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EXPLORATION DIVISION
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EXPLORATION LICENCE 40/85

ELLIOTT BAY

TASMANIA

MICROFILMED
FICHE No. 013025-27

Progress Report for the Period

January 1993 to December 1993

Volume 1 of 1

Compiled by:

for S Richardson
SENIOR GEOLOGIST

Issued by:

David Wallace

D B Wallace
REGIONAL EXPLORATION
MANAGER

November 1993

Internal Report No: Elliott Bay 8

Distribution

Aberfoyle - Burnie	(1/5)
Aberfoyle - Hawthorn	(2/5)
Arimco	(3/5)
Poseidon	(4/5)
Mineral Resources Tasmania	**(5/5)**

93-3525

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1.0 SUMMARY

During the twelve month period to December, 1993 work on Exploration Licence 40/85 Elliott Bay has focussed on drill testing of the EB-1 prospect. One hole was abandoned and one hole completed. The potential bedrock conductor interpreted from surface EM appears to relate to a lateral inhomogeneity at depth within a wide weakly conductive fault zone.

Surface EM follow up of the EB-4 anomaly indicated the response is due to a broad near surface slightly conductive source.

No further work is proposed at either prospect.

2.0 INTRODUCTION

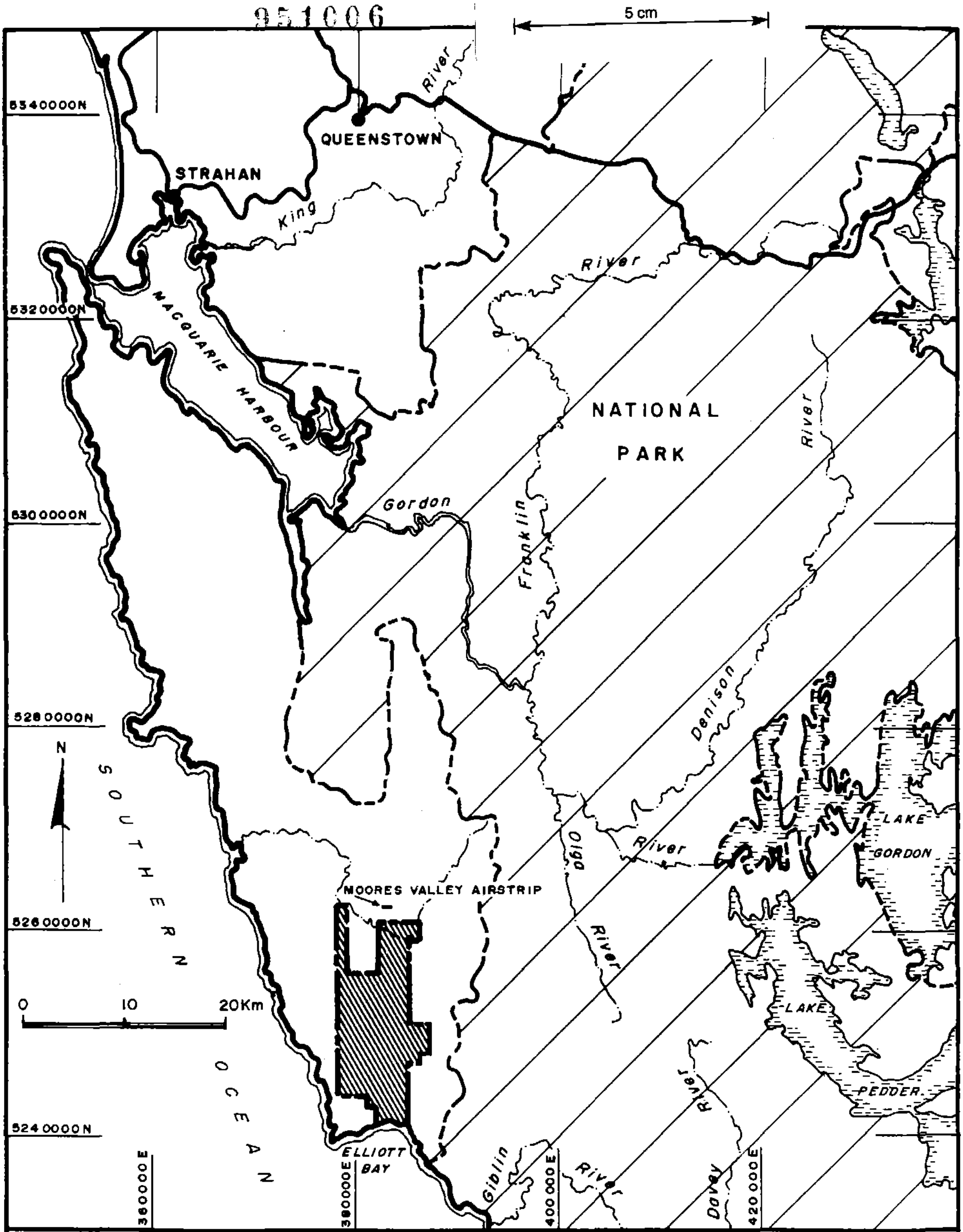
Exploration Licence 40/85 is located in south west Tasmania approximately 85 km. south of Queenstown (Fig. 1). Remote and with very limited access to and within the licence, exploration has historically been conducted during the summer months; usually with helicopter support.

The licence covers the most southern portion of the Mount Read Volcanics and includes outcropping Volcanic Hosted Massive Sulphide (VHMS) at Wart Hill. VHMS is the primary exploration target within EL 40/85.

Extensive exploration of the area including EL 40/85 has been undertaken by BHP (1965-1975), Geopeko (1977-1984) and Cyprus (1985-1989) and is summarised in Wallace, 1991.

This report describes work undertaken on EL 40/85 for the twelve month period to November, 1993.

951006



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EXPLORATION DIVISION

FIG. 1.

REVISIONS			
Init.	Date	Init.	Date

Location Code :

SOUTH WEST TASMANIA
ELLIOTT BAY E.L. 40/85
LOCATION PLAN

Scale : 1:500,000

Date : December, 1991

Compiled :
Drawn : JLR
Traced : JLR
Checked :
Plate No. : EB6

3.0 TENURE

EL 40/85, Elliott Bay, was granted to Cyprus Minerals Aust. Co., on the 24th December, 1985.

After granting of the licence Cyprus entered into a joint venture agreement with Poseidon Minerals Ltd. whereby each party contributed 50% of exploration expenditure and Cyprus acted as manager. On the 9th January, 1991 Aberfoyle Resources entered a joint venture agreement with the existing joint venture partners (Cyprus interest now transferred to Arimco Mining Pty. Ltd.). The agreement provides for Aberfoyle to earn a majority interest in the tenement by funding and managing exploration.

