.61	0.52	3.80	0.38	1.70	99.3
VA12620	74.4	11.5	0.04	2.26	0.34	2.50	4.20	0.43	2.62	98.4

XRF W.R.A. SUMS INCLUDE ALL ELEMENTS DETERMINED. FOR SUMMATION, ELEMENTS ARE CALCULATED AS OXIDES

SAMPLE \ PPM	BA	NI	CU	ZN
VA11509	1570	<10	32	39
VA11510	8100	54	102	93
VA12579	775	<10	21	90
VA12580	550	<10	59	87
VA12581	1290	<10	48	73
VA12582	912	<10	50	69
VA12583	2020	<10	84	47
VA12584	395	<10	38	81
VA12585	329	<10	25	68
VA12586	1010	<10	57	130
VA12587	766	<10	120	227
VA12588	1160	<10	74	198
VA12589	1280	<10	118	48
VA12590	356	<10	60	1030
VA12591	382	<10	56	373
VA12592	267	<10	44	391
VA12593	335	<10	14	174
VA12594	1640	<10	57	60
VA12595	1220	77	49	101
VA12596	1630	<10	49	85
VA12597	1820	66	49	143
VA12598	2540	11	45	78
VA12599	2540	<10	<10	98
VA12600	1350	52	41	115
VA12601	582	39	17	45
VA12602	1240	49	20	58
VA12603	348	22	15	53
VA12604	1250	<10	37	81
VA12605	174	<10	54	62
VA12606	3060	<10	16	50
VA12607	8650	<10	27	110
VA12608	8310	50	30	133
VA12609	2940	58	50	134
VA12610	1240	<10	28	52
VA12611	436	<10	35	67
VA12612	1310	<10	40	187
VA12613	706	21	29	190
VA12614	1640	<10	55	42
VA12615	258	19	309	376
VA12616	216	163	884	456
VA12617	636	51	315	289
VA12618	87	30	131	106
VA12619	364	<10	21	36
VA12620	686	<10	76	49

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BABIY OPTION

HOLE No. P 82-1

HOLE LOCATION:
UTM:
AZIM: 055 ELEV:
DIP: -45 LENGTH: 151.7 m
NTS: CORE SIZE: BQ
STARTED: OCT 10, 1982
COMPLETED: OCT 11, 1982
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP
100		-55			
150		-55			

CLAIM No:
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 4, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO (m)	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)
0	9.45	CASING											
9.45	13.21	CALCAREOUS ARGILLITE -banded dark grey, light grey, argillite and 25% calcareous 1-15mm layers; light grey layers are calcareous fine grained quartzite and sultstone; 5% dacite ash layers -3% disseminated pyrrhotite; foliation 70 - 80 degrees to core axis 10.55-10.65 - fold 12.20-12.80 - 1% sphalerite is quartzite bands 13.20-13.80 - 1% sphalerite is quartzite bamds -lower contact gradational											
13.21	19.55	INTERMEDIATE LAPILLI TUFF -grey-brown to grey, 15%, 2-5mm x 5-15mm, light grey siliceous fragments in a fine grained biotite-chlorite-calc-silicate-quartz matrix, locally calcareous; 5%, 1-3mm biotitic spots -foliation 80 - 85 degrees to core axis, 3% pyrrhotite -lower contact gradational over 1.5m, and last 1.5m is argillaceous											
19.55	24.27	CALCAREOUS ARGILLITE AND TUFFACEOUS ARGILLITE -black and grey, banded, 60%, 1-10mm argillite layers, 20% light grey calcareous silt and fine grained quartzite 2-30mm layers, 20% dacite ash layers, siliceous and dacite 1-5mm x 10-20mm fragments or discontinuous layers -5% disseminated pyrrhotite; foliation 70 - 85 degrees to core axis -upper contact sharp, 80 degrees to core axis marked by 25cm fine grained calcareous quartzite layer -possible tops to top of hole but no good tops											
24.27	32.56	DACITE LAPILLI TUFF											

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BABIY OPTION

HOLE No. P 82-1

HOLE LOCATION:
UTM:
AZIM: 055 ELEV:
DIP: -45 LENGTH: 151.7 m
NTS: CORE SIZE: BQ
STARTED: OCT 10, 1982
COMPLETED: OCT 11, 1982
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP
100		-55			
150		-55			

CLAIM No:
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 4, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO (m)	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)
		-grey, 20-40%, 2-20mm x 2 to >30mm grey siliceous fragments in fine grained sericite-chlorite-biotite-quartz matrix -2% disseminated pyrrhotite; foliation 70 - 80 degrees to core axis 31.22-31.86 - dacite ash tuff, 1%, 1mm quartz eyes -moderate sericitization											
32.56	34.33	DACITE ASH TUFF -fine grained, grey-green, weakly banded 1-5mm, ash tuff -5% pyrrhotite, irregular 1-5mm patches and fractures -foliation 80 degrees to core axis 33.00-33.30 - 50% pyrrhotite, dark green chloritic interval. 1% chalcopyrite											
34.33	43.30	ARGILLITE, CHERT AND TUFFACEOUS ARGILLITE -black, grey, 50% black argillite, 1-10mm layers, 40% light grey chert or siliceous dacite ash layers, 10% siliceous 2-10mm fragments -4% pyrrhotite, disseminated and 2-6mm patches and irregular fractures -foliation 70 - 80 degrees to core axis -lower contact gradational over 2m											
43.30	50.59	DACITE LAPILLI TUFF -light grey, 40-70%, 2-10mm x 5-30mm siliceous fragments in fine grained biotite-calc-silicate-quartz matrix -moderate sericitization -6% disseminated pyrrhotite -foliation 70 degrees to core axis first 2m, foliation 40 degrees to core axis to 47m, foliation 47-50.59, 10-20 degrees to core axis 44.30-44.40 - fault zone 80 degrees to core axis 47.55-47.70 - fault zone 40 degrees to core axis											

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

HOLE No. P 82-1

PROPERTY: BABIY OPTION

HOLE LOCATION:
UTM:
AZIM: 055 ELEV:
DIP: -45 LENGTH: 151.7 m
NTS: CORE SIZE: BQ
STARTED: OCT 10, 1982
COMPLETED: OCT 11, 1982
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP
100		-55			
150		-55			

CLAIM No:
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 4, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)

-zone could be a disrupted tectonic zone ?

50.59 76.80 ARGILLITE AND TUFFACEOUS ARGILLITE
-black and grey, banded, 50-70% black argillite, 30% light grey siliceous dacite, chert and fine grained quartzite layers 1-30mm average 5mm, banding 70 - 80 degrees to core axis
-2% pyrrhotite, disseminated
58.38-58.48 - 20% pyrrhotite
64.40-61.68 - quartz vein 3% sphalerite, 10% pyrrhotite
64.40-64.44 - siliceous zone, 2% sphalerite 75 degrees to core axis
68.00-69.70 - dacite tuff layer

76.80 84.55 CALCAREOUS INTERMEDIATE TUFF
-grey and grey brown banded, 50%, 1-3mm light grey-brown tuffaceous (locally 10% calcareous-silicate in layers) layers, 30%, 1-3mm, light bgrey calcareous siliceous layers, 5-10%, 1-3mm biotitic spots
-foliation 70 - 80 degrees to core axis
-2% disseminated pyrrhotite
-weak-moderate sericitization
75.05-75.10 - quartz vein, 25% pyrrhotit4e
78.02-78.30 - foliation 10 degrees to core axis
78.80-78.92 - 70% pyrrhotite in breccia zone
79.00-79.40 - 10% pyrrhotite
80.15-80.23 - siliceous zone, 3% sphalerite
80.93-81.06 - limestone layer 85 degrees to core axis
81.60-82.50 - dacite lapilli tuff layer, 20%, 3-10 mm siliceous fragments
84.00-84.55 - siliceous breccia zone, 10% pyrrhotite, 3% sphalerite

84.55 98.80 ARGILLITE AND TUFFACEOUS ARGILLITE

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BABIY OPTION

HOLE No. P 82-1

HOLE LOCATION:
UTM:
AZIM: 055 ELEV:
DIP: -45 LENGTH: 151.7 m
NTS: CORE SIZE: BQ
STARTED: OCT 10, 1982
COMPLETED: OCT 11, 1982
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP
100		-55			
150		-55			

CLAIM No:
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 4, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO (m)	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)
		-black and grey, 50% black argillite 1-5mm (up to 30mm) layers, 40% grey sericitic layer 1-5mm 10%, 2-5mm fine grained quartzite layers -foliation 70 - 80 degrees to core axis; 2% pyrrhotite -lower contact gradational over 1.5m 89.30-89.70 - fine grained quartzite layer 80 degrees to core axis - possible tops to top of hole 89.70-89.85 - 15% pyrrhotite, siliceous breccia 89.85-90.05 - 20%, 5-15mm quartz-vein fragments, breccia zone, 1% sphalerite 95.47 - 2cm siliceous zone 2% sphalerite											
98.80	102.00	DACITE TUFF -strongly sericitized, light grey, fine grained ash tuff, rare 1mm quartz eye -foliation 70 degrees to core axis; 2% fracture pyrrhotite -lower and upper contacts gradational over 50cm - 1m											
102.00	124.60	CALCAREOUS ARGILLITE -black, 80% argillite with 10-20%, 1-10mm grey calcareous fine grained quartzite layers -foliation 80 degrees to core axis; 1% disseminated pyrrhotite 102.00-106.50 - as at 76.80-84.55 104.50-105.50 - quartz vein 103.62-103.77 - fine grained quartz layer 60 degrees to core axis -lower contact sharp at carbonate vein											
124.60	128.58	INTERMEDIATE TUFF -grey-brown, calcareous, 30% light brown micaeous layer in grey calcareous-siliceous matrix -foliation 85 degrees to core axis; 1% pyrrhotite											

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BABIY OPTION

HOLE No. P 82-1

HOLE LOCATION:
UTM:
AZIM: 055 ELEV:
DIP: -45 LENGTH: 151.7 m
NTS: CORE SIZE: BQ
STARTED: OCT 10, 1982
COMPLETED: OCT 11, 1982
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP
100		-55			
150		-55			

CLAIM No:
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 4, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO (m)	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)
		124.60-126.00 - carbonate vein, 20% limestone band 75 degrees to core axis											
128.58	141.93	INTERMEDIATE OR MAFIC TUFF -pyrrhotite mineralized interval 20-60% pyrrhotite in a siliceous or green chloritic matrix -strong chloritization, silicification 129.58-135.85 - 50% pyrrhotite, 1% chalcopyrite, 5% pyrite - massive pyrrhotite has 5%, 1-8mm fragments of chloritic green material, 3%, 1-4mm fragments of quartz 135.85-140.93 - 15-20% pyrrhotite in weakly chloritized dacite tuff <1% chalcopyrite -some chloritic banding 30 degrees to core axis											
141.93	144.20	SILICEOUS ARGILLITE -black, siliceous, banded siliceous argillite and dark grey siliceous fine grained quartzite, banding 1-8mm; zone weakly chloritic -foliation 80 degrees to core axis; 3% pyrrhotite											
144.20	148.86	INTERMEDIATE TUFF -dark grey, weakly banded, 40% dark grey 1-4mm bands and 60% grey siliceous bands 1-6mm -5-10%, 1-6mm biotitic spots -foliation 80 - 90 degrees to core axis; 2% pyrrhotite											
148.86	151.20	QUARTZ-EYE DACITE TUFF -light greenish-grey, moderate sericitized, siliceous, 5%, 1-3mm quartz eyes in a fine grained matrix -foliation 80 - 90 degrees to core axis, 1% pyrrhotite											

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BABIY OPTION

HOLE No. P 82-1

HOLE LOCATION:
UTM:
AZIM: 055 ELEV:
DIP: -45 LENGTH: 151.7 m
NTS: CORE SIZE: BQ
STARTED: OCT 10, 1982
COMPLETED: OCT 11, 1982
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP
100		-55			
150		-55			

CLAIM No:
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 4, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)
151.7		END OF HOLE											

DIAMOND DRILL CORE LITHOGEOCHEMICAL RECORD
(MAJOR ELEMENTS)

SAMPLE NUMBER	FROM	TO	%SIO2	%AL203	%CAO	%MGO	%NA20	%K20	%FE203	%TIO2	%P205	%MNO	%LOI	SUM	AI	NACA	ALUM
VA12154	9.45	13.21	50.20	15.50	10.10	3.53	0.84	3.87	6.33	0.75			6.63	97.75	40.	11.	105.
VA12155	13.21	19.55	53.40	15.70	6.37	3.86	0.44	4.20	7.89	0.76			5.70	98.32	54.	7.	143.
VA12156	19.55	24.27	56.50	15.30	6.69	3.50	0.45	4.20	6.96	0.76			4.85	99.21	52.	7.	135.
VA12157	24.27	32.56	59.40	15.60	1.42	4.09	1.64	3.24	8.86	0.80			3.08	98.13	71.	3.	248.
VA12158	32.56	34.33	46.80	15.90	1.03	7.07	1.25	1.15	18.60	0.92			5.62	98.34	78.	2.	464.
VA12159	34.33	43.30	57.70	16.40	1.42	4.35	1.65	2.40	9.74	0.81			3.31	97.78	69.	3.	300.
VA12160	43.30	50.59	59.80	14.00	1.37	3.92	0.63	3.05	11.80	0.68			3.23	98.48	78.	2.	277.
VA12161	50.59	63.69	56.80	18.10	2.24	3.90	1.88	3.01	8.37	0.88			2.70	97.88	63.	4.	254.
VA12162	63.69	76.80	57.40	16.40	3.02	4.06	1.64	2.90	8.85	0.91			2.77	97.95	60.	5.	217.
VA12163	76.80	84.55	53.70	15.10	5.83	4.45	0.56	3.58	8.74	0.83			4.85	97.64	56.	6.	151.
VA12164	84.55	98.80	53.60	15.40	5.92	4.77	0.83	3.59	8.21	0.77			5.08	98.17	55.	7.	149.
VA12165	98.80	102.00	62.70	16.60	2.86	2.49	1.78	3.34	5.54	0.63			2.62	98.56	56.	5.	208.
VA12166	102.00	106.50	49.10	17.60	7.51	4.08	0.41	4.63	7.17	0.87			6.16	97.53	52.	8.	140.
VA12167	106.50	117.65	51.90	17.70	6.75	3.46	0.71	4.58	6.58	0.78			5.39	97.85	52.	7.	147.
VA12168	117.65	124.60	50.90	13.90	10.90	3.18	0.84	2.96	6.52	0.66			7.93	97.79	34.	12.	95.
VA12169	129.58	141.93	47.10	10.70	0.99	4.43	0.85	0.41	27.40	0.70			6.00	98.58	72.	2.	476.
VA12170	141.93	144.20	56.70	16.70	2.24	4.31	3.31	1.69	9.54	0.82			3.31	98.62	52.	6.	231.
VA12171	144.20	148.86	56.90	15.70	2.17	4.59	1.05	2.69	10.90	0.74			3.23	97.97	69.	3.	266.
VA12172	148.86	151.20	74.40	13.50	0.38	1.16	0.96	2.90	3.41	0.24			2.00	98.95	75.	1.	318.

DIAMOND DRILL CORE LITHOGEOCHEMICAL RECORD
(MINOR ELEMENTS)

SAMPLE NUMBER	FROM	TO	RB (ppm)	SR (ppm)	BA (ppm)	Y (ppm)	ZR (ppm)	NB (ppm)	CR (ppm)	CU (ppm)	ZN (ppm)	NI (ppm)	ROCK	ALT	MIN
VA12154	9.45	13.21			641.0					135.0	126.0	28.0	SAT	?	DCO
VA12155	13.21	19.55			778.0					239.0	86.0	40.0	TIB	?	DCO
VA12156	19.55	24.27			707.0					88.0	74.0	26.0	SAT	?	DCO
VA12157	24.27	32.56			1310.0					516.0	189.0	31.0	TIB	?	DCO
VA12158	32.56	34.33			658.0					754.0	239.0	32.0	TIA	?	DCO
VA12159	34.33	43.30			1270.0					682.0	160.0	26.0	SAT	?	DCO
VA12160	43.30	50.59			1300.0					611.0	180.0	28.0	TIB	PSM	DDO
VA12161	50.59	63.69			1910.0					252.0	299.0	41.0	SAT		DCO
VA12162	63.69	76.80			1210.0					244.0	1130.0	47.0	SAT		DCO
VA12163	76.80	84.55			970.0					307.0	169.0	28.0	TIA		DCO
VA12164	84.55	98.80			930.0					142.0	249.0	43.0	SAT		DCO
VA12165	98.80	102.00			1050.0					156.0	109.0	18.0	TIA	PSS	DCO
VA12166	102.00	106.50			999.0					143.0	72.0	37.0	TIA	?	A
VA12167	106.50	117.65			630.0					98.0	64.0	38.0	SAT	?	DCO
VA12168	117.65	124.60			462.0					71.0	50.0	27.0	SAT	?	DCO
VA12169	129.58	141.93			279.0					1870.0	254.0	<10.0	TIA	PHS	DEO
VA12170	141.93	144.20			770.0					462.0	188.0	28.0	SAT	PQS	DCO
VA12171	144.20	148.86			1060.0					330.0	128.0	27.0	TIA	?	DCP
VA12172	148.86	151.20			1820.0					81.0	59.0	<10.0	TIAQ	?	DCP

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BABIY OPTION

HOLE No.P 82-2

HOLE LOCATION:
UTM:
AZIM: 060 ELEV:
DIP: -45 LENGTH: 138.98
NTS: CORE SIZE: BQ
STARTED: OCT 12, 1982
COMPLETED: OCT 13, 1982
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP
75		50			
125		50			

CLAIM No:
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 5, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO (m)	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)
0	9.97	CASING											
9.97	14.20	DACITE ASH TUFF -strongly sericitized, light grey, weakly banded 5-20mm siliceous layers and sericitic layers -banding and foliation 70 - 80 degrees to core axis -5% disseminated pyrite -lower contact sharp 80 degrees to core axis 11.00-11.50 - 2% sphalerite, 1% galena in siliceous 5-10mm zone, or veins in foliation 13.00-13.20 - fold											
14.20	17.70	SILICEOUS ARGILLITE AND DACITE TUFF -black siliceous argillite (70%) with 5%, <1mm - 2mm pyrite rich layers interbedded with 30% sericitic dacite tuff as above; 5% fine disseminated pyrite; foliation 75 degrees to core axis 15.40-16.40 - dacite ash tuff 17.30-17.40 - 2% sphalerite in quartz vein and in argillite in small fractures 17.40-17.50 - quartz veined dacite tuff 1% sphalertie 17.60-17.65 - quartz vein 2% sphalerite, 10% pyrite -lower contact sharp 80 degrees to core axis, marked by 10cm siliceous fine grained quartzite											
17.70	29.95	DACITE ASH TUFF -light grey, fine grained quartz-sericite, moderate to strongly sericitized ash tuff -3% disseminated pyrite; foliation 70 - 80 degrees to core axis -lower contact gradational over 20cm 17.70-24.00 - fine grained ash tuff, <1% sphalerite in 2%, 1-10mm, quartz-rich fractures; moderate seritization											

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BABIY OPTION

HOLE No.P 82-2

HOLE LOCATION:
UTM:
AZIM: 060 ELEV:
DIP: -45 LENGTH: 138.98
NTS: CORE SIZE: BQ
STARTED: OCT 12, 1982
COMPLETED: OCT 13, 1982
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP
75		50			
125		50			

CLAIM No:
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 5, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO (m)	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)
		24.00-29.95 - strongly sericitized; dacite lapilli tuff 5-20%, 2-10mm x 2-20mm siliceous fragments											
29.95	40.05	DACITE ASH TUFF -upper contact marked by 25cm very siliceous ash tuff -light grey, moderate sericitized, fine grained, ash tuff, 2%, <1-2mm biotitic spots; 2% disseminated pyrrhotite, 2% disseminated pyrite, foliation 75 - 80 degrees to core axis 39.74-40.05 - strongly sericitized 10% pyrite											
40.05	56.19	ARGILLITE -black moderate hard to siliceous argillite (80% siliceous) local graphite -foliation and local banding 80 - 85 degrees to core axis -3% fine disseminated pyrite 47.50-49.00 - 30% light grey tuffaceous argillite 10% fine pyrite, <1% sphalerite in 1-3mm quartz fractures 50.30-50.65 - dacite layer contacts sharp 80 degrees to core axis -lower contact gradational over 50cm											
56.19	59.65	INTERMEDIATE TUFF -grey, 20%, <1mm feldspar crystals in a fine grained matrix; 5% <1mm biotite spots; 10% <1mm disseminated epidote spots -foliation 85 degrees to core axis											
59.65	68.00	SILICEOUS ARGILLITE -black siliceous argillite, interbedded dacite tuff as noted below -2% disseminated pyrite, foliation 80 -85 degrees											

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BABIY OPTION

HOLE No.P 82-2

HOLE LOCATION:
UTM:
AZIM: 060 ELEV:
DIP: -45 LENGTH: 138.98
NTS: CORE SIZE: BQ
STARTED: OCT 12, 1982
COMPLETED: OCT 13, 1982
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP
75		50			
125		50			

CLAIM No:
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 5, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)

to core axis
61.00-61.75 - sericitic, dacite ash tuff contacts 80 degrees to core axis, gradational over 10cm
65.10-66.25 - biotite spotted dacite tuff, uper contact sharp 85 degrees to core axis, lower contact gradational over 30cm

68.00 94.17 QUARTZ-EYE DACITE TUFF
-light grey, 10-20%, 1-5mm biotite spots in a fine grained siliceous matrix, <1-2%, 1-2mm bluish quartz eyes
-1% disseminated pyrrhotite; foliation 80 degrees to core axis
68.88-69.37 - black siliceous argillite
70.17 - 5cm gouge zone and fractured rock
71.55-73.10 - fine grained intermediate dyke; lower contact sharp 85 degrees to core axis, no chill
75.58-75.65 - 2, 1mm, fractures 1% sphalerite over 7cm
68.00-81.40 - moderate sericitization
81.40-94.17 - weak sericitization, minor chlorite
90.27-90.50 - fracture zone

94.17 128.69 DACITE LAPILLI TUFF
-light grey, 10-20%, 2-5mm x 2-10mm light grey siliceous fragments in fine grained siliceous matrix
-foliation 80 degrees to core axis; 1-2% pyrite and pyrrhotite
-moderate to locally strong sericitization
103.42-104.06 - argillaceous dacite lapilli layer, contacts sharp 80 degrees to core axis
96.70- 97.00 - fold
107.90-108.18 - siliceous argillite layer contact

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BABIY OPTION

HOLE No.P 82-2

HOLE LOCATION:
UTM:
AZIM: 060 ELEV:
DIP: -45 LENGTH: 138.98
NTS: CORE SIZE: BQ
STARTED: OCT 12, 1982
COMPLETED: OCT 13, 1982
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP
75		50			
125		50			

CLAIM No:
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 5, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO (m)	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)
		sharp 80 degrees to core axis 108.18-108.46 - fine grained cherty dacite tuff 108.55-108.88 - quartz vein 108.80-109.30 - cherty fine grained interval 109.30-109.40 - siliceous argillite											
128.69	135.50	DACITE TUFF -light grey, strongly biotite spotted, 5-40%, 1-8mm biotitic spots, in a fine grained siliceous matrix; locally banded on scale 1-5cm -banding and foliation 80 degrees to core axis -weak to moderate sericitization -1% disseminated pyrrhotite -lower contact sharp 80 degrees to core axis											
135.50	138.98	SILICEOUS ARGILLITE -black, siliceous graphitic argillite -1% disseminated pyrite; foliation and banding 75 - 85 degrees to core axis 135.90-136.00 - 10cm gouge 80 degrees to core axis											
138.98		END OF HOLE											

DIAMOND DRILL CORE LITHOGEOCHEMICAL RECORD
(MAJOR ELEMENTS)

SAMPLE NUMBER	FROM	TO	%SIO2	%AL2O3	%CAO	%MGO	%NA2O	%K2O	%FE2O3	%TIO2	%P2O5	%MNO	%LOI	SUM	AI	NACA	ALUM
VA12173	9.97	14.20	60.40	15.60	0.67	3.70	0.52	3.18	7.23	0.67			5.16	97.13	85.	1.	357.
VA12174	14.20	17.70	74.70	10.90	0.35	0.71	0.06	3.03	3.42	0.44			4.85	98.46	90.	0.	317.
VA12175	17.70	24.00	59.50	13.40	1.80	6.55	0.30	2.11	7.70	0.93			5.47	97.76	80.	2.	318.
VA12176	24.00	29.95	68.60	14.50	0.90	1.91	0.22	3.71	4.47	0.45			4.16	98.92	83.	1.	300.
VA12177	29.95	33.42	81.80	6.61	0.75	0.84	0.02	1.66	3.39	0.29			3.62	98.98	76.	1.	272.
VA12178	33.42	40.05	56.20	15.30	2.12	6.71	0.17	2.71	8.07	1.11			5.70	98.09	80.	2.	306.
VA12179	40.05	56.19	74.80	8.95	1.52	1.00	0.13	2.13	3.61	0.42			5.62	98.18	65.	2.	237.
VA12180	56.19	59.65	56.60	15.50	6.59	3.04	2.20	2.01	6.85	1.03			5.08	98.90	36.	9.	144.
VA12181	59.65	68.00	71.40	10.10	1.29	1.52	0.33	2.48	5.04	0.51			5.31	97.98	71.	2.	246.
VA12182	59.65	68.00	63.40	15.60	1.84	4.26	1.88	2.89	5.36	0.47			2.85	98.55	66.	4.	236.
VA12183	81.40	94.17	62.00	15.80	2.05	5.61	2.07	2.25	5.66	0.46			3.16	99.06	66.	4.	248.
VA12184	94.17	103.42	69.90	14.60	1.73	1.78	1.80	3.26	2.81	0.27			2.39	98.54	59.	4.	215.
VA12185	104.06	107.90	70.50	13.50	1.44	1.50	1.61	3.36	2.88	0.23			3.00	98.02	63.	3.	211.
VA12186	109.40	121.96	68.90	14.70	1.97	1.25	3.69	2.67	3.11	0.25			2.47	99.01	41.	6.	176.
VA12187	121.96	128.69	67.40	14.20	2.27	2.24	1.98	3.21	3.62	0.23			3.16	98.31	56.	4.	190.
VA12188	128.69	135.50	53.40	18.00	2.15	6.78	2.08	2.81	8.40	1.08			3.93	98.63	69.	4.	256.
VA12189	135.50	138.98	76.80	7.59	0.41	1.84	0.03	1.97	4.36	0.42			4.54	97.96	90.	0.	315.

DIAMOND DRILL CORE LITHOGEOCHEMICAL RECORD
(MINOR ELEMENTS)

SAMPLE NUMBER	FROM	TO	RB (ppm)	SR (ppm)	BA (ppm)	Y (ppm)	ZR (ppm)	NB (ppm)	CR (ppm)	CU (ppm)	ZN (ppm)	NI (ppm)	ROCK	ALT	MIN
VA12173	9.97	14.20			950.0					215.0	1230.0	17.0	TIA	PSS	DCP
VA12174	14.20	17.70			1010.0					132.0	410.0	62.0	SAT	PSS	DCP
VA12175	17.70	24.00			757.0					71.0	2020.0	14.0	TIA	PSM	DCP
VA12176	24.00	29.95			1460.0					114.0	373.0	<10.0	TIA	PSS	DCP
VA12177	29.95	33.42			818.0					197.0	1570.0	31.0	SAT		DCP
VA12178	33.42	40.05			2180.0					137.0	282.0	17.0	TIA	PSM	DCP
VA12179	40.05	56.19			2130.0					66.0	438.0	38.0	SAT	?	DCP
VA12180	56.19	59.65			898.0					37.0	128.0	<10.0	TIA	?	DCP
VA12181	59.65	68.00			1130.0					71.0	338.0	34.0	SAT	?	DCP
VA12182	59.65	68.00			1020.0					64.0	231.0	<10.0	TIAQ	PSM	DCP
VA12183	81.40	94.17			817.0					46.0	121.0	<10.0	TIAQ	PSW	DCP
VA12184	94.17	103.42			1360.0					92.0	87.0	<10.0	TIB	PSM	DCP
VA12185	104.06	107.90			1280.0					89.0	215.0	<10.0	TIB	PSM	DCP
VA12186	109.40	121.96			1070.0					60.0	75.0	<10.0	TIB	PSM	DCP
VA12187	121.96	128.69			1400.0					55.0	104.0	<10.0	TIB	PSM	DCP
VA12188	128.69	135.50			1510.0					21.0	171.0	<10.0	TIA	PSW	DCP
VA12189	135.50	138.98			1610.0					131.0	847.0	122.0	SAT	?	DCP

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BABIY OPTION

HOLE No. P 82-3

HOLE LOCATION:
UTM:
AZIM: 060 ELEV:
DIP: -55 LENGTH: 75.0
NTS: CORE SIZE: BQ
STARTED: OCT 14, 1982
COMPLETED: OCT 14, 1982
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP

CLAIM No: PERCY 1
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 17, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO (m)	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)
0	4.94	CASING											
4.94	7.65	SILICEOUS ARGILLITE -black, siliceous argillite, core broken and weathered -foliation 70 - 80 degrees to core axis -1% pyrrhotite -contact sharp, 90 degrees to core axis											
7.65	22.50	DACITE TUFF -light grey, 30%, 1-10mm biotite-chlorite spots in a fine grained quartz-feldspar matrix -foliation 80 - 90 degrees to core axis, 1% disseminated pyrrhotite, weak to moderate sericitization 14.88-15.88 - fine grained dacite tuff layer 16.47-16.92 - fine grained dacite tuff layer, chloritic 18.08-18.58 - contorted zone, foliation 30 degrees to core axis 18.58-19.80 - grey-green chloritic dacite tuff 19.80-21.50 - fault zone, 10% gouge 80 degrees to core axis 21.50-21.90 - dacite tuff 21.90-22.50 - silicified, cherty zone 2% pyrrhotite, <<1% sphalerite -dacite tuff strongly sericitized from 7.65-8.70 adjacent to argillite											
22.50	29.30	ARGILLACEOUS DACITE TUFF -dark grey to green-grey, interbedded 25% black argilllite 1-5mm layers, 40% grey sericitic ash 1-3mm layers, 20% green 1-2mm chlorite-calc-silicate layers, 10%, 1-10mm x 5-30mm disrupted chert and quartz vein layers or fragments -foliation 80 degrees to core axis, 2% disseminated pyrrhotite											

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BABIY OPTION

HOLE No. P 82-3

HOLE LOCATION:
UTM:
AZIM: 060 ELEV:
DIP: -55 LENGTH: 75.0
NTS: CORE SIZE: BQ
STARTED: OCT 14, 1982
COMPLETED: OCT 14, 1982
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP

CLAIM No: PERCY 1
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 17, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO (m)	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)
		23.20-24.60 - fault zone 50% gouge 80 degrees to core axis, locally contorted											
29.30	33.80	DACITE TUFF OR DYKE -pinkish-grey, weakly foliated, massive, fine grained quartz-feldspar-chlorite with 15%, 1-2mm chlorite spots, 15% <1-2mm biotite-chlorite spots or pseudomorphs after mafic crystals; weak foliation 80 degrees to core axis; <1% pyrrhotite -contacts sharp 80 degrees to core axis, marked by 15cm fine grained cherty material or chill margin, rock looks finer grained for 30cm inside chill margin											
33.80	45.45	DACITE LAPILLI TUFF -dark grey, 15-35%, 2-8mm x 3-25mm, light green-grey to grey, siliceous, cherty and chlorite-siliceous fragments and disrupted layers in a fine grained sericitic, locally biotitic siliceous matrix; foliation 80 degrees to core axis; 2-4% pyrrhotite 36.94-36.97 - grey limestone layers 80 degrees to core axis 37.05-37.13 - grey limestone layers 80 degrees to core axis 39.00-39.55 - fault zone, 75 degrees to core axis, 5% gouge 33.80-39.55 - fragments smaller and more biotite in matrix 39.55-45.45 - rock more siliceous, less biotite, weak to moderate sericitization 42.75-43.15 - quartz vein, lower contact 40 degrees to core axis, upper 85 degrees to core axis 43.40-43.75 - 1% sphalerite, disseminated around siliceous fragments											
45.45	56.40	QUARTZ-EYE DACITE TUFF											

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BABIY OPTION

HOLE No. P 82-3

HOLE LOCATION:
UTM:
AZIM: 060 ELEV:
DIP: -55 LENGTH: 75.0
NTS: CORE SIZE: BQ
STARTED: OCT 14, 1982
COMPLETED: OCT 14, 1982
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP

CLAIM No: PERCY 1
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 17, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO (m)	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)

-light grey, weakly to moderately seriicitized, 3%, 1-3mm, bluish quartz eyes in a fine grained siliceous matrix with 10%. .5-1mm x 2-5mm chlorite patches in foliation which is 80 degrees to core axis
-<1% disseminated pyrrhotite
-upper contact sharp 60 degrees to core axis, and marked by 30cm fine grained siliceous ash tuff, or chert or chill margin; lower contact 85 degrees to core axis, sharp, finer grained no quartz eyes for 20cm

56.40 63.64 DACITE LAPILLI TUFF
-similar to 33.80-45.45
-dark grey, 20-40%, 2-10mm x 3-25mm, grey to grey-green siliceous fine grained dacite tuff or disrupted chert layer fragments in a vanded 1-4mm chloritic-calc-silicate, biotitic and sericitic matrix
-foliation 80 degrees to core axis, 2% pyrrhotite as disseminated and 1-8mm pseudomorphs after pyrite crystals
-lower contact gradational

63.64 67.90 DACITE LAPILLI TUFF AND LIMESTONE
-30% light grey limestone layers (5-50mm) and dacite lapilli tuff similar to 56.40-63.64
-foliation 80 - 85 degrees to core axis, 1% pyrrhotite
63.80-64.90 - 75% grey limestone, banding 80 degrees to core axis locally contorted
-lower contact gradational

67.90 71.93 DACITE LAPILLI TUFF OR INTRAFORMATIONAL BRECCIA
-light grey, 40-60%, 2-15mm x 5-25mm siliceous dacite or chert discontinuous layers, and/or fragments in a fine grained sericitic matrix that

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

HOLE No. P 82-3

PROPERTY: BABIY OPTION

HOLE LOCATION:
UTM:
AZIM: 060 ELEV:
DIP: -55 LENGTH: 75.0
NTS: CORE SIZE: BQ
STARTED: OCT 14, 1982
COMPLETED: OCT 14, 1982
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP

CLAIM No: PERCY 1
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 17, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO (m)	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)
		has weathered brown (Fe-carbonate ? or dolimitization) -5%, 1-4mm dolomite veining 5 - 30 degrees to core axis -foliation 80 - 85 degrees to core axis; <1% pyrrhotite											
71.93	74.98	ARGILLITE, QUARTZITE, TUFF -dark grey, 40% 1-5mm, fine grained quartzite or tuff layers in fine grained biotitic-argillite-tuffaceous matrix -foliation 80 degrees to core axis; 1% pyrrhotite											
75.0		END OF HOLE											

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BIRK CREEK

HOLE No. P 83-1

HOLE LOCATION:
UTM:
AZIM: ELEV:
DIP: -45 LENGTH: 234.24
NTS: CORE SIZE: BQ
STARTED:
COMPLETED:
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP

CLAIM No:
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 1, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO (m)	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)
0	10	CASING											
10	17.45	DACITE LAPILLI TUFF -light grey, moderate sericitized, hard, siliceous, 10-30%, 1-5mm x 3-10mm siliceous grey fragments in a siliceous matrix with 5-10% chlorite-calcareous-silicate-biotite -1% pyrite and pyrrhotite, <1-1mm disseminated -foliation 80 degrees to core axis -saw one possible quartz eye											
17.45	17.95	SILICEOUS ARGILLITE -siliceous, weakly banded black argillite, contacts sharp 80 degrees to core axis											
17.95	22.25	BIOTITE SPOTTED DACITE ASH TUFF -grey, biotite spotted 15-30%, 1-4mm biotitic-pyrrhotite spots in a fine grained quartz-sericite-biotite-calc-silicate matrix; rock is weakly banded 5-15mm finer grained layers 80 degrees to core axis -lower contact gradational -1% disseminated pyrrhotite -weak sericitization											
22.25	26.85	SILICEOUS ARGILLITE -black, graphitic, siliceous weakly banded (80 degrees to core axis) argillite -2% pyrrhotite as disseminated 3-6mm pseudomorphs after pyrite -foliation 80 degrees to core axis -lower contact sharp 80 degrees to core axis											
26.85	57.27	DACITE LAPILLI TUFF AND DACITE TUFF -light grey, moderate hard, moderate sericitized, 70 - 85%, 2-6mm thick very flattened possible lapilli fragments in biotite-calc-silicate-quartz											

DIAMOND DRILL CORE LITHOGEOCHEMICAL RECORD
(MAJOR ELEMENTS)

SAMPLE NUMBER	FROM	TO	%SIO2	%AL2O3	%CAO	%MGO	%NA2O	%K2O	%FE2O3	%TIO2	%P2O5	%MNO	%LOI	SUM	AI	NACA	ALUM
VA12211	4.94	7.65	83.60	5.44	1.08	0.60	0.13	0.94	2.07	0.27			4.00	98.13	56.	1.	253.
VA12212	7.65	18.08	66.20	13.30	1.56	4.48	1.84	2.22	4.50	0.42			3.62	98.14	66.	3.	237.
VA12213	18.08	22.50	62.50	13.10	4.87	2.95	0.64	3.11	5.89	0.76			4.16	97.98	52.	6.	152.
VA12214	22.50	29.30	53.10	13.20	7.68	5.03	0.70	3.18	8.21	0.65			6.93	98.68	49.	8.	114.
VA12215	29.30	33.80	63.00	15.10	4.19	3.11	3.26	1.98	5.52	0.46			2.00	98.62	41.	7.	160.
VA12216	33.80	39.55	55.40	16.80	3.09	3.93	0.88	3.57	8.87	0.78			4.39	97.71	65.	4.	223.
VA12217	39.55	45.45	53.30	16.90	2.81	4.29	0.66	4.79	9.98	0.81			4.70	98.24	72.	3.	205.
VA12218	45.45	56.40	70.40	13.00	1.55	1.35	4.08	1.82	4.20	0.24			2.31	98.95	36.	6.	175.
VA12219	56.40	63.64	56.40	16.90	3.22	4.12	0.73	3.72	9.33	0.79			2.77	97.98	67.	4.	220.
VA12220	63.64	67.90	51.20	15.00	10.70	3.06	0.57	3.95	6.63	0.78			5.77	97.66	38.	11.	99.
VA12221	67.90	71.93	58.70	13.80	2.23	3.23	0.08	1.57	8.08	0.71			9.85	98.25	68.	2.	356.
VA12222	71.93	74.98	56.80	15.30	2.23	5.35	0.18	3.64	9.26	0.78			4.39	97.93	79.	2.	253.

