Redfern

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TULSEQUAH CHIEF and BIG BULL PROJECTS, NORTHWESTERN B.C.

1994 EXPLORATION PROGRAM: DIAMOND DRILLING, GEOLOGY, GEOCHEMISTRY and GEOPHYSICS

OF THE

BIG BULL MINE AND BANKER AREA

NTS 104K/12
Latitude: 58°40' N, Longitude: 133°35' W

for

REDFERN RESOURCES LTD.
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Part 1 of 4

SUMMARY

The Big Bull deposit is a polymetallic volcanogenic massive sulphide body hosted by a variably altered sequence of mafic and felsic volcanic flows, sills and volcaniclastic rocks, which together form part of the upper Paleozoic Stikine assemblage. The stratigraphy at Big Bull includes a mafic footwall that is overlain by an altered felsic package which is in turn overlain by second package of mafic rocks. The altered felsic package is the host to the massive sulphide mineralization. This overall sequence of lithologies is similar to the stratigraphy at the Tulsequah Chief deposit, which is hosted by this same suite of felsic-mafic volcanic rocks.

In 1994, Redfern Resources Ltd. drilled 5228 metres in 15 holes, successfully demonstrating that massive sulphide mineralization remains open outside the limits of the historic workings and the 1993 drilling. Four of the fifteen holes intersected ore grade material (>$45 NSR) over mineable widths (>3 m), and three other holes intersected ore grade over widths between 1 and 3 m (Table 3.1).

Further drilling is recommended in order to fully delineate the suphide mineralization, particularly beyond the northern and southern extents of the current drilling. Continued geological mapping is also required to follow the favourable stratigraphy outside of the deposit area, and to evaluate similar felsic rocks to the north of the deposit area.

The Banker Grid covers an area of similar geology located northwest of the Big Bull area. During 1994, the grid was expanded to the south and west, and a preliminary evaluation of felsic rocks within this package was done to determine the potential for associated VMS mineralization. Geological mapping and sampling at 1:2000 scale was undertaken in order to outline favourable felsic volcanic units mapped by Redfern during 1993; and to investigate the Sparling (Au) and Banker (Ag-Pb) Showings.

The 1994 mapping and sampling program on the Banker Grid outlined an area of altered felsic volcanic rocks, similar to the QSP alteration zones hosting mineralization at the Tulsequah Chief. Additional work is recommended to further explore this area.

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1.0 INTRODUCTION

The Big Bull deposit is a polymetallic volcanogenic massive sulphide body hosted by a variably altered sequence of mafic and felsic volcanic flows, sills and volcaniclastic rocks, which together form part of the upper Paleozoic Stikine assemblage. Quartz-sericite-pyrite alteration of the felsic rocks is intimately associated with, but laterally more extensive than the mineralization. The geometry of the deposit and associated alteration package is complicated by two generations of folds and several faults.

1.1 EXPLORATION AND MINING HISTORY - BIG BULL

The Big Bull deposit was staked by V. Manville of Juneau in 1929. Massive sulphide ore outcropped in a small creek bed over a width of 2 to 8 metres, and a strike length of about 140 metres. Sporadic drilling and underground work were carried out by various parties until 1946, when Cominco Ltd. acquired the property. Big Bull went into production in August, 1951, and continued until December, 1955, with a total production of 360 073 tonnes grading 1.2% Cu, 1.9% Pb, 7.3% Zn, 5.14 g/t Au and 154 g/t Ag. The ore was milled at the nearby Polaris-Taku minesite.

The Big Bull mine was developed on three underground levels, with access to the two lower levels provided by a 90-metre shaft. Ore was also mined from the glory hole, using both surface and underground methods. In December, 1955, low metal prices combined with more favourable economics at the Tulsequah Chief mine forced the closure of the Big Bull Mine. Reserves remaining at closure totalled 57 540 tonnes grading 1.1% Cu, 1.5% Pb, 5.6% Zn, 3.43 g/t Au and 154 g/t Ag.

Interest in the Tulsequah Chief property was rekindled in the early 1970s with the recognition that the deposits are volcanogenic rather than structurally controlled replacements. Cominco resumed exploration in 1987, mainly at Tulsequah Chief, with only limited work at the Big Bull deposit. In 1992, Cambria Geological Ltd. undertook a detailed surface mapping program at Big Bull and, in 1993, Redfern Resources Ltd. initiated a detailed compilation and exploration program. During 1993 to 1994, Redfern drilled 9084 metres in 27 holes, successfully demonstrating that massive sulphide mineralization continued below the old workings, with several holes intersecting ore grade material over widths up to 6 metres.

2.0 BIG BULL PROPERTY GEOLOGY

2.1 DEPOSIT AREA STRATIGRAPHY

The Big Bull stratigraphy has been divided into five main lithologic units: unit 1 mafic volcanic rocks, unit 2 dacite tuffs and minor flows, unit 3 maroon andesite tuffs, unit 4 basalt tuffs, and unit 5 mafic intrusives (Figure 2.0). These subdivisions represent a modification of previous work by Dawson and Harrison (1993) and Carmichael and Curtis (1994). Feldspar-phyric mafic dikes and a distinctive quartz feldspar porphyry dike postdate all other lithologies, and are thought to be related to the Eocene Sloko Group.

UNIT 1: MAFIC VOLCANIC ROCKS

The oldest unit in the Big Bull mine stratigraphy is only exposed to the east of the deposit, and has not been intersected in drill core. It is characterized by mixed mafic lapilli and ash tuffs, with occasional fine-grained, massive, homogeneous, feldspar-phyric sections which are interpreted as flows. Lapilli tuffs typically contain quartz-amygdaloidal basalt fragments, and tend to be massive. Ash tuffs are thinly (1-2 cm) bedded to massive.

UNIT 2: FELSIC TUFFS AND FLOWS

Felsic crystal, crystal lithic, and lapilli tuffs host the ore at the Big Bull deposit. This unit is primarily grey to greenish grey, laminated to chaotically banded dacites, which have been petrographically identified as metamorphosed and deformed dacite tuff and crystal tuff. The tuffs are commonly weakly porphyritic, with plagioclase phenocrysts in a compositionally layered plagioclase-sericite-rich groundmass. Magnetite and/or hematite occurs as disseminations and disrupted bands forming up to 15% of the unit locally. Unit 2 typically shows chaotic banding on a 2 to 5-millimetre scale, although fragmental textures are rare. Locally well preserved bed forms show grain-size grading which helps to establish local structural relationships. Occasional massive, feldspar-phyric flows have been identified within this unit.

UNIT 2a: QUARTZ-SERICITE-PYRITE

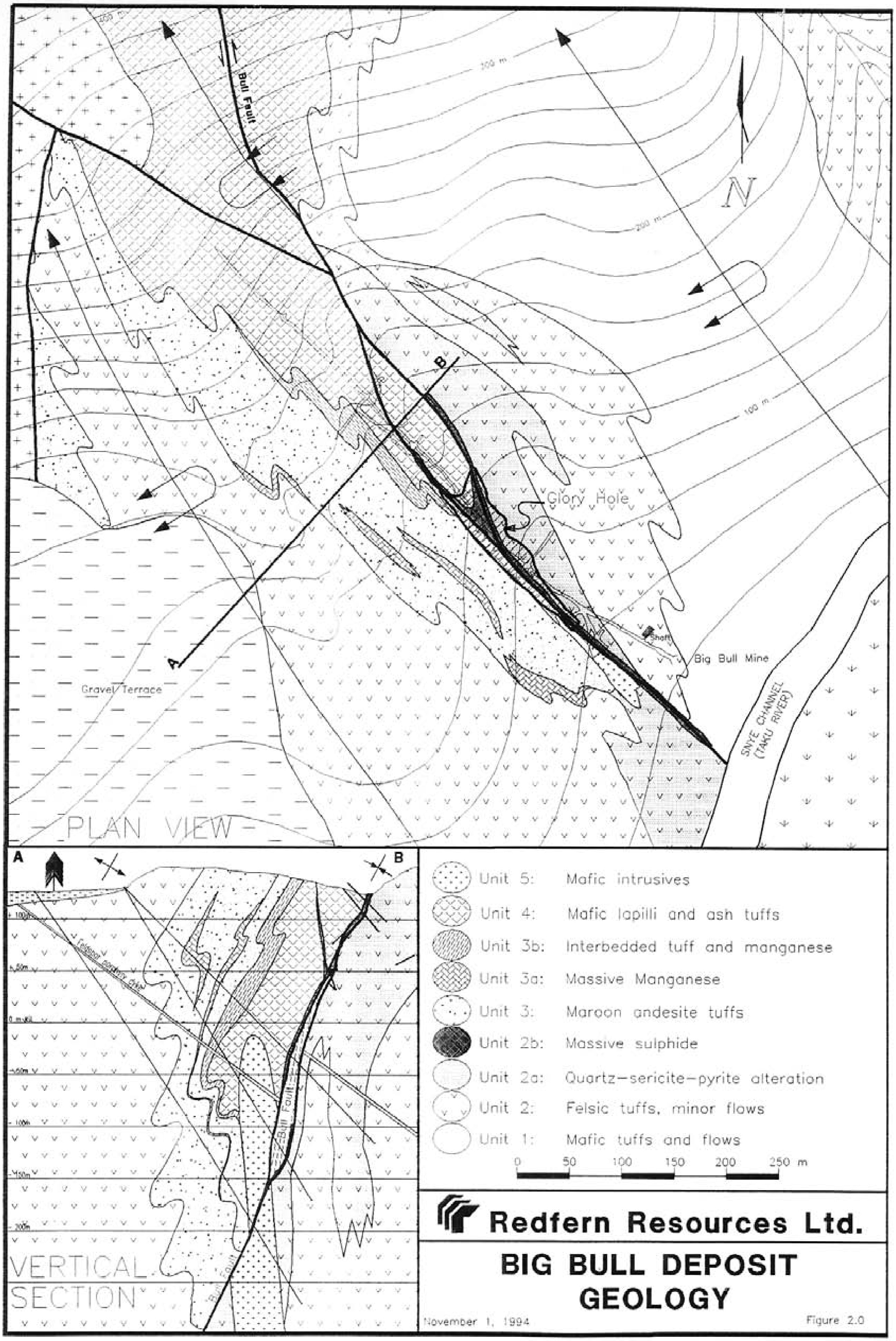
Unit 2a represents parts of unit 2 which were hydrothermally altered during the formation of the Big Bull deposit. The rock comprises a strongly foliated sericite-quartz-pyrite assemblage, containing 5 to 20% disseminated and stringer pyrite, with local base metal sulphides and tetrahedrite. The quartz-sericite-pyrite alteration appears to form a stratiform layer near the top of the felsic tuffs, but may in places be discordant to stratigraphy.

UNIT 2b: MASSIVE SULPHIDE

Unit 2b includes mineralization that ranges from massive, banded sulphides, to 30 to 40% disseminated and stringer sulphides in a matrix of barite, sericite and silica. The mineralogy comprises pyrite, sphalerite, galena, chalcopyrite and tetrahedrite, in a matrix of barite and sericitized lithic fragments. The sulphides are recrystallized, with well developed annealed textures that have obliterated any primary features. The sericitic fragments within the mineralized lenses may represent altered lithic fragments that were incorporated in the mineralized interval.

UNIT 3: ANDESITE TUFF

Grey to maroon, fine to coarse-grained, locally phyllitic andesitic fragmental rocks conformably overlie unit 2 felsic tuffs. The maroon colour is typically due to fine-grained disseminated red hematite, and hematite-discoloured fragments that range in size from 0.5 to 50 millimetres. This unit is variably calcareous, with some sections containing up to 30% pervasive white calcite. The tuffs range from massive to very well bedded, with graded bedding and scour marks commonly, but not exclusively, indicating an overturned section.



Bull Fault
300 m
200 m
100 m
N
B
A
Glory Hole
Shaft
Big Bull Mine
SNYE CHANNEL (TAKU RIVER)
Gravel Terrace
PLAN VIEW
VERTICAL SECTION
Feldspar porphyry dyke
Bull Fault
0 m ASL
Unit 5: Mafic intrusives
Unit 4: Mafic lapilli and ash tuffs
Unit 3b: Interbedded tuff and manganese
Unit 3a: Massive Manganese
Unit 3: Maroon andesite tuffs
Unit 2b: Massive sulphide
Unit 2a: Quartz–sericite–pyrite alteration
Unit 2: Felsic tuffs, minor flows
Unit 1: Mafic tuffs and flows
0 50 100 150 200 250 m
Redfern Resources Ltd.
BIG BULL DEPOSIT GEOLOGY
November 1, 1994
Figure 2.0

UNIT 3a: IRON / MANGANESE CHEMICAL SEDIMENT

Massive, black, fine-grained manganese silicates typically occur near the stratigraphic base of unit 3. They reach a maximum known thickness of 31 metres in drill hole BB94020. Interbeds of red mudstone occur locally within the manganese unit, as do breccia and replacement textures. XRD work by the Mineral Deposit Research Unit at the University of British Columbia has identified braunite and piemontite as the main manganese minerals in this unit. Lithogeochemical samples from this unit indicate that it is a mixture of manganese and iron minerals, with two samples from adjacent massive manganese\hematite layers in DDH BB94017 (179.2 m and 218.2 m) returning values of 20.3% Fe_2O_3, 23.1% MnO and 68.8% Fe_2O_3, 1.7% MnO respectively.

UNIT 3b: INTERBEDDED TUFF AND HEMATITE / MANGANESE

This distinctive unit often occurs at the stratigraphic top of unit 3. Its bedded nature and unique appearance make it useful as a marker interval. Maroon to pink crystal and ash tuff are interbedded with black, massive manganese silicates and/or hematite on a 1 to 10-centimetre scale. Iron / manganese beds are contorted and disrupted, and appear to represent thinly bedded equivalents of unit 3a.

UNIT 4: BASALT TUFF

Unit 4 comprises dark green, chlorite-epidote-rich, mafic lapilli, ash and crystal tuffs. Patches and streaks of black hematite (1 to 20 mm) characterize this unit. Sausseritized feldspar crystals and crystal fragments are common, locally forming up to 30% of the rock. This unit is in gradational contact with unit 3.

UNIT 5: MAFIC INTRUSIVES

Mafic intrusives occur as both dark green, fine-grained chloritic diabase, and as coarser grained diorite. They are included as one unit here, although lithogeochemical data suggests there are more than one intrusive suite. Diabase sills and dykes are typically massive to moderately well foliated, contain abundant chlorite and biotite, and are devoid of primary textures. Their interpretation as intrusive is based largely on contact relations and stratigraphic position. However, they can be difficult to differentiate from massive intervals of unit 4, particularly when they are intrusive into that unit. A large body of blocky weathering diorite outcrops northwest of the glory hole area; the diorite is massive, equigranular to weakly feldspar phyric, and medium to fine grained.

2.2 LITHOGEOCHEMISTRY

Lithogeochemical data suggest that the volcanic rocks at the Big Bull deposit are chemically similar to those at Tulsequah Chief. As the rocks from both deposits are variably altered, wholerock geochemistry is best compared in terms of immobile element ratios. In a plot of Al_2O_3 *versus* TiO_2, felsic rocks at Big Bull outline a narrow fan of alteration lines. This indicates that they were derived from a narrow range of felsic precursor compositions through mass loss and mass gain effects during hydrothermal alteration. Some of the largest net mass loss effects occur in proximity to the mined-out massive orebodies.

Mafic rocks at Big Bull show a range in TiO_2/Al_2O_3 ratios that are interpreted as resulting largely from fractionation effects. Although not plotted here, the mafic rocks can be effectively subdivided using trace element plots such as nickel *versus* chromium. Mafic intrusives are typically characterized by higher nickel, chrome and magnesia abundances relative to the mafic volcanics, indicating that the former were derived from a more primitive mafic magma. The mafic intrusives are relatively unaltered, and probably represent a second phase of mafic magmatism that occurred after the main phase of sulphide-forming hydrothermal activity.

2.3 STRUCTURE

Rocks in the Big Bull area have been affected by two phases of folding and several episodes of faulting, creating an area of structural complexity. The lithologic contacts (S_0) generally trend north-northwest, with steep dips to the southwest.

The first and most important phase of folding (S_1) consists of tight, approximately cylindrical, moderately overturned, folds with axial planar cleavage oriented at about 140/84° southwest, and fold axes trending 321° and plunging at 30 to 50°. A stereonet plot of measured bedding orientations (Figure 2.1) defines a great circle, the pole of which has an orientation of 321/54°, approximately parallel to the measured fold axis, suggesting that only one major phase of deformation has occurred. Parasitic folds on the east side of the glory hole are consistent with a synclinal closure to the west. The first phase of folding is represented by the Big Bull syncline, which repeats unit 2 dacites west of the glory hole.

A second, very weak phase of folding is indicated by a spaced, planar crenulation fabric which does not appear to have significantly reoriented either S_0 or S_1 fabrics. Axial planes are oriented roughly east-west, and dip steeply to the north.

Brittle faulting is an important element in the structural history of the Big Bull deposit. The Bull fault is a northwest-striking, steeply west-dipping structure which is approximately axial planar to the Big Bull syncline. In many instances the Bull fault has disrupted the massive sulphide lenses, with brecciated and rotated mineralized blocks present in the fault gouge. The fault has had a complex history involving several periods and directions of movement, the latest of which offsets a quartz feldspar porphyry dike of probable Eocene age. Although the amount and direction of displacement across the fault is unknown, apparent offsets of lithologic units suggest sinistral strike-slip movement. This is consistent with detailed structural mapping in the collapsed stope area which indicates that faults occurring within unit 2b, subparallel to S_0 and S_1, generally show a dextral offset along southeast-plunging axes or sinistral offset along shallow northwest-plunging axes (Barclay, 1993).

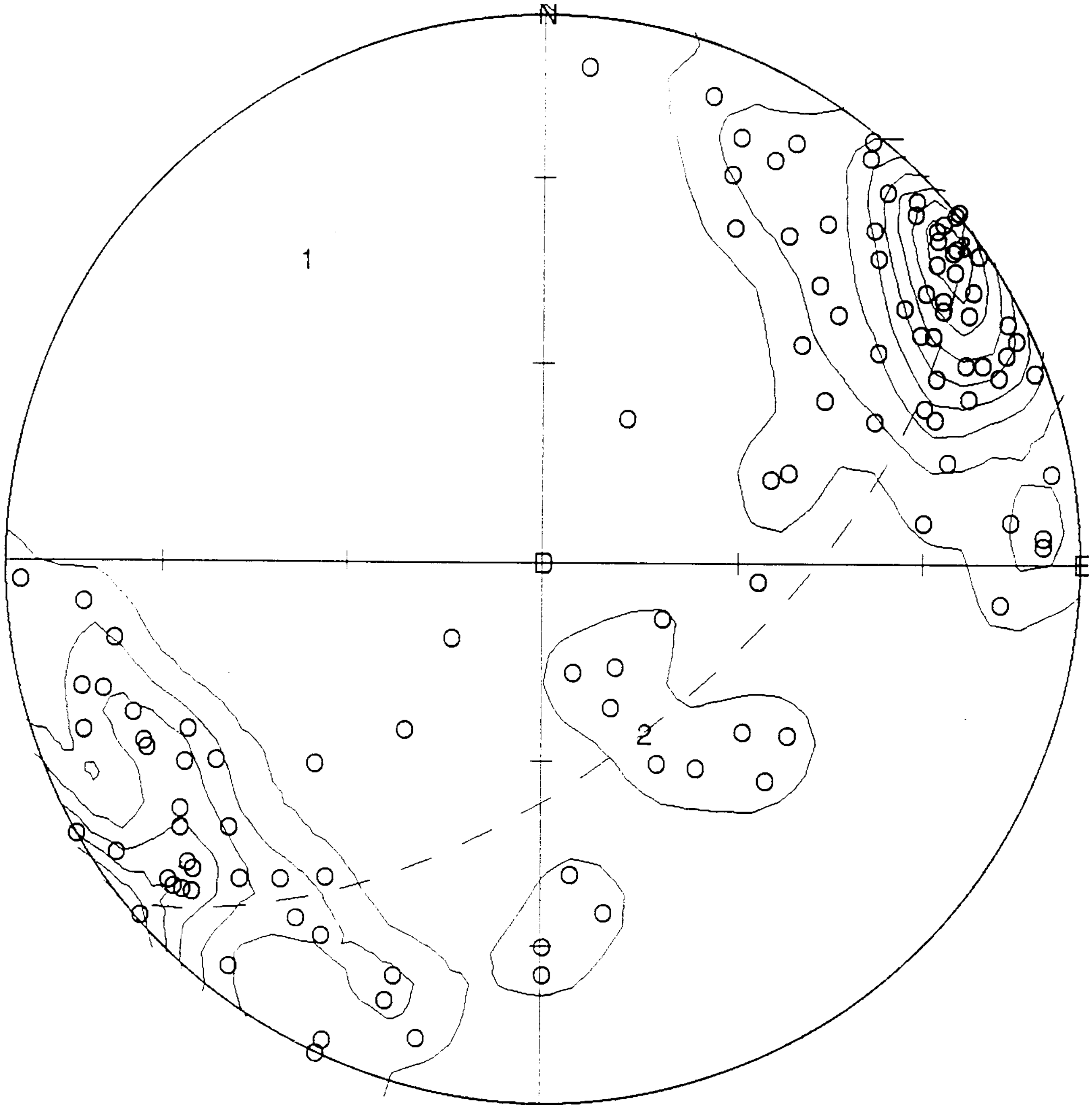
2.4 DISCUSSION

The Big Bull deposit is associated with the same suite of felsic-mafic volcanic rocks that hosts the Tulsequah Chief massive sulphide deposit. The stratigraphy at Big Bull includes a mafic footwall (unit 1) that is overlain by an altered felsic package (unit 2) which is in turn overlain by second package of mafic rocks (units 3, 4). The altered felsic package is the host to the massive sulphide mineralization. This sequence of rocks has been intruded by a diabase-textured mafic sill (unit 5), that has dilated the altered felsic interval, but is relatively unaltered itself, suggesting it was intruded after hydrothermal activity. This overall sequence of lithologies is similar to the stratigraphy at the Tulsequah Chief deposit.

Lithogeochemistry suggests that the volcanic rocks (and mafic intrusives) at Big Bull are closely comparable to those at Tulsequah Chief. At both deposits, the felsic rocks form alteration trends that largely overlap, suggesting that they were derived from similar precursor compositions. Mafic rocks in the stratigraphic footwall at Tulsequah Chief have lower values of nickel, chromium and commonly MgO than mafic rocks that are interpreted as synvolcanic intrusives within the felsic hangingwall stratigraphy. The mafic intrusive rocks at Tulsequah Chief are weakly altered relative to footwall mafic volcanics, and are also closer to basalt in composition. At Big Bull, a group of mafic rocks with high Ni-Cr values is similarly interpreted as representing more primitive intrusives into felsic stratigraphy.

The main difference between the host rocks at Big Bull and Tulsequah Chief is the nature of the volcaniclastic rocks. Felsic volcanic rocks at Tulsequah Chief are primarily coarse grained, poorly bedded, unsorted debris-flow units which are interbedded with felsic flows and intruded by felsic sills. The felsic rocks are altered, variably mineralized, and are interpreted to have been emplaced contemporaneously with the hydrothermal

Big Bull Deposit: Contoured Poles to Layering and Laminations (combined data)



N = 114

k = 100.00

(Peak - E)/Sigma = 15.4

Peak position : 54.5°/ 5.0°

E = 1.14

Sigma = 0.75

activity that formed the ores. At Tulsequah Chief, the coarse-grained and poorly sorted nature of the felsic volcaniclastic rocks, and the prevalence of flows and sills suggests that they were deposited close to a felsic volcanic centre.

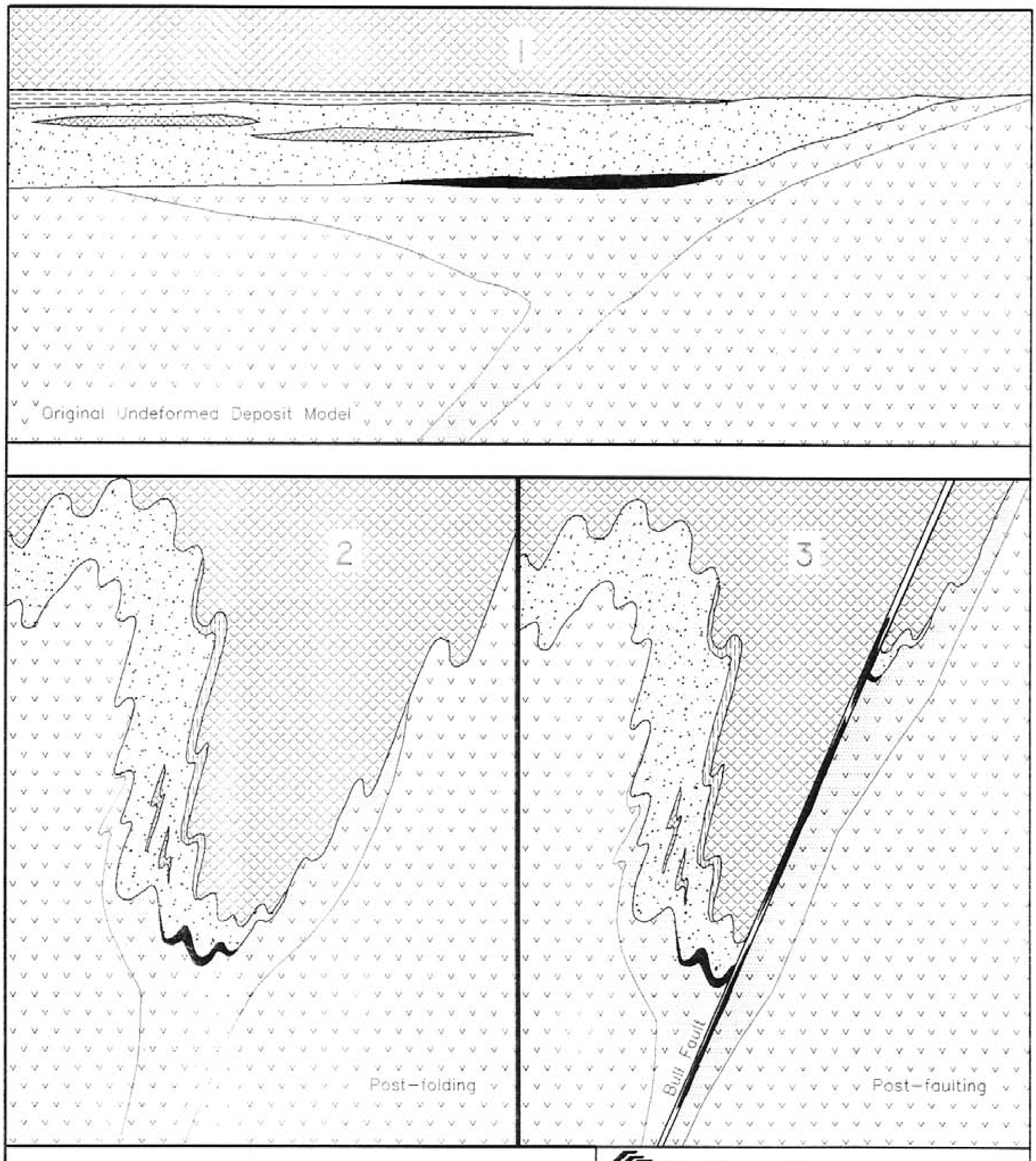
The volcaniclastic rocks at the Big Bull deposit contrast sharply with those at Tulsequah Chief in that they are finely laminated and very fine grained, with well preserved bed forms, although these have been contorted and locally disrupted by subsequent deformation. At Big Bull, massive felsic lavas, either as flows or sills, are rare. These features suggest a distal setting for the volcaniclastic rocks at the Big Bull deposit.