In December, 1991 a statutory relinquishment of 50% reduced the size of EL 40/85 to 125 sq. km.

4.0 PREVIOUS PROGRAMME

Historically the Mount Read Volcanics south of Macquarie Harbour have not been extensively surveyed with modern deep searching EM. In addition the low relief and lack of tall forest make the area ideal for surveying by the new generation of airborne EM techniques.

Aerodata were commissioned to fly a QUESTEM survey over the prospective volcanics. The aim was to locate conductive targets at depths greater than the effective search depth of previous airborne EM surveys such as DIGHEM.

In March 1991 a 725 line km. QUESTEM airborne EM survey was flown over EL 40/85 (Wallace, 1991). Evaluation of the data indicated nine conductors worthy of ground follow up. These are referred to as EB 1-9 with locations as shown on Plate EB 14.

During January and February 1992 a helicopter supported field camp was established at Cowrie Beach and ground follow up carried out. The nine conductors were evaluated by various combinations of gridding, ground EM, mapping, soil and rock chip sampling. As a result all but two were readily attributed to surficial sources. Only EB-1 and EB-4 provided sufficient encouragement for further work.

From February to April 1993 a field camp was again established at Cowrie Beach and exploration continued on EB-1 and EB-4. The results of this work are described below.

5.0 EB-1

5.1 Introduction

Located near the coast at Elliott Bay the EB-1 conductor is a N-S striking 1.8 km. long EM response (Plate EB-14). During 1992 a four line grid was cut over the southern part of the conductor and ground EM, mapping, soil and rock chip sampling carried out. The results of this work are described fully in Richardson, 1992.

Surface geophysics (EM and resistivity) failed to unequivocally resolve the source of the EB-1 conductor. Potential remained for a deep bedrock conductor to be masked by overlying conductive gravels. The surface projection of the potential bedrock conductor occurs adjacent to a mineralised footwall style alteration zone and boundary between a felsic volcaniclastic and lava sequence. Prospectivity was further enhanced by attractive sulphur and Cambrian lead isotopic signatures.

As no further surface work could be proposed to improve understanding of the source of the conductor a diamond drill test was proposed.

5.2 Diamond Drilling Logistics

A four hundred metre diamond hole was proposed to test the potential deep bedrock conductor inferred to be located close to the volcaniclastic/lava contact and adjacent to the footwall style alteration zone. A target at -200 RL at 2520 E on section 1600N was chosen.

Bedding in the EB-1 area is moderately to steeply west dipping indicating a hole drilled from the west to be geologically preferable. However, west of the conductor is a thickly forested slope that would require felling of large trees to allow a helicopter with sling load to approach the drill pad.

East of the target is a flat buttongrass plain requiring no site preparation. This indicated that environmentally and logistically the hole should be drilled from the east.

In order to minimise costs associated with mobilising drilling equipment the Longyear 38 rig and supplies were transported from Strahan to Elliott Bay by fishing boat. Whilst anchored off Cowrie Beach the disassembled rig was transported to the beach by a purpose built landing barge. From there equipment was transferred the short distance to the drill pad by helicopter. However, some of the heaviest items were flown directly from the fishing boat to the drill site.

5.3 DDH EB-1 and DDH EB-2

5.3.1 Introduction

DDH EB-1 was collared on 20-2-93 at AMG co-ordinates 5241597.5 N, 382732.0 E. After only 59m of broken abrasive ground the bit was sliced off downhole and the hole abandoned. A detailed log of this hole is attached as Appendix I and a cross section shown on Plate EB 24.

The hole was recollared on 28-2-93 as DDH EB-2 at AMG co-ordinates 5241597.5 N, 382731.0 E. DDH EB-2 was completed on 25-3-93 at 312m after the rods were bogged and the hole was in danger of being lost.

5.3.2 Geology

A detailed log and petrographic descriptions are attached as Appendix II, whilst a cross section is included as Plate EB 24. A summary log is as follows:

0 - 7.0m	Quartz vein rubble
7.0 - 11.0m	Black Shale
11.0 - 21.0m	Felsic volcanogenic sandstone
21.0 - 31.5m	Silica + Sericite altered volcanogenic sandstone
31.5 - 137.9m	Chlorite + Silica + Sericite altered volcanogenic sandstone
137.9 - 142.4m	Silica + Chlorite rock
142.4 - 153.3m	Chloritic pug - Fault zone
153.3 - 156.5m	Chert
156.5 - 178.5m	Siliceous volcanogenic siltstone
178.5 - 180.9m	Basalt intrusive
180.9 - 220.1m	Rhyolitic fine Lapilli volcaniclastic - volcanogenic sandstone

Drilling conditions in DDH EB-2 were very poor with effectively the entire hole encountering a broad fault zone. The ground was extremely broken and abrasive with core recoveries of only 50%.

Target depth was not reached nor was the lava/epiclastic boundary. After struggling to reach the inferred conductor location the rods were bogging and in danger of snapping which could have prevented a DHEM survey. It was decided to stop the hole at 312m and rely on DHEM to confirm or deny the bedrock conductor.

DDH EB-2 intersected a sequence of felsic volcanogenic sandstones to fine lapilli epiclastics with minor siltstone and shale. Alteration is weak to strong and locally intense with an early pervasive silica + sericite ± chlorite phase subsequently overprinted by a patchy sometimes vein controlled epidote ± silica

± chlorite phase. Mineralisation is only present as trace disseminated pyrite and rare galena + sphalerite + chlorite ± quartz veinlets less than 0.5 cm thick.

The mineralised alteration zone outcropping on the coast does not appear to have been intersected suggesting it either lies east of the hole or does not extend inland.

No conductive body was intersected in the target position

5.3.3 Geophysics

A three loop DHEM survey (Zonge) was conducted in DDH EB-2. Loop locations and survey results are included in Appendix III.

Survey results indicate that the drill hole lies within a broad conductive zone with the most conductive part of the zone lying in front of the end of the hole. It appears that the broad "surficial conductor" interpreted from the surface EM relates to the wide and depth extensive block of faulted ground intersected by the hole. The possible "bedrock conductor" inferred from the surface EM is a slightly more conductive zone at depth within this wide fault zone.

5.3.4 Geochemistry

Seventeen core grind samples from the collar of EB-2 to the base of the lapilli epiclastic at 220m were submitted for Cu, Pb, Zn, Ag, Au, Ba and As assay. Sample intervals were chosen to coincide with lithological or alteration boundaries. Results are presented on Plate EB 25 and in Appendix IV.

Lead and zinc values are slightly elevated throughout reflecting the presence of minor disseminated sphalerite and rare galena ± sphalerite ± chlorite veinlets. Ag and Au assays are uniformly low.