DIAMOND DRILL CORE LITHOGEOCHEMICAL RECORD
(MINOR ELEMENTS)

SAMPLE NUMBER	FROM	TO	RB (ppm)	SR (ppm)	BA (ppm)	Y (ppm)	ZR (ppm)	NB (ppm)	CR (ppm)	CU (ppm)	ZN (ppm)	NI (ppm)	ROCK	ALT	MIN
VA12211	4.94	7.65			979.0					167.0	504.0	24.0	SAT	PQS	DCO
VA12212	7.65	18.08			1980.0					<10.0	425.0	<10.0	TIA	PSM	DCO
VA12213	18.08	22.50			826.0					152.0	184.0	27.0	TIA	PSW	DCO
VA12214	22.50	29.30			505.0					242.0	257.0	34.0	TIA	?	DCO
VA12215	29.30	33.80			822.0					<10.0	65.0	<10.0	PIA	?	DCO
VA12216	33.80	39.55			881.0					479.0	467.0	28.0	TIB	?	DCO
VA12217	39.55	45.45			1190.0					423.0	193.0	37.0	TIB	?	DCO
VA12218	45.45	56.40			1010.0					246.0	64.0	<10.0	TIAQ	PSM	DBO
VA12219	56.40	63.64			1750.0					254.0	192.0	32.0	TIB	?	DCO
VA12220	63.64	67.90			1820.0					141.0	186.0	32.0	TIB	?	DCO
VA12221	67.90	71.93			963.0					201.0	235.0	36.0	TIB	?	DCO
VA12222	71.93	74.98			2370.0					113.0	194.0	36.0	SAT	?	DCO

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BIRK CREEK

HOLE No. P 83-1

HOLE LOCATION:
UTM:
AZIM: ELEV:
DIP: -45 LENGTH: 234.24
NTS: CORE SIZE: BQ
STARTED:
COMPLETED:
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP

CLAIM No:
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 1, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO (m)	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)
		matrix; rock spotted 5-20%, 1-10mm biotitic spots -foliation 80 degrees to core axis -1% disseminated pyrrhotite 39.35-44.00 - 3% <1mm feldspar crystals disseminated 45.35-47.05 - fine grained siliceous dacite ash tuff 50.10-50.55 - calcareous-silicate rich layer 53.68-53.85 - ash tuff layer, light grey dacitic 54.65-54.90 - ash layer 15% <1mm feldspar crystals -lower contact gradational											
57.27	58.50	DACITE LAPILLI TUFF -20%, 1-15mm x 2-30mm, siliceous fragments in a fine grained biotite-chlorite-quartz-calc-silicate-sericite matrix -10% disseminated pyrrhotite -foliation 80 degrees to core axis -some fragments look like disrupted quartz vein material											
58.50	62.70	CHERT, LIMESTONE, DACITE TUFF -light grey-white, banded 2-20mm limestone in calcareous tuff and 10-20mm chert layers 70 - 80 degrees to core axis -2-3% disseminated pyrrhotite 60.05-60.60 - 70% pyrrhotite											
62.70	63.70	DACITE LAPILLI TUFF -30-40% light grey siliceous, 2-5 x 5-25mm fragments in a fine grained sericite-biotite-chlorite-quartz matrix -foliation 80 degrees to core axis											
63.70	69.44	CALCAREOUS, ARGILLACEOUS LAPILLI TUFF OR TUFFACEOUS ARGILLITE											

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BIRK CREEK

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DIP: -45 LENGTH: 234.24
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-dark grey, calcareous, 30%, 1-5mm x 5-30mm, flattened, light grey, locally calcareous disrupted layers or fragments in a fine grained biotite-quartz-argillite matrix
-2% pyrrhotite, foliation 80 degrees to core axis
67.00 - 1mm seam in foliation pyrrhotite-sphalerite

69.44 72.90 CACLAREOUS INTERMEDIATE LAPILLI TUFF
--grey-brown, calcareous, 25%, 2-5mm x 5-20mm light grey fragments in sericite-biotite-chlorite-calc-silicate matrix
-foliation 80 degrees to core axis; 2-3% disseminated pyrite-pyrrhotite
72.10-72.90 - 30% light grey limestone, 5% sphalerite, 2% galena as 2-5mm disseminated irregular bands

72.90 81.47 CALCAREOUS ARGILLITE
-dark grey/light grey interbanded (1-10mm bands) grey argillite and light grey limestone, interval 75% argillite
-foliation 80 degrees to core axis; 1-2% pyrrhotite
74.0 -76.0 - weak fault zone, 80 degrees to core axis
74.50 - fold
80.67-80.97 - fold
76.94-78.34 - dacite tuff layer contact sharp

81.47 95.43 INTERMEDIATE LAPILLI TUFF AND TUFF
-interbedded grey non-calcareous dacite biotite spotted (15%, 1-5mm spots) in fine grained siliceous matrix and calcareous 20-40%, 2-10mm x 10-30mm light grey fragments in a fine grained biotite-chlorite-sericite-quartz matrix and local argillite in matrix; 2% pyrrhotite; foliation 75 - 80 degrees to

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BIRK CREEK

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NTS: CORE SIZE: BQ
STARTED:
COMPLETED:
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP

CLAIM No:
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 1, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO (m)	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)

core axis
-weak alteration
85.00-85.30 - 5-10% pyrrhotite, 2% sphalerite
87.20-87.40 - 20cm 25% pyrrhotite
-upper contact sharp 75 degrees to core axis
-lower contact faulted 30cm gouge 80 degrees to core axis

95.43 110.14 CALCAREOUS ARGILLACEOUS INTERMEDIATE LAPILLI TUFF OR TUFFACEOUS ARGILLITE
-dark grey, calcareous, 10-25%, 1-5mm x 5-20mm light grey calcareous fragments and light grey siliceous fragments in a dark grey argillaceous matrix; 1% pyrrhotite; foliation 80 degrees to core axis
101.20-101.30 - 1% sphalerite in two 1cm bands
103.50-103.60 - 2% sphalerite, 10% pyrrhotite
108.20-109.74 - light grey siliceous, no argillite, 10% pyrrhotite, 1% chalcopyrite
-lower contact sharp 80 degrees to core axis

110.14 116.61 DACITE LAPILLI TUFF
- light grey, weakly sericitized, 1-3mm x 5-10mm vague light grey siliceous fragments in a fine grained siliceous matrix that contains 10% calcareous-silicate and 5-10 <1-3mm biotitic spots
-foliation 90 degrees to core axis; 1% pyrrhotite
115.11-116.61 - 1%xxx pyrrhotite, 1% chalcopyrite very siliceous

116.61 121.30 CALCAREOUS ARGILLITE
-black argillite 10-15%, 1-5mm light grey calcareous bands and possible fragments
-upper contact gradational
-lower contact gradational over 2cm 80 degrees to core axis
-3-5 pyrrhotite, foliation 80 - 90 degrees to core

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

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CLAIM No:
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DATE LOGGED: AUG 1, 1989
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FROM (m)	TO (m)	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)

axis

121.30 140.58 INTERMEDIATE LAPILLI TUFF AND TUFF
-grey to dark grey, 20-30%, 2-6mm x 5-25mm light grey siliceous fragments in a fine grained chorite-biotite-calc-silicate and locally argilleous matrix
-rock calcareous
-5% pyrrhotite; foliation 80 - 90 degrees to core axis
123.50-123.70 - 25% pyrrhotite
128.16-128.76 - 15% pyrrhotite, 1% chalcopyrite
129.70-130.10 - siliceous quartzite layer
138.0 -138.22 - limestone layer
-lower contact gradational

140.58 143.57 ARGILLACEOUS WACKE, CHERT
-black gritty argillite and 1-5mm chert bands (10%) and 5-10mm black argillite
-foliation 80 degrees to core axis; 1% pyrrhotite

143.57 154.80 DACITE TUFF
-grey, moderate hard to siliceous, weakly banded 2-10mm grey siliceous to sericite layers, 25% biotite-calc-silicate layers and spots; 2% pyrrhotite
-foliation 70 - 80 degrees to core axis
147.87-150.87 - rock folded and contorted
151.80-154.80 - foliation 60 degrees to core axis

154.80 160.40 CALCAREOUS ARGILLITE
-light grey banded <1mm-5mm argillite, calcareous argillite, calcareous argillite and 15% limestone layers
-<1% pyrrhotite, foliation 70 degrees to core axis, local folding and contortion
157.60-158.40 - feldspar crystal tuff layer

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BIRK CREEK

HOLE No. P 83-1

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DIP: -45 LENGTH: 234.24
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SURVEY

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CLAIM No:
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 1, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO (m)	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)
160.40	216.43	TUFFACEOUS ARGILLITE -dark grey, calcareous, 20-60%, 1-5mm black argillaceous matrix with light grey calcareous 1-5mm layers and fragments; some layers siliceous, others altered to green calcareous-silicate; minor chert -2% pyrrhotite; foliation 70 - 80 degrees to core axis -rock looks sedimentary in origxxx but contain 20-50% tuffaceous material											
216.43	234.24	MAFIC TUFF -dark green, chlorite-calcareous-silicate matrix rock, 1% pyrrhotite, fine grained tuff -foliation 80 - 90 degrees to core axis 221.88-224.83 - quartz-eye crystal tuff not included in XRAL sample; 2%, 1-2mm quartz eyes											
234.24		END OF HOLE											

DIAMOND DRILL CORE LITHOGEOCHEMICAL RECORD
(MAJOR ELEMENTS)

SAMPLE NUMBER	FROM	TO	%SIO2	%AL2O3	%CAO	%MGO	%NA2O	%K2O	%FE2O3	%TIO2	%P2O5	%MNO	%L.O.I	SUM	AI	NACA	ALUM
VA12117	10.00	17.45	70.30	14.40	1.15	2.51	2.66	2.60	2.99	0.25			2.39	99.25	57.	4.	225.
VA12118	17.95	22.25	55.50	17.50	2.75	6.15	1.49	2.99	7.57	1.04			4.00	98.99	68.	4.	242.
VA12119	22.25	26.85	76.30	7.77	0.88	2.49	0.12	1.88	3.56	0.40			5.23	98.63	81.	1.	270.
VA12120	26.85	45.50	67.40	13.90	0.40	4.17	3.35	1.67	4.29	0.44			3.39	99.01	61.	4.	256.
VA12121	45.50	57.27	64.00	15.20	0.71	4.55	2.75	2.40	4.87	0.45			3.62	98.55	67.	3.	259.
VA12122	63.70	69.44	54.50	14.70	6.41	4.14	0.41	4.00	7.64	0.67			5.62	98.09	54.	7.	136.
VA12123	69.44	72.90	52.00	15.60	6.32	4.23	0.36	4.34	8.19	0.75			6.77	98.56	56.	7.	142.
VA12124	72.90	81.47	39.00	12.70	19.30	2.54	0.56	2.87	5.08	0.65			14.70	97.40	31.	20.	56.
VA12125	81.47	95.43	59.80	15.70	4.21	3.45	1.54	3.51	6.08	0.61			4.70	99.60	55.	6.	170.
VA12126	95.43	110.14	55.80	16.00	5.94	3.94	1.11	3.65	6.82	0.74			5.47	99.47	52.	7.	150.
VA12127	110.14	116.61	61.70	16.70	1.97	3.82	2.17	2.69	6.53	0.66			3.70	99.94	61.	4.	245.
VA12128	116.61	121.30	54.00	16.90	5.98	3.59	1.86	3.47	6.76	0.85			5.39	98.80	47.	8.	149.
VA12129	121.30	140.58	56.00	15.80	4.72	4.43	0.80	3.77	8.25	0.77			4.23	98.77	60.	6.	170.
VA12130	140.58	143.57	53.80	16.80	5.41	3.98	0.41	4.54	7.79	0.88			4.62	98.23	59.	6.	162.
VA12131	143.57	154.80	47.90	14.30	8.78	4.17	1.74	3.09	8.20	0.73			8.08	96.99	41.	11.	105.
VA12132	154.80	160.40	14.90	4.87	42.40	1.92	0.17	1.04	2.71	0.26			31.30	99.57	7.	43.	11.
VA12133	160.40	187.71	52.80	15.60	7.75	3.83	2.19	2.25	7.59	0.76			6.00	98.77	38.	10.	128.
VA12134	187.71	201.64	55.00	15.50	3.54	3.80	2.99	1.57	12.20	0.88			4.00	99.48	45.	7.	191.
VA12135	201.64	216.43	59.90	16.80	2.08	3.97	1.62	2.34	9.19	0.80			2.77	99.47	63.	4.	278.
VA12136	216.43	234.24	42.20	12.40	8.87	11.20	0.64	0.31	15.20	3.56			4.08	98.46	55.	10.	126.

DIAMOND DRILL CORE LITHOGEOCHEMICAL RECORD
(MINOR ELEMENTS)

SAMPLE NUMBER	FROM	TO	RB (ppm)	SR (ppm)	BA (ppm)	Y (ppm)	ZR (ppm)	NB (ppm)	CR (ppm)	CU (ppm)	ZN (ppm)	NI (ppm)	ROCK	ALT	MIN
VA12117	10.00	17.45			1110.0					37.0	98.0	<10.0	TIB	PSH	DCO
VA12118	17.95	22.25			1340.0					33.0	126.0	<10.0	TIA	PSW	DCO
VA12119	22.25	26.85			1540.0					84.0	409.0	61.0	SAT	PQS	DCO
VA12120	26.85	45.50			2370.0					16.0	96.0	<10.0	TIB	PSH	DCO
VA12121	45.50	57.27			1840.0					54.0	108.0	<10.0	TIB	PSH	DCO
VA12122	63.70	69.44			793.0					115.0	1410.0	34.0	SAT	?	DCO
VA12123	69.44	72.90			799.0					153.0	68.0	39.0	TIA	?	DCO
VA12124	72.90	81.47			440.0					51.0	67.0	25.0	SAT	?	DCO
VA12125	81.47	95.43			978.0					87.0	120.0	12.0	TMB	?	DCO
VA12126	95.43	110.14			898.0					116.0	172.0	26.0	SAT	?	DCO
VA12127	110.14	116.61			1010.0					210.0	117.0	<10.0	TIA	PSW	DCO
VA12128	116.61	121.30			891.0					97.0	148.0	33.0	SAT	?	DCO
VA12129	121.30	140.58			805.0					174.0	175.0	27.0	TIB	PSW	DCO
VA12130	140.58	143.57			934.0					98.0	74.0	37.0	SAT		DCO
VA12131	143.57	154.80			813.0					260.0	69.0	28.0	U	PQM	DCO
VA12132	154.80	160.40			53.0					<10.0	36.0	<10.0	SAT	?	DBO
VA12133	160.40	187.71			502.0					170.0	104.0	34.0	SAT	?	DCO
VA12134	187.71	201.64			553.0					761.0	126.0	32.0	SAT	?	DCO
VA12135	201.64	216.43			984.0					395.0	146.0	35.0	SAT	?	DCO
VA12136	216.43	234.24			186.0					3730.0	446.0	243.0	TMA	?	A

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BABIY OPTION

HOLE No.P 83-2

HOLE LOCATION:
UTM:
AZIM: ELEV:
DIP: LENGTH: 215.33
NTS: CORE SIZE: BQ
STARTED:
COMPLETED:
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP

CLAIM No:
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 3, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO (m)	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)
0	10.0	CASING											
10.0	13.65	DACITE TUFF -grey, 30% dark grey biotitic spots (1-5mm) and spotted discontinuous layers (1-5mm) in a grey siliceous fine grained layers -foliation 80 - 90 degrees to core axis; <1% pyrrhotite 13.00-14.00 - lapilli 40%, 5-10mm 14.00-14.65 - core broken possible fault zone											
13.65	20.06	CALCAREOUS TUFFACEOUS ARGILLITE -dark grey, calcareous to non-calcareous, banded, 1-5mm, 20% light grey quartzite or silty wache layers, 10%, 1-20mm calcareous light grey layers and balance argillite layers -foliation 70 degrees to core axis; 2% pyrrhotite 13.65-14.00 - fold 15.00-17.56 - dacite lapilli tuff 25%, 5-20mm stretched fragments in a biotitic matrix; 5% pyrrhotite											
20.06	46.50	QUARTZ-EYE FELSIC TUFF -light grey to grey, 5%, 1-5mm, quartz eyes in a fine grained siliceous matrix with 10% chlorite-biotite-calc-silicate -foliation 70 - 80 degrees to core axis; 1-2% disseminated pyrrhotite 20.06-21.55 - dacite lapilli tuff 21.60-22.30 - white quartz vein 22.30-31.00 - felsic tuff silicified moderate sericitized 31.00-46.50 - moderate sericitized, weakly silicified 23.25-24.75 - cherty interval, 23.60-24.17 banded chert 70 degrees to core axis, 75% dark green mafic tuff with 10-15%											

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BABIY OPTION

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FROM (m)	TO (m)	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)

pyrrhotite, 1% chalcopyrite
27.27-27.43 - 20% pyrrhotite, 1% chalcopyrite
34.80-35.10 - weak fault zone
45.11-46.50 - fine grained felsic ash tuff
-lower contact very sharp 80 degrees to core axis

46.50 62.60 CALCAREOUS MAFIC ASH TUFF
-green, weakly banded, 2-8mm, green to dark green layers of chlorite-calc-silicate-carbonate
-lower contact gradational over 20cm
-foliation weak 70 - 80 degrees to core axis
-2-3% disseminated pyrrhotite
60.00-60.30 - 1% sphalerite in 2, 1mm, irregular layer or fractures
61.10-61.25 - 1% sphalerite as above
57.40-57.70 - weak fault zone, 20% gouge

62.60 75.50 INTERMEDIATE LAPILLI TUFF
-40-60%, 1-15mm x 3-30mm, light grey fine grained siliceous dacite fragments in fine grained intermediate matrix with 10-30% biotite and 5% chlorite local fragments to 5cm
-foliation 75 - 85 degrees to core axis; 1% pyrrhotite <<1% chalcopyrite
65.60-65.85 - fine grained intermediate dyke 80 degrees to core axis
66.60-67.00 - feldspar, 25%, 1-3mm physic intermediate dyke
66.35-66.45 - siliceous ash tuff layer 15% pyrrhotite, 1% sphalerite, 1% chalcopyrite layer 70 degrees to core axis
-lower contact gradational and marked by siliceous dacite or chert fragment lapilli tuff over 1m

75.50 84.95 QUARTTZ-EYE DACITE LAPILLI TUFF AND TUFF
-dark grey to light grey-brown, 0-20%, 2-10mm,

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

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vague, siliceous fragments in a siliceous biotite-chlorite-quartz matrix with 2%, 1-5mm light bluish quartz eyes; moderate sericitization
-2%, locally 5% pyrrhotite, 1% chalcopyrite
76.26-76.56 - fold
75.60-76.10 - 5% pyrrhotite, 1% chalcopyrite
80.60-82.00 - strongly sericitized
84.50-84.95 - 30% quartz vein, 20% pyrrhotite, 1% chalcopyrite

84.95 90.60 DACITE LAPILLI TUFF OR INTRAFORMATIONAL BRECCIA
-dark grey, 30-40%, 2-15mm x 3-40mm siliceous dacite, chert, possible quartz vein material fragments in a fine grained biotite-chlorite-seritite matrix, 10%, 2-10mm argillite rich layers, one quartz-eye crystal tuff fragment
-rock looks like an intraformational breccia, but could be a structurally dismembered chert-argillite-tuff bedded sequence
-5% pyrrhotite disseminated and as 1-5mm discontinuous layers in foliation, <<1% chalcopyrite
-foliation 80 degrees to core axis
-lower contact sharp 90 degrees to core axis

90.60 107.20 QUARTZ-EYE FELSIC TUFF
-grey, 1-3%, 1-6mm, bluish quartz eyes in a fine grained siliceous, seritite-chlorite-biotite matrix; rock moderate sericitized 2-3% disseminated and irregular <1-2mm layers in foliation
-foliation 70 - 80 degrees to core axis
91.20- 93.70 - dacite lapilli tuff as in 84.95-90.60
93.70- 94.90 - quartz vein, 5% pyrrhotite
95.40- 97.90 - strongly sericitized
98.80- 99.00 - siliceous zone, 80 degrees to core axis, 15% pyrrhotite, 1% sphalerite, 1% chalcopyrite

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

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99.00-102.30 - as in 84.95-90.60, <1% chalcopyrite, 5% pyrrhotite
103.10-103.15 - massive pyrrhotite, 5% chalcopyrite layer 85 degrees to core axis
-lower contact sharp 80 degrees to core axis
99.97-100.20 - fine grained intermediate dyke

107.20 114.50 MAFIC TUFFACEOUS SEDIMENTS
-dark brown to light brown banded, 1-5mm, dark brown and light brown and grey calcareous layers 80 degrees to core axis
-rock looks like a mafic tuff 107.20-111.0, then becomes lighter coloured more calcareous and grades into next unit of calcareous argillite
-1% disseminated pyrrhotite
109.20-109.30 - limestone layer 75 degrees to core axis
109.30-110.80 - quartz vein zone 50% quartz, 5% pyrrhotite
112.85-112.95 - limestone layer

114.50 139.22 CALCAREOUS ARGILLITE
-dark grey, calcareous, weakly banded 60% black argillite and light grey siliceous chert, and calcareous bands, 1-10mm, 80 degrees to core axis, light grey layer look like fine grained calcareous quartzite and chert
119.90 - graded bed suggests tops to bottom of hole ???
-foliation 80 degrees to core axis, 2% disseminated pyrrhotite
133.00 - dewatering structure suggests tops to top of hole and graded bedding

139.22 154.60 DACITE LAPILLI TUFF
-5-25%, 1-20mm x 2 to >40mm, siliceous, fragments

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BABIY OPTION

HOLE No.P 83-2

HOLE LOCATION:
UTM:
AZIM: ELEV:
DIP: LENGTH: 215.33
NTS: CORE SIZE: BQ
STARTED:
COMPLETED:
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP

CLAIM No:
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 3, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO (m)	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)
		in a fine grained biotite-chlorite-calc-silicate-quartz matrix; <<1% quartz eye -foliation 70 - 85 degrees to core axis, 1-2% disseminated fracture pyrrhotite and 4-10mm pseudomorphs after pyrite -upper contact gradational over 3m											
154.60	160.95	INTERMEDIATE ASH TUFF -green, siliceous, locally calcareous, weakly banded, chlorite-calc-silicate-biotite and chert layers, 2-8mm, 80 - 90 degrees to core axis -foliation 80 - 90 degrees to core axis, 1% pyrrhotite 154-45-154.60 - limestone layer 157.50-157.85 - quartz vein 5% pyrrhotite 160.07-160.53 - quartz breccia zone, silicified, 20% pyrrhotite, <1% chalcopyrite											
160.95	166.66	QUARTZ-EYE FELSIC TUFF -grey to grey-green, 5%, 1-8mm quartz eyes in a sericitic-biotitic-chloritic matrix -weak to moderate sericitization -1% disseminated pyrrhotite, foliation 80 - 90 degrees to core axis											
166.66	215.33	MAFIC ASH TUFF -dark green, fine grained, weakly banded, 2-18mm, green to dark green layers 80 - 90 degrees to core axis; rock chloritic-calc-silicate and calcareous -upper contact gradational over 1m -foliation 80 - 90 degrees to core axis weak -lighter green layers coarser grained with 15% <1mm epidote after possible clinopyroxene crystals; 5-10% <1mm feldspar crystals 166.05-166.12 - 20% pyrite, 10% pyrrhotite, 1% magnetite, 1% chalcopyrite 166.28-166.31 - as at 166.05-166.12											

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BABIY OPTION

HOLE No.P 83-2

HOLE LOCATION:
UTM:
AZIM: ELEV:
DIP: LENGTH: 215.33
NTS: CORE SIZE: BQ
STARTED:
COMPLETED:
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP

CLAIM No:
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 3, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)
		175.57-176.57 - quartz vein 85 degrees to core axis 180-86-185.86 - 5% pyrite and pyrrhotite 185.86-186.66 - quartz vein											
215.33		END OF HOLE											

DIAMOND DRILL CORE LITHOGEOCHEMICAL RECORD
(MAJOR ELEMENTS)

SAMPLE NUMBER	FROM	TO	%SIO2	%AL203	%CAO	%MGO	%NA2O	%K2O	%FE203	%TIO2	%P2O5	%MNO	%LOI	SUM	AI	NACA	ALUM
VA12137	10.00	13.65	66.50	13.20	0.47	4.87	2.21	1.73	5.20	0.42			3.62	98.22	71.	3.	299.
VA12138	13.65	20.06	49.80	16.40	6.37	4.00	0.43	4.84	7.66	0.81			8.23	98.54	57.	7.	141.
VA12139	20.06	31.00	71.60	12.70	1.85	1.20	4.80	1.07	3.41	0.21			2.70	99.54	25.	7.	165.
VA12140	31.00	46.50	69.00	13.80	1.79	1.42	3.42	2.26	3.34	0.27			4.00	99.30	41.	5.	185.
VA12141	46.50	62.60	43.10	13.10	9.31	10.50	1.14	0.27	14.70	3.88			3.08	99.08	51.	10.	122.
VA12142	62.60	75.50	59.70	18.00	1.28	3.79	0.51	3.37	9.16	0.89			2.39	99.09	80.	2.	349.
VA12143	75.50	84.95	64.10	13.50	0.52	3.56	0.92	2.25	10.70	0.43			4.23	100.21	80.	1.	366.
VA12144	84.95	90.60	58.40	16.30	0.53	4.56	0.83	3.21	9.72	0.78			3.54	97.87	85.	1.	357.
VA12145	90.60	107.20	69.90	13.60	0.89	2.11	1.57	2.75	5.49	0.28			3.08	99.67	66.	2.	261.
VA12146	107.20	114.50	37.80	14.30	12.40	5.49	2.10	2.61	10.30	2.49			7.16	94.65	36.	15.	84.
VA12147	114.50	126.12	52.90	16.30	7.66	3.57	0.62	3.97	7.16	0.79			5.77	98.74	48.	8.	133.
VA12148	126.12	139.22	54.40	16.40	7.43	3.53	0.54	3.47	6.78	0.77			5.93	99.25	47.	8.	143.
VA12149	139.22	154.60	54.30	18.60	5.41	3.50	0.97	3.98	7.53	0.80			4.00	99.09	54.	6.	180.
VA12150	154.60	160.95	60.80	12.20	5.36	3.11	0.59	3.41	9.81	0.72			3.31	99.31	52.	6.	130.
VA12151	160.95	166.66	70.10	12.00	0.63	2.87	0.69	3.03	5.39	0.19			4.00	98.90	82.	1.	276.
VA12152	166.66	189.25	47.20	13.30	5.84	8.32	2.06	0.49	15.50	2.42			4.23	99.36	53.	8.	159.
VA12153	189.25	215.33	43.60	13.20	8.71	10.30	1.87	1.21	13.30	3.65			3.39	99.23	52.	11.	112.