In addition to the massive sulphide mineralization at Big Bull, there is a second phase of hydrothermal activity represented by massive iron and manganese oxide and silicates (unit 3a). This unit appears to occur stratigraphically above the massive sulphides, within the andesite tuffs (unit 3). The manganese mineralization may represent a low temperature hydrothermal system that existed after the higher temperature system that formed the sulphides, or it may be a lateral facies equivalent of the massive sulphides. The structural complexity at the Big Bull deposit presently precludes the establishment of the sulphide-manganese relationships.

2.5 SUMMARY

The Big Bull deposit is a polymetallic volcanogenic massive sulphide deposit which occurs in a bimodal, largely tuffaceous sequence within the Paleozoic Stikine assemblage. The host rocks are chemically similar and roughly stratigraphically equivalent to those at the nearby Tulsequah Chief deposit. The sequence of events that formed the Big Bull deposit is outlined below, and shown schematically in Figure 2.2.

1. Deposition of widespread mafic footwall rocks.
2. Deposition of finely bedded felsic tuffs, with contemporaneous hydrothermal activity, alteration of the felsic package, and deposition of massive sulphides.
3. Deposition of finely bedded mafic tuffs, with coeval low-temperature hydrothermal discharge and the formation of massive manganiferous chemical sediments. These chemical sediments may represent cooling of the first, sulphide-depositing hydrothermal system or, alternatively, the lateral margin of a second hydrothermal system.
4. Intrusion of mafic sills $\pm$ flows after the main phase of hydrothermal activity had ended.
5. Folding of the stratigraphy into a syncline in the Big Bull area.
6. Offset of the stratigraphy along the Bull fault, forming the present deposit configuration.



See Figure 2.0 for Legend

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BIG BULL DEPOSIT

SCHEMATIC CROSS SECTION

November 1, 1994

Figure 2.2

3.0 1994 BIG BULL WORK PROGRAM

1994 exploration work at the Big Bull lasted from late May until early September. In June, Scott Geophysics carried out down-hole induced polarization surveys in six of the 1993 drill holes. Diamond drilling of 15 holes totalling 5528 m was completed in two phases, June 13 to July 24, and September 9 to September 17. A total of 379 samples were taken and sent to Acme Analytical Laboratories for ICP analysis, 64 of the samples were also assayed. Drill hole information and significant intersections are shown in Table 3.1. A total of 17.6 km of cut and picketed line was added to the Big Bull grid. Geological mapping was done over this extended area, and much of the original grid was re-mapped. Lithogeochemical sampling of outcrop and drill core was done in order to differentiate between various mafic units, and also to aid in comparison between the Big Bull and Tulsequah Chief settings. A total of 46 samples were sent to Chemex and McGill for lithogeochemical analysis.

3.1 DIAMOND DRILLING

Drilling at the Big Bull property in 1994 successfully demonstrated that massive sulphide mineralization remains open outside the limits of the historic workings and the 1993 drilling. Four of the fifteen holes drilled in 1994 intersected ore grade material (>$45 NSR) over mineable widths (>3 m), and three other holes intersected ore grade over widths between 1 and 3 m (Table 3.1).

Holes BB94013, 014, 015, 016 and 025 were all drilled to the south of the keel of the Big Bull syncline, and are entirely within footwall dacites of unit 2a and 2b. Mineralization is weak in these holes, but is generally best developed near the upper contact of the QSP unit. Drill holes from the 1950's intersected ore grade mineralization at or near this contact (Figures 3.6, 3.7) and it is possible that this represents a stratiform sulphide horizon.

Mineralized intersections in holes BB94019, BB94020, and BB94021 are all correlative and all occur within splays of the Bull fault. This represents the down dip continuation of the ore mined in the 5030 stopes of the Big Bull Mine. Holes BB94022 and BB94023 close off this fault hosted mineralization to the north. To the south, an enigmatic intersection in BB94017 may correlate with 19, 20 and 21, although the mineralization occurs in the hanging wall of the main Bull fault. This intersection is underlain by a large diabase intrusive which cuts off the mineralization.

To the north, hole BB94024 intersected 4.16 m of disseminated and stringer mineralization in the QSP unit in the footwall of the Bull fault. Holes BB94026 and 27 were drilled up-dip of this intersection but failed to intersect any extension to the mineralization, with the exception of 33 cm of massive sulphide in a fault splay in BB94026. A diabase intrusive was intesected in the immediate footwall of the Bull fault in BB94026, instead of the QSP unit. Several fault splays occur between BB94024 and BB94027, apparently truncating the mineralization. The intersection in BB94024 is significant in that it appears to represent footwall stringer-type mineralization and occurs in the footwall to the Bull fault. Stratiform sulphides above this footwall mineralization may be preserved to the north and down-dip.

3.2 GEOLOGICAL MAPPING

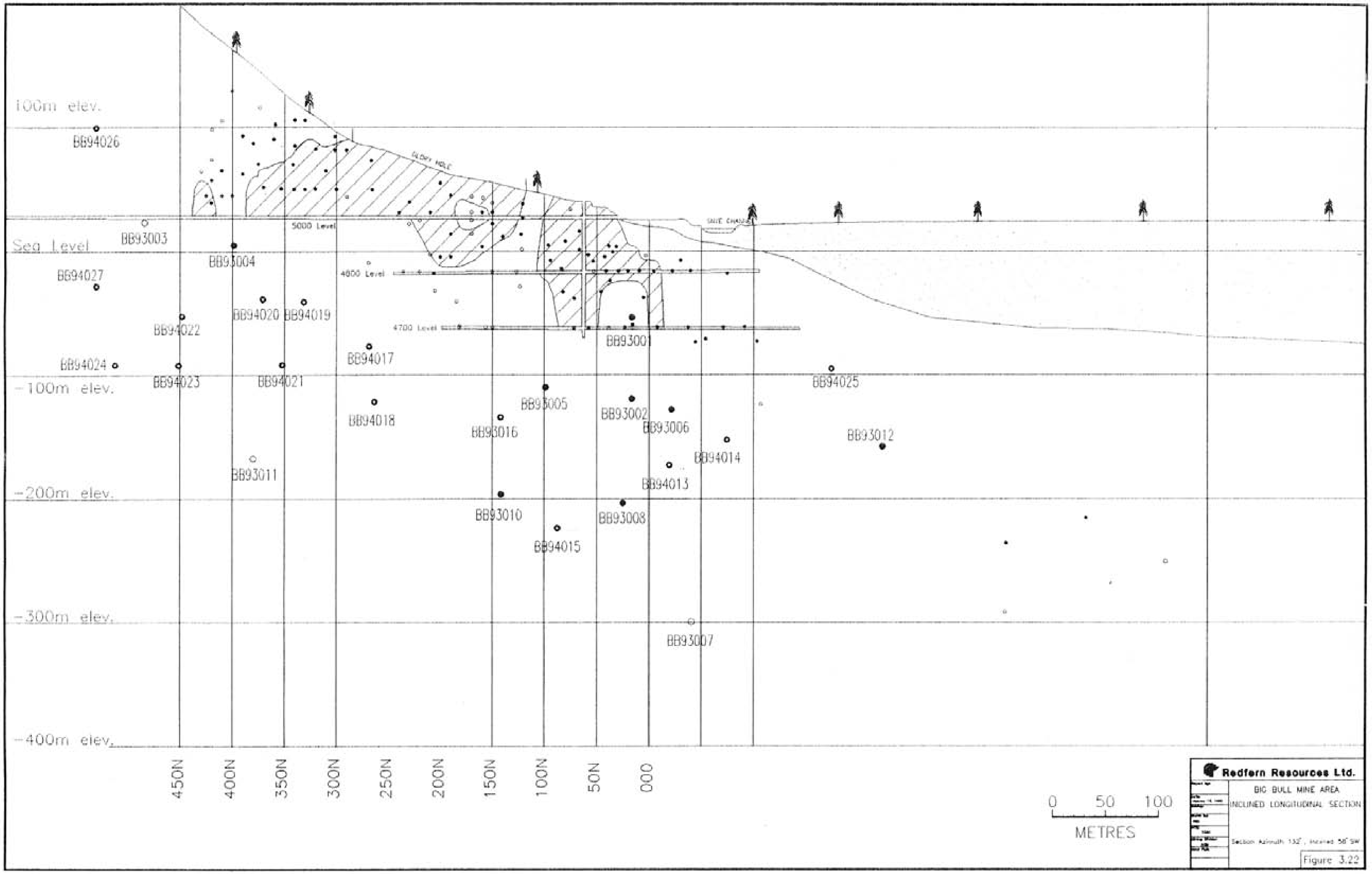
The geological mapping program at the Big Bull had two goals in 1994: to try to reconcile differences between the lithologies encountered in drilling and mapping in the deposit area in 1993; and to extend the mapping coverage to the north of the deposit area.

During the 1993 work program, it became apparent that the stratigraphy seen on surface did not correlate well with that intersected in drill holes. The 1994 mapping and drilling successfully explained this difference and provided a much more complete understanding of the stratigraphy and structural setting of the Big Bull area. Mapping outlined the northward thickening wedge of unit 3 and 4 mafic rocks in the west limb of the Big Bull syncline. Evidence for the occurrence of an anticlinal closure to the west of the deposit area was also obtained.

TABLE 3.1: DRILL HOLE INFORMATION AND INTERSECTIONS

HOLE	Northing	Easting	Elev(m.asl)	Length(m)	Azimuth	Dip	From	To	TT(m)	AT(m)	Cu %	Pb %	Zn %	Au g/t	Ag g/t	NSR $
BB94013	6937.51	13046.03	53.38	362.71	36.5	-58.3	173.94	175.19		1.25	0.48	0.75	6.87	0.754	22.63	$78.41
							228.65	228.90		0.25	2.59	3.93	17.92	3.840	316.12	$282.38
							232.43	232.93		0.50	0.19	2.55	4.55	0.960	173.83	$82.93
BB94014	6937.48	13046.16	53.39	384.05	56.5	-51.5	228.20	228.60		0.40	0.05	0.27	0.70	3.429	207.09	$63.45
BB94015	6990.70	12927.36	84.64	454.15	42.8	-63.1					NO SIGNIFICANT VALUES					
BB94016	7040.96	12901.01	89.11	427.90	43.4	-50.1					NO SIGNIFICANT VALUE					
BB94017	7156.86	12838.09	113.60	391.36	44.1	-44.8	221.50	222.50		1.00	0.28	0.71	2.21	1.509	68.91	$49.09
							232.00	238.02		6.02	0.89	3.24	6.58	1.954	448.12	$150.53
							240.80	241.20		0.40	0.11	4.10	7.47	0.617	134.74	$110.07
BB94018	7156.82	12837.95	113.49	387.10	43.2	-55.9					NO SIGNIFICANT VALUES					
BB94019	7246.89	12811.48	130.11	374.90	53.1	-47.0	212.15	215.75		3.60	0.28	4.04	11.33	2.537	254.06	$172.98
BB94020	7247.24	12811.39	130.18	344.42	37.1	-45.3	223.47	226.58		3.11	0.51	4.46	9.50	8.606	341.49	$235.02
							229.58	230.39		0.81	0.07	0.71	1.43	13.920	43.20	$126.97
BB94021	7246.79	12811.15	130.32	350.52	41.7	-59.5	301.90	303.05		1.15	0.80	1.38	9.71	1.474	49.03	$120.70
BB94022	7295.93	12717.08	148.47	399.29	45.5	-45.8					NO SIGNIFICANT VALUES					
BB94023	7295.86	12717.12	148.22	475.49	43.8	-55.6					NO SIGNIFICANT VALUES					
BB94024	7328.50	12646.42	152.57	438.91	44.0	-46.4	320.10	324.26		4.16	0.09	0.72	1.46	3.703	248.23	$78.42
BB94025	6905.20	13173.40	18.80	192.94	54.5	-44.7	80.40	81.95		1.55	0.21	0.95	1.89	16.457	186.52	$211.55
BB94026	7439.60	12744.40	207.30	250.85	42.0	-44.5					NO SIGNIFICANT VALUES					
BB94027	7439.60	12744.40	207.30	293.83	42.0	-74.8					NO SIGNIFICANT VALUES					
			Total	**5528.4**												

* NSR = (16.47 x %Cu)+(6.96 x %Pb)+(8.07 x %Zn)+(.089 x g/t Ag)+(10.31 x g/t Au)


100m elev.
Sea Level
-100m elev.
-200m elev.
-300m elev.
-400m elev.
5000 Level
4800 Level
4700 Level
GLORY HOLE
BB94026
BB93003
BB94027
BB93004
BB94020
BB94019
BB94022
BB94024
BB94023
BB94021
BB94017
BB94018
BB93011
BB93001
BB93005
BB93016
BB93002
BB93006
BB94014
BB94013
BB93010
BB93008
BB94015
BB93007
BB94025
BB93012
450N
400N
350N
300N
250N
200N
150N
100N
50N
000
0
50
100
METRES
Redfern Resources Ltd.
BIG BULL MINE AREA
INCLINED LONGITUDINAL SECTION
Section Azimuth 132°, inclined 58° SW
Figure 3.22

The northern extension of the Big Bull grid cut in 1993 was again extended, this time to the east, to cover an area which widely spaced mapping had shown to be underlain by rocks similar to those near the deposit area. Due to time and weather constraints in 1994, only the northern portion of this extended grid was mapped, leaving a gap between it and the deposit area. Several lithologies, including maroon calcareous mafic tuffs and thinly laminated dacite tuffs, appear similar to those in the deposit area, however stratigraphic correlations between the two areas are difficult to make due to the lack of information in between and the 500 to 1000 m of elevation difference.

3.3 GEOPHYSICS

Down-hole induced polarization surveys were conducted in six of the 1993 drill holes. Other holes had caved over the winter and were blocked. A logistical summary of the work completed is contained in Appendix IV, and geophysical profiles are included in the accompanying map tube.

The detailed survey profiles clearly show the high induced polarization and low resistivity associated with the mineralized intersections in holes BB93002, BB94006 and BB94008, and generally correlate very well with the expected responses from the geology logged in the holes. The directional plots, created with the current electrodes to the north, south, east and west of the holes are more difficult to interpret. Profiles are generally similar to the detailed array profiles, however a more detailed interpretation is required to fully understand the responses. This detailed interpretation, incorporating the geological data from the 1994 drilling will provide a good indication of the usefulness of this geophysical technique in the Big Bull geological environment.

4.0 1994 BANKER WORK PROGRAM

Geological mapping and sampling at 1:2000 scale was undertaken on the Banker Grid South and West located approximately 7 km to the south of the Tulsequah Chief deposit near the convergence of the Tulsequah and Taku Rivers. The purpose of this mapping program was to outline favourable felsic volcanic units mapped by Redfern during 1993; and to investigate the Sparling (Au) and Banker (Ag-Pb) Showings. The Banker (Ag-Pb) showing was not located during the 1994 program due to very dense forest cover and thick overburden along the Tulsequah River Floodplain.

4.1 BANKER GRID SOUTH

The Banker Grid South was cut in 1994, adding 4000m of new line to the 1993 Banker Grid (Figure 4.0). Mapping in this area was intended to further delineate favourable felsic volcanic units outlined during 1993 by Redfern. The baseline to the grid is oriented at 325^{0} with perpendicular crosslines spaced at 100m and slope corrected stations at 20m spacings.

4.1.1 GEOLOGY (Figure 4.0)

The 1994 surface mapping and sampling program outlined two main units in the Banker South area: felsic volcanics (Unit 1) and mafic intrusives and flows (Unit 2) of the Mount Eaton suite.

The felsic volcanic unit consists of rhyolite flows, and dacite flows and tuffs. The rhyolite flows are invariably quartz-eye phyric, and commonly contain feldspar phenocrysts. These rocks tend to be bleached and silicified, with minor sericite and hematite alteration. The rocks often display a strong penetrative foliation and/or bedding that are subparallel. Some rare clastic textures were also noted in these rocks, which may represent flow breccias.

The dacitic flows and tuffs make up the most abundant rock type in the area. These rocks are commonly feldspar-phyric, and display a wide range of volcanic and volcaniclastic textures. The rocks are generally bleached and silicified, with minor sericite and chlorite alteration. These dacitic rocks also commonly display a strong penetrative foliation and/or a bedding that are subparallel where visible. These fabrics are especially well developed in the volcaniclastic rocks.

A large quartz-sericite +/- pyrite and hematite alteration zone was outlined in the area, between L8N and L6N from stations 7+00E to 4+00E. This alteration appears to be hosted by both the dacites and rhyolites, and is similar to the QSP units at the Tulsequah Chief. A total of 27 samples were collected from this area. Geochemical analysis (Appendix V) produced values as high as 490 ppb Au, 0.4 ppm Ag, 38 ppm Cu, 174 ppm Pb and 302 ppm Zn.

The mafic rocks are principally found to the east of a linear valley at tieline 9+00E. The unit consists of feldspar +/- pyroxene phyric basalt, which is generally massive, however some rare fragmental textures have been noted. The rocks are commonly propylitically altered with abundant chlorite and minor amounts of calcite, and silica +/-epidote.

4.1.2 GEOCHEMISTRY

A total of 61 samples were collected for geochemical analysis from the Banker Grid South during the 1994 sampling program. These samples were analyzed by Chemex Labs Ltd. using a 9 element plus Au ICP package (Au-ppb; Ag,As,Bi,Cu,Hg,Mo,Pb,Sb,Zn-ppm). Twenty-two of these 61 samples were further analyzed by McGill University for major oxides and trace element geochemistry. The major element analysis was performed using x-ray fluorescence on fused beads, while pressed powder pellets were analyzed for trace elements (see Appendix V for a more detailed description of analysis).

The results of the geochemical analysis helped to confirm the occurrence of the quartz-sericite alteration zone, as well as confirming a felsic protolith for these rocks. The alteration zone is characterized by a marked depletion in Na_2O (<1%) coincident with an increase in K_2O (e.g. RL94009-0.63,5.33; ML94008-0.60,4.59; RL94006-0.70,4.16; Na_2O, K_2O respectively). This may suggest alteration by hydrothermal fluids proximal to emplacement of massive sulphide mineralization. The results of the geochemical analysis also indicate that the alteration zone may be smaller than estimated by visual analysis of the rocks in the area.

4.2 BANKER GRID WEST

The Banker Grid West (Figure 4.9) was established to investigate the Sparling showing west of the baseline and to extend mapping coverage west to the Tulsequah floodplane. The grid extends 1400m from L28N to L14N and contains 5500m of new grid. An additional 500m was cut at L11N and L10+50N to map the Banker showing.

4.2.1 GEOLOGY (Figures 4.0 and 4.9)

The 1994 mapping on the Banker Grid West delineated an extensive gabbro unit (Unit 2b) and associated border phases throughout the grid area. Compositions vary from true gabbro to feldspar and pyroxene phyric basalts (BIN 1/4). These rocks are usually coarse grained, often propylitically altered (chlorite, calcite, epidote, silica, magnetite and hematite) and are intruded by Tertiary aged Sloko rhyolite dykes (Unit 11). The Sloko dykes which trend roughly north-south, are generally foliated, highly bleached, quartz-eye phyric, and contain fibrous manganese crystals.

The southern and western margins of this grid contain mafic ash and lapilli tuffs (Unit 2c) which are often schistose and commonly propylitically altered. An apparent cover sequence of conglomerates (Unit 12) was also found on the western flank of the grid. These conglomerates are poorly sorted and clast supported, with coarse grained, angular to sub-rounded clasts. Clasts consist of gabbro, feldspar and pyroxene phyric basalt, basalt ash and lapilli tuff, rhyolite and limestone.

4.2.2 GEOCHEMISTRY

A total of 11 geochemical samples were taken from the Banker Grid West (Figure 4.10). These samples were analyzed by Chemex Labs Ltd. using their 9 element plus Au ICP package. Three samples were taken from the mafic intrusive unit (unit 2b). These samples indicate that the unit may contain elevated Cu values. One sample in particular, RG94052, taken from a mineralized calcite vein in the gabbro, produced a value of 1235ppm Cu. Three samples were also taken from the Sloko rhyolite dykes (unit 11). These samples indicate that this unit lacks significant sulphide mineralization. The remainder of the samples were taken in the vicinity of the Sparling Showing and are described below.

4.3 SPARLING SHOWING (Figure 4.9)

The Sparling (Au) showing consists of a series of shallow trenches excavated by Cominco in 1987. The area is situated between L18N and L16N, and covered by a thick overburden.

Three trenches with visible mineralization were sampled. The mineralization is hosted in a highly altered (quartz - sericite - pyrite) massive gabbro intrusive. Pyrite, galena, sphalerite and gold - silver mineralization occurs within a sericitic, foliated, quartz vein(s) (15 - 45cm wide, thickening northward) in a shear zone. Mineralization occurs in bands, up to 4cm wide, with geochemical sampling producing values as high as 1090 ppb Au, 19.5 oz/T Ag, 14.2% Pb, 5.54% Zn and 0.72 % Cu. The mineralization is thought to be of the Polaris - Taku type.

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Big Bull

The 1994 drilling and surface mapping program at the Big Bull area has allowed a working hypothesis of the stratigraphy and structural setting of the deposit area to be formed. This model will be refined as more data is collected, but is useful in guiding further exploration efforts. Massive sulphide mineralization occurs primarily within the Bull fault zone, which cuts approximately the axial plane of the Big Bull syncline, a tight, slightly overturned fold which plunges moderately to the north. Sulphides have been remobilized along the fault, resulting in local, potentially economic, concentrations. Stratiform sulphides may be preserved away from the Bull fault, and represent the main target for continuing exploration at the Big Bull.

To the north, BB94024 intersected significant mineralization which may be a feeder zone lying stratigraphically below a stratiform sulphide deposit. Unfortunately, this overlying stratigraphic interval has been removed by the Bull fault in BB94024. The area down-dip and to the north of this intersection should be tested to determine if: i) the sulphide horizon has been preserved by the fault diverging into the hanging wall or ii) the stringer mineralization is of economic interest.

A potential ore horizon occurs at the upper contact of the QSP unit on the hanging wall side of the Bull fault. Ore grade intersections in holes BB93001, BB93002, BB93008 and BB93006 seem to fit this interpretation, although they are complicated by diabase intrusives. Mineralization in the QSP unit in holes BB93012, BB94014 and BB94025 increases towards this contact. This favourable contact continues to the south of the Big Bull area, under the fluvial sediments in the Taku valley into an area where significant mineralization was drilled by Cominco in the 1950's (holes C-25, C-27, Carmichael and Curtis, 1993). This area should be tested by three holes, as outlined in the 1993 Big Bull final report (Carmichael and Curtis, 1993).

Several ore grade intersections have been drilled at the Big Bull in 1993 and 1994, roughly outlining a mineralized body with dimensions of at least 450 m x 70 m by 3 to 6 m thick. This area should be tested for continuity by at least two infill holes; one between BB94017 and BB93005, and one between BB93005 and BB93008. Additional holes are also required to test for a down-dip and down-plunge (north) extent to the mineralization intersected in BB94017 and BB94021, and BB94024.

Geological mapping coverage will be extended to cover the gap between the Big Bull deposit area and the area north of grid line 19+00N. Additional detailed mapping to the immediate northeast of the deposit area will attempt to delineate the eastern limb of the Big Bull syncline. Induced polarization work done in 1993 over this area detected an unexplained chargeability anomaly in this area. The new interpretation of the geology suggests that this may coincide with the alteration zone in the west limb of the syncline.

5.2 BANKER

The 1994 mapping and sampling program on the Banker Grid South has outlined an area of altered felsic volcanic rocks, located between L8N and L6N from stations 7+00E to 4+00E. This quartz-sericite alteration is similar to the QSP alteration zones hosting mineralization at the Tulsequah Chief, and additional work is recommended to further explore this area. Work should include coverage by I.P. and mag geophysical surveys, in order to determine if the alteration and/or potential mineralization occur at depth. This work should then be followed by a drill program, if warrented by favourable geophysical results.

The mapping and sampling program on the Banker Grid West failed to uncover any significant alteration or mineralization, with the exception of the Sparling Showing. The showing was drilled by Cominco in the 1980's, with only limited success. Therefore, this area probably does not warrent any further work at this time. However, some effort should be made to locate the old excavations of the Banker Showing, so that they can be systematically mapped and sampled to determine if further work is warrented in that area.

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7.0 STATEMENTS OF QUALIFICATIONS

I, Robert G. Carmichael hereby state the following:

1) I obtained a Bachelor of Applied Science degree in Geological Engineering from the University of British Columbia in 1987;
2) I am registered as a Professional Engineer with the Association of Professional Engineers and Geoscientists of British Columbia;
3) I have worked in the mineral exploration industry since graduation, and previously held positions with Esso Minerals Canada and Homestake Mining Company.
4) I have been employed by Redfern Resources Ltd. as a Project Geologist since May of 1993.

PROFESSIONAL
R. G. CARMICHAEL
ENGINEER

Dated this 19th day of JANUARY , 1995

STATEMENT of QUALIFICATIONS

<u>Roger B. March</u>

I, Roger B. March, do hereby certify:

- I hold a Bachelor of Science, Honours degree in Geology granted by Memorial University, Newfoundland in 1992.
- I am a Geoscientist-in-training with the Association of Professional Engineers and Geoscientists of Newfoundland.
- I have worked in the field of geology and mineral exploration since 1992.
- I worked on the Tulsequah Chief project during the period June 1, 1994 to present.
- I have not received, nor do I expect to receive any interest directly or indirectly in Redfern Resources Ltd.

Dated at Richmond, B.C., this 16th day of January, 1995.

Roger B. March

Roger B. March

STATEMENT of QUALIFICATIONS

Brian T. McGrath

I, Brian T. McGrath, do hereby certify:

- I hold a Bachelor of Science degree in Geology granted by Memorial University, Newfoundland in 1992.
- I have worked in the field of geology and mineral exploration since 1992.
- I worked on the Tulsequah Chief project during the period June 1, 1994 to present.
- I have not received, nor do I expect to receive any interest directly or indirectly in Redfern Resources Ltd.

Dated at Richmond, B.C., this 16th day of January, 1995.