6.0 EB-4

6.1 Introduction

Anomaly EB-4 occurs 1 km. NE and along strike from Geopeko's Voyager 12 gold prospect. This prospect consists of a west dipping breccia and weakly mineralised sulphide vein zone over a true thickness of up to 20m.

During initial ranking of the Elliott Bay Questem conductors, EB-4 was nominated for reconnaissance mapping only. Indications of favourable geology or mineralisation we necessary to warrant further follow up.

Outcrop in the area of EB-4 is sparse with complex geology including felsic lavas, volcanogenic sandstones and feldspar biotite porphyry. Just south of the southern end of the airborne EM response, gossanous veining with weakly elevated base metals was found adjacent to a feldspar biotite porphyry body.

The potential association of the EB-4 conductor with mineralisation; possibly a more sulphide rich section of the Voyager 12 prospect, indicated that EB-4 warranted further follow up.

6.2 Geophysics

During March 1993 a one loop three line EM survey was undertaken over the conductor. Loop and line locations are shown on Plate EB 10/J4+K4 whilst survey results are included as Appendix V.

An unknown but surficial source for the conductor is indicated by the surface EM. Therefore, no further work is proposed for EB-4.

7.0 LEAD ISOTOPE RESEARCH PROJECT

1993 was the final year of a two year collaborative research project between CODES (Dr. B Gemmel), SIROTOPE (Dr. G Carr) and Aberfoyle into the nature of Pb isotopes at Elliott Bay. The aim of the project was to better understand the complex signature of mineralisation in the southern Mount Read Volcanics. This will improve their usefulness in evaluating mineralisation.

Three phases of mineralisation are evident. Two are Cambrian and one is Devonian. Results are discussed in a report attached as Appendix VI.

8.0 REFERENCES

Richardson, S., 1992. Exploration Licence 40/85, Elliott Bay, Tasmania. Report on Exploration to December, 1992. Aberfoyle Resources Ltd. Unpub. Report.

Wallace, D., 1991. Exploration Licence 40/85, Elliott Bay, Tasmania. Report on Exploration to December, 1991. Aberfoyle Resources Ltd. Unpub. Report.

APPENDIX I

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EXPLORATION DIVISION

DIAMOND DRILL LOG

HOLE No. EB1
PAGE 1 OF 2
GEO. RJI
DATE 16/6/93

DRILLING

DEPTH	DRILLING RUN / CORE RECOVERY	CORE TRAY NO.
0	0	
	35	
2	0	
	0	
	0	
10	5	1
	5	
12	5	
	20	
14	5	
	20	
16	35	
	130	
18	65	
20		20.2
	106	
22	45	
24	45	2
	45	
26	75	
28	35	28
	45	
	40	
30	90	3
32	35	
	10	
34	5	
	75	35.4
36	40	
	10	
	60	4
38	60	
	10	
	46	
40	15	

LITHOLOGY

STRATIGRAPHY	ROCK TYPE	COLOUR	VOLCANICLASTICS FRAGMENTS COMPOSITION	MAX. SIZE (MM)	SORTING	SHAPE	MATRIX COMPOSITION	VOLUME %	LOWER CONTACT GRADATION	STYLE
	Q	wh							?	?
10.4	Bsh	bl							?	?
14.5	vlcSS	gn gy	Q	2	M	R	SiSell	20%		

VESICLES: CONCENTRATION | MAX. SIZE (MM) | SHAPE

ALTERATION

	TEXTURE	INTENSITY	MINERALOGY
14.5	per	3	Cl
	per	4	SiSe
	pat	3	Ep
20.3	per	4	Cl
	per	3	SiSe
	pat	2	Ep
26.9	per	4	SiSe
	pat	2	Cl
	pat	4	Ep.
33.1	per	4	SiSe
	pat	3	Cl
	pat	3	Ep.

VEINING

INTENSITY	MAX. WIDTH (MM)	MINERALOGY
3	50	SiEpCl
1	3	Cc

MINERALISATION

	TEXTURE	MINERALOGY & CONTENTS
10.4	dis	Py 10

FAULTS: POSITION OF BASE TOP | DOWNHOLE WIDTH (CM) | CORE AXIS ANGLE | GOUGE

FOLIATION

TYPE	CORE AXIS ANGLE
6	25°
Cl	35°
Cl	25°
Cl	30°

WEATHERING

STANDARD COLOUR LOG

REMARKS

triconed to 0.7m

3.96 to 9.60m - open hole

Top and bottom of shale not well defined ~~H~~ (due to core loss)

14.5 - 20.3 more oxidised/ weathered - some iron staining

SAMPLE NO.

DEPTH: 0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40

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DIAMOND DRILL LOG

HOLE No. EB1
PAGE 2 OF 2
GEO. RJT
DATE 18/1/93

DEPTH	DRILLING RUNS / CORE LOSS	CORE TRAY NO.	MINERALISATION: TEXTURE	MINERALISATION: MINERALOGY & CONTENTS	FOLIATION: TYPE	FOLIATION: CORE AXIS ANGLE	REMARKS	DEPTH
40	40	40.75						40
	15							
	10							
42	70				a	35°		42
	55							
44	10	5						44
	60							
	10							
46	10							46
48		48.05						48
	25		dis	Py1				
50	30						TO - minor feldspar in vein	50
	50							
52	125	6						52
	20				a	35°		
54	40							54
56	30	56.0						56
	20	7						
58	45							58
	15						EOH 58.75m	
60								60

log.0193.mrr

951019

APPENDIX II

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DIAMOND DRILL LOG

HOLE No. EB2
PAGE 1 OF 8
GEO. RJI
DATE 25/5/93

REMARKS: This whole hole has incredibly broken core. Probably one big fault zone. Thus only obvious, large faults have been mapped.