DIAMOND DRILL CORE LITHOGEOCHEMICAL RECORD
(MINOR ELEMENTS)

SAMPLE NUMBER	FROM	TO	RB (ppm)	SR (ppm)	BA (ppm)	Y (ppm)	ZR (ppm)	NB (ppm)	CR (ppm)	CU (ppm)	ZN (ppm)	NI (ppm)	ROCK	ALT	MIN
VA12137	10.00	13.65			2480.0					50.0	254.0	<10.0	TIA	PSW	DCO
VA12138	13.65	20.06			1470.0					90.0	577.0	34.0	SAT	?	DCO
VA12139	20.06	31.00			1120.0					169.0	54.0	<10.0	TFAQ	PMS	DCO
VA12140	31.00	46.50			1850.0					171.0	93.0	<10.0	TFAQ	PMS	DCO
VA12141	46.50	62.60			148.0					166.0	380.0	203.0	TMA	?	DCO
VA12142	62.60	75.50			2200.0					275.0	639.0	41.0	TIB	?	DCO
VA12143	75.50	84.95			901.0					1950.0	839.0	<10.0	TIBQ	?	DCO
VA12144	84.95	90.60			1190.0					482.0	430.0	40.0	TIB	?	A
VA12145	90.60	107.20			1930.0					248.0	252.0	<10.0	TFAQ	?	DCO
VA12146	107.20	114.50			612.0					246.0	101.0	54.0	TMA	?	DCO
VA12147	114.50	126.12			685.0					157.0	115.0	37.0	SAT	?	DCO
VA12148	126.12	139.22			594.0					67.0	117.0	30.0	SAT	?	DCO
VA12149	139.22	154.60			779.0					132.0	169.0	44.0	TIB	?	DCO
VA12150	154.60	160.95			848.0					578.0	115.0	38.0	TIA	?	DCO
VA12151	160.95	166.66			1390.0					74.0	97.0	<10.0	TFAQ	?	DCO
VA12152	166.66	189.25			195.0					468.0	353.0	186.0	TMA	?	A
VA12153	189.25	215.33			399.0					96.0	159.0	187.0	TMA	?	DCO

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BABIY OPTION

HOLE No. P 83-3

HOLE LOCATION:
UTM:
AZIM: ELEV:
DIP: LENGTH: 152.33
NTS: CORE SIZE: BQ
STARTED:
COMPLETED:
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP

CLAIM No:
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 16, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO (m)	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)
0	9.45	CASING											
9.45	21.67	TUFFACEOUS ARGILLITE -dark grey to light grey, 60% grey to dark grey 1-30mm average 5mm layers of argillite, 20%, 5-20mm fine grained quartzite layers, 30% fine grained possible dacite tuff 1-40mm, average 5mm layers or fragments; locally 10%, 1-5mm light grey calcareous layers -foliation 60 - 70 degrees to core axis -13.0m, graded bed tops to top of hole 1-2% disseminated pyrrhotite, 2-5mm patches and pseudomorphs after pyrite 15.70-16.40 - silified zone											
21.67	23.67	DACITE LAPILLI TUFF -grey-green, siliceous, 60%, 5-20mm x 5 to >30mm, light grey siliceous fragments in a quartz-chlorite-biotite-calc-silicate matrix -foliation 80 degrees to core axis; 2% disseminated pyrrhotite -lower contact gradational, upper contact sharp 85 degrees to core axis											
23.67	25.29	DACITE TUFF -light grey, fine grained, 10-15%, 1-5mm biotite spotted tuff -foliation weak 85 degrees to core axis -2% disseminated pyrrhotite -upper contact marked by 15cm chert 85 - 90 degrees to core axis -lower contact sharp 85 degrees to core axis											
25.20	38.50	TUFFACEOUS ARGILLITE -light grey-green, 10-30%, 1-5mm x 2-15mm, light grey-green and grey siliceous fragments in a fine grained chlorite-calc-silicate-quartz matrix											

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BABIY OPTION

HOLE No. P 83-3

HOLE LOCATION:
UTM:
AZIM: ELEV:
DIP: LENGTH: 152.33
NTS: CORE SIZE: BQ
STARTED:
COMPLETED:
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP

CLAIM No:
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 16, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO (m)	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)
		-foliation 85 degrees to core axis; 5% pyrrhotite 39.70-41.50 - 30% pyrrhotite, 1% chalcopyrite in a siliceous chloritic breccia, 40%, 2-15mm, siliceous dacite and quartz vein fragments											
43.00	49.00	DACITE ASH TUFF -grey, fine grained quartz-feldspar-chlorite ash tuff, 3% <1-2mm biotite-chlorite spots -foliation weak 80 - 90 degrees to core axis -1% pyrrhotite -lower and upper contacts sharp 85 degrees to core axis											
49.00	54.00	TUFFACEOUS ARGILLITE AND DACITE LAPILLI TUFF -dark grey and light grey 60%, 1-10mm, black argillite layers, 30% light grey 1-3mm dacite tuff layers, 10%, 1-8mm x 2-15mm dacite fragments 49.00-49.90 - dacite lapilli tuff 49.60.49.90 - 30% pyrrhotite lapilli tuff 51.60-52.00 - dacite lapilli tuff											
54.00	58.51	DACITE ASH TUFF -grey, fine grained, quartz-feldspar-chlorite-biotite, ash tuff, 10-20%. 1-3mm biotite-chlorite spots -foliation weak 80 - 85 degrees to core axis, <1% pyrrhotite											
58.51	64.70	DACITE LAPILLI TUFF -grey, 5-20%, 1-8mm x 3-20mm siliceous fragments in quartz-chlorite-biotite-calc-silicate matrix -foliation 85 - 90 degrees core axis -2-3% pyrrhotite -weak to moderate sericitization											
64.70	66.82	TUFFACEOUS ARGILLITE											

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BABIY OPTION

HOLE No. P 83-3

HOLE LOCATION:
UTM:
AZIM: ELEV:
DIP: LENGTH: 152.33
NTS: CORE SIZE: BQ
STARTED:
COMPLETED:
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP

CLAIM No:
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 16, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO (m)	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)

-60% black argillite as 5-15mm layers with 40% light grey dacite ash tuff layers and 2-10mm x 5-30mm fragments; foliation 85 degrees to core axis; 1% pyrrhotite

66.82 69.82 DACITE LAPILLI TUFF
-same as 58.51-64.70

69.82 72.82 TUFFACEOUS ARGILLITE
-same as 64.70-66.82

72.82 75.00 DACITE ASH TUFF
-white-grey, fine grained siliceous ash tuff, 5% <1-2mm biotite-chlorite spots
-5% pyrrhotite <1-3mm fractures and disseminated
-foliation very weak 85 degrees to core axis
-contacts sharp 80 - 85 degrees to core axis

75.00 81.60 CHERT, SILICEOUS ARGILLITE, DACITE TUFF
-grey to dark grey, silicified dacite tuff or chert with 15%, 1-10mm black argillite layers
-5-10% fracture and disseminated pyrrhotite
78.00-80.00 - strongly silicified 5-10% pyrrhotite, 1% sphalerite
80.00-81.60 - 10-30% pyrrhotite, 1% chalcopyrite in chloritic matrix

81.60 87.00 LIMESTONE AND ARGILLITE
-70%. 5-200mm, light grey limestone and 30%, 1-40mm black argillite layers
-foliation and banding 70 - 80 degrees to core axis
-2% disseminated pyrrhotite
-less limestone lower in interval and lower contact gradational

87.00 97.00 CALCAREOUS ARGILLITE
-grey to black, 80% black argillite to siliceous

FALCONBRIDGE LIMITED DIAMOND DRILL LOG

PROPERTY: BABIY OPTION

HOLE No. P 83-3

HOLE LOCATION:
UTM:
AZIM: ELEV:
DIP: LENGTH: 152.33
NTS: CORE SIZE: BQ
STARTED:
COMPLETED:
PURPOSE:

SURVEY

DEPTH	AZIM	DIP	DEPTH	AZIM	DIP

CLAIM No:
SECTION:
LOGGED BY: S. CLEMMER
DATE LOGGED: AUG 16, 1989
DRILLING CO:
ASSAYED BY:

FROM (m)	TO (m)	DESCRIPTION	SAMPLE No.	FROM (m)	TO (m)	WIDTH (m)	TOTAL SULPHIDES	Cu (ppm)	Pb (ppm)	Zn (ppm)	Ag (ppm)	Au (ppb)	Ba (ppm)
		argillite, 20% grey clacareous fine grained quartzite and dacite tuff ? layers 1-5mm -local layer 2-8mm feldspar crystal tuff, may be fragments -foliation 80 - 90 degrees to core axis -1-2% pyrrhotite -lower contact charp 80 degrees to core axis											
97.00	103.85	DACITE LAPILLI TUFF AND ARGILLITE -40% of interval black argillite, 60% light grey-green, banded, 5-15%, 2-6mm x 2-10mm siliceous fragments -foliation 80 - 90 degrees to core axis -2% pyrrhotite											
103.85	152.23	INTERMEDIATE LAPILLI TUFF -light grey green to grey green weakly banded, 2-20mm light grey green ash layers, 5-20%, 1-6mm x 5-30mm light grey siliceous fragments in a fine grained quartz-feldspar-chlorite-biotite-calc-silicate matrix -1-2% pyrrhotite locally 5% pyrrhotite -foliation 70 - 80 degrees to core axis 145.13-149.63 - rock fractured, weak fault zone 139 -152.23 - 10%, 2-15mm, argillite layers -rock is locally chloritic and may have a mafic component; also rock has a sedimentary component											
152.33		END OF HOLE											

DIAMOND DRILL CORE LITHOGEOCHEMICAL RECORD
(MAJOR ELEMENTS)

SAMPLE NUMBER	FROM	TO	%SIO2	%AL2O3	%CAO	%MGO	%NA2O	%K2O	%FE2O3	%TIO2	%P2O5	%MNO	%LOI	SUM	AI	NACA	ALUM
VA12190	9.45	21.67	55.40	14.80	6.03	4.41	0.92	3.22	8.55	0.82			5.00	99.15	52.	7.	146.
VA12191	21.67	23.67	58.50	14.10	6.72	4.01	1.20	2.43	7.49	0.91			3.85	99.21	45.	8.	136.
VA12192	23.67	25.20	64.80	14.90	3.77	2.97	3.61	1.91	4.66	0.42			2.70	99.74	40.	7.	160.
VA12193	25.20	32.00	62.60	13.10	3.51	4.17	1.81	2.19	7.74	0.66			2.93	98.71	54.	5.	174.
VA12194	32.00	38.50	55.70	17.60	1.44	3.85	3.52	2.35	9.73	0.93			3.62	98.74	56.	5.	241.
VA12195	38.50	43.00	54.30	15.40	1.37	5.16	0.80	2.69	12.70	0.83			4.85	98.10	78.	2.	317.
VA12196	43.00	49.00	62.30	15.30	3.80	3.32	3.46	1.87	5.47	0.48			3.39	99.39	42.	7.	168.
VA12197	49.00	54.00	56.50	18.50	0.47	3.41	0.67	4.50	9.11	0.81			4.16	98.13	87.	1.	328.
VA12198	54.00	58.51	62.30	15.40	3.59	3.22	3.52	2.25	5.44	0.48			2.31	98.51	43.	7.	165.
VA12199	58.51	64.70	58.80	15.60	4.07	3.74	0.56	4.05	7.07	0.74			3.62	98.25	63.	5.	180.
VA12200	64.70	66.82	60.90	16.40	1.84	3.47	1.09	3.82	7.46	0.82			3.08	98.88	71.	3.	243.
VA12201	66.82	69.82	51.10	21.70	2.64	3.25	0.76	5.86	7.39	1.01			4.31	98.02	73.	3.	234.
VA12202	69.82	72.82	55.60	16.40	4.81	3.23	1.97	3.83	6.73	0.77			5.16	98.50	51.	7.	155.
VA12203	72.82	75.00	70.10	14.20	0.89	1.02	5.01	1.71	3.77	0.34			2.31	99.35	33.	6.	187.
VA12204	75.00	81.60	60.40	13.30	2.44	3.41	1.47	2.06	10.80	0.80			4.08	98.76	58.	4.	223.
VA12205	81.60	87.00	13.90	3.98	41.80	2.02	0.29	0.76	2.41	0.24			31.50	96.90	6.	42.	9.
VA12206	87.00	97.00	46.30	15.90	12.10	3.51	1.15	2.90	6.84	0.73			6.54	95.97	33.	13.	98.
VA12207	97.00	103.85	56.70	18.60	1.69	2.93	0.65	4.57	7.70	0.88			5.00	98.72	76.	2.	269.
VA12208	103.85	118.34	54.00	16.10	1.21	6.22	0.81	2.12	12.20	0.91			4.85	98.42	81.	2.	389.
VA12209	118.34	133.21	55.80	16.20	2.41	4.23	2.03	1.32	11.10	0.79			4.93	98.81	56.	4.	281.
VA12210	133.21	152.23	58.00	14.60	2.78	3.38	2.10	1.58	9.98	0.74			5.16	98.32	50.	5.	226.

DIAMOND DRILL CORE LITHOGEOCHEMICAL RECORD
(MINOR ELEMENTS)

SAMPLE NUMBER	FROM	TO	RB (ppm)	SR (ppm)	BA (ppm)	Y (ppm)	ZR (ppm)	NB (ppm)	CR (ppm)	CU (ppm)	ZN (ppm)	NI (ppm)	ROCK	ALT	MIN
VA12190	9.45	21.67			594.0					402.0	158.0	45.0	SAT		DCO
VA12191	21.67	23.67			653.0					129.0	171.0	33.0	TIB		DCO
VA12192	23.67	25.20			699.0					25.0	73.0	<10.0	TIA		DCO
VA12193	25.20	32.00			523.0					149.0	164.0	35.0	SAT		DCO
VA12194	32.00	38.50			582.0					204.0	148.0	44.0	SAT		DCO
VA12195	38.50	43.00			842.0					1020.0	292.0	20.0	TIB		DCO
VA12196	43.00	49.00			902.0					21.0	74.0	<10.0	TIA		DCO
VA12197	49.00	54.00			1340.0					251.0	109.0	51.0	SAT		DCO
VA12198	54.00	58.51			978.0					37.0	83.0	<10.0	TIA		DCO
VA12199	58.51	64.70			887.0					74.0	107.0	32.0	TIB		DCO
VA12200	64.70	66.82			829.0					112.0	139.0	35.0	SAT		DCO
VA12201	66.82	69.82			1350.0					186.0	87.0	38.0	TIB		DCO
VA12202	69.82	72.82			929.0					116.0	116.0	34.0	SAT		DCO
VA12203	72.82	75.00			809.0					155.0	62.0	<10.0	TIA		DCO
VA12204	75.00	81.60			659.0					485.0	1000.0	26.0	SH	PQS	DDO
VA12205	81.60	87.00			123.0					75.0	38.0	<10.0	SAT	?	DCO
VA12206	87.00	97.00			471.0					277.0	151.0	25.0	SAT	?	DCO
VA12207	97.00	103.85			809.0					93.0	127.0	38.0	TIB	?	DCO
VA12208	103.85	118.34			515.0					115.0	143.0	69.0	TIB	?	DCO
VA12209	118.34	133.21			501.0					867.0	193.0	27.0	TIB	?	DCO
VA12210	133.21	152.23			650.0					478.0	97.0	29.0	TIB	?	DCO

APPENDIX 5 : PETROGRAPHIC DESCRIPTIONS

SAMPLE ID NUMBERS

VA12011	VA12043	VA12142
VA12016	VA12044	VA12144
VA12017	VA12047	VA12149
VA12022	VA12049	VA12163
VA12023	VA12052	VA12169
VA12024	VA12053	VA12183
VA12025	VA12073	VA12186
VA12036	VA12083	
	VA12084	
AG09303	VA12139	VA12216
AG09307	VA12152	VA12217
AG09315	VA12172	VA12218
AG09316	VA12190	VA12221
AG09324	VA12198	VA12222
AG09330	VA12209	VA12224
VA12040	VA12212	VA12226
VA12136	VA12214	
	VA12215	
VA12538		
VA12540		
VA12546		
VA12560		
VA12594		
VA12596		
VA12598		
VA12604		
VA12610		

Vancouver Petrographics Ltd.

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Stan Clemmer, Project Geologist
Falconbridge Limited
202-856 Homer Street
Vancouver, B.C. V6B 2W2

August 20, 1989
Our file # 8367

Dear Stan:

Re: Samples VA 120 and 121 series.

Petrographic descriptions have been completed for a suite of 25 thin sections or polished thin sections. Polished thin sections were prepared for some of the more mineralized specimens.

As anticipated no two sections contain exactly the same mineral assemblages or relative percentages of minerals but the rocks can be roughly grouped according to their similarities.

The ore minerals, although more uniform, suggest zoning by presence or absence of pyrite, magnetite, pyrrhotite, tenor of chalcopyrite, sphalerite and galena and colour differences (internal reflection) of sphalerite.

Quartz-sericite phyllite/schist is the most common rock type in the suite and is represented by samples VA 12011, 16, 17, 24, 49, 52, 73, 83; 12168, 86. These rocks are, in general, composed of a very fine groundmass of quartz (or quartz and feldspar) which is segregated into lensoids or lamellae by diffuse, discontinuous, foliated laminations, lensoids, partings or networks of sericite with varied biotite and chlorite content. Coarse rounded (resorbed) quartz phenocrysts/fragments are widely scattered in the groundmass of some of these rocks. In some rocks biotite predominates over sericite to form biotite schists represented by samples VA 12044; VA 12142, 44, 49, 53, 83. In still others chlorite may dominate or be the main constituent of the rock suggesting a different initial lithology and/or grade of metamorphism. The chloritic suite is represented by samples VA 12022, 23 (mixed), 25, 47; 12169.

Superimposed on the above general rock types there are coarser grained segregations of diffuse masses, lensoids or veins containing varied amounts of quartz, feldspar (plagioclase and/or K-feldspar), biotite, muscovite, chlorite (chloritoid), carbonate and sulphides. Commonly these minerals, particularly quartz, plagioclase and K-feldspar, biotite and sulphides appear to have impregnated the schistose groundmass and/or forms veins. This is apparent in most samples, particularly VA 12036 and 77. In other

cases carbonate appears to have partially replaced (dolomitized) the host rock; VA 12043. Sample VA 12084 is a foliated rock of metadacite/andesite composition.

The original lithologies are not known but presence of remnant rounded resorbed quartz phenocrysts and fragmental feldspars suggests a felsic volcanic/hypabyssal origin for at least some of the suite. How much of the quartz, plagioclase and K-feldspar is original content and how much is introduced is not known. Some of the more siliceous rocks probably are former mature sediments. There is also conflicting evidence for coarser segregations being original constituents, (strained, fractured and altered), and impregnations (diffuse, unaltered, poikilitic grains). Carbonatized rocks and rocks with veins and coarser unaltered gangue segregations containing sulphides suggests hydrothermal processes.

Yours truly.

Ken Northcote

K.E. Northcote Ph.D., P.Eng. (604) 796-2068

[1] VA 12011 Thin section

Quartz sericite schist/phyllite (vuggy):

Groundmass very fine anhedral quartz (& feldspar) preferred orientation of elongate grains. Superimposed on this groundmass are wispy foliated lensoids of sericite which form diffuse networks throughout the groundmass. Lesser chlorite and carbonate in clusters of grains also form lensoids in plane of foliation. Embedded in this groundmass are coarser anhedral subrounded quartz grains with diffuse margins and plagioclase laths with strong sericite/muscovite at grain ends forming over all lensoidal shapes in foliation plane. Minute grains of epidote (?) are evenly distributed throughout.
Stained tablet indicates no K-feldspar. Non magnetic.

PETROGRAPHY
Groundmass

Quartz: 40%, anhedral, (<.01 to 0.1 mm, generally <.05 mm), elongate in direction of foliation.

Sericite 30%, anhedral/bladed, (<.01 to .05 mm) in clusters of grains forming felted lensoidal clusters and wispy lensoids along plane of foliation. Form diffuse networks throughout groundmass.

Carbonate; <5%, anhedral, (<.01 to .05 mm), widely scattered grains and clusters of grains grading to aggregates of several mm in planes of foliation with coarser grains sizes described below.

Chlorite; 10% anhedral bladed, (<.01 to 0.1 mm), aggregates of grains forming small lensoids in plane of foliation.

Epidote (?); 2%, anhedral, very fine granular, pale greenish colour, high RI, low birefringence (bluish) to 1st order yellow anomalous colour of epidote.

Crystal inclusions and segregations.

Plagioclase; 5%, subhedral, (.05 to 0.6 mm), elongate, orientation across foliation at varied angles; sericitic alteration weak to moderately strong in some grains. Some grains broken lensoidal, in foliation plane as aggregates (to 2 mm). Commonly has sericite at grain ends in foliation plane.

Quartz; 1%, anhedral/subrounded, (0.1 to 0.4 mm), grain margins irregular/slightly diffuse, uniform extinction.

Zircon; traces, subhedral/rounded, (0.15 mm).

Sphene; 2%, anhedral, (0.1 mm), fine granular aggregates to scattered coarser grains.

[1] Continued

Chlorite; 5%, anhedral, (<.01 to 0.2 mm), as aggregates of grains associated with carbonate lensoids.

Carbonate; <5%, anhedral, (<.05 to 0.5 mm) forming elongate aggregates, (to several mm), in plane of foliation. Commonly associated chlorite, trace of biotite.

[2] VA 12016 (Thin section)

Quartz sericite muscovite schist.

Quartz forms granular lensoids in plane of foliation separated by wispy lensoids and networks of aggregates of foliated muscovite/sericite. Carbonate grains (iron-rich?) and aggregates of grains disrupt the foliation which piles up against the grains but shows slight streaming around the grains. Schistose foliation shows crinkle cross folding and dislocation. Some iron staining is associated with carbonate.

Pyrite and associated iron stain are evident in hand specimen and thin section. Nonmagnetic.

Stained tablet indicates no K-feldspar.

PETROGRAPHY

Groundmass

Muscovite/serictite; 30%, bladed/plumose, (to 0.2 mm), as foliated aggregates producing schistosity, enclosing lensoidal aggregates of quartz grains. Folded. Stream around included coarse carbonate grains and quartz.

Quartz; 35%, anhedral, (<.01 to 0.3, generally 0.1 to 0.2 mm), elongate lensoidal, lying in foliation plane.

Chlorite; 10%, bladed, (<.01 to 0.2 mm, generally 0.1 mm).

Inclusions

Quartz; <5%, anhedral, (0.1 to 0.3 mm), as lensoidal aggregates of grains in foliation plane associated with carbonate.

Carbonate; 10%, anhedral irregular grains, (iron-rich?)

Opaques; 1%, (pyrite) anhedral grains (to 0.1 mm) clusters of grains strung out in foliation plane, (to >1.0 mm).

[3] VA 12017 (Thin section)

Quartz muscovite/sericite schist/phyllite.

Consists entirely of quartz and very fine muscovite/sericite, which are segregated into quartz-rich lensoids and muscovite/sericite rich foliated laminae and wispy lensoids. Although there is some diffuse mixing of the two minerals segregation is nearly complete. Foliation is only locally slightly crinkled. Small iron-stained vugs in hand specimen and thin section. Stained tablet shows no K-feldspar. Nonmagnetic.

PETROGRAPHY

Quartz; 40%, anhedral, (<.01 to 0.2, but generally 0.05 to 0.1 mm), in nearly pure quartz lensoidal segregations/layers which are locally interupted by sericite in cross fractures.

Muscovite/sericite; 50%, anhedral bladed/plumose (<.01 to 0.2 mm), foliated aggregates of grains. Forms nearly pure laminae and diffuse lensoids and networks through quartz.

Rutile (?) <<1%, subhedral/euhedral, (<.01 to .06 mm), small rods and irregular grains, semiopaque (under low power); orange brown high birefringence and RI (high power).

Opaque, <1%, anhedral grains.

Clots/Impregnations

Chlorite; <5%, anhedral and bladed, (to 0.5 mm), as fine aggregates and clusters of blades associated with quartz.

Quartz; 5%, anhedral, coarser grains, (0.1 to >1 mm), forming coarser grained clots/lensoids in the generally finer grained groundmass.

[4] VA 12022 (Polished thin section)

Chlorite/clinochlore(?) schist

Foliated schistose, composed of chlorite /clinochlore (?) with small amounts of disseminated pyrite pyrrhotite (?) and hematite and associated iron staining. Magnetic.
Stained tablet incicates no K-feldspar.

PETROGRAPHY

Chlorite/clinochlore; 70%
(a) Fine,plumose, (<.01 to <.05 mm), felted/foliated, forms the groundmass of the rock.
(b) Coarser segregations, bladed (<0.1 to 0.7 mm) felted radiating forming segregations, and irregular veins.

Carbonate; <10%, anhedral, (<.01 to .02 mm)

?; <5%, anhedral, (irregular masses to >1.0 mm) semiopaque, contains fine bladed granules, alteration grains in cloudy, white, microgranular groundmass mixed with carbonate.

Epidote (?); <1%, anhedral (<.01 to .02 mm), pale yellowish colour, high relief,anomalous blue-grey birefringence with carbonate and Ti (?) minerals.

Zircon; trace

Reflected light; opaques; 20%,

In approximate order of abundance the sulphides are: sphalerite, galena, pyrite, chalcopyrite, pyrrhotite. Hematite is abundant, associated with iron sulphides. The sulphides occur as isolated grains and coarser composite grains with generally mutual boundaries. Chalcopyrite, although it occurs as fine grains in gangue is closely associated with sphalerite.

[5] VA 12023 (Polished Thin Section)

Chlorite-sericite/muscovite schist containing knots of quartz-feldspar-chlorite/clinochlore-sericite-sulphides. Impregnations ?

Strong foliated sericite/muscovite, chlorite, quartz which tends to be segregated into lensoidal or wispy zones composed of primarily one or other of these minerals. Some mixed zones of chlorite-sericite which contain interstitial K-feldspar. Foliation interrupted by knots or irregular lensoids of quartz with sericite. Magnetic.

Impregnation and veining by coarser quartz with associated coarser sericite and chlorite. Stained tablet indicates diffuse (+) stain for potassium through portions of rock matrix interstitial to fine chlorite.

Less than 5% disseminated pyrrhotite, pyrite, hematite, very minor sphalerite and chalcopyrite.

PETROGRAPHY
Groundmass

Sericite; 35%, anhedral/fibrous plate edges, (<.01 to 0.1 mm), plumose foliated aggregates forming diffuse laminae and lensoid. Forms nearly pure layers/laminae but also in mixed lensoids/laminae with chlorite, and interstitial feldspar (K-feldspar?)

Quartz; 30%, anhedral, (<.01 to .05 mm), as aggregates of grains forming lensoids, knots discontinuous laminae with varied amounts of sericite. (See impregnations and veining below).

Chlorite; 15%, bladed grains, occurs in two modes both of which may be related to impregnation/veining.
(a) fine fibrous/plumose, (<.01 to 0.1 mm), foliated to weakly felted irregular masses cutting through but also partially controlled by foliation. Significant amounts feldspar (impregnation?).
(b) coarser bladed, associated with coarse grained quartz-sericite-sulphide knots and veins.

K-feldspar; <10%; anhedral (<.01 to 0.2 ?mm), forms interstitial masses with chlorite (a) above. Close association with coarser quartz-chlorite-sericite-sulphide knots (and veins) suggests late impregnation?

Rutile (?)

Biotite; <1%, anhedral, (<.05 to 0.1 mm), occurs in segregated patches.

[5] continued

Impregnations and veining

Quartz, 10%, anhedral, (0.1 to >1.0 mm) lensoids and veins, aggregates of grains, strained extinction, associated with coarse chlorite/clinochlore, sericite and sulphides.

Chlorite/clinochlore; 10%, bladed, (0.1 to 0.3 mm), foliated/felted, associated with sericite and sulphides. Also associated with masses of finer chlorite with interstitial K-spar surrounding some of these segregations.

Sericite <5%, bladed, (<.05 to 0.2 mm) associated with the above impregnation/vein minerals.

K-feldspar (?), as described in previous section.

Biotite; <10%, anhedral, (<.01 to 0.2, generally about 0.05 mm), as diffuse networks and clusters of grains associated with quartz, k-feldspar

Reflected light:

Pyrrhotite <5%, hematite, pyrite and very minor sphalerite and chalcopyrite.

[6] VA 12024 Thin section

Sericite, quartz, (chlorite) schist/phyllite

Foliated laminated schist/phyllite composed of segregated foliated laminae of sericite forming diffuse networks around long narrow lensoids of aggregate quartz grains. Crinkled cross folds. Superimposed lensoidal clots and diffuse disrupted chlorite laminae with minor biotite adjacent to quartz vein. Minor coarse bladed chlorite/clinochlore and muscovite accompany quartz and sulphides to form the vein which cuts foliation at a small angle.
Stained slab indicates no K-feldspar. Weakly magnetic in veinlets.

PETROGRAPHY
Groundmass

Quartz; 30%, anhedral, (<.01 to 0.2 mm, mainly .05 to 0.1 mm), aggregates of grains forming disrupted laminae and lensoids in foliation plane.

Sericite; 25%, anhedral, (<.01 to 0.1, generally 0.05 mm). forms plumose, foliated to weakly felted wispy disrupted laminae and diffuse networks around quartz lensoids.

Chlorite; 15%, anhedral,(<.01 to 0.1 mm) forming diffuse lensoidal clots and disrupted laminae and partings, intermixed with diffuse felted knots of biotite which are most abundant in close proximity to quartz veins.

Biotite; <10%, anhedral bladed, (<.01 to 0.2 mm, generally .05 to 0.1 mm), clusters of felted grains scattered throughout the matrix but are most abundant adjacent to the quartz vein and as clusters in lines crossing foliation leading from the quartz vein.

NOTE: irregular long lensoids of microgranular brown alteration dusting occur along foliation planes particularly in close proximity to the quartz vein.

Feldspar; <<5%, although feldspar is suspected there is no suggestion of K-feldspar in the stained tablet nor do differences in relief of interstitial quartz suggest significant amounts of untwinned feldspar.

Impregnations/veins

Quartz; 10%, anhedral, (<.05 to >1.0 mm, generally 0.4 +/- mm), aggregates of grains form veinlet 1 to 2 mm wide. Accompanied by coarse bladed clinochlore, muscovite and minor sulphides.

[6] continued

Clinochlore (?); <5%, anhedral, (<.05 to 0.4 mm), bladed/plumose radiating, warped grains.

Muscovite; <5%, anhedral, (<.05 to 0.4 mm), bladed to plumose, and diffuse clusters of grains healing fractures (?) crossing the quartz vein.

Opaque; (pyrrhotite) <<1%, anhedral (<.01 to .25 mm), some grains very irregular aggregates interstitial to quartz in veins.

[7] VA 12025

Mineralized (pyrite), chloritic schist/phyllite

The chloritic schistose texture is disrupted by diffuse impregnations of quartz accompanied by clots of coarser chlorite related material (clinochlore) with coarse clusters of pyrite.

The stained tablet indicates no K-feldspar. Nonmagnetic.

PETROGRAPHY

Groundmass

Chlorite, 30%, anhedral (<.01 to 0.1 mm), bladed, felted to foliated, forms schistose foliation. Contains clots/lensoids coarser grained felted chlorite/clinochlore which also form segregations with quartz veins.

?; 10%, fine granular alteration forming "snowflake" texture clots of aggregates of irregular granular texture. Microgranular brown alteration dusting. Some association with opaques (pyrite).

Impregnation

Quartz; 30%, vein/impregnation, composite, fine grained <.01 to 0.3 mm; generally 0.1 to 0.2 mm) on one margin with minute sericitic partings but becoming coarser grained (to >1.0 mm) on the other margin. Associated clinochlore, sulphides and very minor biotite.

Chlorite/clinochlore; <10%, bladed, (<.05 to 0.5 mm), in clusters of radiating grains at margins of quartz veins, low birefringence, grey/1st order yellow, biaxial (+) low 2v (<10°). Micaceous, crinkled blades in thin section. Twinned, good cleavage in at least 1 direction, length fast (-) elongation, near parallel extinction.

Reflected light.

Opaques; 20%, predominantly pyrite in masses, (to several mm), with very minor associated chalcopyrite. Hematite.

[8] VA 12036 (Polished thin section)
Polymineral impregnated laminated schist.

Foliated/schistose composed of laminae of a variety of minerals. In hand specimen the lamination-foliation is conspicuous but in thin section less obvious because of the felted nature of the many bladed varieties of minerals. Laminations are evident because of one or pairs of different minerals may predominate in adjacent lamellae; ie. biotite-chlorite-muscovite-rich; carbonate-muscovite-biotite-rich; quartz-K-feldspar-rich; jarosite-carbonate-rich etc.

Quartz, K-feldspar, carbonate, biotite and opaque minerals occur as diffuse lensoids and stringers more or less following the foliation and have the appearance of having impregnated the matrix.

Opaques include pyrite, sphalerite, chalcopyrite, pyrrhotite. Abundant hematite.

Stained tablet indicates K-feldspar. Weak magnetic.

PETROGRAPHY

Carbonate; 35%, anhedral, (<.01 to 0.8 mm, generally 0.1 to 0.2 mm), aggregates of grains with biotite forms the groundmass of most lamellae.

Biotite; 25%, anhedral (<.01 to 0.4 mm, generally 0.1 to 0.2 mm) bladed, felted patches, foliated, associated with carbonate and quartz.

Muscovite; <5%, anhedral (<.01 to 0.4 mm, generally 0.1 to 0.2 mm) bladed, felted patches,associated with quartz.

Mica; pale/dark green pleochroic, <1%, mottling of biotite, alteration to chlorite? but retains high birefringence.

Chlorite.

Chlorite; <10%, fine anhedral (<.01 to 0.2 mmm), felted, with K-feldspar and shredded biotite forming diffuse layers, generally finer grained than adjacent biotite-rich layers.

Clinochlore; <5%, coarse subhedral, (to 0.3 mm), bladed, radiating clusters of grains. Requires confirmation.

Quartz; 10%, anhedral, (<.01 to 0.4 mm), generally .05 to 0.1 mm as aggregates of grains forming diffuse, discontinuous, layers. Larger grains, (to 0.4 mm), form coarser segregations with sulphides, coarser biotite and minor muscovite.

[8] Continued

K-feldspars; <5%, anhedral (to 0.2 mm), interstitial, with chlorite and biotite forming diffuse layers.

Note: Suggestion of plagioclase twinning.

Jarosite (?); <5%, anhedral aggregates, (<.01 to >0.2 mm) forming diffuse clusters of grains associated with sulphides and shredded chloritic altered biotite. Requires confirmation.

Reflected light

Opaques; 10%, anhedral (<.01 to aggregates >1.0 mm) associated with a wide range of minerals but particularly biotite and quartz. In approximate order of abundance they include pyrite, chalcopyrite, sphalerite, pyrrhotite. Pyrite shows some granular alteration. Abundant hematite.

[9] VA 12043 (Polished thin section)

Carbonatized biotite, amphibole schist.

Layered, composed largely of carbonate, altered amphibole (actinolite-hornblende), and biotite.
Weathered and some foliation surfaces produces a soft chalky/waxy powder probably from the light brownish coloured interstitial alteration material.

Stained slab shows no evidence of K-feldspar. Moderately magnetic.

Opaques 15%, include hematite, pyrrhotite, pyrite, sphalerite, chalcopyrite.

PETROGRAPHY

Carbonate; 30%, anhedral, (<.01 to 0.6 mm, generally 0.05 to 0.1 mm) aggregates of grains in a foliated groundmass

Biotite/chlorite; 20%, anhedral ragged, (<.01 to 0.1 mm), felted clusters of grains, largely altered to chloritic leaving ragged biotite remnants.

Feldspar; <5%, suspected but not confirmed, (<.01 to 0.1 mm), interstitial with quartz, slight brownish clouded appearance, untwinned, no evidence of K-stain.

Quartz; <5%, anhedral, (<.01 to 0.2 mm) , interstitial. Few coarser grains associated with coarse carbonate and opaques.

Amphibole; 25% bladed/altered fibrous, (<.01 to 0.15 mm), pleochroic, medium green/colourless, inclined extinction. Altered to chlorite. Felted masses and foliated, forming a diffuse network among carbonate grains. Scattered felted lensoids associated with opaques.

Alteration; <10%, low relief, light brown colour, microgramular dusting. Requires microprobe for identification.

Reflected light

Opaque; 15%, anhedral grains and laths, disseminated throughout groundmass. In approximate order of abundance they are hematite, pyrrhotite, pyrite, sphalerite, chalcopyrite. Pyrrhotie shows abundant alteration (to hematite).

[10] VA 12044 Thin section

Quartz, feldspar, biotite, muscovite schist.

The rock shows strong foliation but granular quartz and feldspar disrupt schistosity with exception of schistose planes of micaceous minerals. Disseminated sulphides, pyrite and pyrrhotite? (weakly magnetic).

Stained slab does not indicate K-feldspar.

PETROGRAPHY

Quartz; 25%, anhedral, (<.01 to 0.1 mm), irregular grains, associated with plagioclase forming the rock matrix.

Note: Few coarse quartz grains to 1.0 mm, rounded, partial resorption.

Feldspar; 20%, anhedral (<.01 to 0.1 mm), irregular grains, (untwinned plagioclase), unaltered, evident by lower relief than quartz.

Biotite; 25%, (a) bladed, (<.01 to 0.2 mm), forming felted clusters (segregations) of grains, strong pleochroic. Also as warped diffuse disrupted laminae. (b) bladed, (<.01 to 0.1 mm, generally about 0.05 mm) felted masses, weak pleochroism. Both show crenulations, locally very intense deformed, cross folding and rupture.

Muscovite; 10%, bladed (<.01 to 0.1 mm), shredded, associated with biotite (b) as warped diffuse locally intensely disrupted laminae.

Chlorite; <10%, bladed, (<.05 to 0.1 mm), clusters of grains in matrix and associated with biotite.

Carbonate; <10%, anhedral (<.01 to 0.2 mm, generally 0.05 to 0.1 mm), irregular grains disseminated in localized patches.

?; traces, anhedral, aggregates, light brown colour, high relief, birefringence?

Opaques; <5%, anhedral, (<.01 to 0.1 mm), strong association with biotite.

[11] VA 12047 (Polished thin section)

Chlorite, quartz, magnetite schist (pyrite/pyrrhotite)

Chlorite schist, strong foliation containing quartz eyes. Contains lensoids of aggregates of quartz grains and veins. Feldspar patches poikilitically enclosing chlorite and minute opaque grains appear to be original constituents.

Mineralized by disseminated aggregate grains of pyrrhotite and magnetite, sphalerite and lesser chalcopyrite. Hematite in fractures and as fine disseminations.

Stained tablet indicates no K-feldspar. Magnetic.

PETROGRAPHY

Chlorite; 55%, bladed, (<.01 to 0.3 mm, generally 0.05 to 0.1 mm), foliated, with foliation streaming around quartz grains, lensoids, with coarser grains in foliation plane at ends of more angular quartz.

Quartz; 20%, anhedral, (<.01 to 0.6 mm), few single large grains but generally aggregates of grains in lensoidal shape along foliation. Impregnations or disrupted veins.

Feldspar; 15%. subhedral, (<.01 to 1.5 mm), broad patches of low relief, low birefringence, poikilitic texture enclosing chloritic grains, quartz and fine opaques. Untwinned, requires confirmation. Original rock constituents?

Reflected light: Opaques 15%
(a) fine elongate and aggregate of opaques as disseminations along planes of foliation.
(b) coarse anhedral clusters of grains some associated with quartz.

In approximate order of abundance the opaque minerals include: pyrrhotite, magnetite, sphalerite and chalcopyrite. Hematite in fractures and as finely disseminated grains in matrix.

[12] VA 12049 (Thin section)

Quartz-sericite schist/phyllite. Cut by quartz vein.

Groundmass of fine grained elongate quartz grains show preferred orientation in plane of foliation. Scattered sericite grains and more abundantly sericite partings and diffuse wispy masses produce foliation. Crenulationed by cross folding.

Quartz veins. Clots of sulphides disseminated through rock matrix and lesser associated with quartz veins.