Brian T. McGrath

APPENDIX I
STATEMENT OF COSTS

1994 BIG BULL PROJECT EXPENDITURES

ALLOCATION OF COSTS TO MAJOR WORK AREAS

COST CATEGORY	DESCRIPTION	CATEGORY EXPENDITU	SURFACE DRILLIN		LINE-CUTTING		SURFACE GEOPHYSIC		SURFACE GEOL/GEOC		TOTALS	
			%	Amount	%	Amount	%	Amount	%	Amount	%	Amount
Computer software & sup	Maintenance fee - LOGII	$75.00	100%	$75.00		$0.00		$0.00		$0.00	100%	$75.00
Communications	Satellite phone rental, phone, courier	$20,016.35	85%	$17,013.90	2%	$400.33	5%	$1,000.82	8%	$1,601.31	100%	$20,016.35
Office supplies	Office supplies, misc.	$155.01	75%	$116.26	1%	$1.55	4%	$6.20	20%	$31.00	100%	$155.01
Publication/book/map	Photos, topo maps etc.	$155.85	55%	$85.72	0%	$0.00	5%	$7.79	40%	$62.34	100%	$155.85
Air/land commercial travel	Air fares, taxi, bus - To/From property	$6,791.71	75%	$5,093.78	5%	$339.59	0%	$0.00	20%	$1,358.34	100%	$6,791.71
Accomodation/meals	Hotels, meals - to/from property	$1,686.65	80%	$1,349.32	0%	$0.00	0%	$0.00	20%	$337.33	100%	$1,686.65
Vehicle lease, rental	Vehicle rentals - Whitehorse/Atlin	$1,467.54	80%	$1,174.03	0%	$0.00	0%	$0.00	20%	$293.51	100%	$1,467.54
Helicopter	Charter helicopter hours	$129,657.38	80%	$103,725.90	5%	$6,482.87	5%	$6,482.87	10%	$12,965.74	100%	$129,657.38
Helicopter fuel	Charter helicopter fuel	$20,518.49	80%	$16,414.79	5%	$1,025.92	5%	$1,025.92	10%	$2,051.85	100%	$20,518.49
Fixed wing	Fixed wing charters	$31,479.21	80%	$25,183.37	5%	$1,573.96	5%	$1,573.96	10%	$3,147.92	100%	$31,479.21
Fixed wing fuel	Fixed wing Fuel	$5,514.41	80%	$4,411.53	5%	$275.72	5%	$275.72	10%	$551.44	100%	$5,514.41
Freight/shipping	Freight to/from property	$6,186.64	60%	$3,711.98	2%	$123.73	8%	$494.93	30%	$1,855.99	100%	$6,186.64
Employee Wages - Geolog	Geological personnel cost	$67,516.64	70%	$47,261.65	1%	$675.17	5%	$3,375.83	24%	$16,203.99	100%	$67,516.64
Employee Wages - Suppor	Support Personnel cost (Cook, camp manager etc.)	$26,139.69	65%	$16,990.80	5%	$1,306.98	5%	$1,306.98	25%	$6,534.92	100%	$26,139.69
Contract labour	Temporary labour	$739.50	100%	$739.50	0%	$0.00	0%	$0.00	0%	$0.00	100%	$739.50
Geological Consulting	Petrographic services/Structural studies	$9,780.86	80%	$7,824.69	0%	$0.00	0%	$0.00	20%	$1,956.17	100%	$9,780.86
Geophysical	Contract down hole IP	$14,207.98	0%	$0.00	0%	$0.00	100%	$14,207.98	0%	$0.00	100%	$14,207.98
Draft/plot/reproduction	Misc. map/plan copying	$321.00	80%	$256.80	0%	$0.00	0%	$0.00	20%	$64.20	100%	$321.00
Assay and analysis	Drill core and surface assays and analysis	$8,205.86	75%	$6,154.40	0%	$0.00	0%	$0.00	25%	$2,051.47	100%	$8,205.86
Drilling	Direct contractor footage, time and materials	$388,259.30	100%	$388,259.30	0%	$0.00	0%	$0.00	0%	$0.00	100%	$388,259.30
Expediting	Atlin/Juneau expediting costs	$10,643.53	75%	$7,982.65	5%	$532.18	5%	$532.18	15%	$1,596.53	100%	$10,643.53
Surveying/line cutting	Line-cutting, drill pads, heli-pads	$26,872.50	25%	$6,718.13	75%	$20,154.38	0%	$0.00	0%	$0.00	100%	$26,872.50
Equipment purchase	Core saw, replacement blades	$2,075.80	90%	$1,868.22	0%	$0.00	0%	$0.00	10%	$207.58	100%	$2,075.80
Equipment rental	Survey, Light Log, Sperry Sun etc.	$22,021.47	80%	$17,617.18	15%	$3,303.22	0%	$0.00	5%	$1,101.07	100%	$22,021.47
Field/technical supplies	Sample bags, notebooks, plotter supplies etc.	$3,090.37	75%	$2,317.78	0%	$0.00	0%	$0.00	25%	$772.59	100%	$3,090.37
Camp/Construction supplie	Misc. hardware, lumber, safety, etc.	$7,899.52	55%	$4,344.74	10%	$789.95	10%	$789.95	25%	$1,974.88	100%	$7,899.52
Groceries	Groceries for crew	$21,185.21	70%	$14,829.65	9%	$1,906.67	6%	$1,271.11	15%	$3,177.78	100%	$21,185.21
Fuel, camp, drilling	Diesel, propane, regular gas	$6,932.02	85%	$5,892.22	2%	$138.64	3%	$207.96	10%	$693.20	100%	$6,932.02
Fuel, other	Regular gas for vehicles	$334.96	85%	$284.72	0%	$0.00	0%	$0.00	15%	$50.24	100%	$334.96
Lubricant/additives	Motor oils, grease, fluids	$745.70	75%	$559.28	2%	$14.91	0%	$0.00	23%	$171.51	100%	$745.70
Repairs	Misc. repairs	$119.30	60%	$71.58	0%	$0.00	0%	$0.00	40%	$47.72	100%	$119.30
Spare parts, misc.	Survey tripod replacements	$460.12	50%	$230.06	0%	$0.00	0%	$0.00	50%	$230.06	100%	$460.12
Drilling supplies	Core boxes, racks, mud, cement	$11,555.34	100%	$11,555.34	0%	$0.00	0%	$0.00	0%	$0.00	100%	$11,555.34
TOTAL		$852,810.91		$720,114.23		$39,045.77		$32,560.21		$61,090.70		$852,810.91
		Units	metres	5,528.42	km.	26.20	metres	1,702.00	km.	36.68		
		Unit Costs	$/m	$130.26	$/km	$1,490.30	$/m	$19.13	$/km	$1,665.50		

1994 BIG BULL PROJECT EXPENDITURES

ALLOCATION OF EXPENDITURES BY CLAIM

Claim Name	Record #	Expiry Date	Drilling metres	Line Cutting line-km.	Geophysics metres	Geol. mapping line-km.	Apportioned Expenditures by unit cost Drilling	Line Cutting	Geophysics	Geol. mapping	TOTAL
Big Bull Exten	G.37/21	18-Jul-2004	607.22		286.00	1.30	$79,094.53	$0.00	$5,471.34	$2,165.16	$86,731.02
Bull 3	H.142/32	19-Jul-2004	153.09				$19,941.01	$0.00	$0.00	$0.00	$19,941.01
Bull 4	H.143/32	19-Jul-2004	1,061.44		832.00	0.72	$138,259.76	$0.00	$15,916.63	$1,199.16	$155,375.55
Big Bull	6303	03-Jul-95	1,856.26	0.28	305.00	3.64	$241,790.46	$409.83	$5,834.82	$6,062.44	$254,097.55
Bull No. 1	6304	03-Jul-95		0.48		2.82	$0.00	$715.34	$0.00	$4,688.39	$5,403.74
Bull No. 5	6306	03-Jul-95	1,850.41		279.00	1.43	$241,028.46	$0.00	$5,337.43	$2,381.67	$248,747.56
Bull No. 6	6305	03-Jul-95				1.27	$0.00	$0.00	$0.00	$2,115.19	$2,115.19
Webb 1	2766	27-Nov-2000		6.25		4.10	$0.00	$9,306.90	$0.00	$6,828.57	$16,135.47
Wendy 1	320163	31-Jul-2004		9.70		9.70	$0.00	$14,455.88	$0.00	$16,155.39	$30,611.27
CO 5	998	04-Mar-2003		0.90		2.50	$0.00	$1,341.27	$0.00	$4,163.76	$5,505.03
Vega No. 1	6155	03-Jul-95		2.03		2.30	$0.00	$3,025.30	$0.00	$3,830.66	$6,855.96
Vega No. 3	6157	03-Jul-95		2.75		2.75	$0.00	$4,098.32	$0.00	$4,580.14	$8,678.45
Vega No. 5	6159	03-Jul-95		0.35		0.35	$0.00	$521.60	$0.00	$582.93	$1,104.53
Janet W. No.	6161	03-Jul-95		1.15		0.90	$0.00	$1,713.84	$0.00	$1,498.95	$3,212.79
Janet W. No.	6162	03-Jul-95		0.40		0.90	$0.00	$596.12	$0.00	$1,498.95	$2,095.07
Janet W. No.	6164	03-Jul-95		0.57		0.47	$0.00	$849.47	$0.00	$782.79	$1,632.26
Janet W. No.	6166	03-Jul-95		1.20		1.38	$0.00	$1,788.36	$0.00	$2,298.40	$4,086.75
Joker	6169	03-Jul-95		0.15		0.15	$0.00	$223.54	$0.00	$249.83	$473.37
TOTAL			5,528.42	26.20	1,702.00	36.68	$720,114.23	$39,045.77	$32,560.21	$61,082.37	$852,802.58
			$130.26	$1,490.30	$19.13	$1,665.50					

TULSEQUAH CHIEF PROPERTY - CLAIM STATUS

PROPERTY AREA		RECORD NO.	TITLE NO.	UNITS	AREA (ha.)	EXPIRY DATE
Tulsequah Chief	Birds	5224	203794	1	25	30-May-2004
	Pat	5225	203795	1	25	30-May-2004
	Ross	5226	203796	1	25	30-May-2004
	Mary 1	4289	203385	20	500	05-Aug-2004
	Marcie 1	4290	203386	20	500	05-Aug-2004
	Marcie 2	4291	203387	20	500	05-Aug-2004
	Marcie 3	4292	203388	20	500	05-Aug-2004
	Elysa 1	4293	203389	20	500	05-Aug-2004
	Elysa 2	4294	203390	20	500	05-Aug-2004
	Elysa 3	4295	203391	6	150	03-Aug-2004
	Elysa 4	4296	203392	20	500	05-Aug-2004
	Wendy 1		320163	20	500	31-Jul-2004
	Wendy 2		320164	20	500	01-Aug-2004
	Strong 1		320339	16	400	17-Aug-2004
	Strong 2		320340	12	300	18-Aug-2004
	Strong 3		320341	8	200	18-Aug-2004
	Strong 4		320342	12	300	19-Aug-2004
	Strong 5		320343	10	250	19-Aug-2004
	Rodger 1		322046	20	500	21-Oct-94
	Rodger 2		322053	20	500	21-Oct-94
	Rodger 3		322054	20	500	21-Oct-94
	Rodger 4		322055	10	250	21-Oct-94
	Rodger 5		322056	12	300	21-Oct-94
	Rodger 6		322057	18	450	21-Oct-94
	Rodger 7		322058	20	500	21-Oct-94
	T.M.F. 1		324199	6	150	22-Mar-95
	T.M.F. 2		324200	16	400	22-Mar-95
	T.M.F. 3		324201	12	300	22-Mar-95
	T.M.F. 4		324202	3	75	22-Mar-95
	Shazah 1		323102	18	450	22-Dec-94
	Shazah 2		323103	20	500	22-Dec-94
	Shazah 3		323104	6	150	22-Dec-94
	CST 4		323358	18	450	27-Jan-95
Crown Grants:						
	River Fr.	5669		1	7.99	03-Jul-95
	Tulsequah Bonanza	5668		1	20.9	03-Jul-95
	Tulsequah Bald Eagle	5676		1	14.16	03-Jul-95
	Tulsequah Chief	5670		1	20.9	03-Jul-95
	Tulsequah Elva Fr.	5679		1	9.7	03-Jul-95
Big Bull	Big Bull Extension	37/21	203965	1	25	18-Jul-2004
	Bruce Fr.	303	203781	1	25	17-Aug-2004
	Bull 2	141/32	203966	1	25	19-Jul-2004
	Bull 3	142/32	203967	1	25	19-Jul-2004
	Bull 4	143/32	203968	1	25	19-Jul-2004
	Bull 8	142	203779	1	25	16-Jul-2004
	Bull 9	179	203780	1	25	25-Apr-2003
	CO 3	997	201802	20	500	04-Mar-2003
	CO 5	998	201803	18	450	04-Mar-2003
	Goat 1	1707	201925	16	400	23-Jul-2004
	Swamp 1	1708	201926	4	100	23-Jul-2004

TULSEQUAH CHIEF PROPERTY - CLAIM STATUS

PROPERTY AREA		RECORD NO.	TITLE NO.	UNITS	AREA (ha.)	EXPIRY DATE
	Swamp 2	1709	201927	1	25	23-Jul-2004
	Swamp 3	1710	201928	1	25	23-Jul-2004
	Webb 1	2766	202279	20	500	27-Nov-2000
	Webb 4	2769	202282	20	500	27-Nov-2000
	Webb 5	2770	202283	20	500	27-Nov-2000
	Webb 9	2774	202284	10	250	27-Nov-2000
	Webb 10	2775	202285	16	400	27-Nov-2000
Big Bull						
Crown Grants:						
	Big Bull	6303		1	20.65	03-Jul-95
	Bull No. 1	6304		1	16.95	03-Jul-95
	Bull No. 5	6306		1	14.57	03-Jul-95
	Bull No. 6	6305		1	17.22	03-Jul-95
	Hugh	6308		1	20.71	03-Jul-95
	Jean	6307		1	17.02	03-Jul-95
Banker	Tallon No. 1	1979	202030	20	500	08/02/2003
	Tallon No. 2	1980	202031	9	225	08/02/2003
Crown Grants:						
	Vega No. 1	6155		1	20.9	03-Jul-95
	Vega No. 2	6156		1	17.62	03-Jul-95
	Vega No. 3	6157		1	18.97	03-Jul-95
	Vega No. 4	6158		1	19.85	03-Jul-95
	Vega No. 5	6159		1	14.94	03-Jul-95
	Janet W. No. 1	6160		1	18.95	03-Jul-95
	Janet W. No. 2	6161		1	18.75	03-Jul-95
	Janet W. No. 3	6162		1	16.6	03-Jul-95
	Janet W. No. 4	6163		1	20.76	03-Jul-95
	Janet W. No. 5	6164		1	18.2	03-Jul-95
	Janet W. No. 6	6165		1	19.02	03-Jul-95
	Janet W. No. 7	6166		1	18.78	03-Jul-95
	Janet W. No. 8	6167		1	17.98	03-Jul-95
	Joker	6169		1	16.6	03-Jul-95
					16,638.69	

1 Maintained through annual tax payments due July 2 of each year.

N.B: Expiry dates reflect claim status as of October 19, 1994 at time of current assessment filing.

APPENDIX II
PROGRESS REPORT ON STRUCTURAL GEOLOGY AT THE BIG BULL DEPOSIT

W.A. BARCLAY
EXPLORATION
SERVICES LTD.

GRENADIER RD TORONTO ONTARIO M6R 1R1 TEL (416) 537-4523 FAX (416) 537-4253

PROGRESS REPORT ON STRUCTURAL GEOLOGY

at the

BIG BULL DEPOSIT

for

Redfern Resources Ltd.

by

W.A. Barclay

September 13, 1994

TABLE OF CONTENTS

INTRODUCTION

The following comments report on progress to date in determining the structural setting of the Big Bull deposit. They are principally founded on a detailed review of core logs and diamond drill sections, between section 5+30N and 2+70 N. They are additionally informed by check logging of selected core intervals, and by remapping of critical outcrops on the west side of the grid. This study was undertaken with the on-going assistance of B. Carmichael.

REVIEW OF SECTIONS

A series of annotated diamond drill sections has been compiled from computer-derived base plots for all sections north of 2+70N. To these base plots have been added data previously obtained by surface mapping of outcrop, as well as core axis angles for bedding and/or banding and foliation, and textural observations from drill core. Inferred folds, faults, and lithology-fault intersections have been projected from the surface data into the plane of sections, where it has been possible to do so with reasonable confidence. Hence, the annotated plots are more fully constrained by pertinent observations that have been accumulated to date than are the unammended computer-generated base sections. To some extent, however, they remain limited: mainly by i) the paucity of exposure on surface, and ii) the lack of survey control for elevations grid south of Line 3+00N.

For the present exercise, extrapolations of the inferred lithologic contacts and faults through the sections have been constrained by core axis angles, surface geology, and fold style as previously interpreted from surface mapping. The extrapolations are deliberately conservative in order to generate a well-constrained set of inferences, from which more speculative possibilities may be considered. For example, faults generally have not been extended more than a few tens of metres down-dip in the sections without independent support from data in adjacent sections. Specific fold closures have been projected through sections only where data from surface mapping can be extended down-plunge with a reasonable degree of confidence. The possibility that distribution of lithology as presently understood reflects refolding of an earlier fold is not implicitly evident in these sections. While there exists limited indirect evidence (e.g., equivocal facing directions) for such a refolding event, thus far no unequivocally supportive hard data have been discerned either on surface or in drill core.

To a large extent, the map units as presently distinguished reflect alteration rather than primary stratigraphy. Differences in protolith among them remain uncertain, in particular for the hangingwall dacite, andesite, and basalt units, and for the footwall dacites and basaltic unit as well. The alteration reasonably may be anticipated to reflect stratigraphy, but conclusive evidence will require added confirmation by petrography and/or whole rock analysis. In the immediate setting, however, jasper-hematite-mangangese-rich rocks can reasonably be used as stratigraphic markers locally.

Based on lithologic extrapolation in plan and section, and on the style of small-scale folds observed on surface, the hangingwall rocks at Big Bull appear to be characterized by asymmetric, S-shaped, minor folding. The minor folds may be parasitic to an antiformal closure to the west. Synformal closure to the east is inferred, and the footwall rocks indeed exhibit on surface asymmetric, Z-shaped, fold patterns. However, no major fold closure can be traced between them: neither on surface nor in section. Instead, inferred HW and FW units appear to become increasingly attenuated near the Big Bull deposit setting. The locally phyllitic, hematite-enriched, maroon andesitic unit appears to pinch out down-dip in section. HW basalt tuffs and lapilli tuffs are restricted to upper elevations in the sections. They occur up-dip of mafic rocks which may be intrusive, and which occur more or less along what would be anticipated to be the axial plane of the expected fold closure. At no point can the HW units be extended confidently to FW rocks across the Bull and West Faults, despite evident similarities in textures and alteration signatures. QSP sericitic alteration appears restricted to the FW of the known deposit in these sections, and sites the Bull Fault and down-dip splays which likely emanate from it; this unit may be slivered by the fault locally. In sections located south of 2+70N, the QSP unit may be repeated by one or more of these fault splays.

Hence, the inferred fold closure which is suggested by small-scale fold style on opposite sides of the Bull Fault has not thus far been verified, nor refuted, by drilling. Instead, the HW and FW units may represent opposing fold limbs which have been offset: disconformably juxtaposed by faulting along the Bull and West Faults. Such an offset would logically involve a significant strike-slip component, normal to the plane of section. A possible analogue structure has been observed in outcrop above the Tulsequah Chief deposit, immediately south of the Chief X-Fault.

MINERALIZATION POTENTIAL

Ore previously mined from underground workings up to the glory hole constitutes the most significant known mineralized setting within the range of these sections. Although its geometry was likely modified by the Bull Fault and West Fault, preserved widths locally in the order of 20 m suggest that it represented a lens which was stratigraphic and more or less in-place. In contrast, sulphide intersections elsewhere within these sections not only are spatially associated with faults, but textures (in DDH 94017 core for example) suggest as well that at least minor remobilization and/or tectonic reworking has taken place. These latter intersections may therefore be distal to a potentially larger ore setting.

Present longitudinal sections, coupled with fold styles observed in surface outcrop, suggest a moderate northwest plunge to mineralization at Big Bull. (Apparent southward trends could be the result of either or both i) strike-slip fault offset through the mineralized setting or ii) superposition of two or more distinct mineralized zones on to the common plane of longitudinal section). The northwest plunge conforms to the plunge of minor fold axes measured on surface at Big Bull, and to the pole to the best-fit great circle described by poles to bedding in the area. These combined data intimate a slightly overturned fold geometry, with axial plane inclined steeply to west-southwest, and a plunge of roughly 30° to the northwest. The NW mineralization plunge is also interrupted at depth by mafic rocks which exhibit interpreted intrusive relationships in drill core.

The best near-term potential for successful sulphide intersections is perceived to occur immediately northwest of this former production area. Higher elevations to the north have been tested previously by only one drill hole, piercing section 4+80N. This hole intersected (intrusive) "diabase" in the area of anticipated mineralization and, consequently, proved inconclusive. No other diamond drill testing of upper levels north of section 4+40N is referred to in the historical data available. The preservation of enhanced widths of QSP footwall alteration on surface, and past delineation of a significant Induced Polarization response in the area, encourage an exploration focus for this setting. It is mineralized at depth; in section 5+30N, DDH 94024 intersected economic sulphides at ≈-95 m elevation, down-plunge of the most northerly stope in past workings. Moreover, the potential down-plunge extension of the glory hole setting remains untested.

DRILL RECOMMENDATION

A minimum of two drill holes is recommended for the conclusion of 1994 drilling, directed on section 5+30N, to intersect the favourable setting at elevations of +100 and, roughly, -25 to -30 m. One deeper hole is warranted below DDH 94024 as well, if the earlier results are encouraging. This step-out drilling, and any future step-outs to the north, should be conservative in intent, directed cautiously from the known to the unknown into the side of the ridge. The intent should be to locate ore which hopefully has not been disrupted severely by later faulting nor interrupted by mafic intrusive. The alternative approach of continuing a pattern of deep drilling over widely spaced intervals is likely to yield at best inconsistent results, similar to those that have been obtained thus far at Big Bull, even if successful drill hits are encouraging in grade. Such an approach, moreover, will contribute little more than is currently recognized about the lithologic setting of the deposit.

ADDITIONAL COMMENTS AND RECOMMENDATIONS

The present exercise of revising drill sections has demonstrated a clear need to incorporate all available data into the sections. Many of these data cannot be plotted from computer-generated software, and must be rendered by hand. Preparation of a full set of such sections to include surface geology, core axis angles, down-plunge projections, textural data, etc., should be standard procedure upon the completion of each major phase of drilling.

Additional survey control is presently required to complete this process for available sections south of 2+70N. Lines south of there lack elevation data which are required to project surface data (fold closures, contact-fault intersections) into the planes of successive sections. These traverses should be surveyed before the termination of the current field program, in order to be able to generate a full set of constrained and informative sections prior to a renewed drill effort in the future.

The current dearth of fabric orientation data in surface geologic plan inhibits any attempt to address the question of possible refold geometries, and leaves the drill sections far too loosely constrained than is warranted. It can only be improved by systematic stripping of much outcrop, particularly on the west side of the grid. The outcrops are generally covered by 10-50 cm of soil and vegetation, and cannot be adequately stripped by rock hammer alone. It is recommended that part of on-going work at Big Bull incorporate a speciality team armed with grub hoes: their purpose being to expose broad areas of outcrop which remains covered at present.

The currently available NSR longitudinal section incorporates grade values for all economic minerals, including both the base and precious metal values. The distribution of these individual minerals will not likely be uniform. The present section constitutes a rendering of the deposit's economic configuration, but its incorporation of significant geologic information is potentially misleading. Separate longitudinal sections of grade X thickness should be prepared for each metal. Such a set of values, for each metal, should be accompanied on the sections at drill pierce points by a value for the distance above or below the plane of section, in a direction perpendicular to the section. It is the intent of such an exercise to separate out distinct mineral zones which may overlap in the current longitudinal section.

Respectfully submitted

W.A. Barclay, M.Sc., FGAC
Exploration Geological
Consultant

September 13, 1994

APPENDIX III
PETROGRAPHIC STUDY OF SELECTED SAMPLES FROM THE BIG BULL DEPOSIT

BIG BULL WHOLE ROCK / THIN SECTIONS

Aug 17, 1994

SECTION 2+70N

BB94017 225 m
Daibase: dark green, fine grained, strong pervasive chlorite alteration, very vague banding parallel to core axis. defined by chorite-epidote, trace euhedral pyrite to 5 mm.

BB94017 246 m
Diabase: broken core 5-15 cm lengths with <1mm hematite gouge on fractures and slickensides, medium dark green, strong pervasove epidote>>>chlorite alteration, fine grained to grainy (<0.1 mm feldspar crystals ??), non penetrative and patchy foliation with local segregation bands at 0° to core axis, cross-cut by 5-8% 1-3 mm chlorite veins with epidote-quartz envelopes to 5 mm.

BB94017 270 m
Diabase: medium-pale green, fine grained, massive, very weak penetrative foliation at 20-30° to core axis (drill chatter marks), cross-cut by 5% chlorite veinlets, local 1-10 cm zones with trace sausseritized feldspars ??

BB94017 321m
Dacite tuff: medium grey (purple), very thin laminations defined by chlorite/sericite >> quartz, disrupted by 15-20% epidote-quartz knots to 20 cm, S_1=0-90°, S_2=0-90° to core axis, trace hematite laminations to 1 cm (1 mm thick), strong chlorite-sericite alteration, trace magnetite veins with disseminated pyrite and chalcopyrite.

BB94018 51m
Dacite tuff: dark purple, massive, fine grained, vague 0.8-1.5 mm subround-round siliceous fragments (crystals?) rimmed with chlorite that defines strong penetrative foliation at 30° to core axis, (no S_2), trace magnetite as veinlets. Dacite crystal tuff?

BB94018 380 m
Dacite tuff: dark green, fine grained, grainy crystal tuff ?? thin laminated, grainy 0.5 cm laminations with 0.1 mm very fine grained chlorite laminations, 1-2 mm ciliceous laminations, strong chlorite alteration, patchy moderate silicification, trace magnetite as very fine grained wisps, strong penetrative S_1=0-80° and moderate to strong penetrative S_2=30-80° to core axis, 8-10% quartz-calcite veins, folded and dismembered, may be agglomeratic tuff with folded and dismembered fragments/ segregation bands/veins to 10 cm.

SECTION 3+70N

BB93011 385m
Diorite: pale green, massive, <5% 1-2 mm euhedral blocky pyroxene (?) ghosts, altered to chlorite, matrix is fine grained and feldspar phyric (?), broken core in 10-30 cm lengths, cross-cut by <5% epidote-quartz veins.

BB94020 217m
Diabase: dark green, fine grained massive, mealy grainy, strong pervasive chlorite alteration, patchy magnetite, strong pervasive foliation at 15° to core axis defined by very fine grainde chlorite wisps

and 0.2 m white 'feldspar' crystals, vague segregation banding defined by magnetite and chlorite.

BB94020 337m
Dacite crystal tuff: medium green, very fine grained laminations (pale green silica <1cm, and hematite-chlorite <0.1 mm), about 25% silica, 75% sericite>chlorite>hematite, trace hematite, 10% 0.5-5.0 mm calcite and quartz blebs (elongate-subround = feldspar ??), strong penetrative S_1=5-30°, S_2=25-30° (irregular) to core axis, <5% local foliation and cross-cutting calcite-quartz veins (<0.5 cm).

BB94021 24m
Dacite: Medium grey, massive, chlorite>sericite>quartz matrix, well sorted flattened lapilli (<6mm), slickensides and hematitic oxide on joint/fracture faces (1 m apart), disseminated magnetite and calcite in matrix, penetrative foliation strong at 45°, and is highly disruptive throughout.

BB94021 57m
Dacite lapilli tuff: dark green, massive, chlorite/sericite > quartz > calcite > hematite, well sorted, aligned and flattened lapilli (<8mm), strong penetrative foliation at 45° to core axis.

BB94021 200m
Diabase: dark green, massive with 0.5-2.0 mm rounded epidote knots, other larger 2-5 mm epidote and/or feldspar irregular patchy blebs, strong penetrative, patchy floiation (@30°) defined by epidote-quartz 'bands' and fine grained magnetite stringers.

BB94021 250m
Basalt/diabase: dark green (chlorite/sericite) altered, massive, magnetite disseminated through matrix (weak) and massive in stringers/veins, cross-cutting chlorite veins, weak patchy foliation at 45° to core axis.