DEPTH	LITHOLOGY											VESICLES			ALTERATION			VEINING			MINERALISATION		FAULTS				FOLIATION		WEATHERING	STANDARD COLOUR LOG	REMARKS	SAMPLE NO.
	STRATIGRAPHY	ROCK TYPE	COLOUR	VOLCANICLASTICS FRAGMENTS COMPOSITION	MAX. SIZE (MM)	SORTING	SHAPE	MATRIX COMPOSITION	VOLUME %	LOWER CONTACT GRADATION	STYLE	CONCENTRATION	MAX. SIZE (MM)	SHAPE	TEXTURE	INTENSITY	MINERALOGY	INTENSITY	MAX. WIDTH (MM)	MINERALOGY	TEXTURE	MINERALOGY & CONTENTS	POSITION OF ? TOP	DOWNHOLE WIDTH (CM)	CORE AXIS ANGLE	GOUGE	TYPE	CORE AXIS ANGLE				
0–3.0	3.0																														NO CORE RECOVERY 3.0	
3.0–7.0	7.0	Q	wh							?	?																				Quartz rubble 7	
7.0–11.0	11.0m	Sh	dk gy							S	C										dis	Py 10					bd	35°			Disseminated pyrite concentrated parallel to bedding Cross bedding ⇒ right way up 11	11
11.0–13		vlc Ss	ow/gn	Q	2	P	R	SeSi	60						per vn	4 1	SeSi Cl	2	5	Cl	dis	Py 1					Cl	65°			Silica increases SeSi alteration with later Cl alteration 13	
13–14.5	14.5m									S	C				per vn per	4 ? 2	SiSe Cl Ep	2	10	ClQ											Epidote clots 14.5	14.5
14.5–15.25	15.25m	Vlc Sh/HA													per	5	SiCl	3	10	QFd											15.25 Highly siliceous - Cherty	15.25
15.25–		vlcSs	gy gn	Q	2	M	R	Si/Cl/Se	50%						per	3	ClSiSe	1	2	Cl											increasing Cl	
– 17.2															per	5	Si				17 17.2											
															per	3	Cl SiSe				dis	Py 1									19-23.5m very broken ground.	
21–															per	4	Si SeCl	3	10	ClSiFdCa							Cl	30°			↑RHQ ↓NQ around 21m – 30m intense veining of siliceous material gives lapilli appearance. occasional Feldspar spots. 27-30m very broken ground.	21
30–																											Cl	25°			Some veins have silica filled tension gashes	30
															per sfr	4 1	SiClSe Fd				dis 1/m 33.3m	Py 10									increasing Cl	
																											Cl	32°			one quartz vein at 34.7m = 70mm wide.	
																											Cl	35°				

DRILLING RUNS / CORE RECOVERY: 0, 10, 10, 10, 10, 80, 90, 90, 5, 75, 60, 20, 25, 5, 40, 60, 30, 10, 5, 70, 60, 35, 95, 75, 35, 40, 40, 30, 20, 100, 80, 60, 70, 90, 105, 50

CORE TRAY NO.: 1, 13.6, 2, 17.6, 3, 22.6, 4, 27.2, 5, 31.0, 6, 36.5, 7

Total of 17.40m of core recovered in 39.2 m

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DIAMOND DRILL LOG

HOLE No. EB2
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GEO. RJI
DATE 27/5/93

DEPTH	DRILLING RUNS CORE LOSS RECOVERY (%)	CORE TRAY NO.
	90	7
		41.35
42	80	
	70	
44	0	8
	35	
46	35	
	20	
		47.75
	50	
48	5	
	50	
	25	9
50	80	
	40	
		52.1
52	45	
	50	
54	90	10
	40	
56	25	
		57.4
58	60	
	60	
	70	11
60	100	
	70	
		61.5
62	90	
	90	
64	50	
	70	12
66	15	
	20	
68		68.3
	55	
	35	
70	80	13
	65	
72	5	
	15	73.1
	30	
74	10	
	15	
76	35	14
	80	
	15	
78	10	
	23	78.25
	80	
80	10	

DEPTH	STRATIGRAPHY	ROCK TYPE	COLOUR	VOLCANICLASTICS FRAGMENTS COMPOSITION	MAX. SIZE (MM)	SORTING	SHAPE	MATRIX COMPOSITION	VOLUME %	LOWER CONTACT GRADATION	STYLE	VESICLES CONCENTRATION	MAX. SIZE (MM)	SHAPE	ALTERATION TEXTURE	INTENSITY	MINERALOGY
42.6															br	3	SiClEpSe
44.5															dis	2	Cl
46															pv	3	SiSe
59.5		vlcSs	gy gn	Q	2	M	R	SiClEp	50%								
68.5															pev	3	ClSiSe

DEPTH	VEINING INTENSITY	MAX. WIDTH (MM)	MINERALOGY	MINERALISATION TEXTURE	MINERALOGY & CONTENTS	FAULTS POSITION OF BASE	DOWNHOLE WIDTH (CM)	CORE AXIS ANGLE	GOUGE	FOLIATION TYPE	CORE AXIS ANGLE	WEATHERING	STANDARD COLOUR LOG	REMARKS	SAMPLE NO.
42.5														Epdt-Se alteration in clots.	
43														43 – 48.5m very broken ground	
46										Cl	38°				
48.5				Ds	Py 2										
49.5	3	5	ClCc												
50.5										Cl	25°				
51.5														51.9 – T.S. 624918	51.8
53	4	10	Cl												
54.5	3	5	CcSi												
55.1										Cl	40°			Epidote clots.	
57	3	7	ClCa	mdis 57.2	Py 15										
59.5														59.4 – Caved.	59.5
60.5										Cl	30°				
64.3	3	15	ClSiCc											64.3 – dis Py X up to 3mm.	
65										Cl	35°				
70.5														70.5 – 20 cm EpSi vein.	
78										Cl	35°			78.2 – 78.35 100% core recovery!	
80					Gn										

Total of 20.75 m of core recovered in interval 39.3 – 80.3m

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EXPLORATION DIVISION

DIAMOND DRILL LOG

HOLE No. EB2

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GEO. RJI

DATE 27/5/93

DRILLING			LITHOLOGY											VESICLES			ALTERATION			VEINING			MINERALISATION		FAULTS				FOLIATION		WEATHERING	STANDARD COLOUR LOG	REMARKS	SAMPLE NO.	DEPTH
						VOLCANICLASTICS						LOWER CONTACT																							
						FRAGMENTS				MATRIX																									
DEPTH	DRILLING RUNS CORE ~~LOSS~~ Recovery	CORE TRAY NO.	STRATIGRAPHY	ROCK TYPE	COLOUR	COMPOSITION	MAX. SIZE (MM)	SORTING	SHAPE	COMPOSITION	VOLUME %	GRADATION	STYLE	CONCENTRATION	MAX. SIZE (MM)	SHAPE	TEXTURE	INTENSITY	MINERALOGY	INTENSITY	MAX. WIDTH (MM)	MINERALOGY	TEXTURE	MINERALOGY & CONTENTS	POSITION OF BASE	DOWNHOLE WIDTH (CM)	CORE AXIS ANGLE	GOUGE	TYPE	CORE AXIS ANGLE					
80	5	15																					vndis	Gn 5 at 80m					Cl	27°					80
	10																																Gn in CcSiCl Veins.		
82	60																			4	400	Cl													82
	35	83.0																					vndis	Gn5 at 83m											
	60																			3	5	CcSi													
84	40																																		84
	60	16																					dis	Py5					Cl	25°					
86	30																																Patches of intense Cl alteration. from 84-90m		86
	40	87.5																																	
88	90																																		88
90	105	17																											Cl	35°					90
	50																																		
	50	91.7																															mineralized vn ≈ 1.5 mm wide.		
92	105																			92 4	25	SiClCcFd	vndis	Gn10Sp5 at ≈92m											92
94	90	18																		94.6															94
	20																																		
96	20	96.5															95			3	15	SiClSe Cc							Cl	30°				96	96
98	250																																		98
	90			vlc Ss													per	3	SiSeCl				vndis	Sp20Gn2 at 98.2m					Cl	30°			Mineralised Vein 2mm wide		
100	30																																		100
102	0	19																																	102
104	20																103.4																NQ/BQ 103.4		104
	~~10~~	106.5																											Cl	36°					
106	50																																		106
	10																																		
108	10																per	4	ClSiSe																108
110	5																																		110
	25																																		
112	20	20															112																	112	112
114	40																																		114
	15																																		
116	30																			3	10	SiCc FdSe	dis	Py5											116
	15																per	3	SiSeCl																
118	5																																		118
	15	119.3																																	
120	30																																		120