PETROGRAPHY

Quartz; >65%, anhedral, (<.01 to 0.1 mm), most grains to 0.05 mm, elongate grains are oriented in plane of foliation.

Sericite/muscovite; 15%, anhedral, (<.01 to 0.1 mm), bladed/plumose, as widely scattered grains in foliation plane, as foliated partings in and crossing foliation and in diffuse, irregular crenulated masses containing disseminated quartz grains and aggregates of grains, lensoids.

Opaque; <5%,
(a) anhedral, irregular grains, (<.01 to >1.0 mm), larger aggregates of grains disseminated throughout quartz matrix.
(b) Microgranular dustings in fractures and along some foliation planes.

Veins and segregations. (cutting across and parallel to foliation)

Quartz, 15% anhedral, (<.05 to >0.5 mm), grains forming irregular veins and isolated clusters of coarser grains.

[13] VA 12052 (Polished thin section)

Quartz sericite schist/phyllite. As for (VA 12049)

This specimen is similar to VA 12049 but is more schistose, because of a greater amount sericite. Quartz is segregated into narrow lensoidal discontinuous laminae separated by wispy/diffuse discontinuous laminae of foliated sericite which are abundantly crinkled by cross folding and fracturing. Coarser grained quartz veins, lensoids follow and cross foliation. Euhedral/subhedral fine pyrite is disseminated throughout the matrix. Coarser aggregates of euhedral to subhedral pyrite with traces of pyrrhotite, sphalerite and galena blebs occur in quartz veins impregnations.

PETROGRAPHY

Quartz; >45%, anhedral, (<.01 to 0.1 mm) most grains, (to 0.05 mm), with elongate grains showing preferred orientation. Discontinuous laminae.

Sericite/muscovite; >35%, anhedral, (<.01 to 0.2 mm) bladed/plumose, foliated diffuse/wispy, discontinuous laminae, abundantly crinkled by cross folding.

Veins/segregations

Quartz; 10%, anhedral, (to >0.5 mm), grains forming veins and lensoids of coarser grains in and cutting across foliation plane.

Reflected light

Opaques; <10%:

Pyrite;
(a) euhedral/subhedral, (<.01 to 0.2 mm), disseminated and in clusters of grains strung out along foliation. (Note: very weak but distinct anisotropism; possibly arsenical.)
(b) clusters of coarse grains, (to >1.0 mm), associated with quartz veins/impregnations. (Note: very weak but distinct anisotropism; possibly arsenical).

Sphalerite; trace, as blebs in pyrite in (b).

Pyrrhotite; trace, as blebs in pyrite in (b)

Galena; trace, as blebs in pyrite in (b)

[14] VA 12053 (Thin Section)

Quartz-biotite-sericite schist.

Quartz forms a fine granular groundmass with elongate grains showing preferred orientation. Sericite forms wispy discontinuous foliated laminae and diffuse lensoids throughout quartz groundmass producing schistosity. Coarse (>2 mm) rounded quartz grains and lensoidal aggregates with muscovite are widely scattered through the quartz groundmass. Irregular diffuse patches of very fine, felted biotite with minor coarser chlorite produce a dark spotted texture.

Stained tablet indicates no K-feldspar.

PETROGRAPHY

Quartz; 35%, anhedral, (<.01 to 0.05 mm with scattered coarser grains, aggregates of grains form discontinuous lamellae. Lack of difference of relief indicate predominantly quartz. Elongate grains preferred orientation. Coarse rounded quartz grains, (>2 mm), resorbed phenocrysts, are scattered through matrix.

Biotite; 30%, (a) anhedral, (<.01 to .05 mm), bladed to ragged felted. Pale brownish pleochroism (not intense as in unaltered biotite). Forms irregular, diffuse masses associated with lesser chlorite.
(b) anhedral, (<.01 to 0.1 mm), bladed/plumose, forms wispy discontinuous laminae and diffuse lensoids (similar to sericite). Stronger pleochroism than (a).

Chlorite; ≤10%, anhedral, (<.01 to .05 mm), bladed, weak felted, associated with biotite.

Sericite; 20%, anhedral, (<.01 to 0.1 mm), plumose, foliated, forms wispy discontinuous laminae and diffuse lensoids.

Feldspar (?); ≤5%, anhedral (to 1 mm) elongate grains in plane of foliation, poikilitic texture enclosing micas. Feldspar-like but untwinned. Not K-feldspar. Unaltered. Low birefringence, low relief, biaxial (+) with large 2V.

Note: some fine granular feldspar rich lamallae were anticipated within the quartz groundmass but were not detected.

[14] Continued

Veins/segregations

Quartz; 5%, some coarse grained quartz, (to 2 mm), forms lensoidal aggregates with muscovite.

Muscovite; traces, coarse bladed.

Opaques >5%, anhedral (<.01 to.3 mm) irregular, scattered throughout but most abundant associated with biotite clots.

[15] VA 12073 (Thin section)

Quartz sericite schist/phyllite

Quartz laminae/lensoids separated by foliated, fibrous appearing, sericite (mica) as diffuse, wispy partings, masses and networks. Lesser chlorite lensoids are found in certain layers. Segregations of coarser chlorite is associated with euhedral/subhedral carbonate crystals and aggregates with very minor sulphides. Pits, leached out sulphides. Stained slab shows no K-feldspar. Nonmagnetic.

PETROGRAPHY

Quartz; 40%, anhedral, (<.01 to >0.1 mm), irregular, aggregates form laminae/layers, long lensoids. Elongate grains have a preferred orientation. Grain edges are ragged and many contain fine inclusions. Suspect feldspar but relief differences not conclusive, no twinning, no cleavage. Coarser grains uniaxial (+). Few scattered coarse grains to >1.0 mm.

Sericite/mica; 40%, anhedral/fibrous, (<.01 to 0.1 mm, generally 0.05 mm), shredded, foliated. Occur in diffuse discontinuous lamellae/partings separating and forming a diffuse wispy network among quartz lensoids. Crinkled by cross folding and hairline fractures. Pale greenish and brownish colours, weakly pleochroic indicating some biotite-green mica.

Chlorite; 15%, anhedral, (<.01 to >0.3 mm), slightly coarser grained than sericite, (generally 0.1 mm), bladed. Forms diffuse lensoids among quartz-sericite lamellae. Coarser grains associated with carbonate and sulphides.

Carbonate; <5%, subhedral/euhedral grains, (to 1.0 mm), generally clusters of smaller anhedral grains associated with chlorite and sulphides. Iron staining.

Opaque; <1%, anhedral, (<.01 to 0.3 mm), shows tendency for concentration along certain lamellae, and with chlorite.

[16] VA 12083 (Thin section)

Spotted quartz, sericite phyllite/schist

Groundmass of fine grained anhedral quartz (and feldspar?) separated by narrow laminae of foliated/crenulated sericite. There are abundant coarse grained subhedral phenocrysts/fragments of twinned feldspar and lesser rounded quartz. Superimposed on this are diffuse clots of clusters of very fine felted chlorite, green mica, opaques (magnetite), and associated coarser carbonate aggregates.

Stained slab does not indicate K-feldspar. Magnetic.

PETROGRAPHY

Quartz; 40%
(a) Groundmass; anhedral, (<.01 to 0.1 mm), generally about (0.05 mm)
(b) Phenocrysts-fragments; <1%, anhedral, (to 0.2 mm), rounded.

Plagioclase
(a) Suspected in groundmass; <u>but not confirmed; no twinning, cleavage or sericitic alteration of groundmass.</u> May be recrystallized untwinned and very similar to quartz in appearance. Differences in relief that may be present are masked by minute sericite grains.
(b) Phenocrysts-fragments; 20%, subhedral to euhedral, (<0.1 to 0.5 mm) some of which show strong sericitic cores but many are clear, virtually unaltered (recrystallized?)

Sericite; 30%, anhedral/fibrous, (<.01 to 0.2 mm, generally 0.05 mm), aggregates of foliated grains form narrow diffuse partings along foliation and networks among quartz -(feldspar) groundmass. Crinkled by small cross folds.

Zircon; trace, subhedral rounded, (>0.1 mm).

Clots: 10%, mixture of:
Chlorite; forms small segregations of coarser grains and aggregates of very fine grains.

Carbonate; diffuse grains and coarser aggregates.

Mica (green); very fine <.01 to .02 mm

Opaques; magnetite; very fine anhedral, small clusters of grains scattered throughout the clots.

[17] VA 12084 (Thin section)

Foliated Metadacite/andesite

Elongate grains of fine feldspar and lesser quartz form a foliated groundmass which streams around included coarser feldspar grains and aggregates and locally cuts through included coarser grained mixed mineral lensoids. The lensoids are composed of coarse grained feldspar, quartz, chlorite, muscovite, and sulphides. There is some leaching of sulphides. Large, rounded, partly resorbed quartz grains are widely scattered through the fine foliated groundmass.

Stained tablet does not indicate K-feldspar. Nonmagnetic.

PETROGRAPHY

Crystal-lithic fragments and lensoids: 40%

Plagioclase; 30%, anhedral/subhedral, (<.05 to >1.0 mm< generally approximately 0.5 mm), twinned, weak sericite and dusting of alteration. Twinning indicates composition in oliogoclase range. Single crystals/fragments and clusters of crystals strung out in plane of foliation. Some show rounding.

Chlorite; <5%, anhedral bladed, (<.05 to 0.3 mm) shredded appearance, with quartz, muscovite, plagioclase leached sulphide lensoids.

Quartz; <5%, anhedral, (to 1.0 mm), strained, as single rounded, coarse, partially resorbed grains, and aggregates of smaller grains with associated muscovite, leached sulphides (iron-stained cavities) and plagioclase forming lensoids oriented parallel to foliation plane.

Muscovite <5%, anhedral bladed (<.05 to 0.2 mm) associated with quartz, leached sulphides and plagioclase lensoids.

Groundmass; 60%

Plagioclase; 45%, anhedral (<.01 to >.05 mm generally 0.02 mm) grading in size up to coarser grains in lensoids described above.

Quartz; <10%?, anhedral, (<.01 to <0.05 mm), suspected because of differences of relief between clear grains comprising groundmass. Not confirmed.

Chlorite; <10%, anhedral, (<.01 to 0.1 mm), thin plates as single grains and clusters of grains in plane of foliation.

[18] VA 12142 (Polished thin section)

Quartz, biotite, sericite, (K-spar) schist/phyllite

The rock is composed of quartz, biotite, lesser sericite, minor chlorite and clots of optically continuous K-feldspar. Layering results from relative concentration of one or more of these minerals into separate layers with foliation produced by preferred orientation of the elongate and micaceous grains. K-feldspar is concentrated in certain biotite-rich layers as optically continuous masses which poikilitically enclose the micas (impregnation ?).
Stained tablet indicates small masses of K-feldspar.
Nonmagnetic.

PETROGRAPHY

Quartz; 30%
(a) groundmass, anhedral, (<.01 to 0.1 mm, commonly <.05 mm), elongate grains have a preferred orientation. Associated with individual grains and clusters of grains of biotite and sericite which form small partings, diffuse, discontinuous stringers and networks surrounding clusters of quartz grains. Some minor associated sericite feldspar grains.
(b) coarser grained anhedral (to >0.2 mm) as irregular veins/segregations associated with opaques (sulphides) in coarser biotite layers. Impregnations ?

Biotite; 35%
(a) finer groundmass, (<.01 to 0.2 mm) strong foliation, forming layers mixed with lesser sericite, fine granular feldspar (sericite), small irregular granular quartz lensoids and minor porphyroblasts of K-feldspar.
(b) coarser purer layers, wide bladed, (<.05 to 1.0 mm), cross foliated/felted. Contains <1% minute grains producing pleochroic haloes. Contains K-feldspar. porphyroblasts and minor coarser granular quartz lensoids. Impregnations ?

Sericite; 20%, anhedral, (<.01 to0.3 mm, generally <0.1 mm), forms foliated irregular diffuse sericite-rich masses/layers; and as diffuse wispy partings in biotite and in quartz-rich layers.

Chlorite; <5%, anhedral, (<.01 to 0.1 mm) bladed, few small felted patches in biotite-rich layers.

K-feldspar; 10%, anhedral, (to several mm) optically continuous masses poikilitically enclosing micas. Truncates foliation. Featureless masses, <u>unaltered</u>. Biaxial (-), 2V>50. Impregnations ?

[18] Continued

Tourmaline (?); trace, mottled green, twin striations on long prismatic axis, maximum absorption perpendicular to polarizer direction (unlike micas)

Reflected light;

Opaques; <5%, anhedral, (<.01 to 0.5 mm), irregular, fairly evenly disseminated some tendency for association with quartz and biotite.

In approximate order of abundance the opaque minerals are: pyrrhotite, hematite, and traces of chalcopyrite, sphalerite and arsenopyrite all associated with pyrrhotite.

[19] VA 12144 (Polished thin section)

Quartz, biotite, sericite, schist.

Composed of quartz, biotite, sericite, carbonate, minor feldspar which are segregated into laminae enriched in one or more of these minerals. The micaceous minerals form wispy diffuse strong foliated lensoids, laminae and layers of varied thickness which show crenulations by cross folding and fracturing. The granular minerals, quartz primarily and lesser feldspar form lensoidal aggregates of irregular grains. Coarser quartz in veins parallel to foliations; boudinaged.

Stained tablet shows no K-feldspar. Nonmagnetic.

Opaques consist of: pyrrhotite, ilmenite/sphene, hematite, chalcopyrite and sphalerite.

PETROGRAPHY

Quartz; 25%, anhedral, (<.01 to 0.1 mm), and segregations with coarser grains, (to >0.3 mm), forms lensoids and boudinaged veins parallel to foliation. Most lensoids have interspersed wispy sericite (lesser biotite) partings.

Sericite; 35%, anhedral, (<.01 to 0.3 mm), strong foliated, plumose masses, forming thick crenulated layers composed of numerous laminae of differing average grain size in adjacent laminae. Coarser grain sizes are associated with coarser grained quartz. Some narrow interlaminations with biotite, very fine granular carbonate, and "dusty" opaque. Contains minor segregations of material (with moderate relief and very low birefringence) which crosses foliation giving the appearance of having soaked into and partly replaced the rock fabric. Impregnation.

Biotite; 20%, anhedral, (<.01 to 0.1 mm), bladed, forming very irregular, felted, diffuse masses in sericitic layers. Also concentrated along lines of dislocation in cross crenulations. Some association with the near isotropic unidentified material described below.

Carbonate; <10%, anhedral, (<.01) fine granular aggregates forming narrow laminae between sericite and as scattered irregular grains and aggregates of grains.

[19] Continued

Unidentified; <5%, (one of chlorite group?), light brownish grey to nearly clear, very irregular continuous masses which surround and partly replace sericite and biotite. Very low birefringence, mottled dark grey to black, plumose extinction. Replaces and partly surrounds micaceous grains so that foliation appears to pass right through.

Reflected light:

Opaque; <10%, anhedral grains (<.01 to irregular masses >1.0 mm). In approximate order of abundance the opaque minerals are: pyrrhotite, ilmenite/sphene, hematite, and chalcopyrite, <1%, and sphalerite. The latter two associated with pyrrhotite.

[20] VA 12149 (Thin section)

Quartz, biotite, sericite schist/phyllite.

Strong foliated; composed mainly of quartz, biotite, sericite segregated into lensoids, laminations with one or two of the minerals dominating. Lensoids of quartz occur in plane of foliation among diffuse, wispy biotite and sericite lensoids, partings and discontinuous laminations. Crenulated by cross folding and dislocations. Black chloritic material on cross fractures.

Opaque minerals pyrite predominating. Nonmagnetic.
Stained slab does not indicate K-feldspar.

PETROGRAPHY

Quartz; 30%. anhedral, (<.01 to 0.4 mm, generally about .05 mm), elongate grains with preferred orientation in plane of foliation. Continuous bands in plane of foliation but with segregated grain sizes, fine and coarse, across the bands. Sulphides are associated with coarser grains. Some admixed sericite and biotite. Some quartz in cross fractures as well as vein-like layers suggests quartz is introduced.

Sericite; 40%, anhedral, (<.01 to 0.1 mm). fibrous appearance of edges of plates, strong foliated, thin lensoidal, abundant intergrowth of thin lensoidal biotite. Crenulated.

Biotite; 25%, anhedral, (<.01 to >0.1 mm), fibrous appearance of edges of plates, strong foliated, diffuse lensoidal, abundantly intergrown with sericite partings.

Feldspar(?); There may be admixed feldspar (plagioclase) with biotite-sericite lamellae, not confirmed.

Chlorite; <10%, anhedral, (<.01 to .05 mm) forms diffuse lensoidal patches in sericite-biotite lamellae.

Tourmaline (?); trace, subhedral prismatic, pleochroic with greatest absorption perpendicular to polarizer, mottled greenish brown to very light brown, second order blue birefringence, (-) elongation. Associated with coarse quartz lensoids and sulphides.

Opaques; <5%, anhedral to euhedral, (pyrite to >2 mm).

[21] VA12163 (Polished thin section)

Quartz, carbonate, sericite (biotite) schist/phyllite.

Composed of quartz, carbonate, sericite, lesser biotite and sulphides segregated into laminae and lensoids dominated by one or two of these minerals forming quartz-rich; sericite-rich; carbonate-biotite-rich and quartz-carbonate-sulphide-rich laminae. The micaceous lamellae show strong crenulation and some dislocation by cross structures. Magnetic.

Sulphides 20%, include pyrrhotite, ilmenite/sphene, chalcopyrite, sphalerite, (hematite).

Stained tablet indicates K-feldspar present.

PETROGRAPHY

Quartz; 15%, anhedral, (<0.1 to >1.0 mm, generally 0.1 to0.2 mm), aggregates of grains forming lensoids/laminae with carbonate and opaques.

Sericite; 40%, anhedral, fibrous (edges of plates)(<.01 to 0.3 mm), form plumose masses, with diffuse margins, strong foliation; crinkled by cross folding and ruptures.

Biotite; 15%, anhedral, fibrous (edges of plates) (<.01 to 0.1 mm), forms narrow very irregular diffuse partings associated with margins of quartz-carbonate-sulphide layers. Also as very irregular diffuse patches associated with sulphides and microgranular semiopaque alteration.

Carbonate; <10%, anhedral (<.01 to 0.2 mm), as aggregates of grains in layers (vein) in plane of foliation associated with quartz segregations and irregular sulphide aggregates.

Feldspar (K-feldspar); 5%, anhedral, (<.01 to <.05 mm), diffuse segregations, (very low relief and birefringence). Within and crossing foliation of micaceous laminae. Very fine dusting of alteration. Stained tablet indicates this material is K-feldspar.

Tourmaline; trace, prismatic,(0.25 mm), pleochroic mottled green brown, maximum absorption perpendicular to polarizer. Associated with sulphides, quartz and carbonate.

Sphene; trace

[21] Continued

Reflected light

Opaque minerals; 15%, anhedral (<.01 to very irregular aggregates to several mm) associated with quartz and carbonate in lensoids, (veins) in plane of foliation.

In approximate order of abundance the opaque minerals are: pyrrhotite, ilmenite/sphene, chalcopyrite, sphalerite, (hematite).

[22] VA12169

Quartz chlorite schist (Thin section)

Predominantly strong foliated chlorite containing abundant sericite pseudomorphs after (?). Most pseudomorphs with relatively unaltered featureless cores remaining. Appears similar to plagioclase but with slightly more grainy appearance. Groundmass contains disseminated rounded grains of twinned plagioclase with no associated sericite. Sulphide masses.

Composite quartz veining, coarse and fine with segregations of coarse plagioclase. Impregnations ?

PETROGRAPHY

Chlorite; 45%, anhedral foliated plumose masses. Contains sericite/clay pseudomorphs with relatively unaltered but slightly grainy cores. Also contains inclusions of rounded, unaltered, twinned plagioclase.

Inclusions in chlorite; 10%
(a) Sericite/clay; granular pseudomorphs, (to >1.0 mm), after (?). Cores; (?) with moderate relief, dusted alteration, biaxial (+) 2V+75°. Featureless with slight grainy appearance. No twinning or conspicuous cleavage.
(b) Plagioclase; rounded, (<.05 to mm), unaltered, many grains show well developed twinning.

Veins; 35%, quartz predominating, minor plagioclase, carbonate, chlorite with associated sulphides.

Quartz; composite, very fine grained and coarse grained components, forming the groundmass.

Plagioclase, euhedral, clusters of very coarse grains, twinning and cleavage visible. Cuts across trend of veins. Associated sulphides.

Sulphides; with very minor carbonate in cross structures in veins.

The veins contain lensoids of aggregates of feldspar grains with minor associated chlorite.

Opaques; 10%.

[23] VA 12183 (Thin section)

Quartz, feldspar, sericite, biotite schist/phyllite

Fine granular groundmass is a mixture of quartz and feldspar (plagioclase) distinguished by differences in relief. Preferred orientation of elongate grains. Elongate grains (edges of plates) and aggregates of grains of sericite are foliated and form discontinuous partings and wispy stringers and networks among the quartz-feldspar grains. Contains diffuse clots of foliated biotite grains with associated plagioclase, very minor carbonate, chlorite and sulphides.

PETROGRAPHY

Groundmass

Quartz; 30%, anhedral (<.01 to .05 mm), scattered lensoids composed of coarser grains (0.1 to 0.2 mm). Elongate grains with preferred orientation.

Feldspar; 30%, anhedral grains (<.01 to 0.5 mm), scattered lensoids of coarser grains (to 0.1 to 0.2 mm). Elongate grains with preferred orientation.

Chlorite; <5%, anhedral grains, (0.1 to 1.0 mm) bladed, foliated and felted aggregates of grains commonly with biotite-carbonate clots.

Sericite; 20%, anhedral, fibrous appearance (edges of plates), (<.01 to 0.1 mm), as single grains clusters of grains in plane of foliation forming diffuse partings laminae and irregular networks in quartz-feldspar groundmass. Wispy dicontinuous laminae show crinkling by cross folding and ruptures.

Biotite; 15%, anhedral, fibrous/bladed appearance, (<.01 to 0.2 mm, generally 0.05 to 0.1 mm), foliated/felted irregular diffuse masses along and crossing plane of foliation (in association with cross structures?). Contains pleochroic haloes around minute inclusions. Associated with minor chlorite, carbonate feldspar and quartz lensoids.

Opaque; <5%, anhedral, (<.01 to >0.1 mm), associated with biotite masses and quartz lensoids.

Veinlets

Carbonate cross veinlets.

[24] VA 12186

Quartz, feldspar (plagioclase and K-feldspar, sericite schist/phyllite.

Groundmass of fine quartz and feldspar. Elongate grains with preferred orientation cut by irregular diffuse partings and discontinuous networks of sericite. Scattered coarser fragments and clusters of fragments forming lensoids of quartz, plagiocase, K-feldspar, biotite, carbonate and opaques.

PETROGRAPHY

Groundmass

Quartz; 30%?; anhedral, (<.01 to 0.05 mm), irregular grains with feldspar (plagioclase mainly), distinguished one from the other because of relief, comprise the groundmass. Elongate grains preferred orientation.

Feldspar; 25%?;
(a) Plagioclase;25%?; anhedral,(<.01 to 0.05 mm) irregular grains with quartz comprise the groundmass. Elongate grains preferred orientation. Extinction angles indicate oligoclase/andesine range of composition if RI (+)
(b) K-feldspar; suspected as a result of staining but not confirmed in groundmass.

Sericite; 20%, anhedral, (<.01 to 0.2 mm) generally <.05 to 0.1 mm), fibrous appearance (edges of plates), forms discontinuous diffuse partings, wispy laminae and networks in quartz and feldspar groundmass.

Lensoids of coarser grains, 20%, clusters of grains of:

Plagioclase; subhedral/fragmental, (to 0.5 mm), single grains and clusters with K-feldspar, quartz, carbonate and opaques.

K-feldspar; similar in appearance to untwinned plagioclase, presence confirmed by stained tablet.

Quartz; anhedral grains, (to 0.5 mm), clusters of grains.

Carbonate; minor amounts, anhedral aggregates, associated with biotite.

Biotite; diffuse clots associated with carbonate and quartz.

Opaques; 5%, mainly associated with coarser lensoids, segregations.

[25] VA 12077 (Polished thin section)

Impregnated quartz, feldspar, sericite phyllite/schist.

Schistose phyllitic rock composed of fine granular quartz and feldspar segregations separated by diffuse foliated masses of sericite showing crinking by cross folding. Coarse rounded partially resorbed quartz grains are scattered through this matrix. This phyllitic groundmass appears to have been impregnated by coarse lensoidal segregations of plagioclase, K-feldspar, carbonate, sericite/muscovite, and sulphides.

PETROGRAPHY

Quartz;
(a) Groundmass quartz; anhedral (<.01 to 0.1 mm) Rounded partially resorbed grain, anhedral (to >1.0 mm), embedded in groundmass.
(b) In coarse segregations, anhedral (to >0.3 mm).

Feldspar;
(a) In groundmass as fine grains as for quartz (<.01 to 0.1 mm)
(b) In course segregations, coarser grains (to 0.3 mm)
Plagioclase twinned
K-feldspar evident in stained tablet.

Sericite/muscovite
(a) Partings, diffuse lensoids, lamellae etc in groundmass;
(b) Muscovite in coarse segregations laths (to 0.4 mm)

Carbonate; In coarse segregations as anhedral grains and cluster of grains.

Sphalerite; (low iron), anhedral rounded (to 0.5 mm) single grains and clusters of grains, yellowish brown colour very fine granular texture, isotropic, high (+) relief, contains blebs of chalcopyrite.

Reflected light.

The opaque minerals, in approximate order of abundance include: pyrite, galena, sphalerite, chalcopyrite.

Vancouver Petrographics Ltd.

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Stan Clemmer, Project Geologist
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September 5, 1989
Our file # 8393

Dear Stan: Re: Samples AG 093, VA 120, 121 & 122 series.

Petrographic descriptions have been completed for a suite of 24 thin sections or polished thin sections. In support of descriptions two sets of 16 photomicrographs each are included. These were not specifically requested therefore, only a basic $50.00 charge was made to cover direct photographic, pick up and delivery costs.

The results of the petrographic analyses are as follows: Quartz sericite schist/phyllite is the most common rock type in the suite. These rocks are, in general, composed of a very fine groundmass of quartz (or quartz and feldspar) which is segregated into lamellae or lensoids by diffuse discontinuous foliated laminations, lensoids, partings or networks of sericite with varied biotite and chlorite content. Scattered throughout the groundmass of many of these specimens from this group are large rounded grains of partially resorbed quartz and single or lensoidal clusters of feldspar crystals/fragments both of which are probably relics of former felsic crystal tuff/lithic tuff. This suite includes samples # AG 09303, 07*, 15, 16*, 24*, 30*; VA 12040*, VA 12136, 39, 72, 98*; VA 12209*, 12*, 15*, 16*, 17*, 18*, 24 and 26*.

Note * indicates photomicrograph.

A gradation through metamorphism from crystal lithic tuff to quartz-feldspar sericite schist/phyllite is shown by samples AG 09307*, 16*, 24*; VA 12040*, VA 12218*, 26*.

Diffuse fine felted clots of biotite commonly containing coarser clusters of chlorite-sericite/muscovite-amphibole-biotite-quartz-carbonate and sulphides are scattered thoughout the rock matrix following foliation or concentrated in the vicinity of cross folding or dislocation. Some of these clots may represent former lithic fragments but tendency for concentration at cross structures suggests introduction or migration of material. These clots occur in many samples of the suite but are illustrated in photomicrographs AG 09307, 24, 52; VA 12190, 98; VA 12209, 12, 14, 15.

There are scattered irregular but optically continuous masses of several mm of plagioclase, K-feldspar, chlorite and an undetermined isotropic material which poikilitically encloses foliated groundmass minerals. The origin of this material is not known but impregnation is probable. These masses or interstitial clots are illustrated by photomicrographs AG 09316, 52; VA 12216.

Of this same suite a number of samples including some with quartz "eyes"; have quartz-rich groundmasses with little or no feldspar. This suggests either an initially quartz rich rock or more likely introduction of silica during metamorphism with altered, replaced feldspars producing sericitic lamellae. Samples: AG 09303, 15, 30*; VA 12136, 72.

Veining along and across foliation by coarser grained quartz, carbonate, some feldspar and sulphides is common. These veins are distorted across foliation and form lensoids or boudins in the plane of foliation.

In some rocks biotite predominates over sericite to form biotite schist. Photomicrograph: VA 12212, 22.

Still others chlorite is the dominant mafic. Samples: VA 12152*; VA 12221.

Two samples form black "carbonaceous" appearing schists/phyllite and may represent former intravolcanic sedimentary rocks. Samples: VA 12190*, 12214*.

No plutonic rocks or rocks of probable plutonic origin were observed in this suite of samples.

Yours truly,

Ken Northcote

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Falconbridge 3 #8393 NDD86-18 40.20m
[1] AG 09303 (Polished thin section)
Quartz, sericite, biotite, chlorite schist/phyllite.

Thin laminated schist/phyllite composed of quartz, foliated sericite, biotite, chlorite. The rock forming minerals are segregated into laminae or lensoids with one or two minerals predominating. Few scattered partly resorbed quartz "eyes".

Superimposed on this schistose framework are layers/lensoids of coarser grained quartz, biotite, chlorite and sulphides.

Nonmagnetic

Stained slab indicates no K-feldspar.

Opaque minerals in approximate order of abundance include: pyrite, chalcopyrite, pyrrhotite, sphalerite, galena, ilmenite (leucoxene).

Transmitted light
Groundmass: 70%

Quartz; 25%, anhedral, (<.01 to .05, grading to coarser segregations), as aggregates of grains forming diffuse layers and lensoids in a foliated sericite-chlorite-biotite network. Some layers very diffuse mixed with sericite, has appearance of impregnation. Although there is masking by chlorite and sericite there are no differences in relief to indicate plagioclase.

Quartz eyes, <1%, anhedral, (>1.0 mm), rounded, partially resorbed with diffuse margins and granular texture locally.

Sericite; 25%, anhedral/fibrous (edges of platy grains lying in plane of foliation) (<.01 to 0.2 mm, generally 0.1 mm). Forms main groundmass as foliated laminae; diffuse, wispy partings/networks around quartz lensoids. Weak crinkling by cross folding.

Biotite; <15%, anhedral/fibrous (edges of platy grains lying in plane of foliation) (<.01 to 0.2 mm, generally 0.1 mm). Forms diffuse clots, mottled colour because of alteration. Associated with coarser segregations of quartz, chlorite, coarser biotite and sulphides.

Chlorite; <10%, anhedral/fibrous (edges of platy grains in plane of foliation) (<.01 to 0.2 mm; generally 0.1 mm)> Associated with biotite clots, diffuse. Grades to coarser segregations.

[1] AG 09303 Continued

Segregations: 30%

Biotite; 5%, anhedral, (to 0.3 mm), bladed, weakly felted/foliated, with coarser quartz, sulphides and with finer chlorite-biotite clots.

Chlorite;; 10%, anhedral, (to 1.5 mm), bladed, foliated, associated with coarser quartz, biotite and sulphides.

(a) ?; <1%, anhedral (masses, 2+ mm) diffuse interstitial, light brown, high (+) relief, isotropic.

(b) ? ; <1%, anhedral/subhedral, (0.02 to 0.1 mm), isotropic, very high (+) relief.

Quartz; <10%, anhedral (<.05 to >0.5 mm), forming lensoidal aggregates of grains, with biotite, chlorite, sulphides, lying in plane of foliation.

Reflected light; <10%

Opaque minerals; less than 10%, anhedral/subhedral (<.01 to 3.0 + mm), aggregates of grains.

(a) finer grains disseminated throughout groundmass
(b) coarser grains associated with quartz-biotite-chlorite segregations.

In approximate order of abundance the sulphides include:

1] Pyrite, euhedral/subhedral (to >1 mm) aggregate grains to several mm.
2] Chalcopyrite, anhedral, (.02 x 0.2 mm), with galena, margin of pyrite. Isolated grain in gangue,cut by pyrrhotite.
3] Pyrrhotite, anhedral, (0.15 mm), associated with galena in pyrite.
4] Sphalerite, anhedral, (to 0.3 mm) irregular intergrowths with pyrite.
5] Galena, anhedral, 0.3 mm, isolated grain in gangue and in pyrite.

Ilmenite (leucoxene)

[2] AG 09307 (Thin section) NDDBC-18 80.50m
Feldspar, quartz, mica, sericite schist/phyllite (Felsic crystal tuff).

Groundmass of feldspar and quartz in diffuse foliated diffuse micas and sericite partings, laminae. Contains diffuse weaker foliated clots of micas, chlorite, carbonate with foliation producing internal lensoidal shapes. Former lithic fragments? Chlorite clots may be mafic crystal/fragment remnants. Metamorphism/deformation is too far advanced to be definitive about lithic and mafic fragments. Resorbed quartz "eyes" are conspicuous.

Stained slab, K-feldspar stain in fractures. Weak diffuse stain (?) in groundmass. Groundmass etched indicating plagioclase content.

Transmitted light
Groundmass; and diffuse clots along foliation 80%

Feldspar; 20%, anhedral, (<.01 to 0.2 mm, generally 0.05 to 0.1 mm), elongate grains oriented in plane of foliation. Differences in relief, (<quartz) distinguishes from quartz.
Stained slab etched groundmass and some alteration of grains also indicates feldspar content. Scattered coarser grains, (to 0.3 mm) some associated with irregular diffuse biotite-chlorite clots.

Quartz; (a) 20%, anhedral, (.01 to 0.2 mm, generally 0.05 to 0.1 mm). Elongate grains in plane of foliation. Relief > feldspar.

*Quartz "eyes" (b) <1%, anhedral rounded, (to 1.5 mm). partially resorbed, diffuse margins.

Sericite; 15%, anhedral, (<.01 to 0.2 mm, generally <0.1 mm), ragged/fibrous (edges of platy grains in plane of foliation). Diffuse partings, lensoids, networks around plagioclase-quartz grains in groundmass. Associated chlorite. Weak warping of foliation by cross folding. Also as clusters of grains associated with biotite-chlorite-carbonate clots.

Biotite; 25%, anhedral platy, (<.01 to 0.1 mm), very irregular grains.
(a) Bright green pleochroic
(b) Brownish green pleochroic
clusters of grains with chlorite and carbonate forming diffuse clots in groundmass.

Carbonate; <10%, anhedral, (to 0.2 mm), very irregular.

[2] Continued

Chlorite; <5%, anhedral, (to 0.2 mm), bladed foliated producing fairly pure ragged clots with some carbonate. Former mafic fragments/crystals .

Actinolite/tremolite; <<5%, anhedral, (<.01 to 0.3 mm) pleochroic pale green/yellowish green, acicular/prismatic, inclined extinction.

Zircon; trace

Opaques; <5%, anhedral, (<.01 to 0.3 mm), disseminated through matrix.

Segregations:

(a) Quartz; <5%, anhedral, (to 0.4 mm), very irregular aggregates, associated with minor:

(b) Carbonate-mica; <5%, anhedral, (<.01 to 0.3 mm), forming diffuse aggregate clots with chlorite and green mica (to several mm) along foliation.