BB94021 291m
Basalt: fine grained, dark green, massive, quartz-carbonate veins (10%, 0.5-1.0 cm), moderately strong banding defined by chlorite, grainy epidote and massive hematite, bands are alternating, undulating and wispy.

BB94011 385m
Diorite: pale green, massive, <5% 1-2 mm euhedral blocky pyroxene ghosts, altered to chlorite, matrix is fine grained feldspar phyric, broken core in 10-30 cm, cross-cut by <5% epidote-quartz veins.

SECTION 4+50N

BB93003 150m
Diabase: dark green, fine grained, grainy, massive, <25% 0.5 mm white feathery laths (feldspar?), strong pervasive chlorite alteration, strong penetrative foliation at 30° to core axis defined by flattened chlorite, trace magnetite veins and stringers, trace calcite veins.

BB94022 80m
Dacite tuff: dark green, very thin laminations defined by chlorite >>> sericite >>quartz >>> hematite, laminations <0.5 mm, trace hematite, moderately magnetic throughout, trace epidote in knots with hematite, quartz is grey, <10% white grainy 'feldspar' (<0.2 mm) defining laminatins, very strong penetrative S_1=50-90° disrupted by S_2 and minor faults.

BB94022 237m
Basalt tuff: dark green-purple, fine grained, well laminated, thin to medium thickness, hematite discontinuous bands to 1 cm (average 1-2 mm), hematite bands separating grainy 'feldspar crystal tuff' (grainy with 0.2 mm feldspars ?), <5% very fine grained magnetite laminations, strong pervasive chlorite-epidote-hematite alteration, local very strong epidote knots/washes, strong penetrative foliation at 60-70°.

BB94022 341m
Dacite tuff: medium grey, massive, penetrative foliation defined by elongate siliceous subround 0.2-2.0 mm subround 'fragments/crystals' with 0.1 mm white grainy 'feldspar' separated by very fine grained chlorite/sericite, 10% siliceous 'segregation' bands to 1 cm, strongly silicified, S_1=50-65°.

BB94022 394m
Dacite tuff: dark green, irregular poorly defined laminations (chlorite rich), strong penetrative foliation defined by vague chlorite +/- calcitic dismembered laminations/veins, grainy texture, strong pervasive chlorite-sericite alteration, trace hematite-jasper fragments to 2 mm, cross-cut by 5-8% quartz calcite veins/blobs to 10 cm, S_1=0-5°.

BB94023 95m
Dacite tuff: medium grey, fine grained, quartz-sericite altered matrix, strong penetrative foliation defined by siliceous, sericitic and hematitic laminae (S_1=30, S_2=45°), quartz blebs to 3 cm and veins to 10 cm.

BB94023 270m
Diabase: dark green, fine grained, chlorite-magnetite rich, 2-3% quartz-calcite veins, <5% 2-3 cm chlorite-epidote blebs, weak floiation or breccia close to massive quartz-carbonate veins.

BB94023 290m
Basalt: fine grained, homogeneous, massive, lime green feldspar phyric (sausseritic), magnetite occurs as groundmass and very fine grained blebe, quartz-calcite veins 0.5-5.0 mm.

BB94023 394m
Diabase: dark green, massive chloritic matrix, 10-15% cross-cutting quartz-calcite veins, strong penetrative foliation defined by chlorite/magnetite laminations (actinolite), wispy, elongate aligned blebs, S_1=30-35°.

BB94023 474m
Dacite lapilli tuff: Silica > epidote > sericite fragments in a fine grained dark green chlorite matrix, 40% elongate stretched and folded fragments.

file name: c:\wpdocs\bbthinse.ltr G. Price

Vancouver Petrographics Ltd.

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Report # 940455 for:

Georgina Price,
Redfern Resources Ltd.,
205 - 10711 Cambie Road,
RICHMOND, B.C., V6X 3G5

September 1994

Project: **Big Bull**
Samples: **BB94017 : 225 m, 246 m, 269 m, 321 m**
BB94018 : 48 m, 380 m
BB94020 : 217 m, 337 m
BB94021 : 24 m, 57 m, 202 m, 250 m, 291 m
BB94022 : 80 m, 237 m, 341 m, 394 m
BB94023 : 95 m, 270 m, 290 m, 394 m, 474 m

BB93003 : 150 m, 208 m
BB93011 : 385 m

Summary:

Samples are divided into a few main types. Metamorphosed felsic rocks are mainly of tuffaceous or tuffaceous sedimentary origin, with minor to moderately abundant, finely laminated, compositional bands, respectively. Some tuffs ~~contain~~ are moderately porphyritic (plagioclase). One sample is of a more massive, much less deformed, latite flow containing lathy plagioclase grains in the groundmass, which escaped recrystallization during metamorphism. The abundances of plagioclase phenocrysts, magnetite, and apatite may be significant for correlation of the tuffaceous rocks.

Most samples are described as latite rather than dacite because of the very low abundance of quartz. In some samples, very fine grained untwinned plagioclase and quartz are optically similar; thus some confusion exists in the actual plagioclase/ quartz ratio. Samples with more abundant quartz are described as latite/dacite or dacite. Some quartz is secondary, either of metamorphic segregation origin or replacement origin. Some misclassification may have resulted between latite and dacite due to interpretation of the abundance and nature of quartz. K-feldspar was not identified in thin section; it forms a minor phase in the groundmass of a few samples, and its distribution can be seen in the stained offcut block.

Mafic rocks commonly are slightly porphyritic (plagioclase and altered mafic minerals), and most are deformed strongly by D_1. They range widely in texture and alteration assemblages. Deformation generally is too intense to determine their origin. Herein, they are described as meta-diabase. A few samples may represent border phases of mafic intrusions or flows.

The main foliation in the samples is defined as S_1. It was warped and kink-folded (F_2) in varying degrees in many of the samples during a second pervasive deformation (D_2). F_2 kink folds are best developed in sericite-rich layers and rocks. In a few samples, D_2(?) is restricted to narrow, in part braided seams of cataclastic deformation, along which a few late veinlets were formed. This indicates that D_2 was pervasive, but of much lower intensity than D_1, and that shearing movement was concentrated in the weakest (i.e., sericite-rich) rocks and layers.

In a few samples, a weakly developed, later(?) kink to flow folding (D_3?) cuts across the plane of the axial-planar fracture cleavage of the F_2 folds.

Some of the field descriptions have interpreted tuffs as metamorphosed diabase. In general, the abundance of chlorite has been over-estimated. Some of this is because, in many samples, biotite is the major mafic mineral. Some is because the color index of aphanitic rocks tends to indicate a much higher content of colored minerals than colorless ones. One per cent of finely disseminated biotite or chlorite will give some of these rock a deep color. Also, many of the samples contain abundant very finely disseminated oxide (ilmenite, magnetite, hematite), which also tend to give the rock a high color index. The presence of moderately abundant leucoxene (secondary Ti-oxide) in many samples suggests that much of the opaque is ilmenite. (Note: no polished-section study was made on these samples).

John G. Payne, PhD.,
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Sample BB94017-225 m **Foliated Altered Meta-Diabase: Chlorite-Plagioclase; Lenses of Quartz-Chlorite-Calcite; Veinlets of Quartz, Calcite**

The sample is a strongly foliated, altered diabase composed mainly of chlorite and plagioclase, with minor Ti-oxide, quartz and calcite. Foliation is warped slightly, and textures suggest strong shear deformation. Lenses parallel to foliation are of quartz with less abundant chlorite, calcite, and opaque (pyrite?). A few quartz and calcite lenses cut across foliation at a moderate angle; these were deformed slightly.

chlorite	45-50%	
plagioclase	40-45	
Ti-oxide	2	
quartz	1	
calcite	0.2	
lenses, veinlets		
1) quartz-chlorite-calcite-(pyrite)	3- 4	(parallel to foliation)
2) quartz (crosscutting)	0.3	
3) calcite (crosscutting)	minor	

Chlorite and plagioclase form aggregates of interlocking grains averaging 0.005-0.01 mm in size. Chlorite also is concentrated in lenses and seams parallel to foliation; lenses average 0.8 mm long and 0.3 mm wide. A few lenses contain a subhedral to anhedral grain of opaque (pyrite?) averaging 0.05-0.07 mm in size. One seam/lens up to 0.4 mm wide contains in its core elongate, lenses averaging 0.02 mm wide of extremely fine grained opaque (pyrite?).

Ti-oxide (leucoxene) forms disseminated patches averaging 0.005-0.02 mm in size and a few patches up to 0.05 mm in size and lenses up to 0.2 mm long.

Quartz forms disseminated grains averaging 0.03-0.07 mm in size. It is concentrated moderately in lenses up to 0.05 mm wide and 1 mm long parallel to foliation as grains averaging 0.01-0.1 mm in size. Larger grains commonly are strained moderately and some original grains of this size probably were recrystallized to extremely fine subgrain aggregates.

Calcite forms disseminated, irregular patches averaging 0.01-0.05 mm in size. It also forms a few wispy, discontinuous veinlets up to 0.02 mm wide.

Opaque (pyrite?) forms a few clusters of subhedral grains averaging 0.02-0.1 mm in size intergrown with chlorite.

One main lens up to 1 mm wide and a few much smaller ones are dominated by quartz with less abundant calcite and chlorite and minor pyrite. Quartz forms submosaic aggregates commonly averaging 0.05-0.07 mm in grain size and locally 0.02 mm. Chlorite flakes are up to 0.1 mm long and commonly intergrown with quartz in lenses parallel to foliation. Opaque (pyrite?) forms subhedral to euhedral grains up to 0.1 mm in size. Calcite is concentrated in extremely fine grained seams, commonly along one margin of the lenses.

A few lenses up to 0.1 mm wide of quartz and minor ones up to 0.03 mm wide of calcite cut moderately across the foliation. Most of those of quartz were deformed slightly to moderately. Many are somewhat discontinuous.

Sample BB94017-246 m **Meta-Diabase: Plagioclase-Tremolite/Actinolite-Chlorite-Epidote; Veinlets of Tremolite/Actinolite-Calcite-Chlorite; Veinlet (?) of Quartz**

The sample is a moderately foliated, very fine grained, altered diabase dominated by plagioclase, with less abundant tremolite/actinolite, and minor to moderately abundant chlorite and epidote. Foliation is defined mainly by Ti-oxide lenses and chlorite segregation lenses. More strongly foliated parts of the sample contain chlorite in place of tremolite/actinolite. In a few places, the foliation is truncated by bands up to 1 mm wide of similar rock, but with foliation at a moderate angle to that in the main rock. Late veinlets are dominated by tremolite/actinolite with patches of calcite and of chlorite. One unusual veinlet(?) in dominated by quartz.

plagioclase	50-55%
tremolite/actinolite	20-25
chlorite	10-12
epidote	7- 8
Ti-oxide	1
calcite	0.3
pyrite	0.1
actinolite (porphyroblasts)	0.1
veinlets	
actinolite-(calcite-chlorite)	3- 4
quartz	0.5
plagioclase	minor

In the weakly deformed part of the rock, plagioclase and tremolite/actinolite are intergrown intimately. Plagioclase forms equant, moderately interlocking grains averaging 0.01-0.02 mm in size, with a few up to 0.05 mm across, and a few prismatic grains up to 0.12 mm long. A few lenses up to 0.4 mm wide are of aggregates of anhedral plagioclase grains averaging 0.07-0.2 mm in size and minor interstitial patches of chlorite. In these, plagioclase is altered slightly to extremely fine grained sericite. A few patches up to 1 mm across are of strongly interlocking aggregates of plagioclase averaging 0.01-0.03 mm in grain size; these may be secondary after original plagioclase phenocrysts. One equant patch 1.5 mm across of plagioclase with abundant epidote and minor actinolite may also be after a plagioclase phenocryst.

Tremolite/actinolite forms ragged, prismatic grains averaging 0.03-0.07 mm long and locally up to 0.1 mm long. Pleochroism is from pale to light green.

Calcite forms scattered anhedral patches averaging 0.1-0.2 mm in size and is concentrated as a few irregular, poikilitic porphyroblasts up to 1.5 mm in size.

Chlorite is concentrated in lenses averaging 0.5-0.8 mm long parallel to foliation; some of these contain patches of very fine grained epidote. One lens contains an elongate cluster of subhedral to euhedral pyrite(?) grains averaging 0.02-0.05 mm in size.

Epidote forms equant patches up to 0.05 mm across of anhedral grains averaging 0.02-0.05 mm in size. It also forms dense patches of cryptocrystalline aggregates which are concentrated moderately in a few layers.

Ti-oxide is concentrated in lenses parallel to foliation.

(continued)

Pyrite(?) forms disseminated grains averaging 0.02-0.03 mm in size.
Actinolite forms subhedral porphyroblasts averaging 0.2-0.4 mm long. Pleochroism is from light to medium green. Some of these are intergrown with patches of chlorite.

In the well foliated parts of the rock, chlorite is much more abundant than tremolite/actinolite. Chlorite also forms lenses up to 0.8 mm wide and 2 mm long of feathery, interlocking grains. These lenses also contain minor to locally moderately abundant equant grains of epidote averaging 0.03-0.07 mm in size. A few contain moderately abundant opaque (pyrite?) as grains averaging 0.01-0.05 mm in size and a few up to 0.25 mm across.

Veinlets up to 0.6 mm in width are dominated by aggregates of ragged to subhedral, prismatic actinolite grains averaging 0.05-0.1 mm long, with patches in some of very fine grained calcite. One also contains a patch of very fine grained quartz in its core surrounded by actinolite containing moderately abundant opaque (possibly in part chalcopyrite).

One diffuse, veinlike zone contains scattered anhedral to euhedral crystals of quartz averaging 0.2-0.5 mm in size and locally up to 0.9 mm long. These are surrounded by plagioclase with minor patches of actinolite and of chlorite.

A few wispy veinlets up to 0.05 mm wide of extremely fine grained plagioclase cut across the foliation at a moderate angle.

Sample BB94017-269 **Meta-Diabase: Plagioclase-Epidote-Chlorite-Tremolite/Actinolite; Veinlets of Quartz, Plagioclase; Cataclastic Seams; Late Veinlets of Chlorite-(Calcite-Quartz)**

The sample is dominated by plagioclase with less abundant epidote, chlorite and tremolite/actinolite. A moderate foliation is defined by elongation of mineral grains and of lenses of chlorite and epidote. A few quartz and plagioclase-rich veinlets cut across the foliation and are warped slightly. Seams of cataclastic deformation cut the rock at various angles to foliation; along a few of these are veinlets of chlorite-(calcite-quartz).

plagioclase	50-55%
epidote	12-15
chlorite	10-12
tremolite/actinolite	10-12
Ti-oxide	2
opaque (pyrite?)	0.3
segregation patches	
chlorite-epidote-(pyrite)	3- 4
early veinlets	
1) quartz-(pyrite?-chlorite)	0.1
2) plagioclase	minor
cataclastic deformation seams	3- 4
late veinlets	
3) chlorite-(calcite-quartz-pyrite)	0.3

Plagioclase forms equant to slightly prismatic grains averaging 0.02-0.03 mm in size and a few up to 0.1 mm long. Some elongate grains are oriented parallel to foliation. A few patches up to 1.7 mm in size dominated by very fine grained, plagioclase probably are secondary after plagioclase phenocrysts (1-2% of the rock). The largest one contains abundant disseminated patches of epidote. Others contain patches of tremolite/actinolite or of Ti-oxide.

Tremolite/actinolite forms ragged, prismatic grains averaging 0.03-0.07 mm long, and subhedral to euhedral crystals averaging 0.1-0.15 mm long and locally up to 0.25 mm long; most of the latter are oriented parallel to foliation. A few of the larger grains are kink-folded.

Epidote forms irregular patches of cryptocrystalline to extremely fine grains.

Chlorite forms disseminated grains averaging 0.005-0.01 mm in size. It is concentrated moderately in interstitial patches and lenses up to 1.8 mm long, mainly parallel to foliation. Many of the patches contain moderately abundant epidote concentrated along the margins of the patch as equant, subhedral grains averaging 0.05-0.07 mm in size. In a few patches epidote is dominant. A few patches contain subhedral to euhedral pyrite grains averaging 0.05-0.2 mm in size.

Ti-oxide forms wispy lenses and patches averaging 0.05-0.1 mm in size, commonly elongated parallel to foliation.

A few veinlets up to 0.1 mm wide cut irregularly across the foliation and are warped slightly by it. They are dominated by very fine to extremely fine grained quartz with minor interstitial patches of chlorite. A few similar, discontinuous veinlets up to 1.5 mm long are of very fine to extremely fine grained plagioclase.

The rock was deformed cataclastically in braided seams up to 0.4 mm wide; these are dominated by cryptocrystalline aggregates, probably dominated by epidote. Adjacent to some of these, foliation in the rock is warped slightly. A few late veinlets up to 0.1 mm wide associated with the cataclastic seams are dominated by chlorite. One of these has a core of calcite 0.01 mm wide. One seam contains a lens 0.8 mm long of quartz with patches of opaque (pyrite?) up to 0.3 mm in size.

Sample BB94017-321 m **Metamorphosed Porphyritic Latite Tuff; Andesite Fragment; Veinlets of Calcite-Chlorite-Pyrite**

Phenocrysts of plagioclase are set in an extremely fine grained, strongly compositionally banded groundmass, with some bands dominated by plagioclase-(chlorite-opaque) and others by sericite. Chlorite and much less abundant biotite each are prominent in a few layers. Quartz forms scattered patches, some of which may be of replacement origin. The rock was contorted very strongly in flow folds in which mineral grains are warped around fold axes. Sericite-rich layers were deformed most strongly, and some contain abundant, irregular kink folds as well. An exotic fragment is of hypabyssal andesite. Late veinlets of calcite-chlorite-pyrite cut the folds.

phenocrysts		
plagioclase	4- 5%	
groundmass		
plagioclase	60-65	
sericite	17-20	
quartz	4- 5	
opaque	3- 4	(in part magnetite)
chlorite	3- 4	
biotite	0.2	
calcite	0.1	
apatite	trace	
fragment		
hypabyssal andesite	0.5	
veinlets		
calcite-chlorite-pyrite	0.5-1	

Plagioclase forms subhedral, prismatic phenocrysts averaging 0.3-0.5 mm in length and a few from 0.7-2 mm long. Many have slightly irregular grain borders caused by recrystallization to extremely fine subgrain aggregates. Alteration is slight to irregular patches of calcite and flakes of sericite.

In the groundmass, plagioclase forms slightly to moderately interlocking grains averaging 0.005-0.015 mm in size intergrown with much less abundant flakes of chlorite, which are oriented parallel to foliation.

Sericite is concentrated moderately to strongly in wispy to dense seams averaging 0.2-0.7 mm thick and locally from 1- 2 mm thick as extremely fine grained aggregates.

Quartz forms disseminated grains and patches of grains averaging 0.02-0.05 mm in size. It is concentrated moderately, commonly with plagioclase, in patches and lenses up to 0.3 mm wide parallel to foliation; in these, grains are extremely fine to very fine.

Opaque/semi-opaque forms abundant disseminated grains averaging 0.005-0.01 mm in size, and a few from 0.02-0.05 mm in size. It is concentrated moderately to strongly in some plagioclase-rich layers. Opaque forms a few lenses and patches up to 1.5 mm long of grains averaging 0.015-0.05 mm in size. The rock is moderately magnetic, indicating that some of the opaque is magnetite.

(continued)

Biotite is concentrated strongly in a few lenses with plagioclase and quartz and occurs as disseminated grain in a few other layers. Grains average 0.02-0.03 mm in size and have slight pleochroism from light to light/medium brown.

Calcite forms ragged patches averaging 0.03-0.05 mm in size and a few up to 0.1 mm across.

Apatite forms anhedral, equant grains averaging 0.02-0.03 mm in size and a few up to 0.17 mm across, mainly in sericite-rich layers.

An exotic fragment 3 mm across is dominated by prismatic plagioclase grains averaging 0.2-0.5 mm in length. Epidote forms a few ragged patches up to 0.4 mm in size of very fine grains. Interstitial patches are of extremely fine grained chlorite and moderately abundant dusty to extremely fine grained opaque.

Two late veinlets averaging 0.05-0.15 mm wide and locally up to 0.25 mm wide consist of very fine grained calcite and chlorite with scattered patches up to 0.6 mm in size of pyrite.

Sample BB94018-48 m Metamorphosed Porphyritic Latite Tuff

Phenocrysts of plagioclase are set in a groundmass dominated by extremely fine grained plagioclase and sericite with moderately abundant opaque (partly magnetite). Abundant replacement lenses and patches are of quartz-calcite-(sericite).

phenocrysts		
plagioclase	5- 7%	
groundmass		
plagioclase		
extremely fine grained	60-65	
recrystallized	5- 7	
sericite	12-15	
opaque/semi-opaque	2- 3	(partly magnetite)
calcite	0.4	
apatite	0.4	
K-feldspar	0.2	
chlorite	trace	
biotite	trace	
replacement lenses, patches		
quartz	5- 7	
calcite	2	
sericite	0.2	
cataclastic seams	0.1	

Plagioclase forms subhedral to anhedral phenocrysts averaging 0.2-0.6 mm in size. In detail, borders of grains range from sharp to irregularly intergrown with groundmass plagioclase. Alteration is slight to sericite and calcite. Dusty opaque is moderately abundant.

Plagioclase-rich groundmass is dominated by interlocking grains averaging 0.01-0.03 mm in size. Intergrown with these are minor flakes of sericite and of chlorite and dusty, disseminated opaque. Scattered patches in the groundmass are recrystallized to interlocking aggregates of plagioclase grains averaging 0.03-0.05 mm in size; these commonly contain minor sericite or calcite, but are relatively free of dusty opaque inclusions. These patches grade texturally into quartz-rich replacement patches, and in places optical distinction between quartz and plagioclase is impossible.

Sericite/muscovite is concentrated slightly to strongly in mica-bearing to mica-rich seams. These are warped moderately to locally tightly. Muscovite flakes are up to 0.15 mm long.

Opaque (in part magnetite) forms disseminated grains ranging from dusty to 0.1 mm in size. Semi-opaque (probably leucoxene) forms patches of dusty to cryptocrystalline grains, in part intergrown with opaque.

Calcite forms irregular, disseminated patches averaging 0.05-0.1 mm in size.

Apatite forms disseminated grains averaging 0.05-0.15 mm in size and moderately abundant prismatic grains up to 0.35 mm long.

The stained offcut block indicates that K-feldspar is concentrated in wispy seams and patches; it could not be recognized in thin section.

(continued)

Biotite forms pale to light brown flakes averaging 0.01-0.02 mm in size; it is concentrated moderately in some plagioclase-rich layers.

Replacement patches up to a few mm in size are of very fine grained quartz with scattered to moderately abundant, ragged patches of calcite and minor patches of sericite/muscovite and disseminated grains of opaque. A few related veinlets up to 0.15 mm in width are of extremely fine, interlocking quartz grains, whose textures suggest that they were deformed.

The rock is cut by a few wispy seams of cataclastic deformation up to 0.1 mm wide. Narrower parts of these contain abundant dusty opaque which masks any other minerals in much of the seams. Locally, opaque forms grains averaging 0.03-0.07 mm in size which straddle the seams. In wider parts of the seams, sericite was recrystallized to unoriented, extremely fine grained aggregates.

Sample BB94018-380 m **Metamorphosed, Porphyritic Latite Tuff; Replacement Patches of Quartz-Calcite; Veinlets of Calcite-Quartz and Calcite-Chlorite-Opaque**

Phenocrysts of plagioclase are set in a variable, compositionally banded groundmass dominated by plagioclase, with a few seams rich in sericite and opaque (in large part magnetite). Strong fold range from flow to locally kink in character; deformation is concentrated in and near a sericite-opaque-rich layer. Replacement patches are of quartz-calcite with minor chlorite and opaque. Veinlets are of calcite-quartz and calcite-chlorite-opaque.

phenocrysts			
plagioclase	5- 7%		
groundmass			
plagioclase	70-75	chlorite	0.3%
sericite	12-15	biotite	0.1
calcite	2- 3	apatite	trace
opaque	2- 3 (in part magnetite)		
replacement patches			
quartz	3- 4	chlorite	minor
calcite	0.5	opaque	minor
veinlets			
calcite-quartz	0.3		
calcite-chlorite-opaque-(biotite)	0.1		

Plagioclase forms subhedral, commonly elongate phenocrysts averaging 0.3-0.6 mm long and equant grains averaging 0.1-0.2 mm across. Extinction in many elongate phenocrysts is wavy, indicating that the grains were strained moderately.

The groundmass is dominated by interlocking grains of plagioclase averaging 0.01-0.02 mm in size. Scattered patches up to 1 mm in size are of plagioclase grains averaging 0.03-0.05 mm in size with minor to locally moderately abundant interstitial flakes of sericite and chlorite. In plagioclase-rich groundmass, sericite and minor chlorite form disseminated flakes and wispy seams. Calcite forms disseminated, irregular patches averaging 0.05-0.1 mm in size.

Opaque (in part magnetite) forms disseminated grains which range from dusty to 0.1 mm in size. It is concentrated moderately to strongly in a few lenses parallel to foliation.

Sericite is concentrated moderately to strongly in seams, most of which range from wispy to 0.1 mm wide. One major band at one end of the section is 1-2 mm wide is dominated by sericite and contains abundant lenses up to 0.3 mm wide of opaque (mainly magnetite). Locally the band is dominated by opaque. This band and the contact between it and the plagioclase-rich layers was deformed very strongly into a tight fold with irregular limbs. In the nose of the fold, the opaque-rich band was broken and fragments displaced slightly. No axial planar cleavage was identified. Kink-folds occur in the sericite-rich parts of this band and a few smaller ones; they are irregular in character and do not have a preferred orientation.

Biotite is concentrated in a few seams as clusters of flakes averaging 0.01-0.02 mm in size; pleochroism is from pale to light/medium brown.

Apatite forms disseminated, equant grains averaging 0.01-0.025 mm in size.

(continued)

Sample BB94018-380 m (page 2)

Replacement patches up to 2 mm in size are of very fine to locally fine grained quartz with minor to moderately abundant, extremely fine to very fine grained calcite, and minor disseminated flakes of chlorite and euhedral grains of pyrite up to 0.1 mm in size. In some patches, quartz grains are strained moderately and have strongly sutured grain borders, indicating that they were deformed; in others quartz is unstrained.

A few lensy veinlets up to 0.4 mm wide are of fine grained calcite and less abundant patches of very fine grained quartz. A few lenses up to 1 mm long are of single grains of calcite; these resemble calcite in the veins. One veinlet 0.1 mm wide is of calcite or calcite-chlorite-(biotite) where it cuts the plagioclase-rich zones outside the fold, and opaque where it cuts the sericite-opaque-rich layer and where it cuts the plagioclase-rich layer in the nose of the fold.

Sample BB943011-385 m **Porphyritic Meta-Diabase: Plagioclase-Epidote-Biotite; Veinlets of Plagioclase, Quartz, Biotite**

Phenocrysts of plagioclase (recrystallized) and pyroxene (altered completely to chlorite-(biotite) are set in an extremely fine grained groundmass dominated by plagioclase and epidote with less abundant chlorite and minor biotite. Veinlets are of quartz-(biotite-calcite-opaque).

phenocrysts	
plagioclase	7- 8%
pyroxene (?)	2- 3
groundmass	
plagioclase	40-45
epidote	35-40
chlorite	4- 5
biotite	1
opaque	0.3
veinlets	
quartz-(biotite-calcite-opaque)	4- 5

Plagioclase forms subhedral phenocrysts averaging 0.5-0.8 mm in size and a few up to 1.2 mm in size. They are recrystallized to extremely fine grained aggregates of plagioclase with minor to moderately abundant patches of cryptocrystalline epidote.