Total of 155c of core recovered in

651023

Aberfoyle Resources Limited
EXPLORATION DIVISION

DIAMOND DRILL LOG

HOLE No. EB2
PAGE 4 OF 8
GEO. RJT
DATE 7/6/93

DRILLING			LITHOLOGY											VESICLES			ALTERATION			VEINING			MINERALISATION		FAULTS				FOLIATION						
						VOLCANICLASTICS						LOWER CONTACT																							
						FRAGMENTS				MATRIX																									
DEPTH	DRILLING RUN CA CORE RECOVERY	CORE TRAY NO.	STRATIGRAPHY	ROCK TYPE	COLOUR	COMPOSITION	MAX. SIZE (MM)	SORTING	SHAPE	COMPOSITION	VOLUME %	GRADATION	STYLE	CONCENTRATION	MAX. SIZE (MM)	SHAPE	TEXTURE	INTENSITY	MINERALOGY	INTENSITY	MAX. WIDTH (MM)	MINERALOGY	TEXTURE	MINERALOGY & CONTENTS	POSITION OF TOP	DOWNHOLE WIDTH (CM)	CORE AXIS ANGLE	GOUGE	TYPE	CORE AXIS ANGLE	WEATHERING	STANDARD COLOUR LOG	REMARKS	SAMPLE NO.	DEPTH
120	5																																120m a single pink K-feldspar vein up to 10mm wide.		120
122	35																																		122
124	10																												Cl	25°					124
126	40	21																		4	3	Cc													126
	10																																		
	[illegible]																127.9																	127.9	
128	10																per	3	ClSiSeEp																128
	10																																		
	5																																		
130	10																130.4																		130
	5																per	3	SiSeCl	1	3	Cc													
132	5																																		132
134	45	135.1																		1	5	Cl							Cl	25°					134
136	5																																		136
	10			vlc Ss																															
138	5																137.9																	137.9	138
140	15																per	5	ClSi	1	3	Cc	Vndis at	Gn80Py20 140 m											140
	80	22																																	
142	[illegible]																142.6																142.4 – 153.3 - lighter green alteration than previous alteration interval.	142.4	142
	45																																		
144	10																																		144
146	[illegible]																								146.2	700	?	PuRu							146
	40																per	4	ClSiSe	3	180	CcSi													
148	100	147.3																																	148
150	0																																		150
152	0																153.3																	153.3	152
154	10	23		vlcSh/[illegible] Cr													per	5	SiCl																154
156																	155.5																unit similar to 14.5 – 15.25m? neither upper or lower contact observable here.	155.5	156
	30																																		
158	30			vlc Ss																															158
160	45																												Cl	30°					160

Aberfoyle Resources Limited
EXPLORATION DIVISION

DIAMOND DRILL LOG

HOLE No. EB2
PAGE 5 OF 8
GEO. RJI
DATE 8/6/93

DRILLING

DEPTH	DRILLING RUNS / CORE LOSS	CORE TRAY NO.
160	60	23
162	10	
	10	
164	10 5	
166	10	
	10	
168	10 5 15	
170	90	24
172	05 45 25	
174	25	
	10	
176	20 66	
	120	
178	90	25
180	205	
182	90	
	70	
184	20	
	150	
186	85	
188	30	26
	25	
190	20	
	25	
192	15	
194	55 5	
196	90	
	100	27
198	65	
	15	
200		

LITHOLOGY

STRATIGRAPHY	ROCK TYPE	COLOUR	FRAGMENTS COMPOSITION	FRAGMENTS MAX. SIZE (MM)	FRAGMENTS SORTING	FRAGMENTS SHAPE	MATRIX COMPOSITION	MATRIX VOLUME %	LOWER CONTACT GRADATION	LOWER CONTACT STYLE
	vlc Ss								Gl	I
176.8	R-lv/vlcSs	gy							s	I
178.45	B-int	gn							s	I
180.9	R-lv/vlc Ss	gy	Q	35	P	sA	Scls	~~60~~ 50		

ALTERATION

TEXTURE	INTENSITY	MINERALOGY
per	3	ClSi
per	4	Si&Cl
per	4	ClSi Se
per per	4 2	Si Cl
per	3	EpSiClSe
per p	4 2	Si Cl
per	4	Si
per per	4 2	Si ClSe

VEINING

INTENSITY	MAX. WIDTH (MM)	MINERALOGY
2	3	CcSi
3	2	Cl
3	5	Cc
2 1	2 10	Cl Ep
5 3	350 2	Si CcCl
2	1-5	ClCcEp

MINERALISATION

TEXTURE	MINERALOGY & CONTENTS
vn + dis	Py2

FAULTS

POSITION OF BASE	DOWNHOLE WIDTH (CM)	CORE AXIS ANGLE	GOUGE
161	10	?	PuPu
167	10	?	PuPu
173	60	50°	PuPu

FOLIATION

TYPE	CORE AXIS ANGLE
Cl	32°
Cl	30°
Cl	45°
Cl	20°
Cl	35°

WEATHERING

STANDARD COLOUR LOG

REMARKS

Pyrite concentrated in veins. However disseminated also occurs

176 - core recovery improves. (core less broken).

} Dyke? fine grained. green colour.

Epidote c bt at ~ 181.75m

188m - Two 20mm thick veins mainly calcite c minor quartz + chlorite.

- large quartz veins have very small calcite and chlorite veins crosscutting.