Veinlets

Carbonate and K-feldspar (confirmed by staining)

[3] AG 09315 (Polished thin section) NDD 86-19 77.25m
Quartz-sericite schist/phyllite

Quartz rich-sericite schist/phyllite with fine quartz grains in groundmass intermixed and interlaminated with foliated sericite. No conspiculous feldspars in the groundmass. Contains widely scattered subangular/subrounded quartz "eyes". Contains laminated/lensoidal segregations of coarser grained chlorite, quartz and lesser biotite which contain the coarser and more abundant sulphides and oxides pyrite, pyrrhotite, sphalerite, galena, chalcopyrite, ilmenite.

Stained slab does not indicate stained K-feldspar or etched plagioclase. Nonmagnetic.

Transmitted light
Groundmass:

Quartz; 40%, anhedral, (<.01 to 0.1, generally <.05 mm), elongate grains with preferred orientation, lensoids, discontinuous laminae.

Sericite; 35%, anhedral, (<.01 to 0.1, generally <.05 mm), fibrous (edges of platy foliated grains), form diffuse discontinuous partings/networks among quartz lensoids.

Also as felted diffuse laminae/discontinuous clots of almost pure sericite which are commonly bounded by foliated sericite.

Biotite; <5%, anhedral, (<.01 to 0.1 mm, generally <.05 mm), diffuse wispy partings. Cutting across sericite quartz laminae leading into coarse biotite chlorite-quartz segregations.

Fragments; <5%

Quartz "eyes"; <<1%, anhedral, (to 0.4 mm) rounded, resorbed.

?; <1%, anhedral, (0.7 mm) isotropic, high (+) relief, diffuse outline. Abundant inclusions, seicite and (rutile?)

?; associated with yellow orange pleochroic, low relief, low birefringence.

?; light brown, nonpleochroic, moderate relief, low order mottled extinction.

Clay (?) <1%

[3] Continued

Segregations 10%

Quartz; <5%, anhedral, (to 0.1 mm),
(a) aggregates of irregular grains forming small lensoids slightly coarser grained than quartz-rich matrix and : (b) anhedral, (to 1.0+ mm) associated with coarse chlorite/clinochlore)

Chlorite/clinoclore <10%, anhedral (to 0.2 mm) broad bladed, plumose foliated/weak felted, cut by sericitic partings.

Reflected light

Opaques; <5%, anhedral, (<.01 to >1.0 mm) single grains and aggregates. More abundant with coarse grain sizes associated with chloritic clots. In approximate order of abundance these include:
Pyrite, euhedral/subhedral, (to >1.0 mm), aggregates of grains to several mm.
Pyrrhotite; anhedral, (0.2 mm)
Spahlerite, anhedral, (0.25 mm), associated with pyrite, pyrrhotite, galena.
Galena; anhedral, (to 0.15 mm), associated with pyrite, sphalerite, pyrrhotite.
Chalcopyrite
Ilmenite

[4] AG 09316 (Polished thin section) NDD86-19 96.80m
Quartz feldspar sericite schist/phyllite.

Groundmass, very fine grained quartz and feldspar, weak layering by foliated partings, lensoids, diffuse networks of sericite. Widely scattered partly resorbed quartz "eyes". Diffuse dark spots in hand specimen are composed of an interstitial, isotropic, mineral which encloses quartz, feldspar and sericite which retain external foliation direction. When etched the isotropic mineral forms a white clay. In addition there are segregations of coarser grained fresh appearing quartz, biotite, chlorite (clinochlore) and sulphides forming lensoids. Stained slab indicates no K-feldspar but etching of groundmass indicates significant amounts of plagioclase. Nonmagnetic.

Opaque minerals include pyrite, ilmenite/sphene.

Transmitted light:
Groundmass: 65%

Sericite; 20%, anhedral, (<.01 to 0.2 mm, generally <0.1 mm), fibrous (edges of foliated plates) forming diffuse partings/discontinuous networks among quartz/plagioclase grains.

Quartz; 15%, anhedral (<.01 to 0.1 mm), irregular grains, clear, unaltered, slight difference in relief as compared to plagioclase.

Quartz "eyes"; <1%, anhedral, (to >2 mm), rounded diffuse "nibbled" margins, partially resorbed.

Plagioclase; 10%?; anhedral, (<.01 to 0.1 mm), irregular grains, not conspicuous, slight difference of relief as compared to quartz, very weak alteration. Untwinned.

Chlorite; 15%, anhedral, (<.01 to 0.2 mm) interstitial masses and fibrous/foliated appearance similar to sericite.

Biotite; 10%, anhedral, (<.01 to 0.2 mm), diffuse masses grading outwards from coarser segregations.

Rutile; <1%, clusters of elongate crystals.

Sphene; <1%, granules, high birefringence, high relief.

Segregations: 10%

Quartz; 5%, anhedral, (to 0.5 mm), as aggregates of grains or in combination with chlorite (clinochlore) biotite, and sulphides.

[4] Continued

Chlorite/clinochlore; <5%, anhedral, (to 0.2 mm), bladed, foliated to weakly felted, as for biotite grades out into finer chloritic networks in general groundmass.

Biotite; <5%, bladed, (to 0.3 mm), felted/foliated grades outwards diffusely as finer grains into groundmass.

Opaques; See Reflected light section.

Fragments; 10%

Quartz; 10%, anhedral (to 0.6 mm), subangular partly resorbed, foliation streams around it in a lensoidal form with chlorite, quartz sericite packed at the ends of the grains in plane of foliation. Similar to quartz "eyes" but not as well rounded, smaller and occur singly or as aggregates of grains.

Plagioclase; <5%, anhedral, (to 0.25 mm), trace twinning.

Clots <10%

?; >5%, anhedral, (diffuse clots to 3.0 mm+), colourless, sieve texture enclosing diffuse quartz, feldspar fragments and sericite grains which retain foliation. Sericite is less abundant within enclosing mineral than in matrix. This material also locally forms diffuse lensoids widely scattered in the general groundmass.

Note: Requires X-ray diffraction or microprobe for identification.

Reflected light;

Opaques: <10%

(a) euhedral/subhedral grains disseminated in matrix, commonly in clusters of fine grains, (<.01 to 0.1 mm). Includes pyrite, ilmenite/sphene.
(b) euhedral to subhedral grains associated with coarser quartz-chlorite (clinochlore)-biotite segregations, (<.01 to 0.15mm). Includes pyrite.

[5] AG 09324 (Thin section) NDD86-21 22.80m
Quartz feldspar sericite schist/phyllite (Crystal lithic tuff).

A fine grained matrix of feldspar and quartz is foliated by discontinuous partings, lensoids and networks of sericite. Abundant fragments of plagioclase crystals, strongly carbonatized, biotitic, mafic and lithic (?) fragments. Also smaller carbonate spots and rectangular carbonate pseudomorphs. Minor segregations and discontinuous "veins" of carbonate, quartz, chlorite (clinochlore), biotite, sericite and sulphides.

Lacks the numerous quartz "eyes" of other samples. Crinkled by cross folding, dislocations.

Stained slab shows no K-feldspar. Nonmagnetic.

Disseminated opaques throughout groundmass, concentrated in certain layers, in segregations and as small cross cutting veinlets.

Transmitted light.
Groundmass: 45%

Quartz; 10%, anhedral, (<.01 to 0.1 mm, generally <0.05 mm), elongate grains parallel foliation.

Feldspar; 10%, anhedral, (<.01 to 0.1 mm, generally <0.05 mm), elongate grains parallel foliation. Differences in relief with quartz are masked by abundance of fine sericite. Etching on stained slab indicates significant percentage of groundmass is feldspar.

Sericite; 15%, anhedral/fibrous, (<.01 to 0.1 mm), foliated, as clusters of grains, partings, diffuse networks throughout quartz-feldspar groundmass.

Chlorite; <5%, present but not conspicuous, associated with sericite.

Biotite; 5%, anhedral grains (generally <.05 mm), forms irregular biotite-rich zones leading from segregations along cross dislocations?

Fragments/clots; original fragmental texture remnants. Contains quartz, twinned plagioclse fragments and spots of carbonate. Abundant larger irregular clots of mixtures of biotite and carbonate.

Quartz; <5%, anhedral, (0.1 to 0.3 mm). subrounded.

[5] Continued

Plagioclase; 10%, subhedral fragmental, (<0.1 to >1.0 mm), remnant twinning, weak sericitic and opaque dusting alteration. Some grains broken into lensoidal shapes. Indicated composition in oligoclase range.

Altered mafic, biotite-carbonate pseudomorphs/clots; 15% forming masses ranging from (<0.1 to several mm). Generally very diffuse outlines possibly replacing lithic fragments; but some patches more regular outline and may be pseudomorphs after mafic fragments.

Carbonate; 10%, small clots, pseudomorphs (<0.05 to 0.2 mm), most irregular shapes, some rectangular pseudomorphs.

Segregations/Veins; <10%

Carbonate, chlorite (clinochlore), sulphides, minor quartz, green mica, and sericite form irregular segregations and discontinuous vein-like structures along plane of foliation. Grain sizes varied.

Opaques <10%

(a) Euhedral/subhedral, (<.01 to 0.2mm)
(b) In segregations/veins as euhedral crystals, (to 0.7 mm) forming aggregates (>1.0 mm).
(c) Cross cutting veinlets, massive, (several mm in length).

[6] AG 09330 (Polished thin section) NDD86-21 94.10m
Quartz, carbonate sericite schist/phyllite

Groundmass primarily fine grained quartz separated into lensoids and discontinuous laminae by sericite as single aligned grains, clusters of foliated grains forming discontinuus partings and networks. Carbonate forms lensoids which grade in size upwards to segregations with associated muscovite/sericite, biotite, quartz, chlorite and opaques.

Contains sparse rounded quartz "eyes". Stained slab indicates no K-feldspar. Nonmagnetic. Opaques include pyrite, sphalerite, chalcopyrite, ilmenite/sphene.

Transmitted light:
Groundmass

Quartz; 35%, anhedral, (<0.01 to 0.1 mm, generally <0.05 mm), elongate grains aligned in plane of foliation.

Quartz "eyes"; <<1%, anhedral, (to >1.5 mm), rounded, nibbled margins, partially resorbed.

Plagioclase; ?%, suspected, not confirmed.

Biotite; <<5%, anhedral, (<.01 to .05 mm), clusters of grains in and crossing foliation. Associated with carbonate lensoids and larger segregations.

Sericite; 30%, anhedral, acicular/fibrous (edges of plates in foliation), (<.01 to 0.2 mm, generally <0.1 mm). Forms discontinuous partings, lensoids and networks throughout groundmass.

Carbonate; 30%, anhedral, (<0.01 to 0.4 mm), aggregates of grains forming lensoids in foliation plane. Grades to carbonate-rich coarser segregations; see below.

Rutile?; <1%, clusters of elongate rods, (to .02 mm).

Coarser segregations: 15%
Carbonate >10%, anhedral, (1 to >1.0 mm)
Quartz; <1%, anhedral, (to 0.3 mm)
Sericite/muscovite; <5%, (to 0.2 mm).
Chlorite/clinochlore; <1%, (to 0.3 mm)
Biotite; <<1%, (to 0.1 mm), generally ragged, partly altered.
Opaques; see reflected light, below.

[6] Continued

Reflected light:

Opaques: 10-15%

(a) Euhedral/anhedral grains pyrite (<.01 to 0.2 mm) disseminated throughout matrix with tendency for concentration along certin laminae. Also ilmenite/sphene, rutile.

(b) Euhedral/anhedral grains, (<.01 to 0.7 mm) associated with carbonate-rich segregations. Includes pyrite, sphalerite, chalcopyrite.

[7] VA 12040 (Thin section)
Quartz sericite, biotite schist/phyllite

A fine granular groundmass of quartz with intermixed and interlaminated sericite and biotite. Sericite forms discontinuous stringers, lensoids and diffuse networks in and around quartz grains of the groundmass. Biotite forms more distinct laminae which are locally deformed into lensoidal shapes. Contains widely scattered coarse rounded partly resorbed quartz "eyes". Diffuse interstitial clots of plagioclase and chlorite. Minor quartz-biotite segregations and veins. Stained slab indicates no K-feldspar. Nonmagnetic. Iron stained. Less than 1% opaques.

Transmitted light
Groundmass; 80%

Quartz; 30%, anhedral, (<.01 to 0.1 mm, generally about 0.05 mm), elongate grains aligned with foliation. In layers of almost totally quartz or mixed with sericite in others.

Quartz; <1%, anhedral (to >1.0 mm), rounded quartz "eyes" widely scattered, uniform extinction.

Sericite; >25%, anhedral, acicular/fibrous appearance (edges of plates in plane of foliation). Forms layers of almost entirely sericite but generally mixed with quartz. Forms discontinuous partings, diffuse lensoids and wispy networks in the quartz groundmass.

Biotite; 20%, anhedral, (<.01 to .05 mm), forms strong partings/laminations. Structural deformation has produced some lensoidal outlines.

Opaques; <1%, anhedral, (to 0.1 mm), associated with biotite.

Interstitial clots:

Chlorite/plagioclase; <5%, diffuse interstitial clots, a mixture of near isotropic and low birefringent minerals.

Chlorite; near isotropic, light green colour, moderate high relief, basal plate of chlorite. Plagioclase; anisotropic, very low birefringence, low relief, weak remnant plagioclase twinning.

[7] Continued
Segregations; <10%

Quartz and biotite; <10%
Quartz, coarser grained than general groundmass forms aggregates of grains associated with clusters of very fine felted biotite and lesser green mica. These segregations, (to several mm), grade to the vein like structures (b) discussed below.

Veins; <5%, (a) cross foliation (b) along foliation.
(a) Feldspar; subhedral, (crystals to 0.5 mm), weak alteration, shows remnant polysynthetic twinning, indicated composition in low oligoclase range.

Biotite; bladed, (to 0.5 mm), felted in vein but locally spread out into wallrock along foliation planes.

(b) Quartz; anhedral, (to 0.5 mm), irregular, strained extinction. Very irregular vein outlines. Some association with coarser grained unaltered biotite.

[8] VA 12136 (Polished thin section)
Quartz, sericite schist/phyllite with quartz "eyes".

Fine granular quartz groundmass with elongate grains aligned parallel to foliation. Segregated into nearly pure quartz laminae with minor disseminated sericite as single grains or clusters of grains lying in plane of foliation. Interlaminated sericite-rich wispy layers containing numerous small quartz grain lensoids. Scattered coarse grained rounded partially resorbed quartz "eyes". Crenulations by cross folding visible in sericite lamillae.

Stained slab indicates no K-feldspar, no appreciable plagioclase etching. Nonmagnetic.

Sulphides include pyrite, pyrrhotite, chalcopyrite also ilmenite/sphene.

Transmitted light
Groundmass

Quartz; 50%, anhedral, (<.01 to 0.1 mm, generally about 0.05 mm), elongated in plane of foliation. In nearly pure lamellae with minor sericite as single grains or clusters of grains in plane of foliation. Forms small lensoids of aggregates of grains in sericite-rich layers.

Quartz; <5%, anhedral, (to >2mm), rounded, partially resorbed.

Sericite; 30%, anhedral, (<.01 to 0.2 mm), acicular appearance (edges of plates in plane of foliation), forms layers/laminae of nearly pure sericite disrupted by lensoids of aggregates of grains of quartz. As single grains and clusters of grains in foliation plane scattered through quartz laminations.

Biotite; <10%, anhedral, (<.01 to 0.1 mm), localized clusters of grains spread along foliation planes and associated with cross dislocations. Some biotite, as diffuse partings, associated with sericite laminations.

Carbonate; <1%, anhedral.

Sphene; <1%, subhedral/anhedral, (to 0.1 mm).

Apatite (?); trace, subhedral

Clots; <5% Scattered biotite-quartz-sulphide clots, slightly coarser grained than general groundmass.

[8] Continued

Segregations; <5% Minor segregations of quartz slightly coarser than general groundmass forming lensoidal aggregates of grains.

Opaques; <5%, anhedral, (<.01 to 0.8 mm) generally associated with biotite but also occur as sparsely disseminated grains in groundmass. In order of abundance they include pyrite, ilmenite/sphene, pyrrhotite, chalcopyrite.

[9] VA 12139 (Thin section)
Quartz feldspar, sericite schist/phyllite

Fine groundmass of quartz and feldspar foliated by discontinuous partings, wispy diffuse lensoids and networks of sericite. Porcellanous appearance. Contains scattered quartz "eyes" and clusters of plagioclase crystals which may represent lithic fragments. Lensoidal quartz segregations with grains slightly coarser than general groundmass.

Stained slab indicates no K-feldspar but etching confirms plagioclase in groundmass. Nonmagnetic.
Opaque minerals very minor

Transmitted light
Groundmass;

Feldspar; 30%, anhedral, (<.01 to 0.1mm), elongate grains in plane of foliation. Untwinned, but lower RI than quartz.

Quartz; 25%, anhedral, (<.01 to 0.1 mm), elongate grains in plane of foliation.

Sericite; 15%, anhedral, (<.01 to 0.3 mm), acicular/ragged outline, (edges of foliated plates). Forms partings, wispy lensoids and discontinuous diffuse laminae. Altered to a dusting of microgranular aggregates. Laminae show crinkling by cross foliation.

?; <1%, fine microgranular sphene-like alteration along foliation partings locally, high birefringence.

Chlorite; <10%, anhedral, (<.01 to >1.0 mm), poikilitic associated with quartz segregations but, although inconspicuous, more abundant with sericite.

Carbonate; trace, anhedral, (0.3 mm), irregular grain.

Tourmaline (?); trace.

Apatite; trace.

Opaques; 1%, euhedral, (<.01 to 0.1 mm) aggregates strung out in plane of foliation.

Fragments; <10%
Lensoidal clusters of plagioclase crystals/fragments; <5%, with sericite and microgranular alteration. Diffuse outlines of the lensoids. Lithic fragments?

Quartz "eyes", <5%, anhedral (to 2.0+ mm), rounded, partly resorbed.

[9] Continued

Segregations
Quartz; <10%, anhedral grains, slightly coarser than general groundmass, (but still about 0.05 mm), commonly at sides of coarse quartz "eyes" in foliation plane producing the "eye" shape.

Veins;
Carbonate; >1.0 mm wide.

[10] VA 12152 (Polished thin section)
Plagioclase, chlorite schist.

The groundmass consists of fine granular quartz and unaltered plagioclase foliated by laths of chlorite and lesser biotite. This groundmass contains optically continuous clots of untwinned plagioclase which poikilitcally enclose sulphides, and foliated biotite and lesser chlorite.

Minor quartz veinlets and discontinuous segregations of quartz, chlorite (clinochlore), biotite and sulphides follow or cut foliation at a low angle.

Stained slab indicates traces of K-feldspar associated with coarser segregations. Magnetic.

Opaques include magnetite, ilmenite, pyrrhotite, pyrite, chalcopyrite.

Transmitted light
Groundmass;

(a) Layers/laminae of fine grained feldspar quartz and foliated chlorite.

Feldspar (plagioclase); 30%, anhedral, (<.01 to 0.15 mm), generally elongate/lenticular oriented in plane of foliation. Confirmed by a few twinned grains, relief lower than quartz and by intensive etching of groundmass on stained slab

K-feldspar; not confirmed in thin section.

Quartz; 15%, anhedral (<.01 to 0.15 mm), elongate grains in plane of foliation. Occur as "strings" of grains along foliation.

Chlorite; 25%, anhedral, (<.01 to 0.2 mm, generally 0.1 mm), bladed, aligned along foliation.

Opaques; 5%, anhedral, (<.01 to 0.1 mm), irregular grains and clusters of grains along foliation. (See reflected light)

Biotite; <10%, anhedral, (<.01 to 0.2 mm, generally 0.5 mm), bladed, foliated/locally felted, <u>weak pleochroism.</u> In diffuse clusters of grains and as partings throughout groundmass.

Clots: In this fine grained groundmass there are large patches, (of several mm), of optically continuous plagioclase enclosing foliated or aligned grains of biotite, sulphides and chlorite although in lesser amounts than the general groundmass.

[10] Continued

Feldspar (plagioclase); 10%, anhedral, (to several mm), as irregular clots which poikilitically enclose sulphides, biotite and minor chlorite (relative to finer grained groundmass). These minerals have continued foliation planes through the clots. A number of these clots occur adjacent to one another forming large irregular patches in the finer grained groundmass. Generally massive appearing with only suggestions of twinning.

Segregations/veins: following or cutting foliation at a small angle.

Plagioclase-rich; coarse grained, (to several mm), showing some twinning, with indicated composition in oligoclase range. Associated with coarse clinochlore, sulphides and lesser biotite.

K-feldspar; not confirmed in thin section.

Quartz rich; anhedral, (to 0.6 mm, generally about 0.1 mm), aggregates form narrow veins approximately in plane of foliation. Some pinching, swelling and braiding.

Opaques; (See reflected light)

Reflected light;

Opaque minerals; 10%

(a) Disseminated in groundmass along planes of foliation, (<.01 to 0.1 mm). In approximate order of abundance they include: ilmenite, magnetite, pyrite.

(b) Coarser grained oxides and sulphides associated with coarser quartz and feldspar segregations, (to >1.0 mm). In approximate order of abundance they include: pyrrhotite, pyrite, chalcopyrite, magnetite, ilmenite.

[11] VA 12172 (Polished thin section)
Quartz, sericite schist/phyllite

Groundmass of fine granular quartz divided into laminae and lensoids by discontinuous partings, diffuse laminae, and wispy networks of sericite. Contains widely disseminated coarser grained quartz "eyes". Scattered clots of aggregates of altered biotite, chlorite, sericite and microgranular aggregates of carbonate. Carbonate forms (sphene-like) lensoids of aggregates of microgranular grains in sericite laminae. Some crinkling of micaceous minerals by cross folding.

Transmitted light;
Groundmass;

Quartz; 35%, anhedral, (<.01 to 0.2 mm, generally about 0.05 mm), elongate grains in plane of foliation.

Feldspar; not detected in groundmass, and not indicated by etching of stained slab.

Sericite/muscovite, 20%, subhedral, (to 0.3 mm, generally <.01 mm) foliated, as discontinuous partings, wispy lensoids/laminae and diffuse networks among quartz grains and lensoids. Some crinkling by cross folding.

Coarser grains of sericite may have a felted texture when associated with segregations and in foliation plane at margins of quartz "eyes".

Biotite/green mica; <5%, anhedral, (<.01 to 0.1 mm), bladed, as small felted clots.

Chlorite; 5%, fibrous/platy, (0.05 to .15 mm), felted/foliated, commonly associated with coarser segregations and altered clots. In association with sericite it extends along foliation into general groundmass. Massive, near isotropic, patches are probably basal sections. Similar green tint and relief.

Carbonate; 10%, anhedral, (<.01 to 0.1 mm), irregular aggregates of grains associated with chlorite forming small clots. Also as long discontinuous lensoids in plane of foliation within sericite laminae. Has appearance of sphene, microgranular, high birefringence.

Tourmaline; trace, uniaxial (-) (1000X)

[11] Continued

Fragments;

Quartz "eyes"; <5%, anhedral (0.2 to >1.0 mm), rounded, nibbled margins, partly resorbed. Associated medium grained quartz aggregates, chlorite, sericite in foliation plane at margins of the larger rounded grains completing the "eye" shape outline.

Clots;

Chlorite; 5%, scattered coarse grained, (to 0.6 mm) bladed, felted clots (to >1.0 mm). Diffuse outlines with associated sericite and carbonate.

Alteration patches; 10%, diffuse, (several mm), very fine grained (0.01 to 0.02 mm) composed of altered biotite, chlorite and a microgranular aggregates and dustings of carbonate and (?). Felted texture.

Segregations <5%

Clusters of quartz, chlorite and sericite generally coarser grained than general groundmass with associated very coarse opaques. Possible feldspar, unconfirmed.

Reflected light

Opaques; <10%

(a) euhedral/subhedral grains, (<.01 to .05 mm), disseminated in alteration clots. Includes: pyrite/marcasite, pyrrhotite.

(b) euhedral/subhedral grains and aggregates (to >3.0 mm) some very coarse euhedral pyrite crystals (>3.0 mm) with associated sericite, chlorite and quartz. Includes: pyrrhotite, pyrite/marcasite, chalcopyrite, sphalerite.

[12] VA 12190 (Polished thin section)
Quartz, feldspar, carbonaceous schist/phyllite

A very finely laminated groundmass is composed of long narrow feldspar and quartz lensoids separated by a myriad of microgranular carbonaceous(?) dustings on foliation surfaces forming diffuse partings. Other layers/laminae are sericite-rich but are reduced to layered aggregates of sericite lensoids by the carbonaceous partings. The rock contains slightly coarser grained quartz-carbonate-rich laminations/lensoids (to several mm in width)

Stained slab shows K-feldspar in long narrow lensoids along foliation planes and as diffuse patches. Etching of groundmass indicates high plagioclase content.

Magnetic. Contains broken, dislocated massive, bedded(?), sulphide fragments. In approximate order of abundance the sulphides include: pyrrhotite, pyrite, chalcopyrite.

Transmitted light:
Groundmass; The groundmass is laminated by differing relative concentrations of feldspar, quartz, carbonate, sericite forming layers rich in one, other or combinations of these minerals.

Feldspar (plagioclase)?; sheared/foliated patches in optical continuity across numerous carbonaceous foliation planes and (for several mm) along foliation. This material is structurless, clear, with very low relief and birefringence. Etched surfaces are chalky suggesting feldspar. <u>This material requires confirmation.</u>

Sericite; foliated lamellae/laminations are sheared into long narrow lensoids by a myriad of carbonaceous partings. Shows crinkling and dislocation by cross-structure.

Carbonaceous partings; 15%, microgranular dustings on foliation planes forming a myriad of diffuse partings cutting through and forming lensoidal structures within the feldspar-rich and sericite-rich laminations.

Segregations:

Quartz and quartz-carbonate, with minor admixtures of other minerals (notably very coarse sulphides); form coarser grained laminations and lensoids following foliation. They show both diffuse and abrupt terminations (cross structures). Stained slab indicates some admixture of K-feldspar (not confirmed in thin section)

[12] Continued

Clots:

Biotite with lesser quartz, carbonate, sulphides, disrupt the general foliation by forming diffuse wispy masses following cross dislocation but locally permeate along planes of foliation.

Reflected light

Opaques:
Groundmass; sulphides and oxides include; pyrrhotite, chalcopyrite, ilmenite/sphene.

Segregations and clots; sulphides include: pyrrhotite, pyrite, chalcopyrite.

[13] VA 12198 (Polished thin section)
Quartz feldspar sericite (biotite) schist/phyllite

The groundmass is composed of intermixed fine granular quartz and feldspar foliated by discontinuous partings diffuse lensoids and wispy networks of sericite. Abundantly scattered throughout the matrix are coarser grained segregations, commonly biotite-rich but containing varied concentrations of sericite, amphibole, quartz, chlorite/clinochlore. Biotite concentrations as finer aggregates of grains extend along foliation planes and follow lines of cross dislocation. Lensoidal patches of plagioclase as coarse single fragments or aggregates of grains with quartz and carbonate.
Stained slab indicates no K-feldspar; etching suggests abundant plagioclase in groundmass. Nonmagnetic.

Transmitted light
Groundmass

Feldspar (plagioclase); 30%, anhedral (<.01 to >0.05 mm, generally <.05 mm), elongate grains in plane of foliation. Untwinned. Presence indicated by etching of stained slab and differences in relief with quartz.

Quartz; 20%, anhedral (<.01 to >0.05 mm, generally <.05 mm), elongate grains in plane of foliation.

Sericite; 20%, anhedral (<.01 to 0.1 mm, generally about .05 mm), fibrous (edges of plates in plane of foliation), forms discontinuous partings, wispy lensoids and networks among quartz and feldspar grains, and more continuous lamellae. Lamellae show crinkling by cross folding.

Biotite; 10%, anhedral, (<.01 to 0.1 mm), irregular bladed, clusters of grains form diffuse partings associated with sericite. Commonly the biotite concentrations lead off along foliation from coarser biotite segregations discussed below.

Opaques: (see reflected light section)

Fragments:

Quartz; on cut surfaces there is the appearance of quartz "eyes" but in thin section there are lensoidal clusters of aggregates of finer quartz grains. No large rounded resorbed quartz grains were observed in thin section.

Feldspar; <5%, anhedral grains (to 0.8 mm), some showing twinning, as single lenticular fragments but more commonly as lensoidal aggregates of grains with quartz and carbonates.

[13] Continued

Segregations: 15%

Biotite, amphibole, carbonate, chlorite/clinochlore opaques. These minerals or combinations of these minerals form irregular diffuse patches (to several mm). They are generally felted with one or other of the minerals, commonly biotite, predominating. The patches are elongate following foliation but cross foliation along lines of dislocation.

Reflected light
Opaque minerals: >5%

(a) Disseminated in groundmass, irregular grains (<.01 to 0.15 mm), and aggregates of grains which include: pyrite, ilmenite/sphene.

(b) Sulphides associated with biotitic segregations, (<.01 to 0.3 mm). and very irregular aggregates including: pyrrhotite, chalcopyrite.

[14] VA 12209 (Polished thin section)
Feldspar, quartz, sericite, biotite, chlorite schist/phyllite

Foliated/schistose with laminae predominantly of mixtures of feldspar, chlorite, sericite with one or other of these minerals predominating in different lamellae. Quartz is a minor constituent occurring as fine grained lensoids and in coarser grained segregations with biotite, sericite, chlorite/clinochlore and coarse grained sulphides. Some cross crinkling and dislocation.

Stained slab gives a slight stain in areas of some coarser segregations. The groundmass is intensely etched indicating high plagioclase content in groundmass. Magnetic. Sulphide and oxide minerals, in approximate order of abundance, include: pyrrhotite, ilmenite, chalcopyrite.

Transmitted light
Groundmass

Feldspar; 30%, anhedral, (<.01 to 0.1 mm, generally <.05 mm), elongated grains in planes of foliation. Quartz is subordinate. Shows wide variation in relative abundance of chlorite and sericite in adjacent laminae.

Quartz; 10%, anhedral, (<.01 to 0.1 mm), elongate grains in plane of foliation. Forms fine grained lensoids (to several mm), in plane of foliation. In some laminae quartz lensoids predominate over plagioclase.

Chlorite; 15%, anhedral, (<.01 to 0.2 mm), foliated. Predominates in some laminae where it is mixed with lesser sericite and feldspar. In adjacent laminae it may be subordinate to sericite and/or feldspar.

Sericite; 15%, anhedral, (<.01 to 0.2 mm), foliated. Forms diffuse networks where subordinate to chlorite with a tendency for concentration in cross folds and dislocations where foliation parallels the cross structure. In sericite-rich lamellae it forms discontinuous partings, wispy lensoidal clusters and diffuse masses within a plagioclase-rich groundmass.

Biotite; <5%, anhedral, (<.01 to 0.1 mm), foliated, very minor wispy partings commonly in quartz rich laminae.

Segregations

Biotite, quartz, sulphides, lesser sericite very minor chlorite (clinochlore) as coarser grained aggregates forming diffuse lensoids along foliation. Felted/foliated.

K-feldspar was not confirmed in thin section.

[14] Continued

Clots; <<1%
Carbonate; <<1%, anhedral, (to 0.2 mm).

Reflected light

Opaques: <10%
(a) Disseminated throughout matrix, anhedral grains (<.01 to .05 mm). Includes: ilmenite, pyrrhotite.
(b) More abundantly as coarse grains (to >2.0 mm), with biotite-quartz-segregations. Includes: pyrrhotite, chalcopyrite.

[15] VA 12212 (Thin section)
Feldspar, (quartz), biotite, (sericite), schist

Groundmass of plagioclase and lesser quartz foliated by wispy lensoids and networks of sericite. Contains clots of fine felted biotite commonly with coarser grained segregations of quartz, biotite, minor feldspar, sericite, clinochlore and sulphides.

Stained slab shows traces of K-feldspar associated with coarse segregations. Not confirmed in thin section.
Magnetic: Pyrrhotite

Transmitted light

Plagioclase; 30%, anhedral, (<.01 to 0.1 mm, generally about 0.05 mm), irregular grains, elongate in plane of foliation. A few grains have polysynthetic twinning.

Quartz; 20%, anhedral, (<.01 to 0.1 mm, generally about 0.05 mm), irregular grains, intermixed with plagioclase grains, higher RI, slightly higher birefringence.

Apatite; trace, subhedral, (0.35 mm).

Opaque; <5%, pyrrhotite

Clots /segregations;

Biotite; 20%, anhedral (<.01 to 0.05 mm) felted masses with diffuse irregular outline, (to several mm in diameter). crinkling by cross folding. The cores of some of these clots contain coarser segregated quartz, biotite, minor feldspar, sericite, clinochlore and sulphides.

Quartz, 10%, anhedral (0.05 to 0.2 mm), aggregates of irregular grains commonly in lensoidal form in foliation.

Feldspar, <<1%, anhedral (to 2.0 mm), optically continuous mass enclosing foliated quartz and biotite grains.

Fragments:

Feldspar; <<5%, as single broken grains or cluster of grains with lensoidal shape may be lithic fragments

Vein: Feldspar, quartz and sericite

Feldspar is massive structureless untwinned but biaxial (-) low RI, low birefringence.

[16] VA 12214 (Thin section)
Feldspar, quartz, sericite, chlorite, biotite carbonaceous schist/phyllite.

Complex mineralogy composed of foliated lamellae rich in one, other, or combinations of K-feldspar, quartz, sericite, chlorite, with a myriad of diffuse microgranular "dusty" carbonaceous (?) partings following foliation. The groundmass is schistose, intensely deformed by cross folding and dislocations (fractures).

Contains fine grained diffuse biotite-rich clots with associated coarser segregations, and disrupted veins of biotite, quartz, carbonate, amphibole (tremolite) and sulphides.

Stained slab indicates the predominant feldspar is K-feldspar. Magnetic.

Transmitted light

Feldspar; 20%, anhedral, (<.01 to 0.05 mm), stained slab indicates high K-feldspar content in the very thinly laminated layers containing myriads of carbonaceous partings. Not confirmed in thin section.

Quartz; 30%, anhedral, (<.01 to 0.1 mm, generally <0.05 mm). In quartz rich laminae with elongate grains in plane of foliation of sericite partings and diffuse networks. Also as abundantly disseminated grains and aggregates forming small lensoids in sericite-rich and carbonaceous laminae.

Sericite; 20%, anhedral/acicular, (<.01 to 0.2 mm) forming plumose foliated networks around feldspar and quartz grains and lensoids. Locally intense carbonaceous partings obscure much of the sericite.

Carbonaceous (?) partings; <10%, very fine, diffuse, microgranular semiopaque material forms a myriad of discontinuous partings which locally predominate in sericitic laminae.

Opaques; <5%, as irregular grains (<.01 to 0.05 mm), most abundant associated with biotitic clots and coarser grained segregations.

Clots/Veins/Segregations 20%

Diffuse clots of fine felted biotite with associated coarser segregations of amphiboles, tremolite carbonate, quartz and sulphides which merge into disrupted composite veins.

The veins follow and cross foliation and are deformed into sinuous shapes, lensoids and boudins. Composed of quartz, carbonate, amphibole (tremolite), biotite and sulphides as for coarse segregations.

[17] VA 12215 (Thin section)

Spotted feldspar, quartz, biotite, sericite, schist/phyllite

Foliated, laminated groundmass composed of predominantly one, two, or more of plagioclase, K-feldspar, quartz and sericite. Scattered rounded partly resorbed quartz grains. Contains biotite-rich clots (to several mm) with irregular outline and which contain coarser segregations of amphibole, quartz, carbonate and opaque grains (sulphides).