Pyroxene forms a few subhedral, equant phenocrysts averaging 0.7-1.7 mm in size. Alteration is complete to extremely fine grained chlorite and minor to moderately abundant patches of biotite-opaque (ilmenite?). A few patches up to 0.7 mm across of extremely fine grained biotite may be secondary after pyroxene or hornblende phenocrysts. A few phenocrysts (of pyroxene or hornblende) are replaced by extremely fine to very fine grained aggregates of chlorite and plagioclase/quartz with minor biotite and opaque.

The groundmass is dominated by a massive intergrowth of plagioclase grains averaging 0.01-0.02 mm in size and ragged patches averaging 0.05-0.1 mm in size of cryptocrystalline to extremely fine grained epidote. Chlorite forms interstitial grains averaging 0.005-0.01 mm in size, mainly in plagioclase, and is concentrated in patches averaging 0.05-0.15 mm in size.

Biotite forms patches averaging 0.05-0.15 mm in size of extremely fine grains and forms disseminated grains associated with chlorite. Pleochroism is from light to medium brown.

Opaque forms disseminated grains averaging 0.02-0.03 mm in size and a few ragged patches up to 0.3 mm in size.

A few veins averaging 0.15-0.3 mm wide are of very fine to extremely fine grained quartz with minor to moderately abundant patches of very fine grained biotite and scattered patches of very fine grained calcite. Textures in a few suggest that quartz was recrystallized. Opaque forms a few equant grains up to 0.07 mm in size, mainly associated with calcite. A few discontinuous veinlets averaging 0.03-0.07 mm wide are of extremely fine to very fine grained quartz. One veinlet 0.3 mm wide is dominated by calcite and biotite with patches of opaque (pyrite?) and only minor quartz.

Sample BB94020-217 m **Metamorphosed, Deformed Tuffaceous Sedimentary Latite; Veinlets and Lenses of Quartz-(Biotite); Vein of Calcite-Opaque-Quartz-(Chlorite)**

The rock is strongly compositionally banded, with layers dominated by one or more of plagioclase, sericite, opaque, and biotite. Quartz and locally biotite are concentrated in a few lenses parallel to foliation. Drag and kink folds (F_2) on the scale of 0.1-0.5 mm are abundant, especially in sericite-rich and opaque-rich layers. Locally they are smeared out along an axial-plane fracture cleavage (S_2), which is best developed in sericite-rich layers. A few later kink folds cut across S_2 at a high angle; one includes a lensy veinlet of quartz-(biotite). A late vein is of calcite-opaque-quartz-(chlorite).

phenocrysts(?)			
quartz	trace		
groundmass			
plagioclase	40-45%	**segregation lenses**	
sericite	30-35	quartz-(biotite)	0.3%
opaque	7- 8	**vein, veinlets**	
biotite	4- 5	calcite-opaque-quartz-(chlorite)	0.5
epidote	0.5	quartz-(biotite)	0.1
chlorite	0.2		
apatite	minor		

One anhedral quartz grain (possibly a phenocryst) is 0.4 mm across. Extinction is strained moderately. The grain is texturally similar to quartz in the calcite-opaque-quartz vein.

Plagioclase forms grains averaging 0.01 mm in size commonly intergrown intimately with sericite and much less biotite.

Sericite and biotite are concentrated slightly to strongly into seams up to 2 mm wide. Mica flakes average 0.01-0.03 mm long. In the zone of abundant opaque seams, biotite is concentrated moderately (at the expense of sericite). Biotite is pleochroic from pale to light brownish green.

Opaque/semi-opaque (probably ilmenite/leucoxene) is concentrated moderately to strongly in wispy to dense seams and lenses averaging 0.03-0.1 mm wide. These are concentrated moderately in one end of the section. One opaque-rich seam ranges form 0.2-1.2 mm wide. Grain size averages dusty to 0.02 mm. Opaque (pyrite?) forms a few subhedral to euhedral, equant grains averaging 0.07-0.2 mm in size.

Epidote forms disseminated, subhedral to euhedral, prismatic grains averaging 0.03-0.05 mm long, and ragged clusters up to 0.1 mm in size of anhedral grains. Chlorite is concentrated strongly in a few very fine grained patches up to 0.7 mm in size. Apatite forms disseminated grains averaging 0.03-0.06 mm in size and a few up to 0.12 mm across.

A few lenses up to 0.3 mm wide and 1.5 mm wide parallel to foliation are of extremely fine to very fine grained quartz. One layer(?) or replacement lens up to 1 mm wide is of very fine grained quartz and moderately abundant, extremely fine grained biotite.

A few late, lensy veinlets up to 0.2 mm wide of very fine grained quartz and minor biotite cut across folded compositional bands.

A lensy vein up to 0.9 mm wide is of very fine grained calcite and opaque with less abundant chlorite and a few grains of quartz up to 1.2 mm in size. Quartz grains are strained moderately. Opaque (pyrite) forms euhedral grains averaging 0.02-0.15 mm in size.

Sample BB94020-337 m **Metamorphosed, Porphyritic Latite/Dacite; Veins of Calcite-Quartz**

Phenocrysts of plagioclase are set in a well foliated, compositionally banded groundmass dominated by plagioclase, sericite, quartz, and opaque. Coarser grained patches, in part of metamorphic segregation origin, are of plagioclase-quartz and quartz-calcite. Late deformation produced abundant minor flow and kink folds, mainly in sericite- and sericite-opaque-rich layers; these commonly have a weak axial-planar foliation. Veins of calcite-quartz cut the deformed rock; textures suggest that some quartz was deformed and recrystallized.

phenocrysts	
plagioclase	5- 7%
groundmass	
plagioclase	60-65
sericite	12-15
quartz	8-10
opaque	4- 5
calcite	1- 2
chlorite	0.3
biotite	0.1
apatite	trace
veins, veinlets	
calcite-quartz	3- 4

Plagioclase forms subhedral phenocrysts averaging 0.2-0.6 mm in size and a few up to 1 mm long. Alteration is slight to locally moderate to calcite and sericite. Most contain very fine, dusty opaque inclusions, probably hematite.

In the groundmass, plagioclase commonly forms interlocking grains averaging 0.015-0.025 mm in size; these grade into coarser grained lenses and patches of grains of plagioclase and minor to moderately abundant quartz averaging 0.02-0.04 mm in size. In the latter, calcite forms scattered, irregular patches averaging 0.05-0.08 mm in size. These grade into lenses up to 1 mm wide of very fine grained quartz and minor to moderately abundant calcite. A few segregation lenses up to 0.3 mm wide parallel to foliation are of plagioclase and calcite grains averaging 0.07-0.15 mm in size.

Sericite is concentrated moderately to strongly in sericite-rich seams and bands up to 2 mm wide. Some of these contain moderately abundant to abundant seams of opaque up to 0.05 mm wide. Wider sericite-rich bands commonly contain minor kink folds. These generally do not continue into adjacent sericite-poor layers.

Opaque and much less semi-opaque (ilmenite/leucoxene?) forms disseminated grains averaging from dusty to 0.02 mm in size. It is concentrated moderately to strongly in layers and lenses parallel to foliation. The largest of these is an opaque-rich seam averaging 0.8-1.5 mm wide. In this opaque and plagioclase are intergrown intimately as grains averaging 0.005-0.01 mm in size. Opaque also forms irregular patches up to 0.4 mm across and lenses parallel to foliation, and plagioclase forms a few phenocrysts averaging 0.15-0.3 mm in size. Sericite forms a few patches up to 0.5 mm long. The second largest is a band up to 2 mm wide which in places is dominated by opaque-(plagioclase) and in places is dominated by sericite with coarse lenses of opaque. The sericite-opaque zone is folded tightly and irregularly in flow and kink folds.

(continued)

Chlorite forms disseminated flakes averaging 0.005-0.015 mm in size and is concentrated slightly in patches with calcite.

Biotite forms disseminated flakes and clusters up to 0.15 mm in size of flakes, mainly concentrated in sericite-rich layers. Pleochroism of biotite is from pale to light greenish brown.

Apatite forms a few subhedral, prismatic grains up to 0.2 mm long; these are broken along basal parting planes into a few segments.

Veins averaging 0.1-0.4 mm wide and one 0.8 mm wide are dominated by very fine to fine grained calcite and very fine to extremely fine grained quartz. These cut across the folded rock; textures in quartz suggest that they were recrystallized.

Sample BB94021-24 m Metamorphosed Dacite Tuff

Minor phenocrysts of plagioclase are set in a well foliated groundmass dominated by plagioclase, sericite, and quartz. Sericite is concentrated moderately in a few sericite-rich lenses; some of these contain minor kink folds, whose axes are subparallel to the regional foliation.

phenocrysts		
plagioclase	1- 2%	
groundmass		
plagioclase	60-65	
sericite	10-12	
quartz	10-12	
biotite	1- 2	
K-feldspar	1	
calcite	1	
opaque (ilmenite?)	1	(includes semi-opaque = leucoxene?)
opaque (pyrite?)	0.3	
apatite	0.2	
hematite	minor	
recrystallized/replacement patches, lenses, veinlets		
quartz	8-10	
calcite	1	
biotite	0.2	
late seam		
opaque-biotite	minor	

Plagioclase forms scattered, anhedral to subhedral phenocrysts averaging 0.2-0.3 mm in size and a few up to 0.7 mm across. Grain borders are slightly intergrown with groundmass plagioclase-quartz. Alteration is slight to ragged patches of calcite and minor sericite and/or biotite.

The groundmass is dominated by interlocking grains of plagioclase and less abundant quartz averaging 0.01-0.03 mm in size. Coarser grained patches averaging 0.02-0.05 mm in grain size may have formed by recrystallization during metamorphism.

Sericite is concentrated moderately in sericite-rich seams and lenses up to 0.5 mm wide. A few wider lenses contain tiny kink folds. Sericite also occurs in a few narrow seams along a second orientation (S_2?) at about 45° to the main foliation plane.

K-feldspar is disseminated throughout the groundmass (see stained offcut block).

Opaque (magnetite and ilmenite?) and lesser semi-opaque (leucoxene after ilmenite) form disseminated grains averaging 0.005-0.015 mm in size. Opaque (pyrite?) forms disseminated, subhedral to euhedral grains averaging 0.05-0.01 mm in size.

Biotite is concentrated in patches and lenses, in part associated with opaque, as grains averaging 0.01-0.015 mm in size. Pleochroism is from pale/light to light/medium greenish brown.

Apatite forms disseminated, anhedral to subhedral grains averaging 0.03-0.05 mm in size, and a few up to 0.1 mm in size.

(continued)

Red-brown hematite is concentrated in a few lenses up to 2 mm long as moderately abundant disseminated grains averaging 0.005-0.01 mm in size.

Quartz is concentrated moderately in irregular patches and lenses up to 0.5 mm in size as interlocking grains averaging 0.03-0.07 mm in size. Larger patches up to 2 mm in size, probably in part of metamorphic segregation origin and in part of replacement origin, are dominated by quartz with patches of calcite and minor biotite. In these, quartz grains are up to 0.5 mm in size; many grains over 0.2 mm in size are strained moderately and were recrystallized slightly to much finer subgrain aggregates.

A major replacement lens up to 2 mm wide is dominated by fine to medium grained quartz with minor disseminated, ragged grains of calcite. Coarser quartz grains are strained moderately and recrystallized moderately to much finer subgrain aggregates.

A few discontinuous veinlets up to 0.4 mm wide and probably genetically associated with the replacement patches are of very fine grained calcite or quartz. They commonly occur parallel to S_2.

A late seam 0.01-0.03 mm wide is dominated by opaque with moderately abundant biotite; the age of this relative to S_2 is uncertain.

Sample BB94021-57 m **Metamorphosed Slightly Porphyritic Dacite; Quartz-Epidote-(Calcite) Patches**

Scattered phenocrysts of plagioclase are set in a well foliated, moderately compositionally banded groundmass dominated by layers rich in plagioclase-(quartz-sericite) and in sericite-(opaque-biotite). Sericite-rich bands are folded tightly and a few contain abundant, tightly spaced kink folds. A few secondary patches are of quartz-epidote-(calcite). A few late seams are of cataclastic deformation.

phenocrysts			
plagioclase	3- 4%		
groundmass			
plagioclase	50-55	apatite	0.2%
sericite	30-35	chlorite	minor
opaque	3- 4	epidote	minor
quartz	2- 3	garnet	trace
phlogopite/biotite	2- 3		
replacement lenses, patches, veinlets			
quartz-epidote-(calcite)	0.5		
cataclastic deformation seams	0.5		

Plagioclase forms subhedral to anhedral phenocrysts averaging 0.2-0.5 mm in size and a few up to 1 mm long. Grains are recrystallized to finer, subgrain aggregates and are altered slightly to calcite and sericite. A few patches also contain moderately abundant biotite flakes averaging 0.05 mm in size; pleochroism of biotite is from pale to light greenish brown.

In the plagioclase-rich layers in the groundmass, plagioclase and minor quartz form interlocking grains averaging 0.01-0.025 mm in size, and some patches and lenses averaging 0.02-0.03 mm in size. Sericite forms disseminated flakes and wispy seams.

Sericite is concentrated strongly in sericite-rich layers up to a few mm wide. In some layers, tightly spaced kink folds are common. Phlogopite/biotite is concentrated moderately to strongly in some mica-rich layers up to 0.3 mm wide as extremely fine grained aggregates with pleochroism from very pale to pale brown. Chlorite forms disseminated flakes and patches of a few flakes averaging 0.015-0.02 mm in size.

Opaque (ilmenite?) is concentrated moderately to strongly in seams and lenses, mainly in or near sericite-rich layers. Grain size averages 0.01-0.03 mm. Opaque forms a few patches up to 0.7 mm in size.

Apatite forms disseminated anhedral grains averaging 0.02-0.05 mm in size and a few up to 0.3 mm long. Epidote forms disseminated grains averaging 0.02-0.03 mm in size. It is concentrated in one folded seam in a sericite-rich layer adjacent to a replacement patch of quartz-epidote. Garnet forms two ragged, equant grains 0.25-0.3 mm in size.

Quartz, epidote, and minor calcite are concentrated in late lenses and equant patches. Quartz forms anhedral grains averaging 0.03-0.07 mm in size. Epidote forms subhedral to euhedral, prismatic grains averaging 0.07-0.15 mm long and a few acicular grains up to 0.4 mm long. Calcite forms grains averaging 0.05-0.07 mm in size.

A few late, in part braided seams up to 0.15 mm wide are of cataclastic deformation in which the rock was granulated.

Sample BB94021-202 m **Metamorphosed Andesite Tuffaceous Sedimentary Rock; Replacement Lenses of Quartz, Patches of Epidote**

The rock is a finely laminated, tuffaceous meta-sedimentary andesite/latite dominated by sericite and plagioclase with moderately abundant chlorite and epidote, and minor biotite and opaque. A few layers contain abundant opaque. Primary foliation (F_1) parallel to the compositional layers was deformed strongly with development of tightly spaced F_2 folds with wavelengths ranging from 0.05 to 5 mm. Quartz forms lenses parallel to F_1, probably formed by metamorphic segregation. Epidote forms replacement patches, commonly with a radiating texture.

phenocrysts	
plagioclase	0.5%
groundmass	
sericite	35-40
plagioclase	30-35
chlorite	10-12
epidote	5- 7
opaque	2- 3
quartz	2- 3
biotite	1- 2
apatite	minor
replacement patches	
quartz	3- 4
epidote	2- 3
chlorite	0.3
cataclastic deformation seams	minor

Plagioclase forms scattered, subhedral phenocrysts averaging 0.2-0.5 mm in size.

Sericite-rich layers are tightly folded, with extremely fine grained sericite and less abundant chlorite flakes warped around tight kink and flow folds averaging 0.1 mm in wave length. Opaque/semi-opaque (probably ilmenite/leucoxene) forms disseminated grains and lenses parallel to primary foliation. Opaque is concentrated strongly in one layer up to 0.6 mm wide. Epidote forms disseminated grains up to 0.15 mm in size.

With increasing content of plagioclase, sericite-rich layers grade into plagioclase-rich layers in which plagioclase and minor to moderately abundant quartz form interlocking grains averaging 0.01-0.02 mm in size. Epidote is moderately abundant as disseminated grains averaging 0.02-0.04 mm in size. Chlorite and minor sericite form interstitial flakes. Biotite is concentrated moderately in a few mica-rich layers; pleochroism is from pale to light/medium greenish brown.

Apatite forms equant grains averaging 0.03-0.05 mm in size.

Lenses up to 1.5 mm long parallel to S_1 are of slightly interlocking quartz grains averaging 0.015-0.03 mm in size, with minor interstitial epidote, chlorite and sericite; these are folded about F_2 folds averaging 0.8-1.5 mm in wavelength.

Epidote forms dense replacement patches up to1.5 mm in size of extremely fine to very fine grains. Many have a poorly developed, radiating texture. Some contain interstitial patches of extremely fine grained chlorite.

A few wispy late seams up to 0.01 mm wide are of cataclastic deformation.

Sample BB94021-250 m **Metamorphosed Andesite Crystal Tuff or Strongly Deformed Meta-Diabase Sill/Flow; Actinolite-(Quartz) Veinlets**

Abundant phenocrysts and crystal fragments of plagioclase and a few phenocrysts of hornblende (altered to chlorite-actinolite-pyrite) are set in a groundmass dominated by extremely fine grained plagioclase and patches of epidote with less abundant actinolite, opaque, and chlorite. A few replacement lenses are of plagioclase. A few subparallel veinlets are of actinolite with minor quartz.

phenocrysts, crystal fragments			
plagioclase	25-30%	**replacement lenses**	
hornblende	2- 3	plagioclase	0.2
groundmass			
plagioclase	25-30	**veinlets**	
epidote	20-25	actinolite	1- 2%
actinolite	10-12	quartz	minor
chlorite	3- 4		
opaque	3- 4		

Plagioclase forms phenocrysts and crystal fragments averaging 0.1-0.4 mm in size and a few from 1-2 mm long. One patch 1.8 mm across of very fine to fine grained plagioclase intergrown with abundant epidote probably is secondary after a large plagioclase phenocryst. Several large phenocrysts are replaced moderately to strongly by extremely fine grained plagioclase with minor disseminated flakes of chlorite (as in the groundmass)

Hornblende forms a few subhedral phenocrysts averaging 0.7-1.3 mm long and one 2.5 mm long. Alteration is complete; In a few grains it is to extremely fine to very fine grained actinolite, with or without patches of chlorite, and with moderately abundant disseminated pyrite grains averaging 0.02-0.05 mm in size. A few grains are altered completely to unoriented to subparallel aggregates of very fine grained chlorite and moderately abundant disseminated, euhedral grains of pyrite(?) averaging 0.02-0.07 mm in size.

The groundmass is composed of plagioclase, epidote, actinolite, chlorite, and opaque in widely varying abundances. Plagioclase forms grains averaging 0.005-0.01 mm in size. Epidote forms patches of cryptocrystalline to very fine grains, in part intergrown with actinolite. Actinolite forms clusters of ragged prismatic grains up to 0.15 mm in size. Pleochroism is from light to medium/dark green. Chlorite forms extremely fine grained flakes in patches and in selvages between plagioclase phenocrysts/crystal fragments. Pleochroism is from light yellowish green to light/medium green. Opaque (ilmenite and minor magnetite) and much less abundant semi-opaque (leucoxene after ilmenite) are concentrated in lenses averaging 0.1-0.2 mm long and locally up to 0.4 mm long.

A few lenses up to 1.5 mm long are of interlocking plagioclase grains averaging 0.005-0.01 mm in size with minor interstitial flakes of chlorite: lenses are foliated parallel to their length.

A bulbous veinlet averaging 0.2-0.35 mm wide is of very fine grained, commonly prismatic actinolite. A few lenses along a two wispy seams (probably of cataclastic deformation) parallel to the main veinlet are of actinolite and minor quartz.

Sample BB94021-291 m **Metamorphosed Andesite Tuffaceous Sedimentary Rock; Veins of Calcite-(Chlorite) with Biotite Envelopes; Biotite-(Calcite) Veinlets**

The rock is a moderately compositionally banded, tuffaceous sedimentary andesite dominated by plagioclase with less abundant chlorite, opaque, and biotite. A few fragments are of latite flow. Foliation (F_1) is warped moderately to strongly by F_2 flow folds on the scale of 2-5 mm. Abundant late veins are dominated by calcite with biotite envelopes. Smaller biotite-(calcite) veins do not show a preferred orientation.

plagioclase	50-55%
chlorite	20-25
opaque	7- 8
biotite	4- 5
quartz	2- 3
calcite	0.3
apatite	trace
fragments	
latite flow	minor
segregation lenses	
quartz-(plagioclase-chlorite)	0.5
veins, veinlets	
calcite-(chlorite) with biotite envelopes	5- 7
biotite-(calcite)	1- 2

Much of the rock is of bands composed of plagioclase with moderately abundant chlorite and much less abundant opaque and biotite, in which grains average 0.01-0.015 mm in size. A few plagioclase-rich layers and lenses are of similar to slightly coarser grain size (up to 0.1 mm); these contain minor to moderately abundant interstitial chlorite. These grade into plagioclase-quartz-rich lenses with decreasing mafic mineral content, and into plagioclase-opaque-rich layers with increasing opaque content. Opaque is concentrated strongly in a few opaque-rich seams.

Biotite forms disseminated grains and is concentrated moderately in a few layers. It also forms irregular patches averaging 0.1-0.2 mm in size as cryptocrystalline to extremely fine grained, unoriented flakes. A few patches up to 0.3 mm in size consist of radiating aggregates of cryptocrystalline to extremely fine grained biotite/chlorite. Pleochroism of biotite is from pale to light greenish brown.

Quartz forms disseminated grains averaging 0.02-0.03 mm in size and a few up to 0.05 mm across.

Calcite forms ragged, disseminated grains and patches, mainly less than 0.05 mm in size.

Apatite forms anhedral, equant grains averaging 0.02-0.04 mm in size.

A few latite flow fragments averaging 0.3-0.5 mm long and one 0.7 mm long are of extremely fine grained plagioclase altered slightly to moderately to sericite/biotite. Plagioclase has a radiating texture. Fragments are rimmed by an opaque-rich layer averaging 0.01-0.02 mm wide.

One lens 1.2 mm long is of very fine grained sericite/biotite oriented parallel to the length of the lens.

(continued)

A few slightly coarser grained lenses and patches up to 1.5 mm long are dominated by interlocking, slightly strained quartz grains averaging 0.03-0.07 mm in size. Some of these also contain minor to moderately abundant, chlorite and plagioclase or calcite. They probably were formed by metamorphic segregation.

Abundant late veins up to 1 mm wide are of very fine grained calcite with disseminated, subhedral flakes of chlorite averaging 0.07-0.1 mm long. An envelope averaging 0.1-0.2 mm thick is of extremely fine grained biotite with pleochroism from pale to light greenish brown. Where veins intersect, the biotite-rich envelope is broader and more diffuse. One vein contains several, euhedral grains of pyrite averaging 0.02-0.05 mm in size.

Abundant veinlets up to 0.05 mm in width are dominated by biotite with or without less abundant calcite. These are most common cutting opaque-rich layers.

Sample BB93003-150 m Strongly Altered Meta-Diabase; Calcite Veinlets

Phenocrysts of plagioclase are set in a strongly foliated groundmass dominated by chlorite and calcite. Plagioclase phenocrysts are altered to quartz, calcite, and patches of specular hematite. Foliation is warped slightly around plagioclase phenocrysts. Late veinlets are of calcite.

phenocrysts		
plagioclase	15-17%	
hematite	1- 2	(alteration of plagioclase)
groundmass		
chlorite	30-35	
calcite	25-30	
plagioclase	12-15	
opaque	1- 2	(hematite and minor pyrite)
veinlets		
calcite	2- 3	

Plagioclase forms phenocrysts averaging 0.3-0.7 mm in size and a few up to 1.2 mm in size. They are replaced by pseudomorphs of quartz with minor to moderately abundant calcite. Quartz grains commonly are strained slightly to moderately. Many also contain patches up to 1 mm in size of parallel platy opaque grains up to 0.25 mm long (probably specular hematite). A few equant to elongate patches up to 2.5 mm long of very fine grained calcite and quartz, with or without patches of hematite, may be secondary after plagioclase phenocrysts.

In the groundmass, plagioclase forms interlocking grains averaging 0.01-0.03 mm in size. Chlorite forms flakes averaging 0.02-0.03 mm in size. It is concentrated in a few seams up to 0.3 mm wide parallel to foliation. Calcite is concentrated in patches up to 1 mm in size as grains averaging 0.02-0.07 mm in size.

Opaque (hematite and minor pyrite?) forms disseminated grains averaging 0.02-0.05 mm in size, and patches up to 0.2 mm long, mainly concentrated in chlorite-rich patches. A few equant hematite grains averaging 0.2-0.5 mm across occur in lenses of chlorite.

Calcite forms post-deformation veinlets averaging 0.1-0.2 mm in width of very fine grains.

Sample BB94022-80 m **Metamorphosed Porphyritic Latite/Dacite Tuff; Quartz-Magnetite/Hematite Replacement**

Phenocrysts of plagioclase are set in a foliated groundmass dominated by plagioclase with a few seams up to a few mm wide containing abundant sericite. Opaque is concentrated in layers and irregular patches. Several replacement patches are dominated by quartz and contain coarse patches of opaque. The rock and replacement lenses of quartz and magnetite/hematite were folded moderately by F_2 folds averaging 1-10 mm in wavelength; tight kink folds occur in some sericite-rich layers.

phenocrysts	
plagioclase	5- 7%
groundmass	
plagioclase	70-75
sericite	7- 8
quartz	3- 4
opaque	2- 3
chlorite	1- 2
biotite	0.5
calcite	0.1
epidote	0.1
apatite	minor
replacement lenses	
quartz	5- 7
magnetite-hematite	1- 2

Plagioclase forms anhedral to subhedral phenocrysts averaging 0.3-0.5 mm in size, and a few up to 0.8 mm long. They are concentrated moderately in some patches or layers. Borders commonly are ragged against the groundmass, and a few phenocrysts are recrystallized strongly to plagioclase as in the groundmass. Alteration is slight to disseminated flakes of sericite.

In the groundmass, plagioclase forms interlocking grains averaging 0.01-0.03 mm in size. This grades in several parts of the rock to coarser grained aggregates averaging 0.03-0.05 mm in grain size. Some of the latter contain minor to moderately abundant quartz of similar grain size.

Sericite is concentrated moderately to strongly in sericite-rich seams. These commonly are folded more tightly than the plagioclase-rich seams. Some contain coarse lenses of opaque. Some lenses are cut by tiny kink folds on the scale of 0.1 mm.

Opaque is concentrated in irregular, in part strongly contorted seams, mainly associated with sericite-rich layers. A few opaque patches up to 1.5 mm in size occur in plagioclase-rich layers. It also forms disseminated grains averaging 0.005-0.01 mm in size.

Chlorite is concentrated strongly in patches up to 1 mm in size and also forms disseminated, extremely fine grained flakes in plagioclase-rich layers.

Biotite is concentrated moderately in seams up to 0.07 mm wide, which commonly contain moderately abundant disseminated grains of opaque. Pleochroism is from pale to light/medium greenish brown.

Calcite forms disseminated ragged grains and patches averaging 0.01-0.05 mm in size.