1 calcite vein 5cm wide with chlorite selvede. this is the only thick vein [illegible]

clots of Epidote alteration start to increase

SAMPLE NO.: 178.45, 180.9

DEPTH 160 – 200

Total dl 170m [illegible] mm recovered in 29?

log.01 93

951025

Aberfoyle Resources Limited
EXPLORATION DIVISION

DIAMOND DRILL LOG

HOLE No. EB7
PAGE 6 OF 8
GEO. RJI
DATE 8/6/93

DRILLING

DEPTH	DRILLING RUNS / CORE LOSS	CORE TRAY NO.
200	70	200-16
	20	
202	90	
	80	
204	85	28
	25	
206	95	
	35	
208	55	208.3
	40	
210	80	
	55	
212	130	29
214	100	
216	90	216
	150	
218	70	
220	20	
	65	30
222	5	
	15	
	5	
224	35	224.5
	50	
226	60	
	45	
228	200	31
230	95	
232	295	232.4
234	160	
236	280	32
238	76	
	10	
240		

LITHOLOGY / ALTERATION / VEINING / FAULTS / FOLIATION / REMARKS

STRATIGRAPHY	ROCK TYPE	COLOUR	VOLCANICLASTICS FRAGMENTS COMPOSITION	MAX. SIZE (MM)	LOWER CONTACT GRADATION	STYLE	ALTERATION TEXTURE	INTENSITY	MINERALOGY	VEINING INTENSITY	MAX. WIDTH (MM)	MINERALOGY	FAULTS POSITION OF BASE	DOWNHOLE WIDTH (CM)	CORE AXIS ANGLE	GOUGE	FOLIATION TYPE	CORE AXIS ANGLE	REMARKS	SAMPLE NO.
																	Cl	30°		
										209.2										
	R-lv /vlc Ss																Cl	35°	211.3 - T.S. 624919	
										2	1-35	Cc								
										2	3	Cl								
					?	?													220: very possibly a fault contact at 35° to C.A	
220.1	vlc Slt/Ch	lgt gy	?	?			Per	4	Si	2	1-9	Cc					Cl	38°	220 - 255 Epidote clots common, most have poorly defined irregular edges. However some clots have sharp well defined edges and are angular.	220.1
							Per	3	Cl and patches Ep	2	1-10	Ep								
					S	C				2	2	Cl							contact 48° to core	
226.8	vlc Ss		Same as previous vlc Ss.							2	1-90	SiEd							226.6 - T.S. 624920	
													230.2	20	60°	PuRu	Cl	32°	This vlc Ss appears less altered than previous vlc Ss.	
																			238.7 - 238.75 - intense Se Cl alteration.	

Total of 25.10m of core recovered in 39.5m

951026

log.0193l.aer

Aberfoyle Resources Limited
EXPLORATION DIVISION

DIAMOND DRILL LOG

HOLE No. EE2
PAGE 7 OF 8
GEO. RJI
DATE 10/6/93

DRILLING

DEPTH	DRILLING RUNS / CORE RECOVERY	CORE TRAY NO.
240	10	
	15	240.1
	15	
242	0	
	80	33
244	40	
246	80	
	35	
	15	
248	25	
	15	
	50	249.85
250	5	
	90	
252	5	
	25	34
254	70	
256	70	
	30	
258	70	259.1
260	20	
	80	
262	15	
	85	35
264	40	
266	70	
	35	267.1
268	135	
	5	
270	130	
	25	36
272	65	
	10	
274	55	273.35
	5	
	20	
276	70	
	45	
278	75	37
	40	
280	70	

VEINING (from 249.9)

INTENSITY	MAX. WIDTH (MM)	MINERALOGY
2	2	Hmt
3	1-10	CcSi
3	10	Ep
2	2	Cl

FAULTS

POSITION OF TOP	DOWNHOLE WIDTH (CM)	CORE AXIS ANGLE	GOUGE
248.9	20	60°	PuRu
260.35	5	30°	Pu
260.95	1	30°	PuRu
270.5	5	65°	PuRu
277.7	2.5	60°	PuRu

FOLIATION

TYPE	CORE AXIS ANGLE
Cl	40°
Cl	25°

REMARKS

242.9 - 248.7
High concentration of Epidote alteration clots, up to 50 cm ø.

251.9 - 258
- puggy rubbly mess. probably one big fault zone.

266 some fragments are not altered

951027

Aberfoyle Resources Limited
EXPLORATION DIVISION

DIAMOND DRILL LOG

HOLE No. EB[illegible]
PAGE 3 OF 8
GEO. RJI
DATE 11/6/93

DRILLING

DEPTH	DRILLING RUNS CORE LOSS	CORE TRAY NO.
280	35	281
	25	
282	60	
284	55	38
	160	
286		
	225	
288		288.5
	45	
290	110	
292	230	39
294	30	294.9
296	240	
298	125	40
300	185	
302	145	302.4
	45	
304	150	
306	90	41
308	125	
		309.7
310	290	42
312		
314		
316		
318		
320		

LITHOLOGY: STRATIGRAPHY | ROCK TYPE | COLOUR | VOLCANICLASTICS: FRAGMENTS (COMPOSITION, MAX. SIZE (MM), SORTING, SHAPE), MATRIX (COMPOSITION, VOLUME %) | LOWER CONTACT (GRADATION, STYLE)

VESICLES: CONCENTRATION | MAX. SIZE (MM) | SHAPE

ALTERATION: TEXTURE | INTENSITY | MINERALOGY

VEINING

INTENSITY	MAX. WIDTH (MM)	MINERALOGY
298		
3	1-100	EpSi
3	1-10	Cc
2	3	Fd.Cc
2	22	Si
3	1-5	Cc
3	3	Hmt

MINERALISATION: TEXTURE | MINERALOGY & CONTENTS

FAULTS

POSITION OF BASE	DOWNHOLE WIDTH (CM)	CORE AXIS ANGLE	GOUGE
290.2	25	60°	Pu Ru

FOLIATION: TYPE | CORE AXIS ANGLE

WEATHERING | STANDARD COLOUR LOG

REMARKS

Haematite veins increase downhole

286.8 - T.S. 624921

285 - 287.1
numerous small faults
≈ 60° to C.A.

291.4 - 293.6
very broken ground
c̄ numerous small
faults (Puggy).
heavily quartz/calcite
veined.

Epidote veins have Si filled
tension gashes

305 - 307 - large Ep vns
(up to 10 cm)

EOH 312.0 m

SAMPLE NO.

total - 23·90 m of core recovered in 37 ([illegible] 312)

951028

Aberfoyle Resources Limited
A.C.N. 004 664 108

Exploration Division

39 River Road
Wivenhoe
Tasmania 7320
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PO Box 952
Burnie Tasmania 7320
Australia

ABERFOYLE

16 June 1993

Dr Tony Crawford
University of Tasmania
Department of Geology
GPO Box 252C
HOBART TAS 7001

Dear Tony

Please find enclosed four samples for thin section preparation and petrological description. They are representative of lithologies intersected in DDH EB2 drilled on the Elliott Bay licence earlier this year.