Stained slab confirms diffuse K-feldspar in groundmass with etching also indicating high plagioclase content. Weak magnetic (pyrrhotite)

Transmitted light
Groundmass:

Quartz; 10%, anhedral, (<.01 to .05 mm), elongate grains in plane of foliation, mixed in feldspar (K-feldspar) and fine sericite laminae.

Plagioclase; 15%, anhedral, (<.01 to 0.5 mm) stained slab indicates significant etched plagioclase content in groundmass. Untwinned.

K-feldspar; 10%, anhedral, (<.01 to 0.5 mm), stained slab indicates diffuse interstitial clots dispersed in sericite-rich laminae. Not distinguished from untwinned plagioclase in thin section.

Sericite; 15%, anhedral/acicular (<.01 to 0.1 mm), (edges of plates in foliation), forms discontinuous partings, diffuse lensoids and wispy networks around quartz and feldspar grains. Crinkled by cross folding.

Segregations

Quartz; 15%, anhedral grains, (to 0.1 mm), aggregates forming lensoids abundantly distributed throughout the groundmass.

Clots; 30%, very irregular masses, (to several mm), predominantly biotite with coarser grained cores of amphibole, quartz, carbonate and sulphides. Follows and cuts foliation. Each mineral species forms clusters of grains.

Biotite; 15%, anhedral, generally fine grained, (<.01 to .05 mm), close packed felted, forms the main mass of most clots.

Chlorite; <5%, anhedral, (to 0.1 mm), clusters of bladed grains.

[17] Continued

Amphibole (actinolite(?)); <5%, anhedral, (to 0.2 mm), bladed prismatic, felted clusters. Light green pleochroic.

Quartz; <5%, anhedral, (to 0.2 mm), single and clusters of grains, some clusters lensoidal.

Carbonate; <5%, anhedral, diffuse interstitial

Opaques; <5%, anhedral, (<.01 to 0.1 mm), clusters of grains.

Apatite; trace

Fragments:

Quartz; <<5%, anhedral, (to 1.0mm), rounded, partially resorbed.

[18] VA 12216 (Polished thin section)

Quartz, feldspar, biotite sericite (chlorite) schist/phyllite.

Composed of quartz, feldspar, biotite and sericite of which one, or combinations of two or more minerals produce foliated laminations. Most laminations or layers are fine grained but some contain irregular masses of optically continuous plagioclase poikilitically enclosing foliated sericite and biotite. Micaceous minerals and feldspar show crinkling and dislocation by cross structures.

Contains coarse vein like lensoidal segregations of quartz with lesser sericite and sulphides following foliation. Irregular clots of fine felted biotite which follow foliation and cross structures, also contain clusters of sulphides and coarser segregations of biotite and quartz.

Stained slab indicates very minor K-feldspar associated with some clots. Strong etching suggests an abundance of plagioclase grains and clots in some lamellae. Magnetic

Opaques include pyrrhotite, chalcopyrite,

Transmitted light;

Feldspar: 20%

(a) Plagioclase; 10%, anhedral, (<.01 to .05 mm), elongate grains aligned with foliation, in feldspar-rich laminae, some mixing with quartz (?), foliated by sericite/biotite. K-feldspar was not confirmed in thin section.

(b) Plagioclase; 10%, anhedral, (to several mm), optically continuous masses in some laminae enclosing micaceous minerals aligned with foliation. Biaxial (-). Massive, unaltered. Similar grains in previous sections showed polysynthetic twinning. Requires confirmation.

Quartz; 25%

(a) Quartz; 15%, anhedral, (<.01 to 0.2 mm, generally about 0.05 mm) grading to coarser lensoids and segregations. Forms quartz-rich laminae or mixed with feldspar granules.

(b) Quartz; 10%, anhedral, (0.1 to 2+ mm), aggregates of grains forming quartz veins/lensoids in foliation plane or clusters of grains with coarser segregations of sericite/muscovite or biotite.

[18] Continued

Sericite: 20%
(a) Sericite; 15%, anhedral, (<.01 to 0.2 mm), fibrous/plumose foliated where it forms the major constituents of laminae and shows crinkling and dislocation by cross structures.

(b) Sericite; 5%, diffuse, discontinuous partings, wispy lensoids and networks in quartz-feldspar matrices and in coarse feldspar masses.

Biotite:
(a) Biotite; 20%, anhedral, (<.01 to 0.2 mm), bladed, forming large irregular fine felted clots with associated coarse clusters of grains and discontiuous laminae along foliation planes. Associated aggregates/segregations of sulphides. Concentration of biotite in areas of cross dislocation.

(b) Biotite; 5%, anhedral, (<.01 to 0.1 mm), bladed, as disseminated grains, clusters of grains scattered along foliation planes of some laminae.

Chlorite; 5%, anhedral, (to 0.2 mm), bladed/fibrous, forming narrow laminae with sericite.

Carbonaceous material (?), semiopaque dustings; <5%, microgranular, diffuse dustings following foliation with concentration in cross folds and dislocations.

Reflected light

Opaque; <5%

(a) Sulphides as clusters of grains associated with biotite clots and coarser segregations. In approximate order of abundance, they include: pyrrhotite, chalcopyrite, sphalerite.

(b) Clusters of minute grains, elongate rods along foliation planes of groundmass. In approximate order of abundance, they incude: ilmenite, pyrrhotite, chalcopyrite, sphalerite.

[19] VA 12217 (Polished thin section)

Feldspar, quartz, sericite, biotite, schist/phyllite

Composed of feldspar (K-feldspar and plagioclase), quartz, sericite, biotite which are segregated into foliated lamellae rich in one, or combinations of these minerals. The most abundant lamellae are feldspar-sericite-rich, sericite-rich and quartz-rich. The foliated lamellae are crinkled and dislocated by cross structures. Felted biotite clots are superimposed on this groundmass, concentrated at cross folds and dislocations.

Stained slab indicates significant amounts of K-feldspar and plagioclase in groundmass.

Magnetic. Opaque minerals are concentrated in biotite clots and in coarser quartz-amphibole segregations. Sulphides and oxides in approximate order of abundance include: pyrrhotite, chalcopyrite, sphalerite, (ilmenite).

Transmitted light
Groundmass
Feldspar; 20%:

Plagioclase/K-feldspar; 1%, anhedral, (<.01 to.05 mm). Feldspar rich laminae are commonly mixed with varied amounts of sericite and contain lensoids of slightly coarser grained quartz along foliation. The feldspars are very fine grained, structureless, untwinned. Not readily distinguishable optically. Stained slab indicates presence of both with plagioclase >>> than K-feldspar.

Sericite; 15%, anhedral, (<.01 to 0.2 mm, generally <0.1), fibrous/bladed, foliated. Sericite-rich lamellae are diffuse, foliated, with intermixing of varied amounts of feldspar and biotite. Show crinkling by cross folding and dislocations. Grade from sericite-rich to feldspar-rich.

Quartz; 25%, anhedral, (<.01 to 0.2 mm, generally about 0.05 to 0.1 mm), elongated grains parallel to foliation. Fine granular containing diffuse partings of sericite/plagioclase and biotite. Coarser grained quartz lensoids lie in foliation plane. Quartz-rich layers and coarser segregations contain clusters of amphibole (tremolite/actinolite), carbonate and associated coarse sulphides.

Biotite; 20%, anhedral, (<.01 to 0.15 mm), bladed. Occurs as irregular, fine-grained, felted clots (to several mm) which contain coarser segregations. The clots tend to follow foliation but are concentrated along cross folds and dislocation.

[19] Continued

Amphibole; <10%, anhedral, (to 0.1 mm), bladed/prismatic, clusters of grains associated with carbonate in quartz-rich layers and coarser segregations.

Carbonate; <5%, anhedral,(to 0.2 mm) associated with amphibole in quartz-rich layers and segregations.

Reflected light

Opaque minerals: 10%

Sulphides are concentrated in:
(a) Biotite clots; in order of abundance include: Pyrrhotite, chalcopyrite, sphalerite.

(b) Coarse quartz lensoids and segregations with amphibole and carbonate; in order of abundance are: sphalerite, pyrrhotite,chalcopyrite, (ilmenite). Ilmenite is most abundant as disseminations in foliated groundmass.

[20] VA 12218 (Thin section)

Phyllitic quartz, plagioclase, crystal tuff

Groundmass consists of fine granular quartz and feldspar foliated with diffuse sericite lensoids and partings. There are scattered fine, felted biotite clots and a few lensoids of aggregates of coarser grained quartz lying in the plane of foliation. Coarse fragments, clusters of grains of plagioclase and lesser subrounded partly resorbed quartz grains are scattered throughout the groundmass.

Stained slab indicates no K-feldspar but shows strong etching of plagioclase. Nonmagnetic. Weak disseminated opaques associated with micas and chlorite.

Transmitted light
Groundmass

Quartz; 20%, anhedral, (<.01 to 0.2 mm, most grains <.05 mm), elongated grains aligned parallel to foliation. Coarser grains, (to 0.2 mm), form lensoidal aggregates of grains in plane of foliation.

Plagioclase; 25%, anhedral, (<.01 to 0.2 mm, most grains <.05 mm), elongated grains aligned parallel to foliation. Conspicuous by scattered polysynthetic twinned grains and by lower RI than quartz.

Biotite 15%
(a) Red brown pleochroic; anhedral, (<.01 to 0.2 mm), finer grains felted, coarser foliated. Forms irregular clots generally associated with coarser quartz segregations.

(b) Pale yellowish green; anhedral, (<.01 to .05 mm), fibrous to plumose, felted/foliated forming elongate clots and lensoidal shapes along foliation.

Sericite; 10%, anhedral, (<.01 to 0.2 mm, generally <0.1 mm), acicular/bladed, foliated, forming discontinuous partings, diffuse lensoids and networks within quartz-feldspar groundmass.

Opaques; <%, associated with mafics and coarser quartz segregations.

Fragments: 30%

Plagioclase; >20%, fragmental, (to 1.0 mm), twinned, indicated composition in oliogclase/andesine range. (RI very close to epoxy; if (-) then in albite range).

[20]

Quartz; <10%, rounded, (to 1.5 mm), nibbled margins, partly resorbed.

Veins

Quartz; anhedral quartz grains (to 0.5 mm), forming "veins" along foliation. (1 to 1.5 mm wide)

Carbonate veinlets.

[21] VA 12221 (Thin section)

Interlaminated quartz and feldspar chlorite schist

The lamellae are composed of granular quartz interlaminated with an intensely deformed mixture of chlorite and feldspar containing foliated wispy/diffuse clots of sericite. The chlorite-feldspar-sericite mixture is further disrupted by deformed coarser granular quartz lensoids. Sericite clots contain discontinuous partings of iron oxide.

Veined by carbonate

Stained slab gives faint + stain associated with carbonate.
Nonmagnetic

Very minor disseminated irregular opaque grains but strong iron staining in fractures and in foliation of sericite clots.

Transmitted light
Groundmass

Quartz-rich lamellae:

Quartz; 30%, anhedral, (<.05 to 0.1 mm), irregular grains, elongate in plane of foliation. Coarser grains, (to 0.3 mm), as aggregates form lensoids in quartz and feldspar-chlorite-sericite lamellae.

Chlorite, feldspar, lamellae containing sericitic clots and quartz lensoids:

Feldspar; 15%, anhedral, (0.02 to 0.05 mm), interstitial to bladed chlorite.

Chlorite; 20%, anhedral, (<.05 to 0.1 mm), bladed, felted texture.

Clots

Sericite; 15%, anhedral, (0.01 to 0.1 mm, generally 0.05 mm), irregular narrow bladed, patches of felted/foliated grains, intensely crinkled by cross folding and dislocations.

Carbonate; <10%, anhedral, scattered irregular clusters of grains,(to 0.3 mm), some iron-staining.

Veining
Carbonate; <10%
Iron oxides <<5% strong iron staining in fractures and sericite foliation planes.

Opaques; <5%, disseminated irregular grains.

[22] VA 12222 (Thin section)

Quartz, K-feldspar, biotite, chlorite, (sericite) schist.

Laminated groundmass with laminae rich in one or more of quartz, K-feldspar, biotite, chlorite or sericite. K-feldspar as indicated by stained slab occurs as diffuse masses associated with some biotite laminae. Foliated micaceous minerals have strong crinkling by cross foliation with some dislocation.

Stained slab confirms K-feldspar.

Transmitted light
Groundmass

Quartz; 25%, anhedral, (<.05 to 0.2 mm, generally about 0.1 mm), elongated grains parallel to foliation. Quartz-rich laminae contain scattered grains and diffuse partings of biotite and lesser sericite following foliation. Numerous coarser grained lensoidal aggregates occur in the groundmass.

K-feldspar; <10%, anhedral, (to >1.0mm), diffuse irregular clots within biotite-rich lamellae, clouded by very fine inclusions of biotite and sericite in plane of foliation. Very fine dusting of alteration. Crenulated by cross structures and dislocation. Plagioclase was not confirmed in thin section.

Biotite;
(a) dark; 25%, anhedral, (.01 to 0.15 mm), bladed/shredded, foliated/felted. Laminae contain lensoids of quartz grains, others with irregular K-feldspar clots. Biotite projects as diffuse lensoids and networks into quartz-rich laminae.

(b) pale biotite/sericite; 15%, anhedral, (0.02 to 0.05 mm), fibrous altered appearance, very pale brownish pleochroism. Mixed with biotite lamellae and as platy felted masses associated with coarse quartz segregations.

Sericite; 15%, anhedral, (<.01 to 0.05 mm), ragged outline, as single grains and clusters in quartz. As fine foliated irregular masses in biotite lamellae.

Chlorite; <5%, anhedral grains (<.01 to.05 mm) as clusters of grains in biotite and sericite rich lamellae (alteration) and as cluster of grains with sericite in quartz laminae.

Carbonate; <1%, anhedral grains associated with chlorite and sericite.

[22] Continued

Opaques; <5%, anhedral irregular grains and elongate rods, associated with biotite lamellae, feldspar clots and coarser quartz segregations.

[23] VA 12224 (Thin section)

Plagioclase (K-feldspar) quartz meta-crystal tuff

The groundmass is fine feldspathic, weakly foliated by aligned sericite grains, discontinuous partings and diffuse networks.

Disseminated feldspar, quartz crystals and clots of felted altered amphibole, carbonate, sericite chlorite and green mica with associated irregular clusters and fine opaque grains. The mafic minerals follow incipient fractures forming a broad network.

Transmitted light
Groundmass

Feldspar; 30%, anhedral, (<.01 to 0.1 mm, generally <.05 mm), elongate grains oriented in plane of foliation.

Sericite 25%, anhedral, (<.01 to 0.1 mm), acicular/fibrous as individual grains. Clusters of grains form discontinuous partings and diffuse networks through feldspathic groundmass. Locally sericite is so abundant that the feldspar-rich groundmass is subordinate.

Fragments

Plagioclase; 20%, anhedral laths (to 2.0 mm), varied intensity of sericitic alteration from sparsely disseminated to scattered clusters. Conspicuous twinning indicating oligoclase-andesine composition.

Quartz; <<5%, anhedral, (to 0.3 mm), subrounded, nibbled margins, partly resorbed.

Altered amphibole; 15%, subhedral, (to 1.5 mm), clusters of grains, varied degree of alteration, carbonate, secondary amphibole, chlorite, green mica/sericite muscovite. Associated irregular clusters of fine opaque grains. Forms irregular clots, (to several mm), and wispy diffuse networks throughout groundmass.

Opaques; <10%, anhedral, (<.01 to .05 mm), very irregular clusters of grains associated with altered mafic clots and wispy networks.

Segregations

Quartz; 5%, anhedral, (to 0.2 mm), aggregates of grains forming lensoids in plane of foliation in groundmass.

[24] VA 12226

Quartz feldspar crystal lithic tuff

Feldspar, quartz and lithic flow fragments with chloritic clots and diffuse networks in a fine tuffaceous feldspathic matrix.

Stained slab shows no evidence of K-feldspar; etching confirms plagioclase rich groundmass.

Magnetic, contains opaque grains (pyrite and magnetite) associated with chlorite.

Transmitted light
Groundmass

Feldspar; 30%, anhedral fine fragmental, (<.01 to 0.1 mm). Fine lath-like fragments show preferred orientation.

Chlorite; 15%, anhedral, minute grains, (<.01 to .05 mm), irregular shapes disseminated throughout matrix. Merge with coarser diffuse clots and networks.

Epidote; <<1%, anhedral, (<.05 to 0.1 mm), single grains and clusters of grains scattered through groundmass and lithic fragments.

Fragments

Plagioclase; 25%, subhedral fragmental, (.05 to >2.0 mm), varied intensity from scattered grains to clusters of sericitic alteration. Slight brownish microgranular dusting. Polysynthetic twinning indicates composition in oligoclase-andesine range. (RI very close to epoxy, appears (+)).

Quartz; <5%, anhedral, (to 1.5 mm), rounded, some grains with nibbled margins, partly resorbed.

Chlorite; 20%, anhedral (0.05 to 0.8 mm), bladed, some with vague outlines which may be pseudomorphous after mafic grains or clusters of grains. Forms diffuse foliated/felted clots and networks throughout groundmass and around fragments.

Lithic fragments

Andesine flow, felted plagioclase crystals in a fine feldspathic chloritic matrix. Traces of epidote.

[24] Continued

Clots

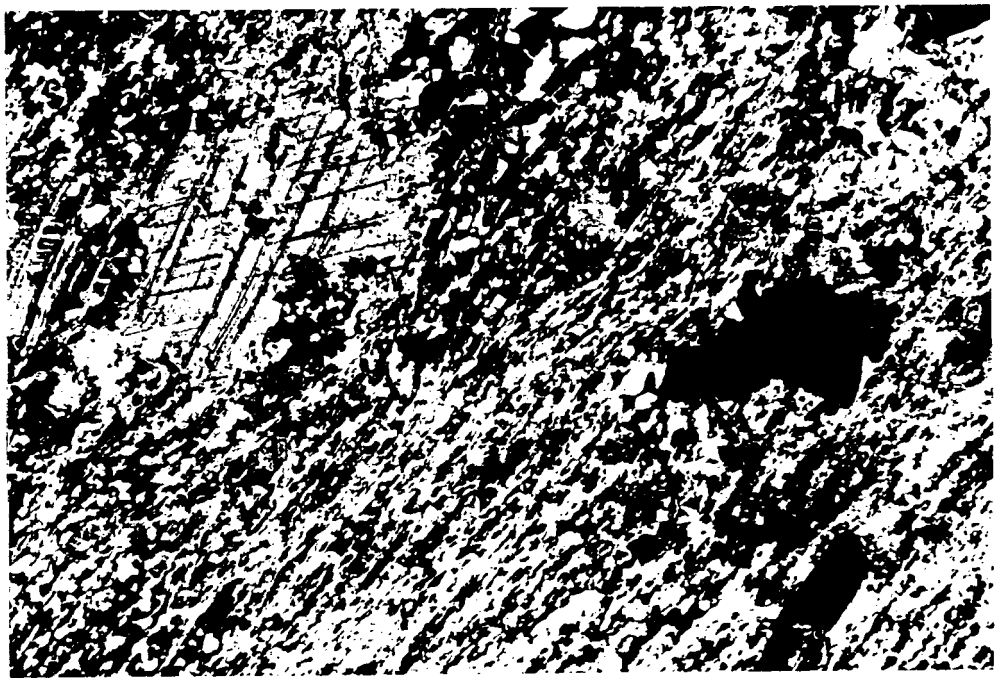
Chlorite; (as described with fragments), very irregular masses (to several mm), forming clots and diffuse networks.

Carbonate; <5%, anhedral, (to 0.8 mm), irregular grains/clots associated with chlorite, in lithic fragments and scattered throughout feldspathic groundmass.

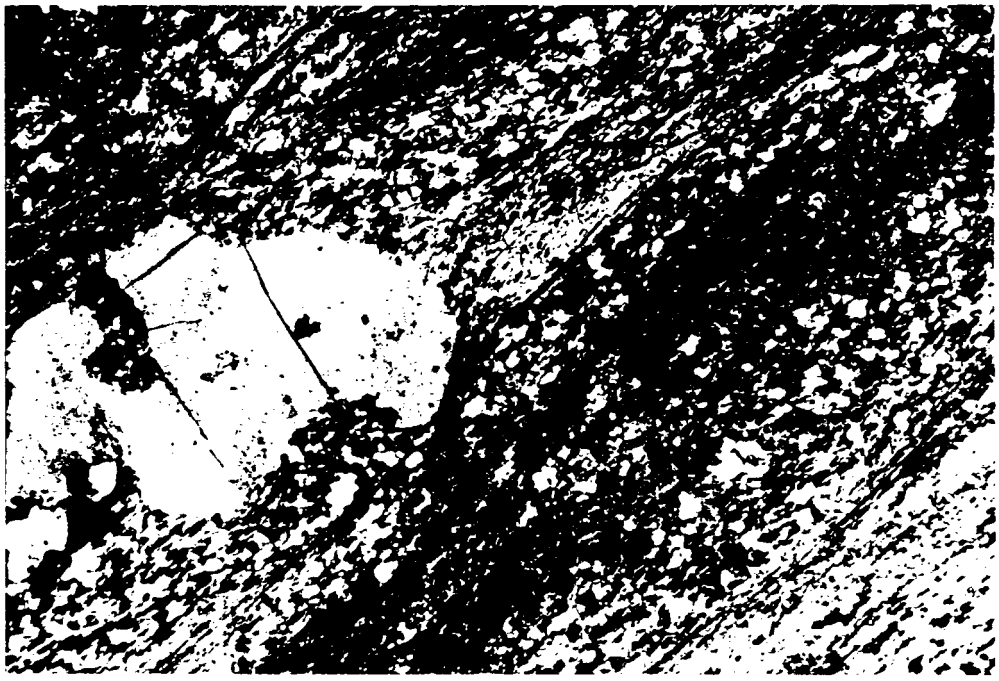
[2] AG 09307 89R XIII 6 X-nicols 0.1 mm
Feldspar, sericite, schist/phyllite. Resorbed quartz "eyes" with eye shape following foliation. Diffuse segregations chlorite, carbonate, green and brown biotite. Carbonate veinlet.

[4] AG 09316 89 XIII 7 X-nicols 0.1 mm
Quartz-feldspar-sericite schist/phyllite. Resorbed quartz. Interstitial low birefringence mass (lower right) enclosing quartz and feldspar grains.

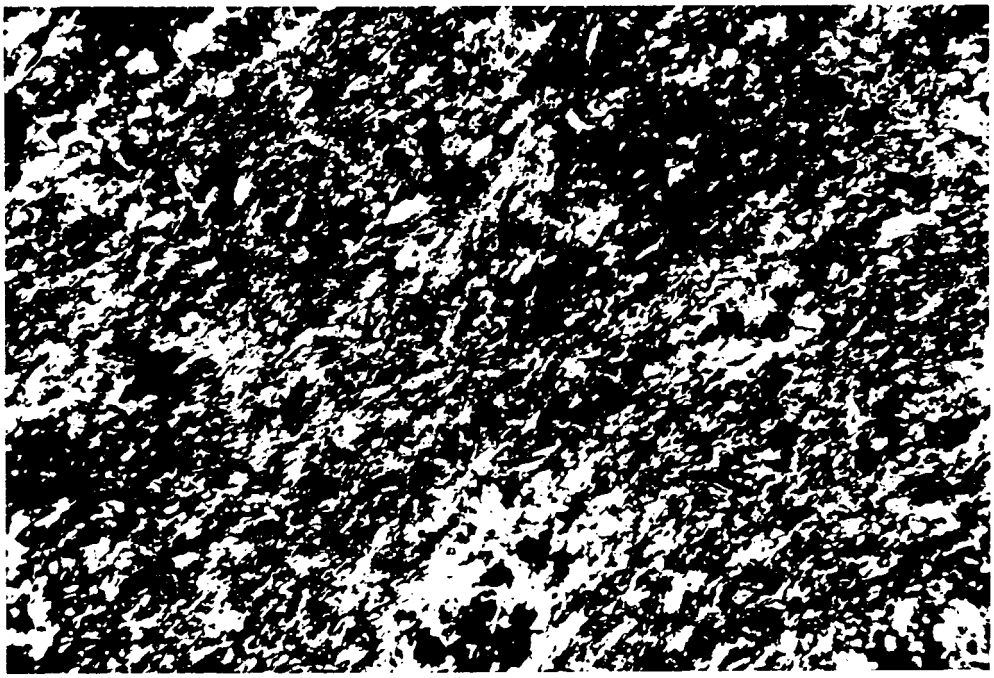
[5] AG 09324 89R XIII 8 X-nicols 0.1 mm
Crystal lithic tuff. Feldspar (quartz) groundmass. Feldspar fragments. Lacks resorbed quartz "eyes". Diffuse segregations carbonate, quartz, chlorite, biotite, sulphides.



[6] AG 09330 89 XIII 9 X-nicols 0.1 mm
Quartz-carbonate-sericite schist/phyllite. Showing coarser grained quartz, muscovite, carbonate, sulphide segregations.



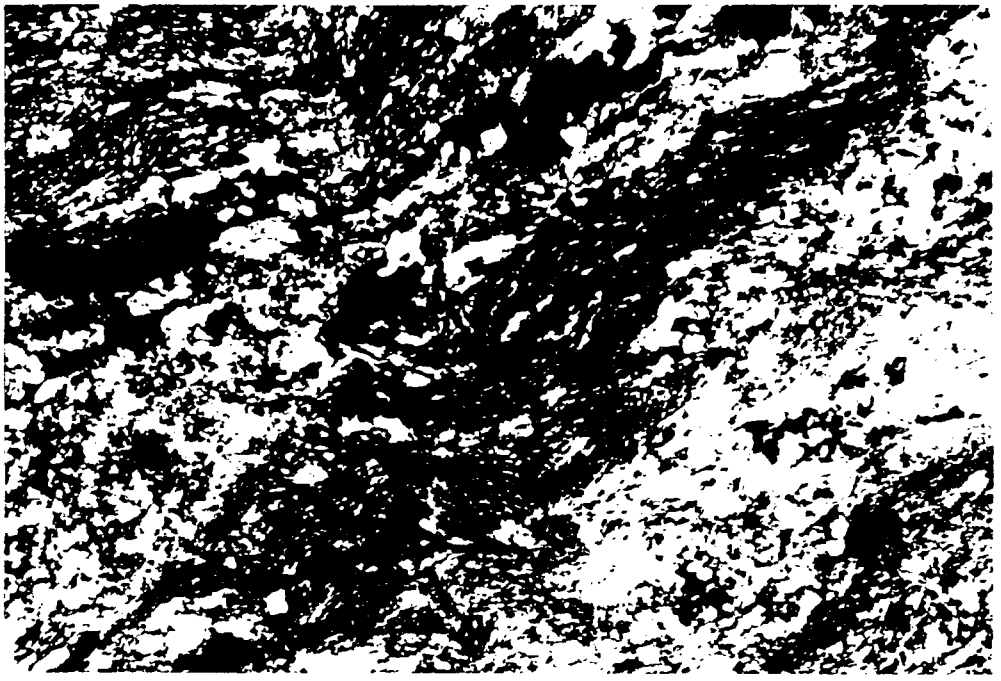
[7] VA 12040 89 XIII 10 X-nicols 0.1 mm
Quartz-sericite-biotite laminated schist/phyllite. Large resorbed quartz grain.



[10] VA 12152 89 XIII 11 X-nicols 0.1 mm
Plagioclase-chlorite schist. Clusters of plagioclase grains and interstitial clots (dark). Biotite clots in a foliated groundmass in a foliated plagioclase-chlorite groundmass.

[12] VA 12190 89 XIII 12 X-nicols 0.1 mm
Quartz-feldspar-carbonaceous schist/phyllite. Carbonate clots. Crinkling by cross folding.

[13] VA 12198 89 XIII 13 X-nicols 0.1 mm
Quartz-feldspar-sericite-biotite schist/phyllite. Clots of biotite-tremolite-sulphides.

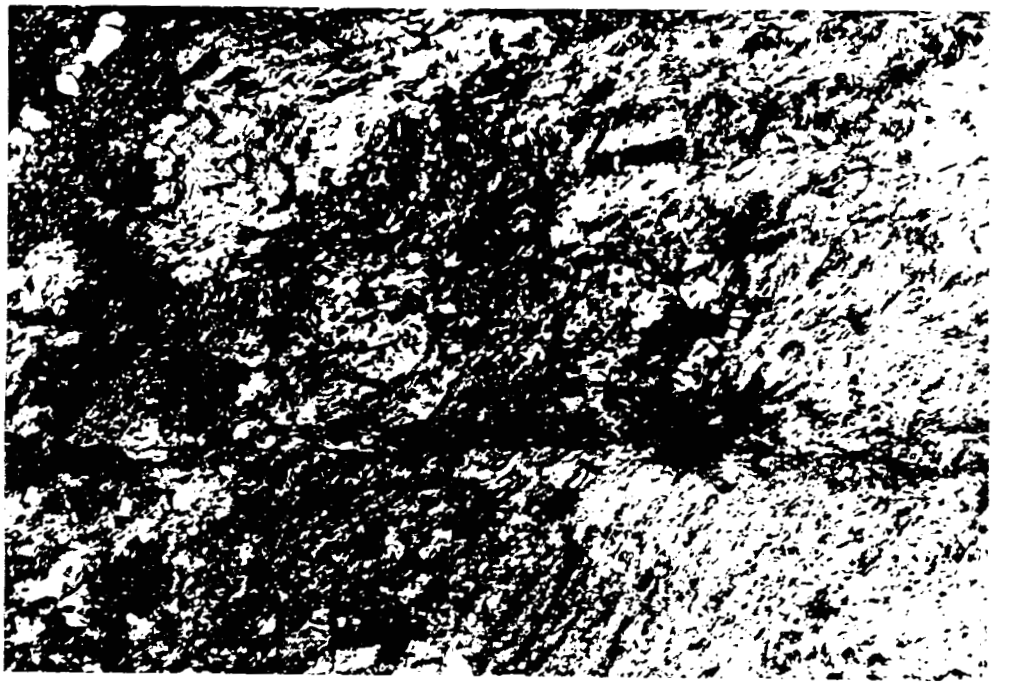


[14] VA 12209 89 XIII 14 X-nicols 0.1 mm
Feldspar-quartz-sericite-biotite-chlorite schist/phyllite. Quartz, biotite and sulphide segregations.

[15] VA 12212 89 XIII 15 X-nicols 0.1 mm
Feldspar-(quartz)-biotite-(sericite) schist. Felted biotite clots with coarser segregations quartz-biotite-minor feldspar-sulphides. Quartz lensoids.

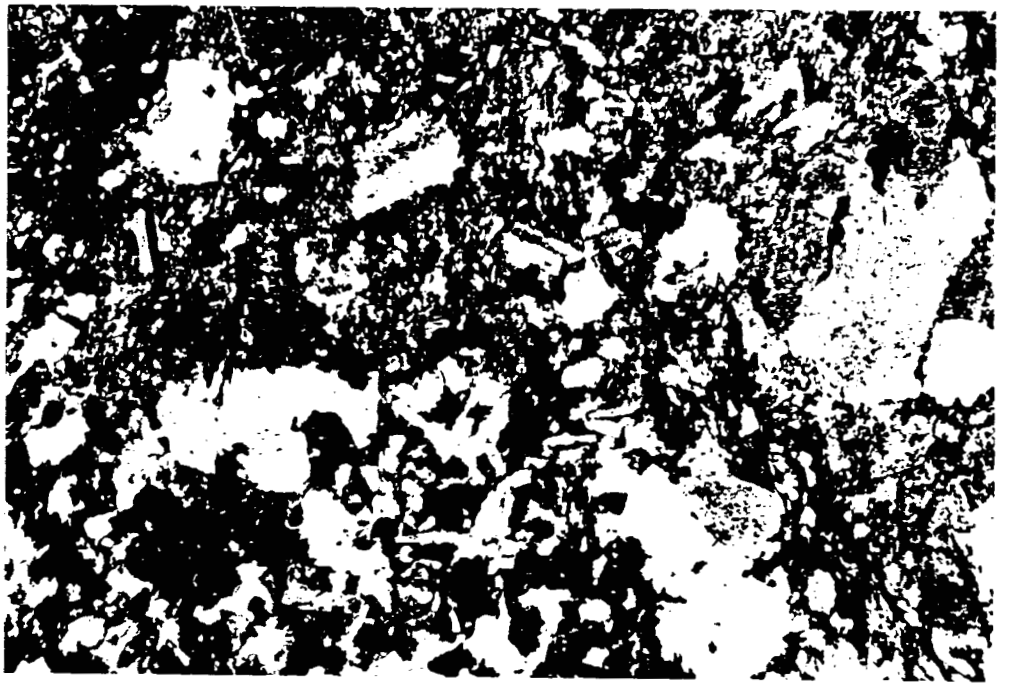
[16] VA 12214 89 XIII 16 X-nicols 0.1 mm
Feldspar-quartz-sericite-chlorite-biotite carbonaceous schist/phyllite. Biotitic clots and quartz lensoids and associated sulphides. Cross crinkling.

[17] VA 12215 89 XIII 17 X-nicols 0.1 mm
Spotted feldspar-quartz-biotite-sericite schist/phyllite. Fine felted biotite clots with coarser grained cores of amphibole, quartz, carbonate and sulphides.

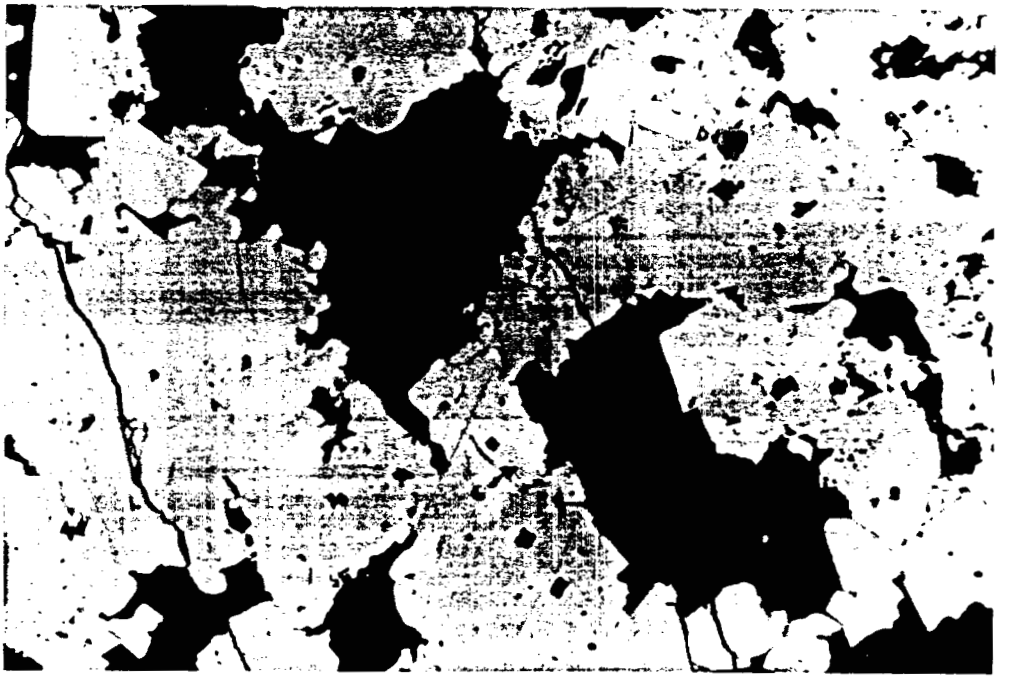


[18] VA 12216 89 XIII 18 X-nicols 0.1 mm
Quartz-feldspar-biotite-sericite-(chlorite)-schist/phyllite. Showing masses of optically continuous plagioclase. Cross folding and dislocation.