(continued)

Epidote forms a few ragged grains up to 0.3 mm in size, in part associated with plagioclase phenocrysts.

Apatite forms anhedral, equant grains averaging 0.05 mm in size and a few prismatic grains up to 0.08 mm long.

Several patches up to a few mm in size are dominated by very fine to fine grained quartz, which commonly shows moderately to strongly strained extinction. Several of these contain grains or clusters of magnetite/hematite up to 2 mm in size. In a few, biotite and/or chlorite form wispy seams and patches of extremely fine grained flakes. A few veinlets up to 0.2 mm wide of similar quartz and minor calcite cut across the foliation.

One recrystallized(?) patch 1 mm across is dominated by interlocking plagioclase grains up to 0.2 mm in size.

Sample BB94022-237 m **Metamorphosed Tuffaceous Sedimentary Andesite**

The rock is dominated by layers of plagioclase-chlorite-epidote-sericite, with a few lensy layers up to 1.5 mm wide dominated by opaque. In some of the sample, layers are folded very tightly by kink folds on the scale of 0.1-0.2 mm. Folds are best shown in one thin opaque-rich layer and surrounding sericite-chlorite-rich layers.

plagioclase	40-45%
chlorite, chlorite/biotite	20-25
epidote	17-20
sericite	7- 8
biotite	4- 5
opaque	3- 4
Ti-oxide	1- 2
quartz	0.1

Plagioclase forms equant grains averaging 0.015-0.025 mm in size intergrown intimately with sericite and chlorite. In a few lensy, plagioclase-rich patches, it is slightly coarser grained (up to 0.05 mm).

Epidote forms disseminated patches averaging 0.05-0.15 mm in size of cryptocrystalline to extremely fine grains. Less common are patches up to 0.4 mm in size of grains averaging 0.05-0.2 mm in size. A few coarser grains are light to medium yellow in color.

Chlorite/biotite and sericite form extremely fine grained flakes intergrown with plagioclase. A few patches up to 0.9 mm long are dominated by extremely fine grained chlorite, chlorite/ biotite, and/or sericite; some contain disseminated grains of epidote or opaque. Chlorite/biotite is weakly pleochroic from pale to light green and has moderate birefringence. Sericite is pale green in color, and grades texturally into chlorite/biotite. Biotite forms patches of extremely fine grains with pleochroism from light to medium greenish brown to brownish green.

Ti-oxide (leucoxene) forms abundant, wavy lenses up to 0.3 mm long parallel to foliation.

Opaque forms disseminated grains averaging 0.02-0.03 mm in size. It is concentrated moderately to strongly in a few lensy layers parallel to foliation. A few disseminated opaque grains away from the opaque-rich layers are up to 0.5 mm across.

Quartz forms a few patches up to 0.2 mm across of anhedral grains averaging 0.03-0.07 mm in size.

Sample BB94022-341 m Metamorphosed Latite Flow/Dome; Calcite Veins

Phenocrysts of plagioclase are set in a weakly to moderately foliated groundmass dominated by plagioclase with moderately abundant sericite and minor K-feldspar. The presence of prismatic plagioclase in the groundmass indicates that this is a flow or dome. Locally the rock contains two preferred orientations of sericite flakes, suggesting that a weak S_2 was overprinted on a moderately developed S_1. Lensy veins of calcite are along wispy zones of cataclastic(?) deformation. A few crosscutting veinlets are of calcite-(quartz-opaque).

phenocrysts			
plagioclase	3- 4%		
groundmass			
plagioclase	75-78	K-feldspar	1- 2%
sericite	10-12	opaque	0.5 (partly magnetite)
quartz	3- 4	apatite	minor
cataclastic(?) seams			
sericite-opaque	1		
veins, veinlets			
calcite-(quartz-opaque)	2- 3		

Plagioclase forms subhedral, prismatic phenocrysts averaging 0.3-0.7 mm in length and a few up to 1 mm long. Alteration is slight to patches of calcite; several grains are replaced moderately by patches and seams of quartz-calcite. A few grains are recrystallized slightly to finer subgrain aggregates.

Quartz is concentrated in patches up to 1 mm in size of anhedral, slightly interlocking grains averaging 0.03-0.07 mm in size. Some patches also contain recrystallized(?) grains of plagioclase and ragged grains and patches of calcite. Several of these patches are adjacent to plagioclase phenocrysts. A few may have formed by replacement of plagioclase phenocrysts.

A few recrystallized(?) lenses up to 2 mm long are dominated by plagioclase grains averaging 0.1-0.2 mm in size with ragged interstitial patches of calcite and sericite.

In the groundmass, plagioclase forms moderately abundant, subhedral, prismatic grains averaging 0.03-0.1 mm long in a groundmass of interlocking grains averaging 0.01-0.02 mm in size of plagioclase and minor K-feldspar. The texture of the groundmass, especially the presence of subhedral prismatic grains indicates that the matrix was magmatic and that the rock was not strongly recrystallized during metamorphism.

Sericite is concentrated moderately in seams averaging 0.05-0.15 mm wide and a few up to 1 mm wide; these are parallel to a weak foliation. Opaque forms disseminated grains averaging 0.01-0.05 mm in size. The weakly magnetic nature of the rock indicates that some of this is magnetite. Apatite forms anhedral grains averaging 0.03-0.05 mm in size and a few subhedral, prismatic grains up to 0.15 mm long. Semi-opaque (leucoxene) is concentrated strongly in patches up to 0.15 mm in size of dusty grains.

A few late, wispy, sub-parallel seams (possibly of cataclastic origin) are of opaque with ragged envelopes of sericite. Along one of these seams is a lensy vein up to 1 mm wide, dominated by very fine to fine grained calcite with minor quartz and lenses of opaque. Calcite contains moderately abundant dusty semi-opaque inclusions. Opaque forms subhedral, equant grains averaging 0.01-0.03 mm in size. A few veinlets up to 0.1 mm wide are of calcite with less abundant quartz and minor opaque.

Sample BB94022-394 m **Metamorphosed Latite/Dacite Tuff; Segregation Lenses of Quartz-Calcite-(Chlorite-Biotite)**

Minor phenocrysts of plagioclase are set in a well foliated, slightly compositionally banded groundmass of plagioclase, sericite, and moderately abundant opaque and semi-opaque. The layers are warped tightly about F_2 folds on the scale of 0.3-2 mm. Lenses of probable metamorphic-segregation origin are of quartz-(calcite-chlorite).

phenocrysts			
plagioclase	4- 5%		
groundmass			
plagioclase	60-65	chlorite	1%
sericite	17-20	calcite	0.5
opaque	4- 5	biotite	0.5
quartz	3- 4	epidote	0.1
leucoxene	1- 2	apatite	0.1
segregation/replacement lenses			
quartz-calcite-(chlorite-biotite)	4- 5		
late seams			
epidote-biotite	0.1		

Plagioclase forms anhedral to subhedral phenocrysts averaging 0.3-0.7 mm in size, and a few up to 1.5 mm long. Many are replaced slightly to strongly by extremely fine to very fine grained quartz and minor calcite and sericite. Some phenocrysts are warped slightly in fold noses.

In the groundmass, plagioclase generally occurs as slightly interlocking grains averaging 0.01-0.02 mm in size. A few coarser grained patches contain plagioclase and minor to moderately abundant quartz grains averaging 0.03-0.05 mm in size.

Sericite is concentrated slightly to strongly in sericite-rich seams. Sericite-rich seams generally are very tightly folded.

Opaque (probably mainly ilmenite) forms disseminated grains averaging 0.005-0.02 mm in size, a few grains up to 0.05 mm in size, and a few ragged patches up to 0.2 mm in size.

Semi-opaque (leucoxene) forms ragged patches up to 0.2 mm in size of cryptocrystalline aggregates.

Biotite is concentrated in a few layers as extremely fine grains with pleochroism from pale to light brownish green. Epidote forms a few subhedral grains averaging 0.1-0.15 mm long, mainly associated with biotite.

Calcite forms ragged patches up to 0.1 mm in size, mainly in plagioclase-rich layers.

Apatite forms a few subhedral, prismatic grains averaging 0.07-0.1 mm long and a few up to 0.2 mm long, and anhedral grains averaging 0.05-0.07 mm in size.

Lenses up to 2 mm in size of metamorphic segregation origin are dominated by extremely fine to very fine grained quartz with minor to moderately abundant calcite and commonly minor chlorite and/or biotite.

Wispy late seams contain lenses and patches of epidote up to 0.2 mm in size and minor ones of extremely fine grained biotite.

Sample BB94023-95 m **Metamorphosed Porphyritic Dacite Tuff; Calcite-(Quartz) Veinlets**

Phenocrysts and crystal fragments of plagioclase are set in a well foliated (S_1), slightly compositionally banded groundmass dominated by plagioclase with less abundant sericite, quartz, and calcite. S_1 foliation is warped slightly by F_2 folds whose axial planes cut S_1 at a high angle. Discontinuous veinlets are of calcite and minor quartz.

phenocrysts	
plagioclase	5- 7%
groundmass	
plagioclase	60-65
sericite	12-15
quartz	10-12 (?)
calcite	4- 5
opaque	0.3
apatite	trace
veinlets	
calcite-(quartz)	1- 2

Plagioclase forms anhedral phenocrysts averaging 0.2-0.5 mm in size. Alteration is slight to patches of calcite and flakes of sericite. Some grains are recrystallized slightly to much finer subgrain aggregates as in the groundmass.

In the groundmass, much of the plagioclase forms slightly interlocking aggregates of slightly strained grains averaging 0.03-0.06 mm in size. In these aggregates, it is difficult to distinguish plagioclase from quartz, so the ratio of plagioclase/quartz ratio o is estimated rather roughly. Coarser grained plagioclase-quartz patches grade into finer grained plagioclase-rich zones in which grains average 0.01-0.02 mm in size. In plagioclase-rich layers, sericite forms disseminated flakes oriented parallel to foliation.

Sericite is concentrated moderately in lenses parallel to foliation which range from wispy to 1.5 mm wide. In the wider lenses, sericite grades into muscovite flakes up to 0.2 mm long oriented parallel to foliation. A few sericite/muscovite-rich layers contain abundant plagioclase crystal fragments/phenocrysts.

Opaque forms disseminated dusty grains in plagioclase-rich layers, and more abundant grains averaging 0.01-0.05 mm in size in sericite-rich seams. A few elongate grains are up to 0.12 mm long.

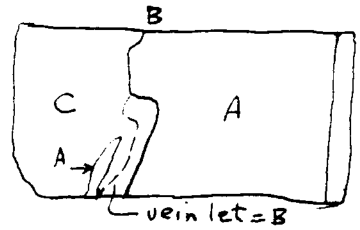
Calcite forms ragged patches averaging 0.05-0.15 mm in size and disseminated, extremely fine grains.

Apatite forms anhedral equant to prismatic grains averaging 0.03-0.07 mm in size and a few up to 0.15 mm long.

A few discontinuous veinlets averaging 0.1-0.3 mm wide are of very fine grained calcite with much less abundant quartz. One diffuse lensy vein locally up to 1.5 mm wide is of very fine to medium grained calcite with less abundant very fine grained quartz. Coarser calcite grains commonly are strained moderately.

Sample BB94023-270 m **Strongly Contorted Sericite-Chlorite Schist (after Latite Tuff) cut by Meta-Diabase(?) Dike(?); Replacement Patches of Chlorite in Schist and of Chlorite-Epidote-Calcite in Dike**

The sample is of an irregular contact between a strongly deformed (D_2), sericite-rich schist and an aphanitic (probably border phase) of a metamorphosed diabase(?) intrusion. The distribution of zones in the sample is as in the sketch below.



Zone A is a very strongly kink-folded schist dominated by sericite and chlorite with less abundant, disseminated grains of epidote and moderately abundant opaque. Epidote and opaque are concentrated in lenses along the axial planes of some F_2 folds. A few lenses are dominated by plagioclase with minor chlorite. The schist is replaced by patches up to 15 mm across of chlorite.

sericite	40-45%
chlorite	15-20
epidote	4- 5
opaque	3- 4
biotite	1- 2
plagioclase	0.5
apatite	0.1
replacement patches	
chlorite	25-30

Sericite and chlorite form flakes averaging 0.02-0.05 mm in length. These are warped strongly about F_2 kink folds on the scale of 0.2-0.5 mm. Chlorite commonly is interstitial to subhedral sericite/muscovite flakes. One irregular layer up to 1 mm wide is of sericite which is free of chlorite.

Epidote forms disseminated, equant, anhedral; to subhedral grains averaging 0.03-0.07 mm in size and a few up to 0.12 mm long. Opaque forms disseminated grains averaging 0.01-0.02 mm in size. It is concentrated moderately to strongly in a few patches and lenses parallel to foliation, which are warped around the kink folds.

Biotite forms disseminated flakes averaging 0.01-0.02 mm in size, concentrated mainly near the chlorite replacement patches. It is pleochroic from pale to light/medium brownish green.

Apatite forms disseminated, equant grains averaging 0.05-0.1 mm in size.

A few lenses up to 0.8 mm wide are dominated by unoriented, plagioclase grains averaging 0.03-0.08 mm in size with less abundant chlorite flakes and minor disseminated patches of epidote and dusty opaque.

Chlorite forms replacement patches and offshooting veinlets of unoriented, interlocking, pale green flakes averaging 0.01-0.03 mm in size. Locally, biotite is concentrated in zones up to 0.1 mm wide as extremely fine grained flakes bordering parts of chlorite patches and veinlets. One veinlet also contains a lens 0.6 mm long of extremely fine grained quartz and very fine grained biotite.

(continued)

Zone B averages 0.3-0.7 mm wide and is dominated by extremely fine grained opaque, epidote, and biotite. In places it is gradational into Zone A. Locally it is absent. It probably is a contact zone developed in Zone A by reaction with the rock of Zone C. An irregular veinlike zone averaging 0.2-0.4 mm wide of opaque-biotite cuts Zone C; it is similar to Zone B.

Zone C is a very fine to extremely fine grained andesite, dominated by plagioclase and biotite with much less abundant epidote and chlorite, and minor quartz. It may be the border zone of a coarser grained diabase or diorite dike. It has an irregular, patchy texture suggesting that it was contaminated by the wall rock during intrusion. A few replacement patches are of chlorite and/or epidote with minor calcite, and a few others are of quartz-(biotite).

plagioclase	65-70%
biotite	12-15
epidote	8-10
chlorite	3- 5
quartz	1- 2
opaque	1
apatite	0.1
replacement patches	
chlorite-epidote-(calcite)	4- 5
quartz-(biotite)	0.3

Plagioclase forms a few anhedral phenocrysts averaging 0.2-0.4 mm in size. In the groundmass, plagioclase forms anhedral, slightly interlocking grains averaging 0.02-0.05 mm in size. Alteration is slight to moderate to cryptocrystalline sericite/biotite.

Biotite forms ragged grains averaging 0.01-0.02 mm in size which are concentrated slightly in parts of the rock.

Epidote is very irregularly distributed. In places it forms abundant grains averaging 0.01-0.02 mm in size. Elsewhere it forms scattered grains averaging 0.05-0.1 mm in size and a few up to 0.2 mm across.

Chlorite forms disseminated grains averaging 0.03-0.07 mm in size.

Opaque forms disseminated grains averaging 0.03-0.05 mm in size, and is concentrated in late seams up to 0.05 mm wide.

Quartz forms disseminated grains and clusters of grains averaging 0.02-0.04 mm in grain size.

Apatite forms anhedral grains averaging 0.07-0.12 mm in size.

Several replacement patches up to 1 mm in size are of very fine grained aggregates of chlorite with minor to abundant epidote and locally moderately abundant calcite, and quartz.

A few, irregular replacement patches up to 0.5 mm in size are of extremely fine to very fine grained quartz and minor very fine grained biotite.

Sample BB94023-394 m **Hornfelsed(?) Diabase; Veins and Replacement Patches of Quartz-Calcite-(Chlorite)**

The sample is dominated by extremely fine grained plagioclase, biotite, and calcite with minor chlorite. Moderate compositional banding is caused by variation in the biotite/(plagioclase-calcite-chlorite) ratio. Dark seams in the hand sample are composed of biotite. Textures of biotite suggest that the rock was contact metamorphosed. Veins and replacement patches up to a few mm across are of quartz-calcite-(chlorite).

phenocrysts	
plagioclase	4- 5%
groundmass	
plagioclase	35-40%
biotite	30-35
calcite	17-20
chlorite	2- 3
quartz	0.2
opaque	0.1
apatite	0.1
inclusion	
andesite(?)	minor
veins, replacement patches	
quartz-calcite-(chlorite)	5- 7

Plagioclase forms disseminated phenocrysts averaging 0.15-0.3 mm in size.

The groundmass is moderately foliated with bands richer in biotite and others richer in plagioclase-calcite-(chlorite). Plagioclase forms interlocking grains averaging 0.02-0.05 mm in size. It commonly is intergrown with moderately abundant, extremely fine grained calcite and minor to moderately abundant biotite. Chlorite forms flakes averaging 0.02-0.03 mm in length, mainly intergrown with calcite.

Biotite is concentrated moderately to strongly in biotite-rich bands up to 0.5 mm wide parallel to foliation. Pleochroism is from pale to medium greenish brown. The texture is typical of rocks which were contact metamorphosed. A few biotite-rich patches up to 0.5 mm in size may be secondary after hornblende(?) phenocrysts.

Quartz forms disseminated grains averaging 0.03-0.05 mm in size, and is concentrated slightly in lenses and patches of a few such grains. Some larger grains have moderately strained extinction.

Opaque/semi-opaque (probably ilmenite/leucoxene) forms disseminated grains and clusters of a few grains averaging 0.01-0.03 mm in size and a few up to 0.05 mm across. It is concentrated slightly to moderately in a few biotite-rich seams.

Apatite forms anhedral to subhedral grains averaging 0.03-0.1 mm in size.

One ellipsoidal inclusion 0.4 mm long is of very fine grained plagioclase with moderately abundant disseminated opaque and minor calcite. Biotite is conspicuously absent.

Veins up to 1.5 mm wide are of extremely fine to very fine grained quartz and calcite and minor flakes of chlorite averaging 0.03-0.05 mm long. A few patches are of fine grained quartz, which has moderately to strongly strained extinction.

Sample BB94023-474 m Metamorphosed Dacite Tuff; Calcite-Biotite Veinlets

The sample is irregularly compositionally banded, with ragged lenses of widely varying composition; thus overall mineral abundances are less precise than in most other samples. The rock is dominated by plagioclase, with moderately abundant sericite, epidote, quartz, and calcite. S_1 foliation was deformed by F_2 folds, which appear as scattered, moderately tight warps in plagioclase-epidote-calcite-quartz layers, and as tightly spaced kinks in sericite-rich layers. Wispy veinlets are of calcite-biotite.

plagioclase	45-50%
sericite	12-15
epidote	12-15
quartz	10-12
calcite	8-10
biotite	0.3
apatite	0.1
chlorite	minor
opaque	trace
veinlets	
calcite-biotite	0.2

Plagioclase forms equant grains averaging 0.01-0.03 mm in size in some layers to 0.05-0.1 mm in others. Finer grained plagioclase commonly has moderately interlocking grain borders, whereas coarser grained plagioclase is more granular. Untwinned plagioclase grains averaging 0.03-0.07 mm in size are difficult to distinguish optically from quartz grains; thus the relative abundances of these minerals is indefinite.

Epidote forms irregular patches averaging 0.1-0.2 mm in size and locally up to 0.5 mm across of cryptocrystalline to extremely fine grains. Elongation of many patches outlines the open warps typical of plagioclase-epidote layers.

Sericite is concentrated moderately to strongly in patches and seams up to 2 mm wide. In some of these, tightly spaced, F_2 kink folds are present, with axial planes subparallel to the S_1 foliation. These folds do not appear to extend into the surrounding plagioclase-rich rock. Epidote is concentrated along axial planes of a few of these.

Quartz and less abundant calcite are concentrated in diffuse patches up to 2 mm in size; these probably formed by metamorphic segregation. Quartz also forms disseminated grains averaging 0.05-0.1 mm in size. Quartz commonly has slightly strained extinction. Calcite also occurs as anhedral grains averaging 0.02-0.05 mm in size intergrown with plagioclase, and is very abundant in some layers.

Biotite and chlorite form disseminated flakes averaging 0.02-0.03 mm in size and a few up to 0.1 mm long. Pleochroism of biotite is from light to medium greenish brown or dark brown. Chlorite is very pale to pale green with weak pleochroism.

Apatite forms equant, anhedral grains averaging 0.03-0.07 mm in size and a few up to 0.1 mm across; it is concentrated moderately in sericite-rich layers..

Opaque forms disseminated, cubic grains averaging 0.03 mm in size.

Wispy veinlets up to 0.03 mm wide are of extremely fine grained calcite and less abundant biotite.

Sample BB93003-208 m **Metamorphosed Latite Tuff; Replacement Patches of Calcite-Quartz-Epidote-Tremolite/Actinolite-Chlorite Veinlets of Epidote-K-feldspar-Quartz**

The sample is a well foliated, moderately compositionally banded rock dominated by plagioclase-rich and sericite-rich layers. Textures suggest that the rock was deformed strongly. Replacement patches and lenses are of two or more of calcite, quartz, epidote, chlorite, tremolite/actinolite and plagioclase. Some sericite-rich layers contain small, tightly spaced, F_2 kink folds, whose axial planes are subparallel to S_1. Locally, the S_1 foliation is warped broadly in F_3(?) folds a few mm across whose axial planes cut across the F_2 fold axes at a moderate angle. Late veinlets are of K-feldspar-epidote and locally of epidote-quartz.

plagioclase	50-55%
sericite	25-30
epidote	5- 7
biotite	3- 4
chlorite	1- 2
quartz	0.5
opaque/semi-opaque	0.5
apatite	0.2
actinolite	minor
replacement patches, lenses	
calcite-quartz-chlorite-epidote-tremolite/actinolite-plagioclase	3- 4
veinlets, lenses	
K-feldspar-epidote-(quartz)	3- 4

Plagioclase is concentrated in layers as equant grains averaging 0.01-0.03 mm in size and a few from 0.05-0.08 mm across. Intergrown with plagioclase are minor to moderately abundant flakes of sericite and patches of epidote. Both plagioclase and sericite grains are elongated parallel to foliation. Some quartz may be intergrown with plagioclase.

Sericite-rich layers contain flakes up to 0.2 mm long in subparallel orientation, intergrown with minor to moderately abundant plagioclase grains averaging 0.02-0.03 mm in size.

Epidote forms irregular patches up to 0.5 mm in size and lenses parallel to foliation up to 2 mm long and 0.2 mm wide. Some of these may be related in origin to the late veinlets. Grain size is very fine to locally extremely fine.

Biotite is concentrated moderately in some layers with sericite as extremely fine grained flakes with pleochroism from pale to light brownish green. It forms envelopes around some epidote-rich lenses.

Chlorite is concentrated moderately in some layers as disseminated flakes and patches up to 0.15 mm in size of extremely fine grained flakes.

Opaque/semi-opaque, probably ilmenite/leucoxene forms ragged disseminated patches averaging 0.05-0.1 mm in size.

Apatite forms anhedral grains averaging 0.05-0.1 mm in size and a few up to 0.2 mm long.

Tremolite/actinolite forms subhedral, prismatic grains averaging 0.07-0.1 mm long. Pleochroism is variable from pale yellowish green to light green or medium green.

(continued)

A replacement patch 2.5 mm across consists of patches of very fine to fine grained calcite intergrown with much less chlorite and minor epidote, and patches dominated by interlocking quartz grains averaging 0.01-0.03 mm in size. Smaller replacement patches are similar, but some also contain tremolite/actinolite.

One replacement lens parallel to foliation and up to 0.5 mm wide is of very fine to fine grained actinolite with less abundant epidote and quartz. One replacement patch is dominated by tremolite/actinolite grains up to 0.2 mm in size associated with calcite and quartz. Some amphibole grains are compositionally zoned with actinolite cores and tremolite/actinolite rims. A few replacement lenses are of plagioclase-actinolite.

An elongate lens 1.5 mm long parallel to foliation is dominated by very fine grained quartz with minor patches of epidote. Quartz is strained moderately and recrystallized locally to much finer subgrain aggregates.

Late, crosscutting veinlets averaging 0.1-0.2 mm wide are of extremely fine grained K-feldspar and patches of very fine grained epidote and minor patches of quartz or actinolite. One veinlet up to 0.2 mm wide is of lensy patches of epidote and quartz; it follows a wispy opaque-rich seam which may represent a zone of cataclastic deformation. Some veinlets also contain moderately abundant dusty semi- opaque (leucoxene/hematite?).

LIST OF PHOTOGRAPHS

(Note: Photo number refers to number on negative film and on back of print)

Photo	Sample	Description
0	94017-225	wavy foliation in chlorite-plagioclase-(Ti-oxide); quartz-(chlorite-calcite) quartz lens parallel to foliation, quartz veinlet cutting foliation. Plane light, length of photo: 2.95 mm
1	94017-246	plagioclase-tremolite/actinolite-chlorite-epidote rock; patch of chlorite-actinolite (darker green). Plane light, length of photo: 1.61 mm.
2	94017-269	moderately foliated plagioclase-epidote-actinolite-chlorite with segregations of chlorite-epidote, early, warped veinlet of quartz, and late cataclastic seam dominated by epidote/semi-opaque. Plane light, length of photo: 2.95 mm.
3	94017-321	folded contact between plagioclase-chlorite-rich layer and sericite-rich layer; cut by veinlet of calcite-chlorite. Crossed nicols; length of photo: 2.95 mm.
4	94018-51	small phenocrysts of plagioclase (white) and apatite (bluish grey) in a warped groundmass of plagioclase with seams rich in sericite. Crossed nicols. Length of photo: 2.95 mm.
5	94018-380	broken and displaced fragments of opaque-rich layer in sericite-opaque-rich band, interlayered with plagioclase-rich layers. Crossed nicols, no blue filter, length of photo 5.9 mm.
6	93011-385	phenocrysts of plagioclase (recrystallized to plagioclase-[epidote]) and pyroxene (altered to chlorite-plagioclase-[biotite-opaque]) in extremely fine grained groundmass of plagioclase-epidote. Veinlets are of quartz-biotite-(opaque). Plane light, length of photo: 2.95 mm.
7	94020-217	sericite-rich layer showing S_1 warped tightly by F_2 kink folds with S_2 axial-planar fracture cleavage containing seams of opaque. Plane light, length of photo: 2.95 mm.
8	94020-337	kink folds cut sericite-opaque-rich layer; weak axial-planar foliation developed in folds, but generally does not penetrate sericite-poor layers. Crossed nicols, length of photo: 2.95 mm.
9	94021-24	plagioclase-quartz with sericite-rich seams with prominent foliation (S_1), with poorly developed, recrystallized sericite-rich seam along S_2 . Crossed nicols, length of photo: 2.95 mm.

Sample BB94023-290 m Metamorphosed Diabase/Basalt; Calcite Veinlets

Minor plagioclase phenocrysts are set in a well foliated groundmass dominated by epidote and plagioclase, with much less abundant chlorite and leucoxene, and minor magnetite, calcite, and quartz. Quartz also is concentrated in lenses parallel to foliation, probably of metamorphic segregation origin. Minor veinlets of calcite cut the foliation.

phenocrysts			
plagioclase	1- 3% (?)		
groundmass			
epidote	40-45	calcite	0.5%
plagioclase	35-40	quartz	0.1
chlorite	5- 7	apatite	minor
leucoxene	5- 7	biotite	trace
magnetite	1- 2		
secondary lenses			
quartz-(chlorite)	0.5		
veinlets			
calcite	minor		

Plagioclase forms a few ragged phenocrysts up to 0.8 mm in size. They are strained, fractured, and replaced moderately by epidote. One lens 2 mm long by 1 mm wide at one side of the section contains abundant ragged, equant plagioclase grains averaging 0.1-0.2 mm in size in a groundmass of extremely fine grained plagioclase and chlorite with minor calcite, magnetite, and epidote. This may be a strongly deformed and recrystallized plagioclase phenocryst.