Once below a thin black shale unit, the bulk of the hole was made up of very broken and altered volcanic sandstone and lapilli volcaniclastic. It has been difficult to determine if a boundary is lithological or simply an alteration change.

Whole rock assays are being done, if you would like to see the results, let me know and I will forward them on completion.

Sample No:	***Depth***	***Description***
624918	51.9	Volcanic sandstone
624919	211.3	Lapilli volcaniclastic
624920	226.6	Volcanic shale (or highly altered vlc Ss?)
624921	286.8	Volcanic sandstone

Also enclosed is a sample from MAC 10 that you requested. Hope this is satisfactory.

Yours faithfully

Richard Inglis
CONTRACT GEOLOGIST

DDH
SAMPLE NUMBER: 624918 EB2 51.9

SUMMARY:

This is a foliated coarse volcaniclastic sandstone composed of clasts of crystal vitric tuff in a matrix of recrystallized vitric ash. Weak hydrothermal alteration has produced widespread biotite±minor epidote± minor garnet± rare sphalerite.

HAND SPECIMEN:

This is a rather sheared, weakly foliated, sericitized felsic lava breccia or coarse-grained volcaniclastic with pale lava fragments to about 1cm across.

THIN SECTION:

This is probably another coarse volcaniclastic sediment derived from felsic glassy volcanics and tuffs. The most obvious lithic clasts are quite large, more than 1cm long, and all are quartz-phyric rhyolitic crystal tuffs composed of about 10-20 modal% of broken quartz phenocrysts in a very recrystallized and quite foliated matrix. The matrix is composed of fine-grained quartzo-feldspathic aggregates with occasional augen and streaks of coarser-grained quartz, and common pale brown to green pleochroic biotite, all thoroughly pervaded by sericite. The latter mineral forms a strong foliation within the largest clasts, but outside the clasts sericite is subordinate to green-brown biotite.

The matrix of this rock was probably vitric ash, makes up in excess of 50 modal% of the sample, and is a strongly recrystallized quartz-biotite intergrowth with fine-grained sericite still defining a weak foliation. Clots of biotite are common, granular epidote is widely dispersed but not abundant, and of particular interest are the occasional colourless small garnet porphyroblasts grown in the recrystallized matrix. Several discontinuous streaks of calcite-hematite are present, and may represent stretched and disrupted former veinlets. A few small spots of quite yellow brown sphalerite are present in the matrix.

* garnet

This is a coarse volcaniclastic sandstone to fine conglomerate derived from felsic vitric crystal tuffs. It has suffered moderate hydrothermal alteration, leading to biotite-epidote±calcite±garnet± sphalerite assemblages, and mild deformation has produced a weak to moderate sericite-defined foliation that probably post-dates the main hydrothermal alteration.

DDH
SAMPLE NUMBER: 624919 EB2 211.3m

SUMMARY:

This is an epiclastic sandstone derived entirely from glassy, plagioclase+quartz-phyric rhyolitic lavas. It has suffered mild hydrothermal alteration.

HAND SPECIMEN:

This is a grey-green quartz+albite-phyric felsic epiclastic or crystal lithic tuff.

THIN SECTION:

This rock was probably originally an epiclastic sediment derived entirely from glassy felsic lavas and tuffs. It contains abundant detrital quartz and albite phenocrysts, and common lithic clasts, some up to at least 6mm across, all set in a very heterogeneous and thoroughly recrystallized groundmass that was probably vitric ash. Detrital quartz grains make up around 10 modal% of the rock and are mainly rounded phenocrysts less than 2mm across from rhyolitic lavas. Many are strained or fractured, with subgrain recrystallization of very fine-grained quartz along fractures. Detrital phenocrysts of albitized plagioclase make up about 12-15 modal% of this rock and are blocky, lightly sericitized, and sometimes contain small granular epidote inclusions.

Lithic clasts range from <1mm across to >6mm across, and are all formerly glassy rhyolitic lavas with variable abundances of quartz and albite phenocrysts Groundmass textures of the clasts vary, but all are composed of fine-grained quartzo-feldspathic aggregates that have crystallized from devitrified felsic glass.

The matrix of this rock is a very heterogeneous and uneven-textured quartzo-feldspathic aggregate, presumably after vitric ash, although no diagnostic shard shapes are preserved due to the very strong recrystallization of the matrix. In some places, matrix quartz is rather coarse, and polycrystalline, and sericite is variably abundant intergrown with the quartz. Interstitial areas are often lined by either crystalline very pale yellow to colourless epidote, or pleochroic bright green biotite, that forms quite prismatic crystals in places.. Calcite is a minor secondary phase dispersed through the rock, and a few small idiomorphic pyrite grains are also present.

This rock was probably an epiclastic sediment derived entirely from quartz+plagioclase-phyric glassy felsic lavas and tuffs. It has suffered weak hydrothermal alteration (silica-biotite±epidote± calcite±pyrite), leading to extensive recrystallization of the vitric ash matrix

DDH
SAMPLE NUMBER: 624920 EB2 226.6m

SUMMARY:

This is a recrystallized pelitic metasedimentary rock derived from a sediment composed mainly of felsic vitric ash and a minor detrital component of quartz and albitized plagioclase phenocryst fragments. Hydrothermal alteration is fairly weak, and produced the assemblage silica-calcite-chlorite-sericite±pyrite.

HAND SPECIMEN:

This is a grey, rather silicified cherty shale or vitric ash with patchy black domains and lamellae of similarly fine-grained material.

THIN SECTION:

This sample is a very fine-grained and quite even-textured, unbedded shale or tuff. It is clearly derived largely from felsic glassy volcanics, as it contains five or six rounded and resorbed, broken quartz phenocryst fragments and a similar number of slightly rounded albitized phenocryst fragments, none larger than 1mm across. The latter show the typical patchy replacement of calcic plagioclase by albite that characterizes strongly recrystallized rocks.