[20] VA 12218 89 XIII 19 X-nicols 0.1 mm
Phyllitic quartz-plagioclase crystal tuff. Sericite, biotite, pale biotite, quartz "eyes" (lenticular shape continued in plane of foliation), plagioclase crystal fragments.



[24] VA 12226 89 XIII 20 X-nicols 0.1 mm
Feldspar crystal lithic tuff. Note felted lithic flow fragment, lower left.



[1] AB09303 89 XIII 22 Reflected light .01 mm
Pyrite (yellow), sphalerite (light grey), galena (light bluish grey blebs).

Vancouver Petrographics Ltd.

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PETROGRAPHIC ANALYSIS OF NINE THIN SECTIONS

Report for: Stan Clemmer
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202- 856 Homer Street
Vancouver, B. C.
V6B 2W2.

Invoice 8537

October 30, 1989

Samples submitted: VA12538, 540, 546, 560, 594, 596, 598, 604, 610.

SUMMARY:

This is a series of similar intermediate volcanic to sub-volcanic (high-level intrusive?) rocks with similar alteration from specimen to specimen. Of the samples, three (VA12538, 60, and 12604) could be high-level intrusive porphyries; one (VA12540) appears to be a lapilli tuff; one (VA12610) may be a flow; and the rest are strongly altered feldspar or quartz-feldspar porphyries that approximate dacite to andesite in composition.

Alteration ranges from relatively weak (transitional propylitic-phyllic, with albite-quartz-calcite-hydrobiotite) in VA12546 and 60, through strong phyllic (quartz-sericite-carbonate) in VA12538, 540, 598 and 604, to transitional phyllic-potassic (quartz-sericite-biotite-chlorite-calcite-alkali feldspar) in VA12596 and 610, to potassic (K-feldspar biotite-quartz-sericite-chlorite-carbonate) in VA12594.

These rocks are all notably deficient in sulfides, with only minor pyrite noted in a few samples. Veining and fracture envelopes are also notably absent, except in the strongly altered VA12598. A mild to moderate foliation is defined in all samples by sericitic laminae.

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VA12538: QUARTZ-PLAGIOCLASE PORPHYRITIC ?HIGH-LEVEL INTRUSIVE, ALTERED TO SERICITE-CARBONATE-CHLORITE-ALBITE

Rusty-weathering, orangey-buff rock with dark green spots. The etched slab shows small quartz phenocrysts as well as other relict phenocryst sites, indicating a former volcanic or high-level intrusive rock. A sheen on the surface of the hand specimen indicates low-grade metamorphism. In thin section, the minerals are:

Sericite (muscovite)	30%
Quartz (partly secondary)	25%
Carbonate (dolomite or ankerite?)	20%
Chlorite	10%
Secondary alkali feldspar (sodic)	10%
Opaques (limonite, pyrite, rutile)	5%
Sphene	<1%

Sericite is abundant in this rock, forming small flakes of about 0.05 to 0.1 mm length. The sericite replaces both former plagiclase phenocrysts and the groundmass. In places, the sericite defines a foliation.

Relict quartz phenocrysts range from clear and subhedral to anhedral and recrystallized. They are about 2 mm in diameter, and show attack at their margins by the fine-grained groundmass, carbonate, and sericite.

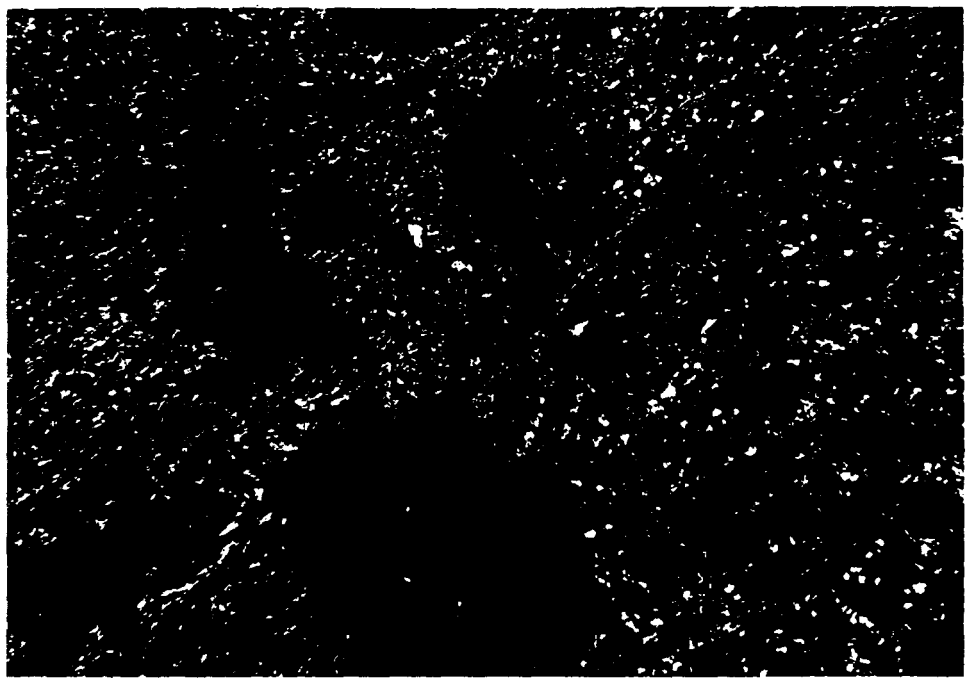
Carbonate forms large anhedral to subhedral grains up to 2 mm across. They probably replace former phenocrysts, possibly mafic crystals. The carbonate reacts only slowly to cold dilute HCl, and it commonly shows alteration to limonite at its margins, so it may be ferroan dolomite (ankerite).

Patches of green flaky mafic minerals, including both chlorite and hydrobiotite (which has higher birefringence), also probably replace former mafic phenocrysts. The chlorite flakes are about 0.01 to 0.02 mm in diameter.

Relict plagioclase phenocrysts are visible, replaced by 1 mm grains of secondary alkali feldspar (mostly vaguely twinned albite to "irregular" albite), accompanied by sericite.

There are few opaques present, and they are not identifiable with certainty in transmitted light. There may be some pyrite as rounded grains up to 0.2 mm diameter. Sphene forms subhedral grains up to 0.3 mm across. Fine opaques (0.01 to 0.03 mm) associated with chlorite may be Fe-Ti oxides such as rutile and leucoxene.

The groundmass of the rock is composed of fine-grained quartz and sericite of 0.03 mm average diameter. This suggests that the protolith was a sub-volcanic porphyry or high-level intrusive. The rock has undergone strong phyllic alteration to sericite, carbonate, and minor chlorite, although there is very little sulfide. Oxidation has produced limonite after carbonate and chlorite.



VA12538: Carbonate altered phenocrysts in fine-grained quartz-sericite groundmass, foliation defined by sericite. Width of field of view is 3.5 mm, crossed polars.

VA12538: Partially resorbed quartz phenocryst, black patch of iron oxides after Fe-carbonate. Crossed polars, width of field of view is 4 mm.

VA12540: PHYLLIC (CARBONATE-SERICITE-QUARTZ-ALBITE ALTERED) ?INTERMEDIATE VOLCANIC

Orange-brown weathering, strongly carbonate altered rock with a poorly preserved fine porphyritic texture suggestive of a volcanic. A weakly developed foliation is apparent. Weathering has produced an irregular surface texture by dissolution of less resistant areas. Small dark lenses in the rock look like fiamme, but may be some other inclusions that have been flattened by deformation. In thin section, the modal mineralogy is:

Carbonate (?Fe-calcite or ankerite)	30%
Sericite (muscovite)	30%
Quartz (partly secondary)	25%
Secondary alkali feldspar (sodic)	10%
Opaques (rutile, pyrite)	3%
Limonite	2%
Sphene	<1%

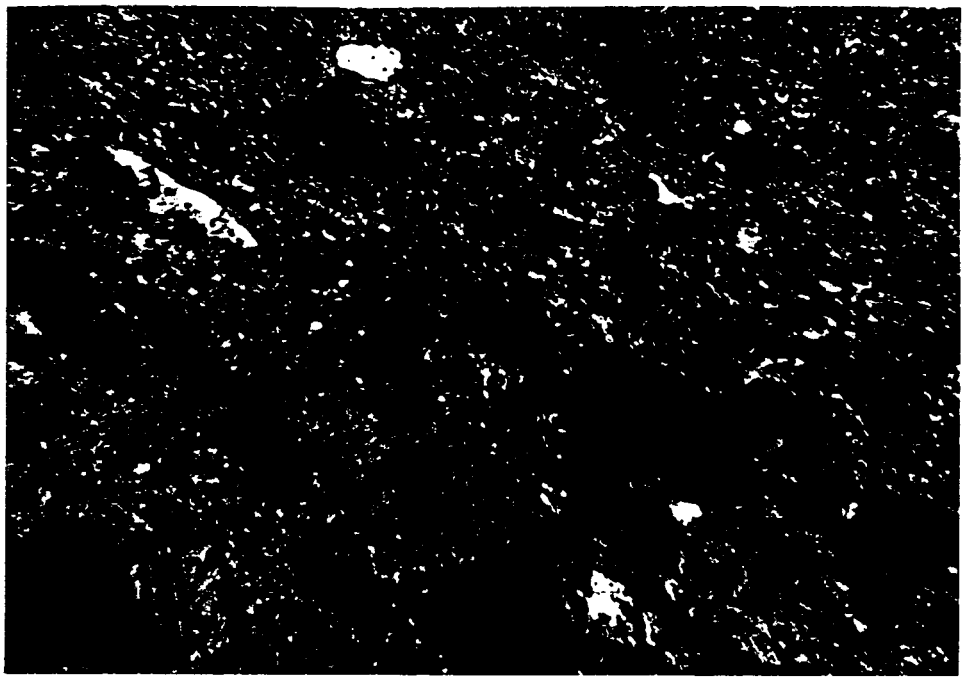
Carbonate forms small phenocrysts in this rock, about 0.5 to 1.0 mm in diameter. It is not obvious what they have replaced, since the shape is now determined by the rhombic outlines of the euhedral carbonate grains. I suspect they replace mafic crystals, since there are other remnants of plagioclase phenocrysts still present. If so, this was a fairly mafic volcanic. The carbonate reacts slowly to cold dilute HCl, and the limonite oxidation product indicates the presence of Fe; it may be either Fe-calcite, ankerite, or a mixture of the two, with cores of ankerite surrounded by rims of Fe-calcite.

Remnants of plagioclase form anhedral relicts up to 0.5 mm across with vague or no twinning ("irregular albite"). These grains are also partly replaced by sericite.

Sericite forms fine flakes of about 0.05 mm diameter, principally in the groundmass with quartz of similar size, and replacing plagioclase. There is a tendency for the sericite to segregate into layers richer in sericite, probably due to weak dynamothermal metamorphism.

Opaques appear to be mostly Fe-Ti oxides, rather than pyrite. Sphene and associated needle-like rutile or anhedral ?leucoxene are widespread but not abundant, forming fine grains up to 0.05 mm across. There is some limonite present with these Ti-bearing patches, and limonite also replaces the margins of carbonate grains.

The dark "fiamme" in hand specimen are areas of higher fine opaque content in thin section (opaques about 1-5 microns long, possibly mainly rutile). They could have been fiamme, of mor mafic rock, caught up in this volcanic rock.



VA12540: Small quartz, carbonate, and apatite (dark grey, high relief) phenocrysts in foliated quartz-sericite groundmass. Width of field of view is 4 mm; crossed polars.

VA12540: Lenticular "fiamme" (?) as dark opaque-rich area parallel to foliation. Width of field of view is 4 mm; uncrossed polars.

VA12546: ALBITE-QUARTZ-CARBONATE-CHLORITE ALTERED, INTERMEDIATE LAPILLI TUFF

Grey-green, brown-weathering intermediate volcanic, probably a fine lapilli tuff, with similar carbonate alteration to 12540 resulting in orangey-brown grains in the fine greenish groundmass. The etched slab suggests the presence of large fragments, up to 2 cm across, somewhat stretched by deformation. In thin section, the minerals are:

Secondary alkali feldspar (sodic)	30%
Quartz	20%
Carbonate (Fe-calcite or ankerite)	20%
Chlorite	15%
Clay, sericite	5%
Biotite	5%
Pyrite	3%
Fe-Ti oxides (rutile, magnetite)	2%

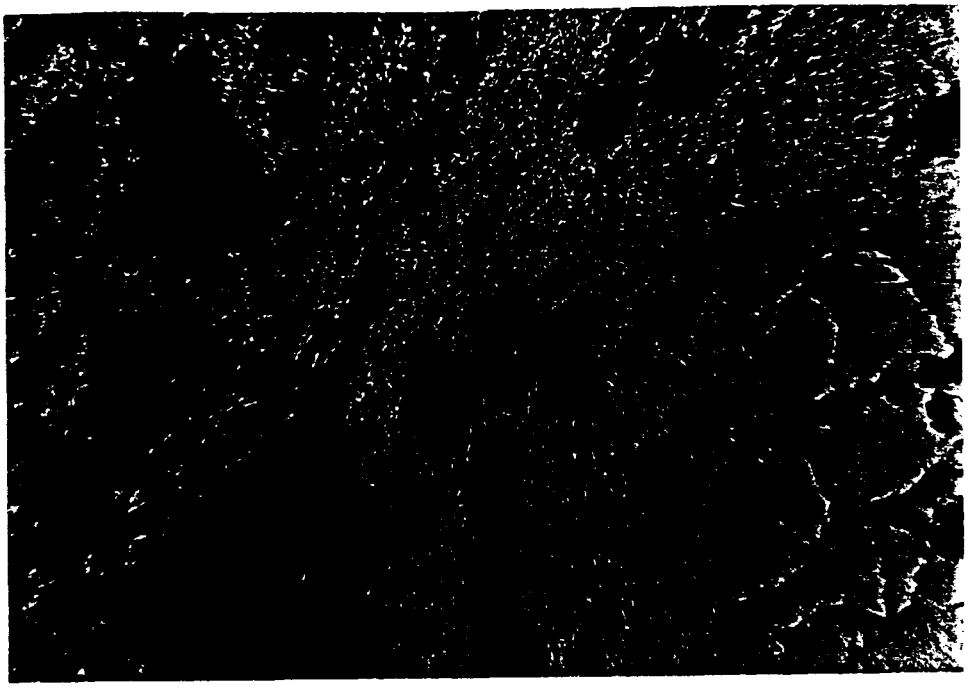
The fragmental nature of this volcanic rock is clear in thin section, with broken phenocrysts (shards) scattered in larger fragments. The larger fragments are distinguished by a slightly less chloritic groundmass than the matrix to the fragments, making them look white in comparison. The fragments are composed of tablets of altered plagioclase, irregular grains of carbonate, and chloritized biotite relics in a groundmass of quartz and chlorite. It is not clear how much of the quartz in the groundmass is secondary. The matrix to the fragments consists of similar but finer minerals, plus more chlorite.

Plagioclase has been replaced by a secondary alkali feldspar that has vague to ill-defined twinning and is probably sodic in composition. The phenocrysts are euhedral and average 0.75 mm in diameter. They are clouded by minute clay and hematite particles, and flecked by sericite of 0.02 to 0.03 mm diameter.

Carbonate forms euhedral to subhedral grains of about 0.3 mm average diameter. They react only slowly to cold dilute HCl, and show oxidation to limonite at their margins; they are likely Fe-calcite or ankerite, or a mixture of the two, as in 12540. They probably replace mafics, presumably a different mafic (e.g. pyroxene?) than the biotite that is pseudomorphed by chlorite. Biotite is pleochroic in brown, forming flakes up to 0.25 mm across that are strongly replaced by chlorite. The chlorite has anomalous interference colours and green to pale yellow pleochroism, forming flakes up to 0.2 mm diameter.

The groundmass is formed of tightly interlocked quartz as anhedral grains of 0.02 to 0.05 mm diameter, with interstitial chlorite flakes less than 0.05 mm long.

Fine anhedral grains of Fe-Ti oxides (rutile, leucoxene, hematite and goethite, plus minor magnetite) are associated with the altered mafic (chlorite) sites, with aggregates ranging up to 0.1 mm across composed of minute crystals of 10-30 micron size. Pyrite forms euhedral cubic crystals of 0.5 to 1 mm diameter. Rare euhedral apatite grains are up to 0.1 mm.



VA12546: Large quartz and albite phenocrysts, with euhedral pyrite and anhedral magnetite in foliated quartz-sericite groundmass (boundary between lighter-coloured fragment, to right, and darker matrix, to left, is marked by opaques). Width of field of view is 4 mm; uncrossed polars.

VA12546: Crowded euhedral quartz and vaguely twinned alkali feldspar phenocrysts, in a fine quartz-chlorite groundmass. Width of field of view is 4 mm; crossed polars.

VA12560: PLAGIOCLASE-QUARTZ-?HORNBLENDE SUB-VOLCANIC PORPHYRY, ALTERED TO ALBITE-QUARTZ-CARBONATE-HYDROBIOTITE

Light grey, fine-grained high-level intrusive porphyry characterized by fine dark elongated mafic relics (?after hornblende), white plagioclase relics and sparse small quartz eyes (visible only in the etched slab). There are indications of minor secondary K-feldspar from the yellow stain in the slab. In thin section, the mineralogy is as follows:

Plagioclase phenocrysts (albitized)	30%
Quartz (groundmass)	25%
Quartz (phenocrysts)	10%
Hydrobiotite (after mafics)	10%
Sericite (mainly groudmass)	10%
Carbonate (calcite)	10%
Opaques (pyrite, magnetite)	2%
Secondary K-feldspar	2%
Chlorite	1%
Apatite	<1%

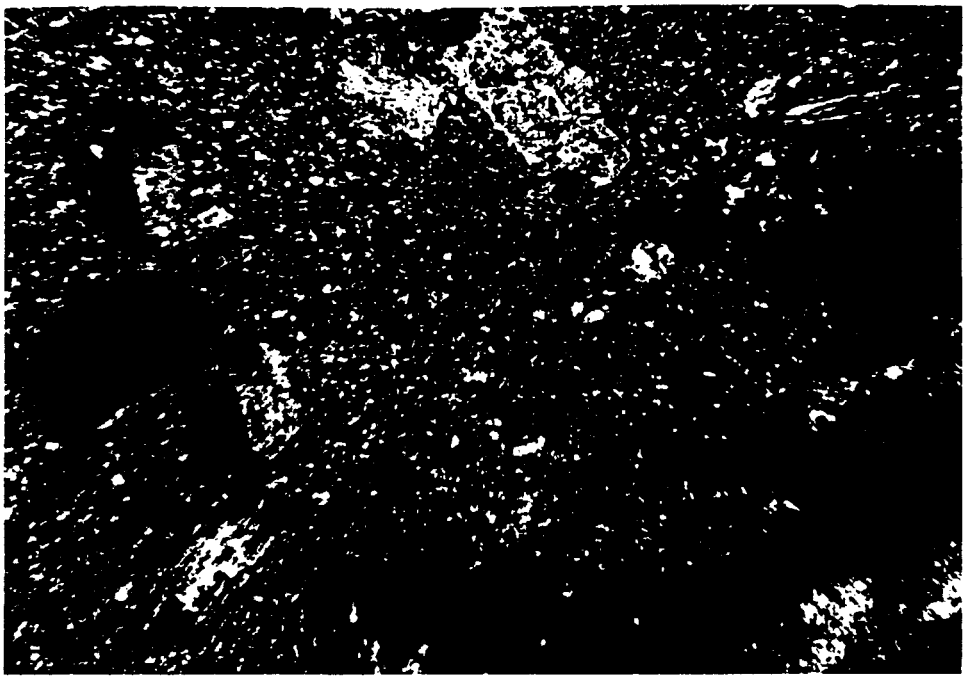
Plagiclase phenocrysts are about 1 to 3 mm long, euhedral to subhedral, and occasionally glomeratic (aggregates of smaller crystals). They are now replaced by albite that shows sharp twinning ("patchwork" albite) to "irregular albite" lacking twinning. There is also minor alteration to flecks of hydrobiotite, carbonate, and sericite.

Quartz phenocrysts are about 0.5 to 0.7 mm in diameter. They are subhedral to broken, with some pyramidal terminations visible.

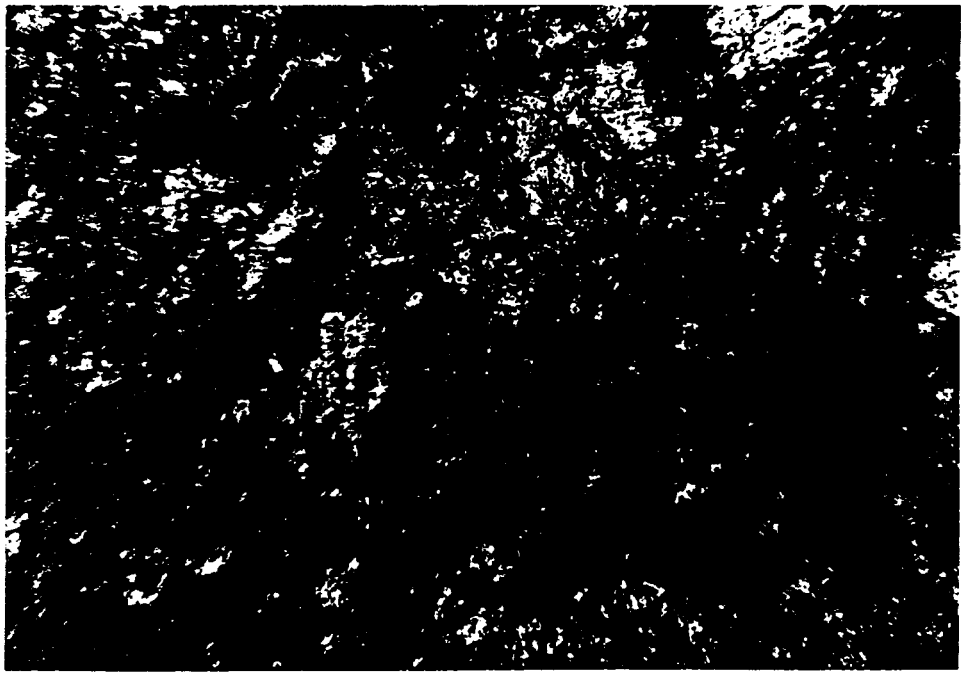
Mafic phenocrysts were about 0.5 mm in diameter, but occasionally up to 2 mm long. They are now completely replaced by dark green hydrobiotite (lacking the typical brown pleochroism of biotite but with higher birefringence than chlorite), as fine flakes less than 0.05 mm in diameter, plus carbonate that forms subhedral grains up to 0.3 mm diameter, and fine opaques. The carbonate and opaques often form the core of the altered grain, with fringing hydrobiotite. Carbonate reacts readily to HCl in this sample, suggesting it is calcite. The elongate shape of some of the mafic relics suggests they may have been hornblende. Chlorite, with anomalous interference colurs, is also found replacing the centers of some of the mafic relics.

The groundmass is composed of finely interlocking anhedral quartz grains of 0.05 mm or less diameter, with lesser euhedral flakes of sericite to 0.03 mm long.

Most of the Fe-Ti oxide opaques in this sample are probably magnetite, as fine (0.01 to 0.07 mm) anhedral grains in the altered mafic sites. However, there is also minor subhedral pyrite as scattered grains of 0.1 mm diameter. Minor apatite forms euhedral prismatic grains up to 0.1 mm long.



VA12560: Small quartz and albite phenocrysts, in a finely interlocking quartz and sericite groundmass; dark patches are green hydrobiotite, replacing former mafic grains. Width of field of view is 4 mm; crossed polars.



VA12594: Thoroughly altered texture of secondary biotite and secondary K-feldspar, completely replacing the former volcanic texture. Width of field of view is 4 mm; uncrossed polars.

VA12594: POTASSIC ALTERED (K-SPAR-BIOTITE-QUARTZ-SERICITE-CHLORITE-CARBONATE) ?VOLCANIC OR SUB-VOLCANIC

Dark grey, diffusely banded rock with a strongly altered texture. The etched and stained slab shows that there is abundant K-feldspar present, except along a couple of fracture envelopes. In thin section, the alteration mineralogy is as follows:

Carbonate (calcite)	25%
Secondary biotite	25%
Secondary K-feldspar	20%
Quartz (partly secondary)	15%
Chlorite	5%
Sericite	3%
Sphene	3%
Opaque (rutile, leucoxene)	3%
Apatite	1%

The texture of this rock in thin section is almost entirely secondary; there are no vestiges of what the primary texture was. It probably was a volcanic or high-level intrusive rock similar to the orthers in the series. It now consists of tightly interlocking K-feldspar, quartz, carbonate and biotite.

Carbonate reacts strongly to cold dilute HCl and so is calcite. It forms anhedral grains of 0.1 to 0.2 mm diameter that appear to "blot out" or overprint the other minerals.

The biotite is clearly good secondary brown (magnesian) biotite, replacing some former mafic. It forms anhedral matted masses up to 0.5 mm across tha are aggregates of fine grains of 0.01 to 0.02 mm diameter. It is often intimately mixed with carbonate, and sometimes with sericite.

There are also patches of chlorite, with pale green colour and weakly anomalous Berlin blue interference colours, intergrown with the carbonate and the biotite. It does not obviously replace biotite.

The groundmass of the rock is composed of finely interlocked, anhedral quartz, K-feldspar and minor sericite. In places the texture of the quartz and sericite is reminiscent of the groundmass textures in the previous slide (12560). Quartz and K-feldspar average about 0.05 mm in diameter, while the sericite tends to be finer. The K-feldspar is partly attacked by biotite and sericite. The K-feldspar (and part of the quartz) have a secondary look to them; they are probably hydrothermal in origin. The alteration in this rock would be classed as potassic.

Sphene is unusually abundant in this sample, forming grains up to 0.2 mm in diameter that are aggregates of finer grains.

Accessory minerals include minor apatite, which forms rare scattered anhedral grains up to 0.3 mm across (really microphenocrysts), and fine Fe-Ti oxides such as rutile and leucoxene that are likely the product of alteration of primary ilmenite.

VA12596: PHYLLIC-POTASSIC ALTERED (QUARTZ-SERICITE-BIOTITE-CHLORITE), MAFIC ?DACITE PORPHYRY

Dark grey-green, "spotted", altered mafic volcanic rock characterized by 1-2 mm dark blotches after mafic grains. There is no quartz evident in phenocrysts, so this may be a more mafic rock than others in the suite. A weak sericitic foliation is developed, probably due to low-grade metamorphism. Plagioclase phenocrysts are only apparent in the etched slab; there is no K-feldspar. Rare grains of pyrite are present, up to 2 mm long. In thin section, the mineralogy is as follows:

Secondary alkali feldspar (sodic)	30%
Quartz (groundmass; partly secondary)	20%
Quartz (phenocrysts)	5%
Secondary biotite	20%
Sericite (muscovite)	15%
Chlorite	5%
Opaques (pyrite, magnetite)	5%

Original plagioclase phenocrysts in this rock were subhedral and ranged from 0.5 to 2 mm long. They have been completely replaced by a sodic alteration feldspar with vague twinning, and flecked by minor sericit-clay and patches of chlorite.

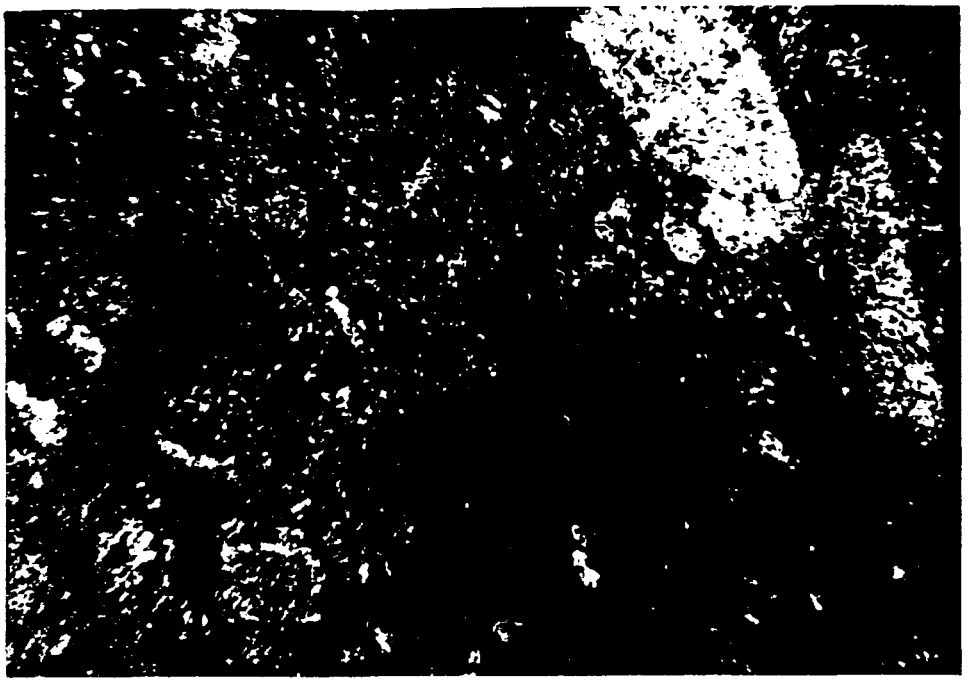
Quartz phenocrysts are up to 3 mm across. They are subhedral to anhedral and broken, showing signs of deformation such as undulose extinction.

Former mafic phenocrysts are replaced by irregular patches of secondary minerals including chorite, biotite, quartz, sericite and opaques. The shapes of the relict mafic sites are too irregular to suggest what their former identity may have been; they range up to about 5 mm long. Their cores tend to be replaced by bright green chlorite, quartz and opaques, while the margins are replaced by a misture of secondary biotite and sericite. The biotite is greenish brown and may be Fe-rich rather than magnesian.

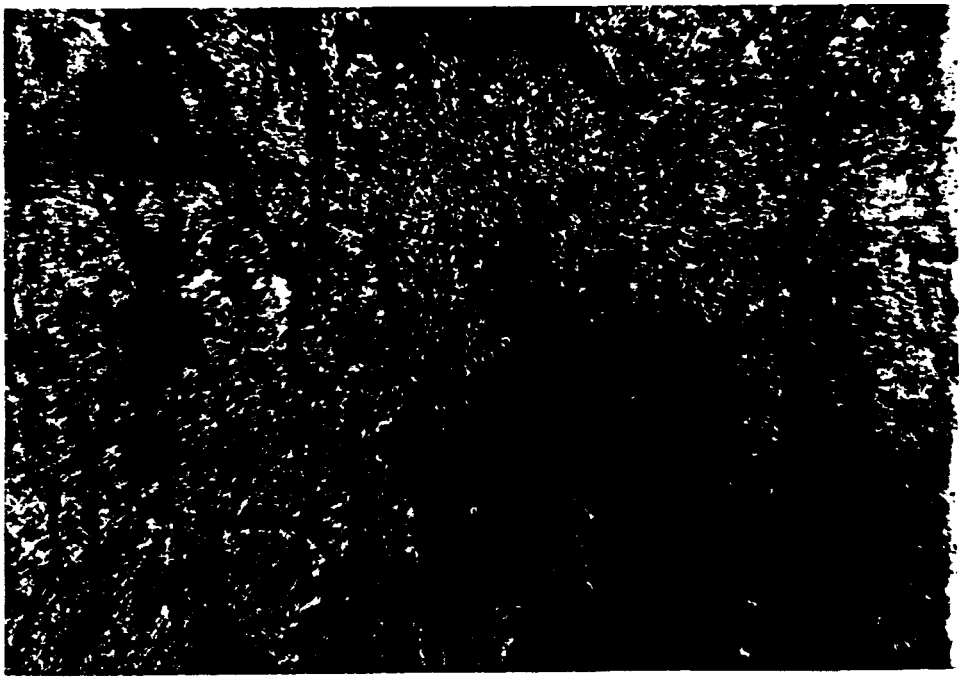
The groundmass is also strongly altered, and consists of fine-grained quartz, sericite, secondary biotite and minor opaques. The average grain size is around 0.025 mm.

The Fe-Ti opaques are probably mostly magnetite, since the rock is moderately magnetic. They mostly form very fine, anhedral grains of 0.02 to 0.05 mm size in the altered mafic sites. Occasional pyrite grains are euhedral to subhedral and up 0.1 mm across (larger ones seen in hand specimen).

There are no definite veins, fractures or envelopes in this sample, but the alteration is pervasive phyllic-potassic in character (quartz-sericite-biotite-sodic alkali feldspar). Carbonate is not developed; the protolith may have been a fairly mafic-rich dacite porphyry.



VA12596: Thoroughly altered albite phenocrysts and irregular patches of chlorite-biotite after former mafics, in a fine groundmass of secondary quartz, sericite, biotite and opaques. Width of field of view is 4 mm; crossed polars.



VA12596: As for photo above, but uncrossed polars, showing fine magnetite replacing former mafic site. Note degree of alteration of former plagioclase (now vaguely twinned secondary alkali feldspar, flecked by sericite-clay and chlorite). Width of field of view is 4 mm.

VA12598: QUARTZ-SERICITE-CARBONATE-ALKALI FELDSPAR ALTERED, FELDSPAR PORPHYRY WITH STOCKWORK OF QUARTZ-CARBONATE VEINS

Strongly altered and veined, medium-grained, grey-green volcanic or sub-volcanic porphyry characterized by abundant irregular dark blotches after former mafics. Carbonate in the veins weathers orangey-brown, but reacts readily to cold dilute HCl, so it may be Fe-calcite. Minor amounts of pyrite are present as disseminations and in the veins. In thin section, the mineralogy is as follows:

Secondary quartz (groundmass)	25%
(veins)	10%
Primary quartz (former phenos)	5%
Sericite	20%
Secondary biotite (hydrobiotite)	15%
Carbonate (Fe-calcite?)	15%
Secondary alkali feldspar (sodi-potassic)	5%
Opaques (magnetite)	3%
Pyrite	2%

There are a few relics of the former volcanic texture, with rare, recrystallized anhedral quartz phenocrysts up to 0.5 mm across, mafic patches up to 3 mm across, and occasional plagioclase remnants up to 1 mm long. However, the texture has been largely destroyed by the hydrothermal alteration and quartz-carbonate vein development.