In the groundmass, plagioclase forms anhedral grains averaging 0.01-0.02 mm in size. These are intergrown with patches of cryptocrystalline to very fine grained epidote, which probably formed by replacement of plagioclase and mafic minerals.

Chlorite forms disseminated flakes, clusters of flakes, and a few lenses parallel to foliation of flakes averaging 0.02-0.03 mm in size.

Leucoxene forms anhedral patches averaging 0.05-0.3 mm in size, and a few up to 0.7 mm long. Many longer patches are elongated parallel to foliation.

Opaque (magnetite) forms disseminated, euhedral to subhedral grains averaging 0.02-0.05 mm in size and a few up to 0.15 mm across.

Calcite forms ragged patches averaging 0.03-0.07 mm in size.

Quartz forms scattered grains averaging 0.1-0.2 mm in size.

Apatite forms a few subhedral grain averaging 0.05-0.12 mm long. Larger grains are broken along a few basal parting planes.

Biotite forms a few flakes up to 0.04 mm in size; pleochroism is from pale to medium greenish brown.

Several lenses parallel to foliation up to 1 mm long by 0.15 mm wide are of extremely fine grained quartz with minor chlorite.

Three wispy, lensy veinlets up to 0.05 mm wide are of very fine grained calcite.

Photo	Sample	Description
10	94021-57	sericite-opaque-rich layer showing tightly-spaced kink folds parallel to overall foliation; S_2 foliation defined by wispy seams of opaque along shear planes. Plane light, length of photo: 2.95 mm.
11	94021-202	tightly folded plagioclase-(epidote) layer with patch of recrystallized quartz (clear) interlayered with layer of sericite-chlorite-(epidote). Replacement patch of epidote showing radiating texture. Plane light, length of photo: 2.95 mm.
12	94021-250	plagioclase phenocrysts (large one moderately replaced by extremely fine grained plagioclase and minor chlorite) in groundmass of epidote-actinolite-chlorite-(opaque). Crossed nicols, length of photo 2.95 mm.
13	94021-291	folded plagioclase-chlorite-(biotite-calcite) schist with opaque-rich seams; small shear zone offsets layers slightly; late biotite-calcite veinlet. Plane light, length of photo: 2.95 mm.
14	93003-150	plagioclase phenocrysts (altered to quartz-calcite-hematite) in a well foliated groundmass of chlorite-calcite-plagioclase. Crossed nicols, length of photo: 2.95 mm.
15	94022-80	plagioclase phenocrysts in plagioclase-rich layers; interlayers rich in sericite with large lens of opaque; minor kink folds in largest sericite-rich layer. Crossed nicols, length of photo: 2.95 mm.
16	94022-237	plagioclase-chlorite-epidote-sericite layers and opaque-rich layers tightly folded by F_2 kink folds. Crossed nicols, length of photo: 2.95 mm.
17	94022-341	lathy plagioclase in groundmass, sericite forms weak foliation. Crossed nicols, length of photo: 1.61 mm.
18	94022-394	very tight F_2 folds in sericite-plagioclase-opaque layers. Plane light, length of photo: 2.95 mm.
19	94023-95	interlayers of plagioclase-rich layers (some with patches of calcite) and sericite/muscovite-rich seams containing abundant plagioclase crystal fragments or phenocrysts. Crossed nicols, length of photo: 2.95 mm.
20	94023-270	strongly kink-folded (F_2) sericite-chlorite schist with seams of epidote-opaque along axial planes of kink-folds, cut by replacement patch of chlorite. Crossed nicols, length of photo: 2.95 mm.

Photo	Sample	Description
21	94023-250	foliated groundmass of epidote-plagioclase-chlorite, with patches of leucoxene and minor disseminated magnetite. A lens parallel to foliation is of quartz-(chlorite). Two veinlets cutting foliation are of calcite. Plane light, length of photo: 2.95 mm.
22	94023-394	biotite-rich seams parallel to foliation interlayered with layers of plagioclase-calcite-chlorite. Large and small replacement patches of quartz-calcite. Plane light, length of photo: 2.95 mm.
23	94023-474	sericite-rich lens showing tightly spaced F_2 kink folds, which are not obvious in the adjacent layers of plagioclase-calcite-epidote-quartz. Two dark grains in sericite-rich patch are apatite, and one is opaque. Crossed nicols, length of photo: 2.95 mm.
24	93003-208	plagioclase-rich layer grading into sericite-plagioclase layer, moderately abundant epidote near transition; veinlet of epidote in plagioclase-rich layer. Crossed nicols, length of photo: 2.95 mm.
E	94023-270	plagioclase-biotite-(epidote) andesite (border phase of dike?) with replacement patch of chlorite-epidote. Crossed nicols, length of photo: 1.61 mm.

APPENDIX IV
LOGISTICAL REPORT
DOWNHOLE INDUCED POLARIZATION SURVEYS

LOGISTICAL REPORT

DOWNHOLE INDUCED POLARIZATION SURVEYS

BIG BULL PROJECT

TULSEQUAH CHIEF AREA, B.C.

on behalf of

REDFERN RESOURCES LTD.
205 - 10711 Cambie Street
Richmond, B.C. V6X 3G5

Field work completed: May 30-June 7, 1994

by

Alan Scott, Geophysicist
SCOTT GEOPHYSICS LTD.
4013 West 14th Avenue
Vancouver, B.C. V6R 2X3

July 5, 1994

1. INTRODUCTION

A test program of downhole induced polarization/resistivity (DHIP) survey was performed at the Big Bull Project, Tulsequah Chief Area, B.C., within the period May 29 to June 7, 1994. The survey was performed by Scott Geophysics Ltd. on behalf of Redfern Resources Ltd.

The purpose of the survey was to determine if DHIP would be a useful tool, in combination with exploratory drilling, for the detection of small, high grade orebodies at the Big Bull and Tulsequah Properties.

Boreholes surveyed were ddh 93002, 93003, 93006, 93007, 93008, and 93011. All holes were surveyed with both a detail array and a directional array.

This report describes the procedures and instrumentation, and presents the results of those DHIP surveys.

2. SURVEY DETAILS AND PRESENTATION

For detail DHIP survey, readings were taken using the pole-pole array, also referred to as the "normal" array, with a current electrode to receiving electrode separation of 2.5 metres. Readings were taken at 2.5 metre intervals in ddh 93002, 03, 06, and 11; and at 5.0 metre intervals in ddh 93007 and 08.

For directional survey, readings were taken at 5 meter intervals with an axial gradient array, and at an "a" spacing of 20 meters. In general, readings were taken for surface pole sources located near the collar, and at 125 and 250 meters to the north, east, and west of the collar. This provides nine separate source-receiver configurations. At Big Bull, the 250S electrode, however, was omitted for ddh 93002, 06, and 07, due to the presence of the Syne Channel. In addition, the collar logs for ddh 93008 and 11 have not been presented, since the chargeabilities for those logs were somewhat erratic, possibly due to current flowing down the casing for the near-collar source for those particular boreholes.

The results for each borehole are presented at a depth scale of 1:200, with a profile scale of 10 mVolts/Volt per cm for the chargeability and 2000 ohm-metres per cm for the resistivity. The results are presented for the south directional, detail, and north directional on one sheet, and the west directional, collar, and east directional on one sheet. The final combined plots have the south, detail, north profiles on the top, and the west, collar, and east profiles at the bottom.

3. PERSONNEL

Jerry Thornton, geophysicist, was the party chief on the survey, on behalf of Scott Geophysics. Bob Carmichael, geologist, was the Redfern Resources representative on site for the survey.

4. INSTRUMENTATION

A Scintrex IPR12 receiver and TSQ3 (3.0 kw) transmitter were used for the directional surveys, and a Scintrex IPC7 (25 watt) transmitter for the detail survey. The downhole equipment was custom manufactured to Scott Geophysics specifications.

All measurements were taken using a 2 second alternating square wave.

The chargeability value that has been plotted on the accompanying profiles and pseudosections is for the interval 690 to 1050 milliseconds after shutoff; midpoint at 870 msecs (equivalent to M7 value for the IPR11).

The resistivities were calculated assuming a constant slope from each individual electrode site to the borehole collar, using the appropriate half space relation for a homogeneous medium, and for the source at the surface and the receiver dipole within the medium. The coordinates for the remote current electrode were taken into account in the calculation.

5. RECOMMENDATIONS

A preliminary examination of the results of the downhole IP surveys at Big Bull indicates that well defined chargeability highs were detected in all boreholes surveyed.

A detailed correlation of the detail profiles to the geological logs is recommended, to evaluate the response to the various lithologies.

A detailed interpretation of the directional logs is required, with reference to the above geological correlations, before any specific recommendations could be made.

Respectfully Submitted,

Alan Scott, Geophysicist

Statement of Qualifications

for

Alan Scott, Geophysicist

of

4013 West 14th Avenue
Vancouver, B.C. V6R 2X3

I, Alan Scott, hereby certify the following statements regarding my qualifications, and my involvement in the program of work described in this report.

1. The work was performed by individuals sufficiently trained and qualified for its performance.

2. I have no material interest in the property under consideration in this report, nor in the company on whose behalf the work was performed.

3. I graduated from the University of British Columbia with a Bachelor of Science degree (Geophysics) in 1970, and with a Master of Business Administration degree in 1982.

4. I am a member of the Association of Professional Engineers and Geoscientists of the Province of British Columbia.

5. I have been practicing my profession as a Geophysicist in the field of Mineral Exploration since 1970.

Respectfully submitted,

Alan Scott

APPENDIX V
LITHOGEOCHEMICAL DATA

Chemex Labs Ltd.

Analytical Chemists * Geochemists * Registered Assayers
212 Brooksbank Ave., North Vancouver
British Columbia, Canada V7J 2C1
PHONE: 604-984-0221

REI N RE ICES ED

205 - 10711 CAMBIE RD.
RICHMOND, B.C.
V6X 3G5

Project : TULSEQUAH
Comments: CC: C/O KAWDY VENTURES

Page
Total Pages :1
Certificate Date: 15-AUG-94
Invoice No. : I9422090
P.O. Number :
Account :PL

CERTIFICATE OF ANALYSIS A9422090

SAMPLE	PREP CODE		Au ppb FA+AA	Ag ppm	As ppm	Bi ppm	Cu ppm	Hg ppm	Mo ppm	Pb ppm	Sb ppm	Zn ppm
RL94001	1646	226	< 5	0.4	8	< 2	38	< 1	1	6	12	32
RL94002	1646	226	< 5	< 0.2	2	< 2	40	< 1	6	16	< 2	62
RL94003	1646	226	< 5	< 0.2	< 2	< 2	3	< 1	< 1	4	2	50
RL94004	1646	226	< 5	< 0.2	< 2	4	115	< 1	< 1	4	2	98
RL94005	1646	226	< 5	< 0.2	16	< 2	3	< 1	6	16	4	28
RL94006	1646	226	< 5	< 0.2	8	< 2	10	< 1	3	2	4	18
RL94007	1646	226	< 5	< 0.2	< 2	< 2	8	< 1	1	6	2	50
RL94008	1646	226	25	0.2	28	< 2	11	< 1	12	8	2	22
RL94009	1646	226	< 5	< 0.2	8	< 2	4	< 1	3	20	2	104
RL94010	1646	226	< 5	< 0.2	12	< 2	11	< 1	1	14	< 2	140
RL94011	1646	226	< 5	< 0.2	2	< 2	12	< 1	3	18	2	12
RL94012	1646	226	< 5	0.2	6	< 2	27	< 1	2	12	2	64

CERTIFICATION: Hart Bichler

Chemex Labs Ltd.
Analytical Chemists * Geochemists * Registered Assayers
212 Brooksbank Ave., North Vancouver
British Columbia, Canada V7J 2C1
PHONE: 604-984-0221

To: F ERN I URCE IITED

205 - 10711 CAMBIE RD.
RICHMOND, B.C.
V6X 3G5

Project : TILSEQUAH
Comments: CC: C/O KAWDY VENTURES

Total Pages :1
Certificate Date: 11-AUG-94
Invoice No. : I9422400
P.O. Number :
Account :PL

CERTIFICATE OF ANALYSIS A9422400

SAMPLE	PREP CODE		Au ppb FA+AA	Ag oz/T	Cu %	Pb %	Zn %					
MA94001	208	226	1090	7.25	0.32	2.04	2.01					

CERTIFICATION: Christie

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RICHMOND, B.C.
V6X 3G5

Project : TILSEQUAH
Comments: CC: C/O KAWDY VENTURES

Total Pages : 1
Certificate Date: 17-AUG-94
Invoice No. : I9422401
P.O. Number :
Account : PL

CERTIFICATE OF ANALYSIS A9422401

SAMPLE	PREP CODE		Au ppb FA+AA	Ag ppm	As ppm	Bi ppm	Cu ppm	Hg ppm	Mo ppm	Pb ppm	Sb ppm	Zn ppm
MG94037	205	226	< 5	< 0.2	16	< 2	6	< 1	1	34	< 2	56
MG94038	205	226	< 5	1.6	70	< 2	314	< 1	< 1	44	< 2	70
RG94040	205	226	< 5	1.6	16	2	118	< 1	< 1	154	< 2	138

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Project : TILSEQUAH
Comments: CC: C/O KAWDY VENTURES

Total Pages : 1
Certificate Date: 17-AUG-94
Invoice No. : I9422404
P.O. Number :
Account : PL

CERTIFICATE OF ANALYSIS A9422404

SAMPLE	PREP CODE		Au ppb FA+AA	Ag ppm	As ppm	Bi ppm	Cu ppm	Hg ppm	Mo ppm	Pb ppm	Sb ppm	Zn ppm
MG94031	205	226	< 5	< 0.2	8	< 2	21	< 1	1	4	< 2	52
MG94032	205	226	< 5	< 0.2	14	< 2	7	< 1	< 1	6	< 2	68
MG94033	205	226	< 5	< 0.2	< 2	2	11	< 1	< 1	8	< 2	104
MG94034	205	226	< 5	< 0.2	6	< 2	2	< 1	< 1	6	< 2	32
MG94035	205	226	75	0.2	4	< 2	15	< 1	1	16	4	118
MG94036	205	226	< 5	< 0.2	8	< 2	33	< 1	< 1	12	< 2	126
RG94033	205	226	< 5	< 0.2	< 2	< 2	54	< 1	< 1	10	< 2	74
RG94034	205	226	< 5	0.2	12	< 2	119	< 1	< 1	20	< 2	100
RG94035	205	226	< 5	< 0.2	16	< 2	4	< 1	1	4	< 2	40
RG94036	205	226	< 5	< 0.2	4	< 2	6	< 1	< 1	6	< 2	28
RG94037	205	226	< 5	< 0.2	4	< 2	14	< 1	1	4	< 2	64
RG94038	205	226	< 5	< 0.2	10	< 2	4	< 1	2	12	< 2	12
RG94039	205	226	150	32.6	826	26	1085	< 1	5	1540	< 2	>10000

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V6X 3G5

Project : TILSEQUAH
Comments: CC: C/O KAWDY VENTURES

Page Number : 1
Total Pages : 1
Certificate Date: 15-AUG-94
Invoice No. : I9422408
P.O. Number :
Account : PL

CERTIFICATE OF ANALYSIS A9422408

SAMPLE	PREP CODE		Au ppb FA+AA	Ag ppm	As ppm	Bi ppm	Cu ppm	Hg ppm	Mo ppm	Pb ppm	Sb ppm	Zn ppm
RL94013	1646	226	< 5	1.6	20	< 2	6	1	< 1	122	2	94
RL94014	1646	226	25	1.0	224	< 2	2	1	< 1	38	6	22

CERTIFICATION: HartBichler

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PHONE: 604-984-0221

To: REDFERN RESOURCES LIMITED

205 - 10711 CAMBIE RD.
RICHMOND, B.C.
V6X 3G5

Project : TULSEQUAH
Comments: ATTN: K. CURTIS CC: C/O KAWDY VENTURES

Page Number : 1
Total Pages : 1
Certificate Date: 25-AUG-94
Invoice No. : I9423075
P.O. Number :
Account : PL

CERTIFICATE OF ANALYSIS A9423075

SAMPLE	PREP CODE		Au ppb FA+AA	Ag ppm	As ppm	Bi ppm	Cu ppm	Hg ppm	Mo ppm	Pb ppm	Sb ppm	Zn ppm
MG94039	205	226	< 5	< 0.2	< 2	< 2	2	< 1	1	28	< 2	48
MG94040	205	226	< 5	< 0.2	< 2	< 2	7	< 1	< 1	< 2	< 2	46
MG94041	205	226	< 5	< 0.2	6	< 2	1	< 1	< 1	2	2	76
MG94042	205	226	175	< 0.2	42	< 2	27	< 1	1	4	2	50
MG94043	205	226	10	< 0.2	< 2	< 2	19	< 1	< 1	10	2	14
MG94044	205	226	5	< 0.2	4	< 2	8	< 1	1	14	4	54
MG94045	205	226	20	< 0.2	4	< 2	23	< 1	< 1	4	< 2	40
MG94046	205	226	15	< 0.2	12	< 2	8	< 1	< 1	8	< 2	192
RG94041	205	226	< 5	< 0.2	< 2	< 2	21	< 1	< 1	12	2	54
RG94042	205	226	< 5	< 0.2	< 2	< 2	20	< 1	< 1	< 2	2	38
RG94043	205	226	< 5	< 0.2	< 2	< 2	< 1	< 1	< 1	4	< 2	32
RG94044	205	226	< 5	< 0.2	4	< 2	2	< 1	< 1	< 2	< 2	8
RG94045	205	226	40	< 0.2	104	< 2	< 1	< 1	< 1	42	2	22
RG94046	205	226	< 5	< 0.2	2	< 2	1	< 1	1	28	< 2	52
RG94047	205	226	490	< 0.2	2	< 2	19	< 1	1	174	< 2	302
RG94048	205	226	< 5	< 0.2	6	< 2	3	< 1	< 1	32	< 2	18
RG94049	205	226	10	< 0.2	< 2	< 2	30	< 1	7	2	< 2	66
RG94050	205	226	5	< 0.2	2	< 2	3	< 1	2	4	< 2	22

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To: REDFERN RESOURCES LIMITED

205 - 10711 CAMBIE RD.
RICHMOND, B.C.
V6X 3G5

Project : TULSEQUAH
Comments: ATTN: K. CURTIS CC: C/O KAWDY VENTURES

Certificate Date: 25-AUG-94
Invoice No. : I9423077
P.O. Number :
Account :PL

CERTIFICATE OF ANALYSIS A9423077

SAMPLE	PREP CODE		Au ppb FA+AA	Ag ppm	As ppm	Bi ppm	Cu ppm	Hg ppm	Mo ppm	Pb ppm	Sb ppm	Zn ppm
ML94005	1646	226	< 5	< 0.2	< 2	< 2	2	< 1	< 1	6	< 2	28
ML94006	1646	226	35	< 0.2	2	< 2	13	< 1	1	8	2	60
ML94008	1646	226	10	< 0.2	< 2	< 2	2	< 1	< 1	4	< 2	28
ML94009	1646	226	< 5	< 0.2	12	< 2	8	< 1	2	24	4	76
ML94010	1646	226	< 5	< 0.2	< 2	< 2	6	< 1	< 1	4	< 2	40
ML94011	1646	226	< 5	< 0.2	8	< 2	10	< 1	1	22	2	40
ML94012	1646	226	< 5	< 0.2	< 2	< 2	16	< 1	< 1	10	< 2	56

CERTIFICATION: Hart Bichler

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PHONE: 604-984-0221

To: REDFERN RESOURCES LIMITED

205 - 10711 CAMBIE RD.
RICHMOND, B.C.
V6X 3G5

Project : BIG BULL
Comments: CC: C/O KAWDY VENTURES

Certificate Date: 03-SEP-94
Invoice No. : I9424228
P.O. Number :
Account : PL

CERTIFICATE OF ANALYSIS A9424228

SAMPLE	PREP CODE		Ag ppm	As ppm	Bi ppm	Cu ppm	Hg ppm	Mo ppm	Pb ppm	Sb ppm	Zn ppm
BB94017-225	1646	226	< 0.2	20	< 2	67	< 1	1	< 2	26	130
BB94017-240	--	--	miss.	miss.	miss.	miss.	miss.	miss.	miss.	miss.	miss.
BB94017-246	1646	226	< 0.2	6	< 2	47	< 1	1	< 2	6	78
BB94017-269	1646	226	< 0.2	< 2	< 2	64	< 1	< 1	< 2	14	58
BB94017-321	1646	226	< 0.2	< 2	< 2	2	< 1	< 1	< 2	6	34
BB94018-048	1646	226	< 0.2	< 2	< 2	11	< 1	< 1	< 2	4	20
BB94018-051	--	--	miss.	miss.	miss.	miss.	miss.	miss.	miss.	miss.	miss.
BB94018-380	1646	226	< 0.2	< 2	< 2	< 1	< 1	< 1	< 2	4	46
BB93011-385	1646	226	< 0.2	< 2	< 2	68	< 1	1	< 2	14	64
BB94020-217	1646	226	< 0.2	8	< 2	11	< 1	1	< 2	12	120
BB94020-337	1646	226	< 0.2	< 2	< 2	< 1	< 1	< 1	< 2	6	34
BB94021-024	1646	226	< 0.2	< 2	< 2	13	< 1	< 1	< 2	2	32
BB94021-057	1646	226	< 0.2	< 2	< 2	1	< 1	< 1	< 2	6	90
BB94021-200	--	--	miss.	miss.	miss.	miss.	miss.	miss.	miss.	miss.	miss.
BB94021-202	1646	226	< 0.2	< 2	2	19	< 1	< 1	< 2	12	82
BB94021-250	1646	226	< 0.2	14	< 2	39	< 1	< 1	< 2	8	56
BB94021-291	1646	226	< 0.2	6	< 2	11	< 1	1	< 2	18	76
BB94011-385	--	--	miss.	miss.	miss.	miss.	miss.	miss.	miss.	miss.	miss.
BB93003-150	1646	226	< 0.2	8	2	86	< 1	1	< 2	16	60
BB93003-208	1646	226	< 0.2	< 2	< 2	1	< 1	< 1	< 2	4	66
BB94022-080	1646	226	< 0.2	< 2	< 2	2	< 1	< 1	< 2	6	64
BB94022-237	1646	226	< 0.2	6	2	41	< 1	1	< 2	16	66
BB94022-341	1646	226	< 0.2	4	< 2	< 1	< 1	< 1	2	2	12
BB94022-394	1646	226	< 0.2	4	< 2	< 1	< 1	< 1	< 2	4	70
BB94023-095	1646	226	< 0.2	< 2	< 2	7	< 1	< 1	< 2	2	18
BB94023-270	1646	226	1.6	2	< 2	94	< 1	1	18	8	602
BB94023-290	1646	226	< 0.2	18	< 2	73	< 1	< 1	< 2	12	76
BB94023-394	1646	226	< 0.2	16	< 2	92	< 1	1	< 2	18	106
BB94023-474	1646	226	< 0.2	< 2	< 2	15	< 1	< 1	< 2	4	24
ML94007	1646	226	< 0.2	< 2	< 2	23	< 1	< 1	< 2	12	82
ML94013	1646	226	< 0.2	< 2	< 2	10	< 1	< 1	2	6	58
ML94014	1646	226	< 0.2	4	< 2	8	< 1	< 1	4	< 2	34
ML94015	1646	226	< 0.2	< 2	< 2	43	< 1	< 1	< 2	4	64

CERTIFICATION: [illegible]

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British Columbia, Canada V7J 2C1
PHONE: 604-984-0221

REDFERN RESOURCES LIMITED
205 - 10711 CAMBIE RD.
RICHMOND, B.C.
V6X 3G5

Project : TULSEQUAH
Comments: ATTN: K. CURTIS CC: REDFERN RES. - ATLIN, BC

Page Number : 1
Total Pages : 1
Certificate Date: 13-SEP-94
Invoice No. : I9425213
P.O. Number :
Account : PL

CERTIFICATE OF ANALYSIS A9425213

SAMPLE	PREP CODE		Au oz/T	Ag oz/T	Cu %	Pb %	Zn %
MA94002	208	226	0.010	19.50	0.78	14.20	5.54

CERTIFICATION: Hauptmann

Chemex Labs Ltd.

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PHONE: 604-984-0221

To: REDFERN RESOURCES LIMITED
205 - 10711 CAMBIE RD.
RICHMOND, B.C.
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Page Number : 1
Total Pages : 1
Certificate Date: 15-SEP-94
Invoice No. : I9425217
P.O. Number :
Account : PL

Project : TULSEQUAH
Comments: ATTN: K. CURTIS CC: REDFERN RES. - ATLIN, BC

CERTIFICATE OF ANALYSIS A9425217

SAMPLE	PREP CODE		Au ppb FA+AA	Ag ppm	As ppm	Bi ppm	Cu ppm	Hg ppm	Mo ppm	Pb ppm	Sb ppm	Zn ppm
MG94047	205	226	< 5	0.4	16	< 2	131	< 1	< 1	18	4	28
MG94048	205	226	< 5	1.4	18	< 2	198	< 1	1	68	18	126
MG94049	205	226	< 5	< 0.2	14	< 2	9	< 1	2	20	< 2	14
MG94050	205	226	< 5	< 0.2	2	< 2	9	< 1	< 1	10	< 2	68
MG94051	205	226	< 5	< 0.2	< 2	< 2	7	< 1	< 1	6	2	30
RG94051	205	226	< 5	< 0.2	4	< 2	2	< 1	1	12	< 2	12
RG94052	205	226	< 5	1.0	8	< 2	1235	< 1	1	4	4	54

CERTIFICATION: Hart Bichler

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To: REDFERN RESOURCES LIMITED

205 - 10711 CAMBIE RD.
RICHMOND, B.C.
V6X 3G5

Project : BIG BULL
Comments: CC: C/O KAWDY VENTURES

Page Number : 1
Total Pages : 1
Certificate Date: 27-SEP-94
Invoice No. : I9426205
P.O. Number :
Account : PL

CERTIFICATE OF ANALYSIS A9426205

SAMPLE	PREP CODE		Au ppb FA+AA	Ag ppm Aqua R	As ppm	Bi ppm	Cu ppm	Hg ppm	Mo ppm	Pb ppm	Sb ppm	Zn ppm
RG94053	205	226	< 5	< 0.2	6	< 2	4	< 1	< 1	14	2	52
RG94054	205	226	< 5	< 0.2	< 2	< 2	7	1	< 1	4	8	76
RG94055	205	226	< 5	< 0.2	< 2	< 2	15	< 1	< 1	2	10	44
RG94056	205	226	< 5	< 0.2	< 2	< 2	9	< 1	< 1	< 2	2	28
RG94057	205	226	< 5	< 0.2	4	< 2	6	1	2	26	6	42
RG94058	205	226	< 5	0.4	6	< 2	16	2	< 1	364	4	204
RG94059	205	226	< 5	0.2	< 2	< 2	2	2	< 1	8	2	14
RG94060	205	226	< 5	< 0.2	4	< 2	8	< 1	< 1	32	2	68
RG94061	205	226	< 5	0.6	< 2	< 2	24	1	< 1	276	4	272

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To: REDFERN RESOURCES LIMITED

205 - 10711 CAMBIE RD.
RICHMOND, B.C.
V6X 3G5

Project : BIG BULL
Comments: CC: C/O KAWDY VENTRURES

Page Number :
Total Pages :1
Certificate Date: 27-SEP-94
Invoice No. : I9426208
P.O. Number :
Account :PL

CERTIFICATE OF ANALYSIS A9426208

SAMPLE	PREP CODE		Au ppb FA+AA	Ag ppm Aqua R	As ppm	Bi ppm	Cu ppm	Hg ppm	Mo ppm	Pb ppm	Sb ppm	Zn ppm
BCL004	1646	226	< 5	< 0.2	8	6	13	< 1	1	50	8	132
BCL005	1646	226	< 5	< 0.2	< 2	< 2	4	< 1	< 1	8	< 2	26
BCL006	1646	226	< 5	< 0.2	4	< 2	26	< 1	< 1	2	10	14
RL94016	1646	226	< 5	< 0.2	< 2	< 2	20	< 1	1	86	8	218
RL94017	1646	226	< 5	< 0.2	< 2	< 2	13	< 1	< 1	4	4	112
RL94018	1646	226	< 5	< 0.2	10	< 2	11	< 1	< 1	2	4	42
RL94019	1646	226	< 5	< 0.2	< 2	2	6	< 1	< 1	4	< 2	90
RL94020	1646	226	< 5	< 0.2	< 2	< 2	67	< 1	< 1	< 2	< 2	136
RL94021	1646	226	< 5	< 0.2	8	< 2	59	< 1	< 1	4	< 2	126
RL94022	1646	226	< 5	< 0.2	< 2	6	4	< 1	< 1	2	< 2	86

CERTIFICATION: Hart Bichler

Geochemical Laboratories
Earth & Planetary Sciences
McGill University, 3450 University Street
Montreal, QC CANADA H3A 2A7

X-ray fluorescence analysis of 34 powders submitted by Dr. K. Curtis/Dr. R. March, Redfern Resources on November 10, 1994.