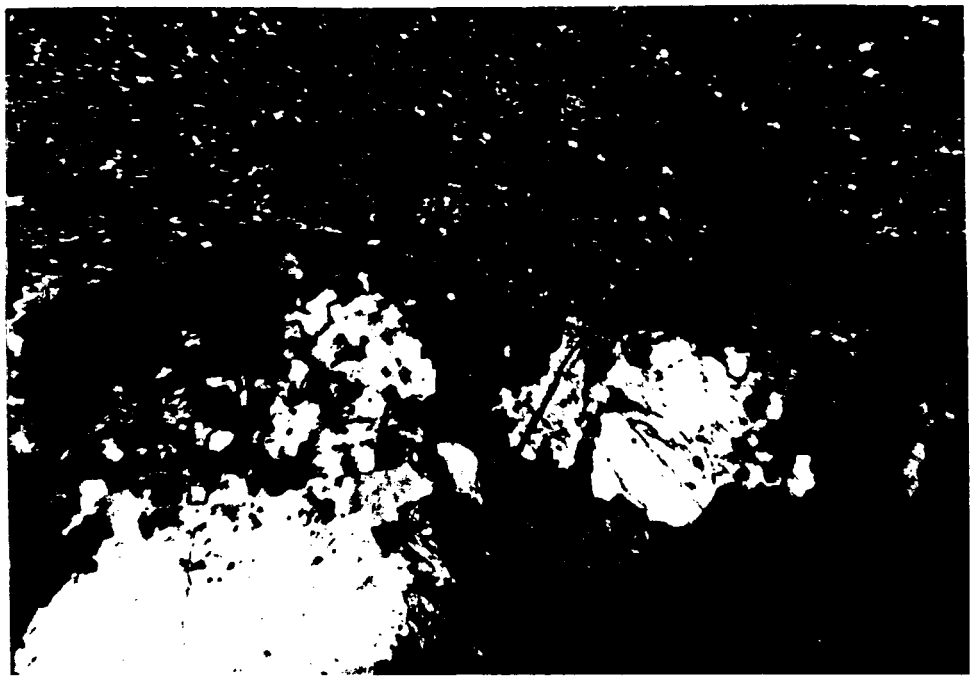
Plagioclase phenocrysts are subhedral to anhedral and are replaced by a secondary alkali feldspar that probably has more potassic molecule than seen in most of the other samples: a faint yellow stain is seen in the etched slab in places, and there is rarely any twinning, even of the vague sort seen in "irregular albite". Many of the former plagioclase crystals are replaced by small secondary feldspar grains; others are completely pseudomorphed by fine-grained sericite, or else replaced by quartz and albite.

Quartz phenocrysts are small (0.5 mm) and not abundant. They are generally strongly recrystallized, showing undulose extinction and sub-grain development.

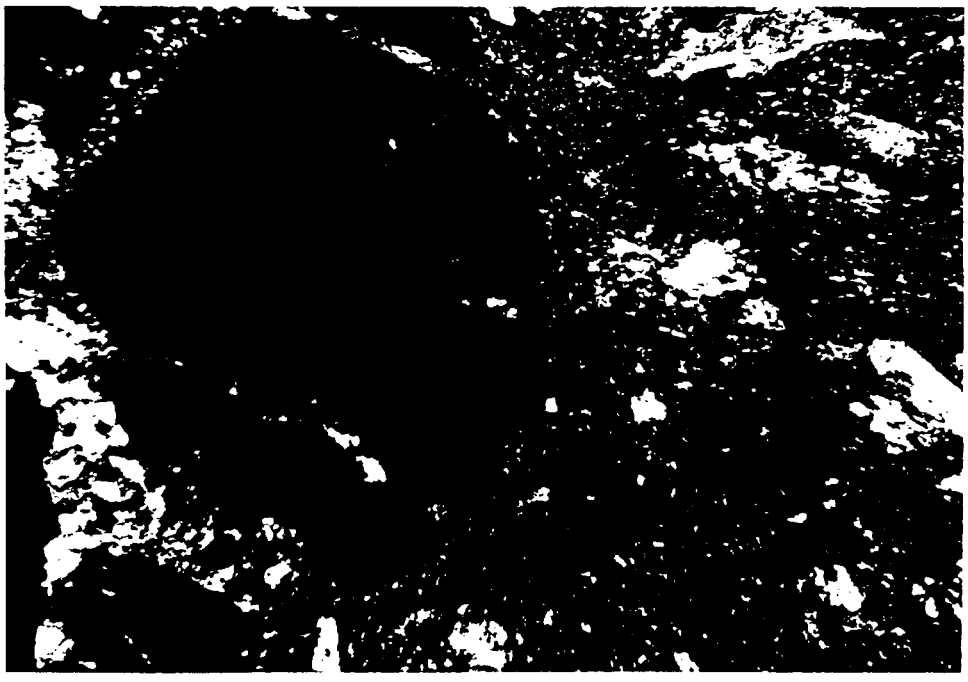
Former mafic phenocrysts were up to 3 mm long. They are now represented by rather shapeless masses of brownish green hydrobiotite and fine opaques. Carbonate forms small anhedral to euhedral grains up to 0.3 mm in diameter, scattered throughout the rock and in the altered mafic sites. The hydrobiotite has higher birefringence than chlorite but lower than normal biotite, and its colour is not a strong brown.

Opaques are mainly fine magnetite in the altered mafic sites, as anhedral grains of 10-100 micron size. They show moderate alteration to limonite. Pyrite forms occasional euhedral crystals up to 2 mm long.

The groundmass is composed of fine (0.025 mm) quartz and abundant sericite, with some sericitic foliation developed. Veins are up to 2 mm thick and are composed of coarse quartz and carbonate as anhedral to subhedral grains up to 1 mm diameter, plus muscovite up to 0.5 mm diameter.



VA12598: Quartz-carbonate-muscovite vein, with a fine laminated quartz-sericite groundmass. Width of field of view is 4 mm; crossed polars.



VA12604: Large quartz (2 mm diameter) and small relict plagioclase phenocrysts, in a very fine quartz-sericite-chlorite groundmass. Crossed polars.

VA12604: PHYLLIC (QUARTZ-SERICITE-CALCITE-ALBITE) ALTERED QUARTZ FELDSPAR PORPHYRY (?SUB-VOLCANIC INTRUSIVE)

Grey-green, slightly foliated volcanic or sub-volcanic rock that has been a quartz-feldspar porphyry before moderate phyllic (quartz-sericite) alteration. Quartz eyes are prominent in this sample, but the relict feldspar phenocrysts are not obvious. There is no K-feldspar; the minerals present in thin section are as follows:

Plagioclase phenocrysts (albitized)	25%
Quartz groundmass (partly secondary)	25%
phenocrysts	10%
Sericite	15%
Carbonate (calcite)	15%
Chlorite	5%
Secondary biotite	3%
Opaques	2%

Compared to VA12598, this is a more felsic (quartz-rich and mafic-poor) rock. It consists of coarse quartz and smaller relict plagioclase phenocrysts, with sparse shredded mafic relics, in a fine quartz-sericite altered groundmass.

The plagioclase phenocrysts are about 1-2 mm long, with euhedral to subhedral outlines. Vague twinning is preserved, showing that they have been thoroughly albitized; many are also moderately flecked by fine sericite and minor chlorite, and some are partially altered to calcite.

Quartz phenocrysts are up to 3 mm across, and are subhedral to euhedral with some bipyramidal terminations. They are strongly resorbed by the groundmass, indicating fluctuating silica activity during crystallization of the rock, and are altered to carbonate, sericite and fine quartz. They are also mildly deformed (undulose).

Mafic phenocrysts are difficult to recognize; it is possible that somewhat shapeless patches up to 2 mm long of chlorite, sericite, carbonate and opaques, were former mafics. In some, the leaved texture suggests former biotite. Carbonate forms small (0.1 mm) subhedral grains, most often in the altered mafic sites, although coarser grains (up to 0.3 mm) are present in altered quartz and feldspar grains.

Fine-grained secondary biotite, with intense brown pleochroism, is sparingly present along foliation planes and replacing former ?mafics. It forms flakes up to 0.1 mm long, and is intergrown with pale green chlorite and minor sericite.

The groundmass is completely altered to a mass of fine (0.025 mm) quartz, sericite and chlorite, with a foliation defined by thin laminae richer in sericite.

The opaques, which form minute grains of 0.01 to 0.1 mm diameter, are not determinable in this section; pyrite does not appear to be present, but neither is the rock magnetic.

VA12610: PHYLLIC-POTASSIC ALTERED (?OR HORNFELSED) QUARTZ-FELDSPAR PORPHYRITIC VOLCANIC ?FLOW

This is a similar rock to VA12604, but less altered, with mild grey-green fine-grained phyllic alteration of a variably quartz-feldspar porphyritic volcanic. Two thin sections were prepared; one has prominent coarse quartz eyes, while the other has less abundant, finer eyes. In thin section, the minerals are:

Altered plagioclase relics	25%
Quartz (groundmass)	20%
(phenocrysts)	10%
Sericite	15%
Chlorite	15%
Secondary biotite	10%
Carbonate (calcite)	5%
Opaques (limonite)	<1%

The original volcanic texture of this rock is more apparent than in VA12604, with euhedral plagioclase and subhedral quartz phenocrysts, plus calcite-altered mafic relics, in a fine partly altered matrix. The sparse phenocrysts and the fineness of the groundmass suggest it may have been a flow, but this is not certain. The form of the secondary biotite, as fine flakes relatively evenly distributed throughout the rock, suggests it could have been hornfelsed or that, if the biotite is due to hydrothermal alteration, it is pervasive.

Plagioclase phenocrysts form euhedral to glomeratic phenocrysts up to 3 mm across. They are mainly albitized, and are mildly to moderately flecked by very fine-grained sericite, chlorite, biotite and carbonate.

Quartz phenocrysts are rounded to subhedral, and up to 2 mm in diameter. They are commonly cut and rimmed by chlorite and biotite.

Secondary biotite forms fine euhedral to subhedral flakes, generally less than 0.03 mm long, but occasionally in radiating rosettes at the margins of quartz phenocrysts up to 0.3 mm long. They have strong brown pleochroism.

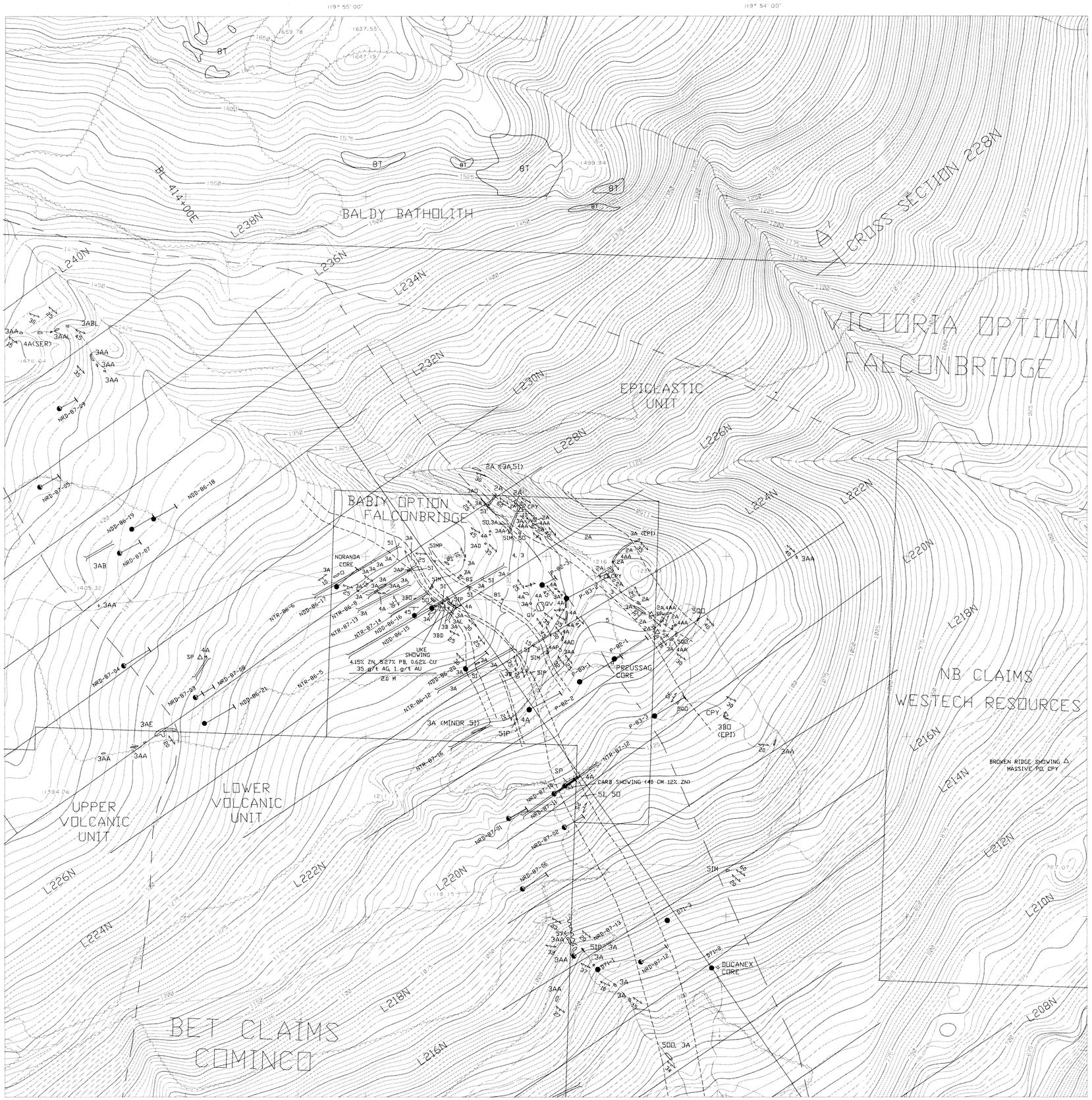
Chlorite forms similar fine flakes of 0.05 mm or less diameter, occasionally in patches up to 0.3 mm across.

Carbonate forms anhedral grains up to 0.1 mm across, possibly replacing former mafic sites, plagioclase and the groundmass. Sericite, together with biotite and chlorite, and quartz up to 0.02 mm diameter, forms the groundmass. It has the same streaky appearance of the other rocks, due to the development of a weak penetrative foliation defined by laminae richer in the micaceous minerals, which average 0.03 mm diameter.

The minor opaque material in this slide appears to be mostly limonite (goethite), possibly after pyrite or magnetite. It forms aggregates up to 0.5 mm across, compsed of grains of 0.01 to 0.05 mm diameter.

VA12610: Small quartz and carbonate, and large albite phenocrysts, in a finely interlocking quartz, biotite, chlorite and sericite groundmass. Width of field of view is 4 mm; crossed polars.

VA12610: Large quartz phenocryst, 2 mm long, with radiating rosette of secondary biotite; groundmass is fine secondary biotite, chlorite, sericite and quartz. Width of field of view is 4 mm; uncrossed polars.



LEGEND

Road
Trail
Building
River
Stream
Lake
Trees
Contours
Index
Intermediates

FALCONBRIDGE LTD.
Barriere Lake
British Columbia

TOPOGRAPHIC MAP
Scale 1:5,000

100 0 100 200 300 400 500

4	5	6
1	2	3

Date of Photography: June 4, 1989
Control taken from N.T.S. Maps 82N/5, 92P/8
Compiled by: THE ORTHOSHOP
WO# 2574

LEGEND

STRATIGRAPHIC UNITS

CRETACEOUS

- Baldy Batholith

EAGLE BAY FORMATION
DEVONO–MISSISSIPPIAN

- Grey Phyllite Unit
- Upper Volcanic Unit
- Lower Volcanic Unit
- Epiclastic Unit

LITHOLOGIES

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

The third and fourth letters 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
I	Leucocratic	R	Massive
		S	Lithic
		T	Dolomitic

SYMBOLS

- Foliation (S_1, S_2)
- Bedding (tops known)
- Lineation
- Drag fold (M, S, Z symmetry, plunge)
- Lithological contact
- Unit contact
- Fault
- Trench
- △ Mineral showing
- Adit
- Outcrop
- ⊡ LCP Claim post (Legal Corner Post)

SER	SERICITIC	GA	GALENA
EPI	EPICLASTIC	PO	PYRRHOTITE
SP	SHPALERITE	PY	PYRITE
CPY	CHALCOPYRITE	QV	QUARTZ VEIN
BIO	BIOTITE		

- Diamond drill hole (vertical)
- Reverse circulation drill hole

NRD	Noranda reverse circulation drilling (1987)
NDD	Noranda diamond drilling (1986)
P	Preussag diamond drilling (1982, 1983)
D	Ducanex diamond drilling (1971)
K	Kennco diamond drilling (1952)
BE	Cominco diamond drilling (1978)
SR	Scurry–Rainbow diamond drilling (1965)
CS	Canadian Superior (1976)

0 100 200 300 400 M
SCALE 1 : 5,000

FALCONBRIDGE LIMITED

VICTORIA AND BABIY OPTIONS
North Barriere Lake, British Columbia

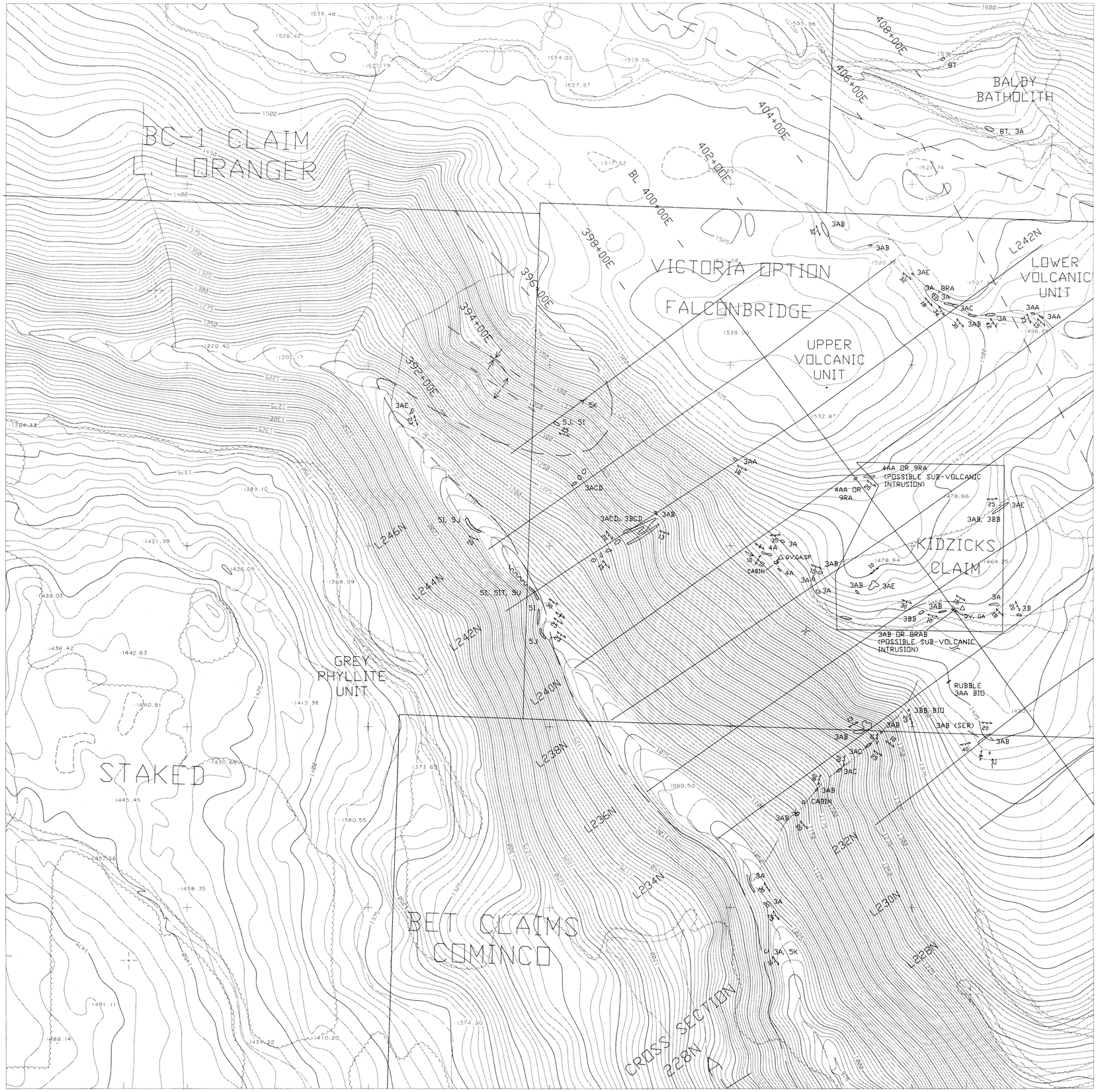
BIRK CREEK AREA
GEOLOGY
EAST SHEET

WORK BY: SC	CLAIM:	
DATE OF WORK: 1989	PROJECT NO: 145/146	FIG NO: 5
DRAWN BY: PW & COMPUTER		
DATE DRAWN: NOV 24 1989	N.T.S. NO.: 82M/5W	

GEOLOGICAL BRANCH
ASSESSMENT REPORT

19,363

PART 1 OF 2



LEGEND

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EAGLE BAY FORMATION
DEVONO–MISSISSIPPIAN

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		T	Dolomitic

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- Unit contact
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- Trench
- Mineral showing
- Adit
- Outcrop
- Claim post (Legal Corner Post)

SER	SERICITIC	GA	GALENA
EPI	EPICLASTIC	PO	PYRRHOTITE
SP	SHPALERITE	PY	PYRITE
CPY	CHALCOPYRITE	QV	QUARTZ VEIN
BIO	BIOTITE		

- Diamond drill hole (vertical)
- Reverse circulation drill hole

NRD	Noranda reverse circulation drilling (1987)
NDD	Noranda diamond drilling (1986)
P	Preussag diamond drilling (1982, 1983)
D	Ducanex diamond drilling (1971)
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0 100 200 300 400 M

SCALE 1 : 5,000

FALCONBRIDGE LIMITED

VICTORIA AND BABIY OPTIONS
North Barriere Lake, British Columbia

BIRK CREEK AREA
GEOLOGY
WEST SHEET

WORK BY: SC	CLAIM:	
DATE OF WORK: 1989	PROJECT NO: 145/146	FIG NO: 6
DRAWN BY: PW & COMPUTER		
DATE DRAWN: NOV 24 1989	N.T.S. NO.: 82M/5W	

LEGEND

- Road
- Trail
- Building
- River
- Stream
- Lake
- Trees
- Contours
  - Index
  - Intermediates

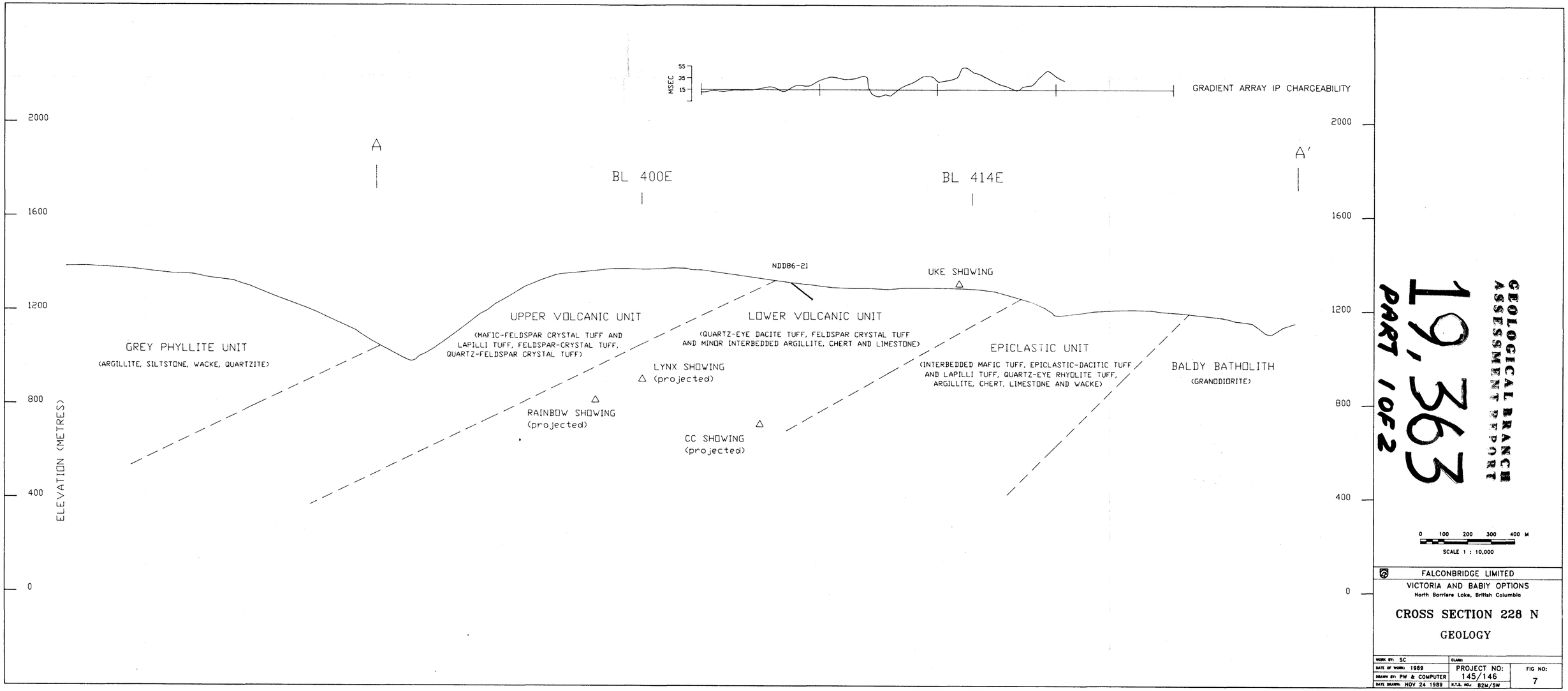
FALCONBRIDGE LTD.
Barriere Lake
British Columbia

TOPOGRAPHIC MAP
Scale 1:5,000

100 0 100 200 300 400 500

4	5	6
1	2	3

Date of Photography: June 4, 1989
Control taken from N.T.S. Maps 82N/5, 92P/8
Compiled by: THE ORTHOSHOP
WO# 2574



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FALCONBRIDGE LIMITED

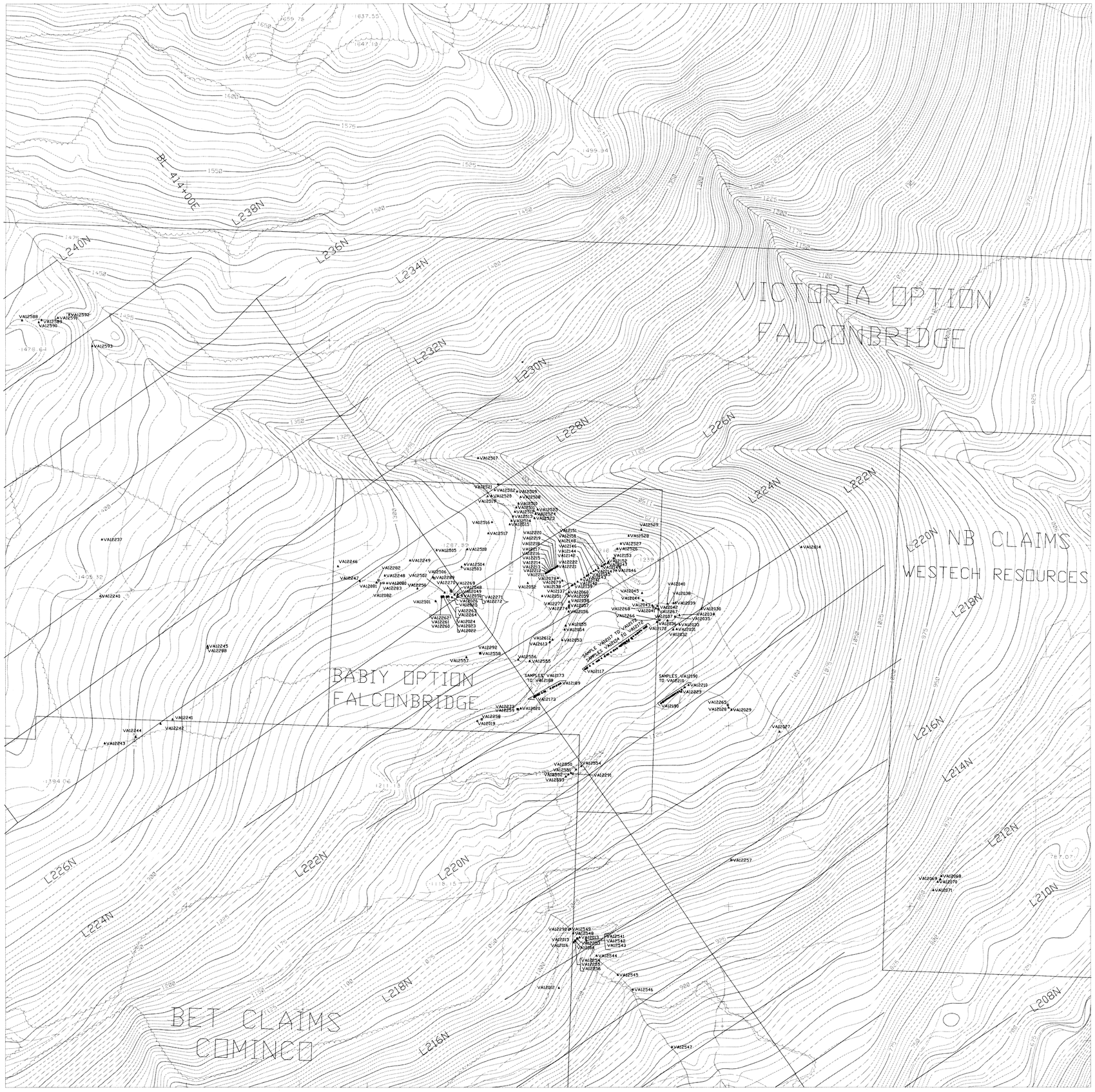
VICTORIA AND BABIY OPTIONS

North Barriere Lake, British Columbia

CROSS SECTION 228 N

GEOLOGY

WORK BY: SC	CLAIM:	
DATE OF WORK: 1989	PROJECT NO: 145/146	FIG NO: 7
DRAWN BY: PW & COMPUTER		
DATE DRAWN: NOV 24 1989	N.T.S. NO.: 82M/SW	



VA12297 ⊡ BONDAR ROCK SAMPLES

VA12616 △ XRAL ROCK SAMPLES

0 100 200 300 400 M

SCALE 1 : 5,000

FALCONBRIDGE LIMITED

VICTORIA AND BABIY OPTIONS

North Barriere Lake, British Columbia

LITHOGEOCHEMICAL SAMPLE LOCATION

EAST SHEET

WORK BY: SC	CLAIM:	
DATE OF WORK: 1989	PROJECT NO: 145/146	FIG NO: 8
DRAWN BY: PW & COMPUTER		
DATE DRAWN: NOV 23 1989	N.T.S. NO.: 82M/5W	

LEGEND

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FALCONBRIDGE LTD.
Barriere Lake
British Columbia

TOPOGRAPHIC MAP
Scale 1:5,000

100 0 100 200 300 400 500

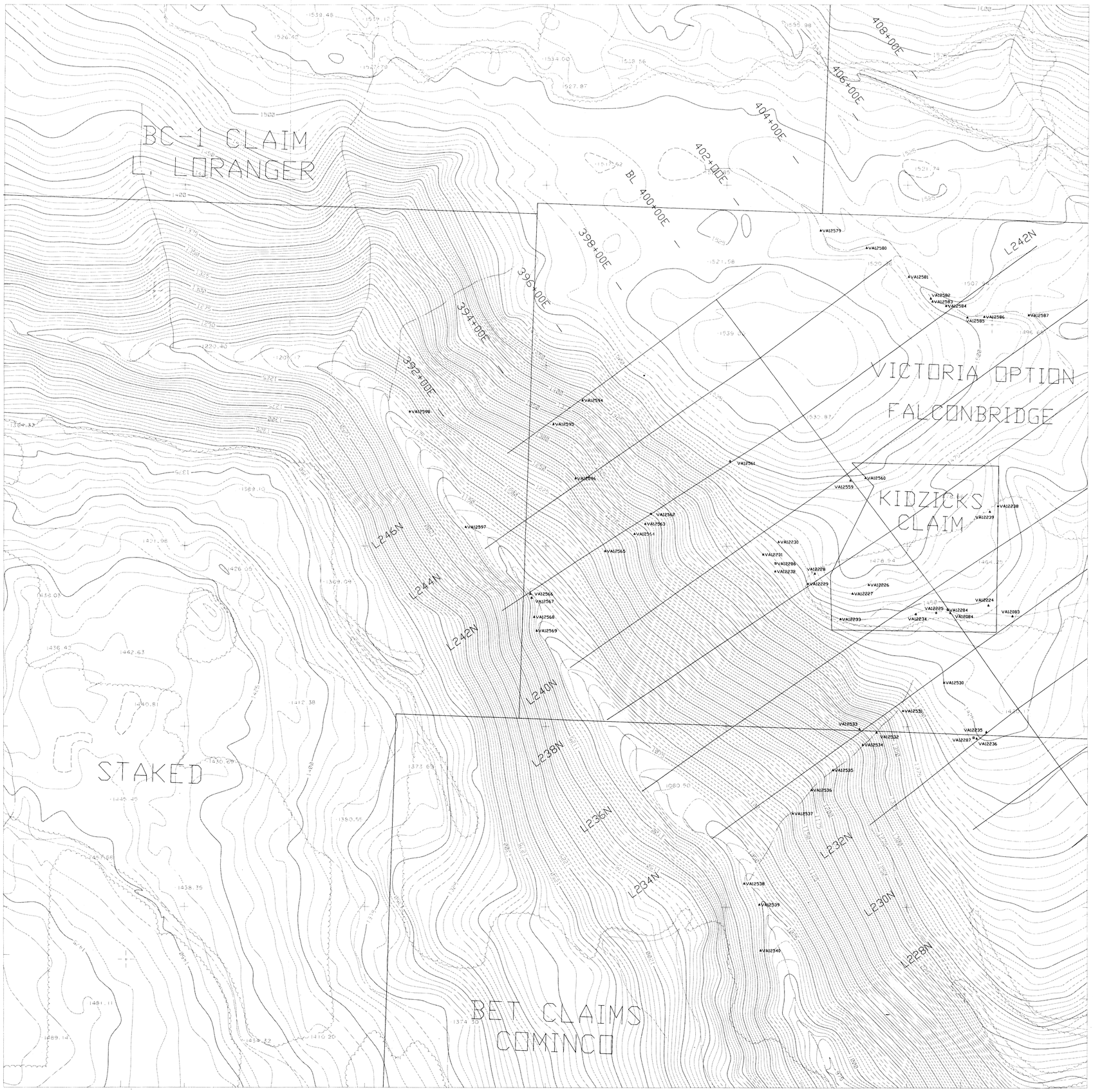
4	5	6
1	2	3

Date of Photography: June 4, 1989
Control taken from N.T.S. Maps 82N/5, 92P/8
Compiled by: THE ORTHOSHOP
WO# 2574

PART 1 OF 2

19,563

GEOLOGICAL BRANCH
ASSESSMENT REPORT



VA12297 ⊡ BONDAR ROCK SAMPLES

VA12616 △ XRAL ROCK SAMPLES

0 100 200 300 400 M

SCALE 1 : 5,000

FALCONBRIDGE LIMITED

VICTORIA AND BABIY OPTIONS

North Barriere Lake, British Columbia

LITHOGEOCHEMICAL SAMPLE LOCATION

WEST SHEET

WORK BY: SC	CLAIM:	
DATE OF WORK: 1989	PROJECT NO: 145/146	FIG NO: 9
DRAWN BY: PW & COMPUTER		
DATE DRAWN: NOV 23 1989	N.T.S. NO.: 82M/5W	

LEGEND

Road

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Barriere Lake
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