Any values given in the results tables which are less than the given detection limits are not significant.

Major element analyses:

Analyses done on fused beads prepared from ignited samples
Total iron present has been recalculated as Fe_2O_3. In cases where most of the iron was originally in the ferrous state (usually the case with unaltered rocks) a higher total is the result.

Trace element analyses:

Analyses done on pressed powder pellets

Detection limits are based on three times the background sigma values.

"int" indicates that there is interference from unusually high quantities of other trace elements.

A copy of the correlation list follows the results.

S.T. Ahmedali, Geochemist
December 15, 1994

Curtis

LAB NO.	SAmple NO.
94-039	BB 94017-225
040	BB 94017-246
041	BB 94017-269
042	BB 94017-321
043	BB 94018-048
044	BB 94018-380
045	BB 93011-385
046	BB 94020-217
047	BB 94020-337
048	BB 94021-624
049	BB 94021-057
050	BB 94021-202
051	BB 94021-250
052	BB 94021-291
053	BB 93003-150
054	BB 93003-208
055	BB 94022-080
056	BB 94022-237
057	BB 94022-341
058	BB 94022-394

Sept. 14/94

LAB NO.	SAmple NO
94-059	BB 94023-095
060	BB 94023-270
061	BB 94023-290
062	BB 94023-394
063	BB 94023-474
064	ML ~~BB~~ 94007
065	ML ~~BB~~ 94013
066	ML ~~BB~~ 94014
067	ML ~~BB~~ 94015

total 29 powder samples

Long Lo2

Curtis/March 34 Powders Nov. 10/94

LONGLO1 - PP for those noted

Sample No.	Lab No.	Remarks	
145881	94-068	Basalt	<1%
145882	069	Basalt	<1%
145883	070	Basalt	1%
145884	071	Basalt	1%
52009 4L1	072	Basalt	15-20%
52009 4L2	073	Basalt	<1%
52009 4L3	074	Basalt	5-8%
52009 4L4	075	Rhyolite	10-15%
BCL001	076	Basalt	<1%
BCL002	077	Dacite	1%
BCL003	078	Basalt	1%
BCL004	079	Basalt	<1%
BCL005	080	Dacite	1%
BCL006	081	Dacite	1%
KL94011	082		
ML94005	083	Dacite	<1%
ML94006	084	Dacite	1-2%
ML94008	085	Dacite	<1%
ML94009	086	Rhyolite	<1%
ML94010	087	Rhyolite	<1%
ML94011	088	Dacite	<1%
ML94012	089	Rhyolite	<1%

MAJORS ONLY

Curtis/March

Sample No.	Lab No.	Remarks	
RL94013	94-090	Dacite 1%	MAJORS ONLY
RL94014	091	Dacite 1%	
RL94016	092	Dacite (<5% S)	
RL94017	093	Basalt (1%) S	
RL94018	094	Dacite <1%	
RL94019	095	Basalt <1%	
RL94020	096	Basalt <1%	
RL94021	097	Dacite <1%	
RL94022	098	Dacite <1%	
TC9418-1	099	Rhyolite 3-5%	
TC9418-2	100	Rhyolite 5-7%	
TC9418-3	101	Basalt 5-7%	

Geochemical Laboratories
Earth and Planetary Sciences
McGill University, 3450 University Street
Montreal, QC CANADA H3A 2A7

Major Element Package

					1.00								1								
	Sample		**SiO2**	**TiO2**	**Al2O3**	**Fe2O3**	**MnO**	**MgO**	**CaO**	**Na2O**	**K2O**	**P2O5**	**BaO**	**Co**	**Cr2O3**	**Cu**	**Ni**	**V**	**Zn**	**LOI**	**Total**
28919	**CURTIS**	**017**	49.25	0.62	22.78	7.38	0.12	5.83	6.09	4.43	2.43	0.14	1470	24	93	48	43	149	348	1.16	100.45
94466A	**CURTIS**	**018**	54.43	0.90	21.28	8.49	0.09	3.27	6.01	3.76	1.09	0.20	110	33	178	49	42	254	52	0.83	100.43
94466B	**CURTIS**	**019**	46.63	0.97	21.80	10.02	0.14	6.24	8.84	3.00	1.65	0.17	841	38	197	111	81	235	73	1.03	100.65
9454004	**CURTIS**	**020**	49.26	1.06	13.40	16.50	0.20	7.48	1.12	0.16	1.84	0.82	1228	40	28	1467	34	250	146	8.31	100.46
9454007	**CURTIS**	**021**	77.27	0.34	12.51	2.07	0.02	0.68	0.17	0.68	4.31	0.06	7878	2	-3	36	2	18	6	2.19	101.10
9454008	**CURTIS**	**022**	73.54	0.36	13.13	3.20	0.01	0.55	0.22	1.11	4.92	0.07	4130	4	6	30	0	7	14	2.63	100.16
94001	**CURTIS**	**023**	75.93	0.23	12.80	1.84	0.05	0.77	0.36	1.48	4.56	0.04	1361	6	18	49	3	21	42	1.69	99.89
94002	**CURTIS**	**024**	72.50	0.26	14.36	3.41	0.10	0.61	0.21	6.64	1.05	0.05	793	18	34	67	5	20	60	0.83	100.13
94003	**CURTIS**	**025**	70.36	0.48	14.98	4.25	0.06	1.23	0.16	4.67	2.44	0.10	712	13	12	122	10	20	50	1.54	100.37
94004	**CURTIS**	**026**	50.40	0.87	13.40	9.55	0.18	6.05	6.09	2.97	3.43	0.57	1753	22	283	159	73	204	116	5.58	99.36
94005	**CURTIS**	**027**	77.30	0.23	12.84	1.89	0.02	0.54	0.05	1.36	3.68	0.06	1526	4	0	24	-2	10	55	2.00	100.12
94006	**CURTIS**	**028**	76.85	0.24	13.28	2.00	0.02	0.64	0.02	0.70	4.16	0.03	1511	5	31	45	21	13	54	1.89	100.00
94007	**CURTIS**	**029**	75.13	0.27	12.42	2.94	0.10	0.86	1.00	0.18	4.31	0.05	755	5	20	60	0	12	71	2.49	99.84
94008	**CURTIS**	**030**	74.98	0.26	14.27	2.02	0.07	0.66	0.04	0.15	4.75	0.05	1318	7	14	38	3	19	34	2.31	99.71
94009	**CURTIS**	**031**	72.80	0.34	13.49	3.64	0.04	1.15	0.12	0.63	5.33	0.09	1102	5	9	28	4	31	118	2.42	100.17
94010	**CURTIS**	**032**	73.96	0.23	12.78	2.67	0.14	1.04	1.09	3.38	2.61	0.04	783	2	13	49	4	21	151	1.77	99.82
94011	**CURTIS**	**033**	75.37	0.22	13.18	2.37	0.01	0.40	0.11	3.41	3.01	0.05	1087	3	19	53	1	18	24	1.65	99.90
94012	**CURTIS**	**034**	70.12	0.33	14.39	4.06	0.15	0.88	0.85	4.88	2.42	0.06	969	8	69	57	3	32	64	1.40	99.66
94001	**CURTIS**	**035**	59.93	2.18	14.80	9.94	0.00	0.71	0.68	0.20	4.00	0.53	315	15	517	68	60	81	54	7.24	100.32
94030	**CURTIS**	**036**	72.53	0.36	13.93	2.60	0.03	1.19	0.11	1.23	4.40	0.07	2084	3	162	84	1	20	19	3.17	99.85
94031	**CURTIS**	**037**	64.31	0.41	15.66	4.29	0.09	2.18	3.01	0.51	5.45	0.10	1237	10	86	35	4	47	66	4.11	100.27
94032	**CURTIS**	**038**	82.18	0.20	9.30	1.85	0.03	0.52	0.10	4.05	0.54	0.06	50	0	137	34	1	22	11	0.82	99.66
	Detection Limits(ppm)		**60**	**35**	**120**	**30**	**30**	**95**	**15**	**75**	**25**	**35**	**35**	**10**	**2**	**15**	**3**	**10**	**2**	**100**	

August 14, 1994

Geochemical Laboratories
Earth and Planetary Sciences
McGill University, 3450 University Street
Montreal, QC CANADA H3A 2A7

Major Element Package

Sample		SiO_2	TiO_2	Al_2O_3	Fe_2O_3	MnO	MgO	CaO	Na_2O	K_2O	P_2O_5	BaO	Co	Cr_2O_3	Cu	Ni	V	Zn	LOI	Total
CURTIS	039	50.59	0.85	17.77	10.28	0.48	8.66	3.00	3.92	0.34	0.17	625	34	318	84	83	248	186	4.47	100.69
CURTIS	040	50.46	0.83	17.66	9.49	0.20	7.63	6.25	4.62	0.08	0.17	25	33	336	42	81	237	135	3.10	100.58
CURTIS	041	49.87	0.83	18.03	9.62	0.17	6.82	7.76	4.45	0.05	0.17	int	37	309	66	78	250	107	2.82	100.47
CURTIS	042	61.38	0.52	18.37	5.91	0.11	2.03	2.94	3.10	2.99	0.10	1479	9	69	23	18	93	80	2.58	100.21
CURTIS	043	69.87	0.55	13.93	4.42	0.05	0.68	1.82	3.97	3.19	0.20	1113	9	7	37	0	37	95	1.90	100.51
CURTIS	044	64.89	0.41	16.69	4.58	0.14	0.92	2.59	3.56	3.40	0.10	827	5	4	18	7	23	93	2.88	100.26
CURTIS	045	50.56	0.84	18.84	9.39	0.17	5.19	8.41	3.04	0.42	0.17	152	34	104	77	38	240	99	3.82	100.92
CURTIS	046	50.53	0.97	20.32	10.48	0.35	5.74	2.86	4.48	3.17	0.06	1045	23	41	23	47	158	178	2.82	101.93
CURTIS	047	67.71	0.37	14.83	3.54	0.13	1.03	2.51	2.86	3.56	0.09	816	10	0	26	0	22	79	3.28	100.01
CURTIS	048	69.54	0.45	14.42	4.14	0.09	1.40	1.53	1.71	4.30	0.11	2070	2	0	31	2	13	85	2.18	100.09
CURTIS	049	63.04	0.53	17.57	5.55	0.66	2.64	3.49	1.54	3.46	0.10	1029	16	3	26	22	39	127	1.81	100.52
CURTIS	050	52.97	0.84	18.27	9.60	0.11	6.41	4.53	1.78	2.93	0.07	402	30	308	28	77	200	122	2.99	100.62
CURTIS	051	50.06	1.00	18.07	9.72	0.21	4.42	9.77	4.00	0.36	0.20	251	30	75	48	34	277	124	2.38	100.27
CURTIS	052	51.52	0.85	17.85	10.12	0.12	6.66	4.06	4.74	1.08	0.23	107	27	268	26	66	191	122	3.17	100.58
CURTIS	053	51.47	0.98	17.55	10.95	0.09	6.98	4.49	1.00	2.54	0.11	454	24	43	81	68	202	99	4.62	100.88
CURTIS	054	64.21	0.38	16.86	3.29	0.07	1.67	4.54	0.35	5.09	0.07	1060	4	14	20	9	14	105	3.52	100.17
CURTIS	055	68.11	0.30	15.23	5.11	0.11	2.63	1.61	2.05	3.33	0.07	1737	13	5	21	1	28	104	1.76	100.50
CURTIS	056	49.05	0.86	18.87	9.76	0.16	7.07	5.86	4.33	1.36	0.28	244	27	326	52	68	215	119	3.01	100.72
CURTIS	057	70.42	0.35	15.13	2.87	0.04	0.37	1.00	3.74	4.29	0.09	1535	11	11	25	3	32	74	1.62	100.09
CURTIS	058	64.91	0.42	17.71	3.97	0.07	1.59	1.84	4.21	3.39	0.08	850	4	36	20	9	21	123	2.20	100.50
CURTIS	059	77.00	0.20	10.17	3.34	0.04	0.68	2.10	1.15	2.66	0.05	1669	16	13	22	0	20	55	2.44	99.99
CURTIS	060	44.60	1.19	22.19	11.40	0.34	7.75	3.16	0.94	5.08	0.17	1148	36	69	90	52	204	781	3.93	100.99
CURTIS	061	46.20	2.34	15.31	12.93	0.26	6.62	9.92	1.52	0.13	0.25	int	43	220	86	77	359	117	4.89	100.46
CURTIS	062	46.82	0.78	15.49	9.38	0.21	7.92	7.81	1.35	4.32	0.35	1119	37	479	75	72	217	126	5.38	100.02
CURTIS	063	69.14	0.30	12.90	3.78	0.09	1.14	4.56	1.11	3.47	0.07	1027	5	8	34	0	38	58	3.56	100.24
CURTIS	064	50.67	1.19	20.63	9.86	0.24	3.60	8.28	0.98	3.13	0.27	1445	18	0	37	6	256	106	1.56	100.60
CURTIS	065	59.38	0.65	21.75	5.50	0.06	1.81	1.61	0.49	5.86	0.12	2526	6	7	33	6	33	102	3.01	100.51
CURTIS	066	72.73	0.32	13.96	3.19	0.06	1.45	0.60	2.81	3.18	0.07	2903	11	0	33	0	23	82	1.53	100.21
CURTIS	067	64.39	0.63	17.01	5.75	0.12	1.20	1.60	4.73	2.69	0.19	423	6	18	49	18	34	120	2.03	100.41
Detection Limits(ppm):		60	35	120	30	30	95	15	75	25	35	35	10	2	15	3	10	2	100	

October 12, 1994

Geochemical Laboratories
Earth and Planetary Sciences
McGill University, 3450 University Street
Montreal, QC CANADA H3A 2A7

Major Element Package

Sample		SiO2	TiO2	Al2O3	Fe2O3	MnO	MgO	CaO	Na2O	K2O	P2O5	BaO	Co	Cr2O3	Cu	Ni	V	Zn	LOI	Total
CURTIS	068	49.05	0.91	20.30	10.25	0.14	5.06	3.14	3.04	3.19	0.09	847	16	66	55	31	193	140	4.70	100.00
CURTIS	069	49.92	0.93	17.87	9.60	0.16	4.86	7.97	4.40	0.07	0.18	265	30	106	86	37	274	112	4.33	100.38
CURTIS	070	46.94	1.08	18.65	11.62	0.23	6.84	3.50	5.04	0.73	0.39	420	22	71	49	45	384	355	5.50	100.65
CURTIS	071	48.27	0.84	18.11	10.07	0.21	7.05	7.77	3.50	1.47	0.20	508	22	341	127	75	232	127	2.72	100.35
CURTIS	072	64.54	0.86	14.66	7.47	0.06	2.02	0.76	0.58	3.97	0.31	2598	9	8	46	2	79	71	5.17	100.68
CURTIS	073	53.98	0.99	12.95	14.12	0.18	5.50	1.53	0.34	2.49	0.26	2230	18	35	281	6	223	197	7.74	100.38
CURTIS	074	69.70	0.36	12.75	6.46	0.02	1.04	0.18	-0.03	4.44	0.06	2976	10	12	51	4	37	72	4.88	100.18
CURTIS	075	71.48	0.38	14.05	4.64	0.03	0.63	0.37	1.06	4.06	0.07	1736	4	13	61	6	17	126	3.61	100.58
CURTIS	076	66.30	0.56	14.05	6.98	0.09	3.02	1.00	4.42	1.24	0.13	459	8	15	62	9	117	120	2.72	100.59
CURTIS	077	66.54	0.57	15.98	5.74	0.06	1.99	0.36	5.52	1.81	0.14	689	8	14	73	1	73	96	1.73	100.54
CURTIS	078	50.01	0.96	18.84	10.24	0.12	7.13	1.99	2.82	3.23	0.10	895	30	101	38	40	104	129	5.34	100.91
CURTIS	079	48.23	0.90	18.96	9.59	0.24	8.98	5.03	2.37	2.45	0.07	593	33	247	33	64	213	186	3.64	100.60
CURTIS	080	80.41	0.19	8.60	1.90	0.07	0.65	2.10	0.26	2.59	0.04	659	5	0	37	2	57	65	3.11	100.00
CURTIS	081	88.77	0.16	5.19	1.28	0.01	0.25	0.07	0.00	1.24	0.03	16210	13	0	46	5	47	51	1.24	99.88
CURTIS	082	50.35	0.99	18.31	9.90	0.16	6.32	4.67	2.46	4.47	0.28	1128	27	102	87	26	225	110	2.56	100.64
CURTIS	083	74.96	0.26	13.69	2.03	0.05	0.67	0.36	3.35	3.13	0.05	1326	11	7	15	3	31	78	1.39	100.09
CURTIS	084	74.68	0.22	12.68	2.38	0.15	0.55	0.97	4.08	2.05	0.11	836	5	45	39	13	33	101	1.84	99.82
CURTIS	085	74.01	0.24	13.67	2.44	0.08	1.17	0.76	0.60	4.59	0.05	1788	6	2	29	8	14	81	2.55	100.35
CURTIS	086	75.81	0.24	13.37	2.40	0.05	0.85	0.27	0.12	4.62	0.05	1262	8	4	31	0	24	135	2.17	100.10
CURTIS	087	74.98	0.28	12.77	2.52	0.09	0.57	1.09	3.11	2.82	0.07	960	0	5	22	0	11	92	2.00	100.41
CURTIS	088	75.74	0.24	13.72	2.22	0.04	0.77	0.03	0.03	4.77	0.03	1470	4	16	35	0	11	102	2.16	99.91
CURTIS	089	73.77	0.23	13.49	3.30	0.08	0.59	0.42	3.41	3.29	0.05	1293	12	2	34	0	28	116	1.56	100.34
CURTIS	090	76.53	0.05	13.69	0.23	0.01	0.00	0.18	3.35	5.35	0.02	358	16	14	22	3	6	124	0.58	100.04
CURTIS	091	76.65	0.07	13.79	0.88	0.07	0.04	0.02	2.44	4.96	0.02	981	10	18	8	0	6	61	1.09	100.14
CURTIS	092	73.37	0.25	13.49	2.65	0.11	1.32	0.73	0.94	4.37	0.04	1404	4	13	36	5	38	288	2.25	99.70
CURTIS	093	54.74	0.94	16.87	11.00	0.16	2.80	3.43	4.47	1.68	0.33	675	20	11	29	0	173	158	4.33	100.86
CURTIS	094	73.84	0.33	13.53	2.10	0.04	0.83	1.59	1.30	3.53	0.08	1043	2	7	29	5	30	96	2.87	100.16
CURTIS	095	52.25	0.65	15.03	9.56	0.18	6.92	6.78	3.23	0.07	0.13	34	85	618	24	192	217	115	5.60	100.53
CURTIS	096	49.12	0.87	17.24	9.27	0.20	2.44	9.43	4.22	0.96	0.26	423	15	5	71	8	243	140	6.08	100.18
CURTIS	097	51.73	1.02	18.32	11.44	0.21	3.14	7.46	3.65	0.52	0.33	307	22	0	73	4	155	164	2.79	100.68
CURTIS	098	55.91	0.81	16.64	9.13	0.14	5.37	3.39	5.24	0.42	0.16	237	24	73	38	41	159	128	3.95	101.23
CURTIS	099	72.86	0.43	14.42	4.31	0.00	0.07	0.14	0.17	4.06	0.10	469	19	49	16	12	45	46	3.89	100.52
CURTIS	100	71.25	0.31	13.63	3.97	0.04	1.45	0.33	0.17	4.48	0.07	1371	11	1	33	2	22	58	4.16	100.01

December 15, 1994

Geochemical Laboratories
Earth and Planetary Sciences
McGill University, 3450 University Street
Montreal, QC CANADA H3A 2A7

Major Element Package

Sample	SiO2	TiO2	Al2O3	Fe2O3	MnO	MgO	CaO	Na2O	K2O	P2O5	BaO	Co	Cr2O3	Cu	Ni	V	Zn	LOI	Total
CURTIS 101	45.59	0.87	15.54	9.89	0.41	6.96	8.01	1.87	1.60	0.16	1149	29	137	67	31	256	132	8.62	99.70
Detection Limits(ppm):	60	35	120	30	30	95	15	75	25	35	17	10	2	15	3	10	2	100	

December 15, 1994

Geochemical Laboratories
Earth and Planetary Sciences
McGill University, 3450 University Street
Montreal, QC CANADA H3A 2A7

Trace Element Package

	Sample		Ga	Nb	Pb	Rb	Sr	Th	U	Y	Zr
TCUE919	**CURTIS**	**017**	24	12	19	56	483	5	1	47	256
TCU9466A	**CURTIS**	**018**	19	4	10	26	428	0	0	25	61
TCU9466B	**CURTIS**	**019**	19	5	3	42	798	0	0	22	66
TC9454004	**CURTIS**	**020**	16	7	38	36	33	0	8	50	74
TC9454007	**CURTIS**	**021**	8	11	5	45	183	0	0	43	145
TC9454008	**CURTIS**	**022**	13	12	20	52	53	0	0	40	159
RL 94002	**CURTIS**	**024**	15	18	17	19	142	5	0	44	261
RL 94003	**CURTIS**	**025**	16	17	7	47	322	2	0	42	156
RL94004	**CURTIS**	**026**	15	6	14	61	393	2	0	29	76
RL94010	**CURTIS**	**032**	12	11	17	48	107	0	0	23	123
RL94012	**CURTIS**	**034**	15	15	13	46	288	5	0	41	218
	Detection Limits:		**1**	**1**	**2**	**1**	**1**	**1**	**1**	**1**	**1**

August 15, 1994

Geochemical Laboratories
Earth and Planetary Sciences
McGill University, 3450 University Street
Montreal, QC CANADA H3A 2A7

Trace Element Package

Sample		Ga	Nb	Pb	Rb	Sr	Th	U	Y	Zr
CURTIS	039	17	3	15	9	325	0	0	21	53
CURTIS	040	16	2	5	1	346	0	0	20	50
CURTIS	041	19	1	4	0	530	0	int	20	53
CURTIS	042	21	8	4	58	153	0	6	23	153
CURTIS	043	15	7	4	65	201	0	4	28	101
CURTIS	044	18	9	4	67	122	0	7	30	152
CURTIS	045	17	1	4	7	545	0	int	20	57
CURTIS	046	19	3	19	73	187	0	7	10	49
CURTIS	047	17	9	3	82	92	0	6	23	134
CURTIS	048	17	8	3	90	168	0	5	31	128
CURTIS	049	19	11	14	82	377	1	0	25	173
CURTIS	050	18	2	5	67	337	0	1	16	51
CURTIS	051	19	3	9	6	374	0	0	24	60
CURTIS	052	18	2	7	22	241	0	4	32	46
CURTIS	053	18	2	8	57	403	0	0	19	55
CURTIS	054	18	9	5	103	107	0	9	27	163
CURTIS	055	16	9	4	72	154	0	5	31	158
CURTIS	056	18	2	4	33	430	0	0	23	54
CURTIS	057	16	9	6	74	98	0	5	28	141
CURTIS	058	18	11	8	74	102	0	6	24	169
CURTIS	059	12	8	1	53	125	0	4	19	111
CURTIS	060	22	4	47	115	185	0	10	24	59
CURTIS	061	21	4	14	3	370	1	3	37	145
CURTIS	062	17	2	8	87	620	0	int	19	80
CURTIS	063	14	6	7	77	216	0	3	23	122
CURTIS	064	21	3	7	75	366	0	3	28	59
CURTIS	065	22	11	6	122	185	3	8	35	227
CURTIS	066	16	8	7	65	222	0	1	28	154
CURTIS	067	20	10	5	61	233	0	4	41	152

Geochemical Laboratories
Earth and Planetary Sciences
McGill University, 3450 University Street
Montreal, QC CANADA H3A 2A7

Trace Element Package

Sample		Ga	Nb	Pb	Rb	Sr	Th	U	Y	Zr
CURTIS	068	18	3	9	79	183	0	6	19	48
CURTIS	069	17	2	6	1	546	0	int	22	62
CURTIS	070	20	4	8	15	196	0	6	25	63
CURTIS	071	18	1	5	35	536	0	int	26	54
CURTIS	072	16	8	15	69	73	0	11	26	84
CURTIS	073	16	4	11	49	35	1	18	23	47
CURTIS	074	19	9	11	78	21	0	13	36	132
CURTIS	075	18	11	52	61	31	0	11	42	149
CURTIS	076	16	9	8	29	82	0	8	33	129
CURTIS	077	17	9	8	40	171	0	4	30	147
CURTIS	078	19	3	3	54	163	0	7	25	54
CURTIS	079	18	2	54	51	304	0	2	17	49
CURTIS	080	12	10	5	46	31	0	6	14	109
CURTIS	081	2	6	0	18	137	0	0	11	43
CURTIS	082	16	3	3	90	185	0	8	23	48
CURTIS	092	13	9	83	80	85	0	7	16	109
CURTIS	093	19	6	4	37	129	0	10	31	82
CURTIS	094	15	9	2	65	64	0	5	20	125
CURTIS	095	15	2	4	2	431	0	0	17	45
CURTIS	096	16	3	7	25	356	0	3	27	59
CURTIS	097	19	4	9	11	576	2	int	32	92
CURTIS	098	18	5	4	12	164	0	6	25	74
CURTIS	099	10	9	7	39	15	0	11	19	125
CURTIS	100	15	8	3	84	26	0	11	30	134
CURTIS	101	16	4	7	30	69	0	11	18	42
Detection Limits(ppm):		1	1	1	1	1	1	1	1	1