The matrix of this rock is a very fine-grained fairly homogeneous quartzo-feldspathic intergrowth peppered with tiny sericite flakes, abundant green chlorite, quite common tiny opaque oxides, and abundant overprinting calcite. This matrix texture is definitely a recrystallized texture, and I suggest that the dominant matrix component was fine-grained vitric ash, which thoroughly recrystallized during weak to moderate hydrothermal alteration. Although the rock appears silicified in hand specimen, I am not convinced that this is the case; the hard, flinty nature of this sample results from recrystallization of the felsic ash. The sample is transected by a number of narrow quartz veinlets, that are themselves cut by several calcite veinlets, A few large idiomorphic pyrite grains are present

This sample is a recrystallized pelitic sediment composed originally of dominant felsic vitric ash and a few modal% of detrital quartz and plagioclase phenocryst fragments. It has suffered weak hydrothermal alteration (chlorite-silica-calcite-sericite).

DDH

SAMPLE NUMBER: 624921 EB2 286.8m

SUMMARY:

This is a strongly hydrothermally altered (epidote-quartz-chlorite-sericite) volcaniclastic sandstone derived from quartz+feldspar-phyric felsic volcanics.

HAND SPECIMEN:

This is a dark grey volcaniclastic sandstone with strong patchy pale-coloured epidote alteration.

THIN SECTION:

This sample is a heavily altered matrix-supported volcaniclastic sandstone derived from felsic volcanics. The main detrital framework grains are quartz phenocryst fragments (5-10 modal%), never larger than 1mm across. These are almost always angular and broken fragments of resorbed phenocrysts, and have been strained, broken, and commonly disaggregated in situ in the rock. Many grains are cut by fractures along which subgrain recrystallization has occurred. Almost as abundant as quartz phenocryst fragments are common detrital albitized plagioclase phenocryst fragments which are similarly strained and broken, and which are variably replaced by epidote, chlorite and sericite. Common lithic clasts composed of recrystallized glassy felsic volcanics are present, but are very difficult to distinguish from the matrix. Former FeTi phenocrysts and microphenocrysts are a not uncommon detrital phase in this sample, and are always altered to messy brown leucoxenitic material.

The matrix of this sample is exceptionally heterogeneous texturally and mineralogically, reflecting the quite strong hydrothermal alteration. It was probably originally a felsic vitric ash, but extensive recrystallization, accompanying brittle deformation reflected in the fragmented and disaggregated quartz and feldspar phenocrysts, has produced domains of highly variable composition and texture. Most obvious among these are the patches of very strongly replaced and recrystallized groundmass composed now of a relatively coarse-grained sugary intergrowth of quartz and pale yellow epidote. The epidote alteration becomes pervasive in places, and epidote forms dense murky patches and veins to almost 1cm across with minor intergrown chlorite and a few cross-cutting calcite and quartz veinlets. Other domains show strong chlorite-quartz replacement of the original matrix constituents, and a mesh of fine-grained silica and chlorite pervades most of the rock that is not epidotized.

This was a volcaniclastic sandstone derived from glassy quartz+plagioclase-phyric felsic volcanics. It has suffered moderate hydrothermal alteration and recrystallization characterized by sericite-chlorite-silica, and this was overprinted by a strong epidote-quartz hydrothermal alteration.

951034

ANALABS

A Division of Inchcape Inspection and
Testing Services Australia Pty. Ltd.
A.C.N. 004 591 664

Phone (004) 316837	14 Thirkell St. COOEE TAS 7320	Fax (004) 318890

ANALYTICAL REPORT No. 100560.60.09570

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

INVOICE TO:

Aberfoyle Resources Limited
Exploration Division
P.O. Box 952
BURNIE TAS 7320

ORDER No.	PROJECT
4467	EBY

DATE RECEIVED	RESULTS REQUIRED
17/06/93	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
3	09/07/93	1	4

SAMPLE NUMBERS	SAMPLE DESCRIPTION	ELEMENT/METHOD
624918/21	DC Prep : 8P033 - CHROME FREE BOWLS	Cu,Pb,Zn,Ag/6A101 Au/66309 Ba,As,Cr,Zr/6X401,Ti/0X408 Whole Rock Analysis/0X408

RESULTS TO

Mr R de Bomford
Aberfoyle Resources Limited
Exploration Division
P.O. Box 952
BURNIE TAS 7320

REMARKS

DDH EB2 PETROLOGY SAMPLES

RESULTS TO

RESULTS TO

AUTHORISED OFFICER

951035

ANALABS

A Division of Inchcape Testing Services (Australia) Pty. Ltd.
A.C.N. 004 591 664

ANALYTICAL DATA

SAMPLE PREFIX	REPORT No.	REPORT DATE	CLIENT ORDER No.	PAGE
	100560.60.09570	09/07/93	4467	1 OF 3

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Au	Ba	As	Cr	Zr
1	624918	4	54	166	<2	<0.008	905	3	9	222
2	624919	6	55	171	<2	<0.008	918	<2	8	198
3	624920	4	24	49	<2	<0.008	548	<2	8	235
4	624921	<4	47	494	<2	<0.008	898	3	103	399
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	4	5	4	2	0.008	10	2	5	5
24	UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
25	METHOD	GA101	GA101	GA101	GA101	GG309	GX401	GX401	GX401	GX401

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
– = element not determined

AUTHORISED OFFICER Gary Lindberg

951036

ANALABS

A Division of Inchcape Testing Services (Australia) Pty. Ltd.
A.C.N. 004 591 664

ANALYTICAL DATA

SAMPLE PREFIX	REPORT No.	REPORT DATE	CLIENT ORDER No.	PAGE
	100560.60.09570	09/07/93	4467	2 OF 3

TUBE No.	SAMPLE No.	Ti	A1203	Si02	Ti02	Fe203	MnO	CaO	K20	MgO
1	624918	1571	12.68	73.7	0.26	4.01	0.24	1.53	3.59	0.69
2	624919	1825	12.24	75.5	0.30	2.17	0.10	1.21	2.45	0.25
3	624920	1715	12.20	72.8	0.29	2.07	0.23	2.66	2.35	0.50
4	624921	5571	15.19	58.5	0.93	7.41	0.55	4.79	2.48	2.91
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	60	0.01	0.1	0.01	0.01	0.01	0.01	0.01	0.05
24	UNITS	ppm	%	%	%	%	%	%	%	%
25	METHOD	OX408	OX408	OX408	OX408	OX408	OX408	OX408	OX408	OX408

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
– = element not determined

AUTHORISED OFFICER Gary Lindberg

951037

ANALABS

A Division of Inchcape Testing Services (Australia) Pty. Ltd.
A.C.N. 004 591 664

ANALYTICAL DATA

SAMPLE PREFIX	REPORT No.	REPORT DATE	CLIENT ORDER No.	PAGE
	100560.60.09570	09/07/93	4467	3 OF 3

TUBE No.	SAMPLE No.	P2O5	S	Na2O	LOI	TOTAL				
1	624918	0.032	0.022	0.42	2.29	99.52				
2	624919	0.035	0.037	3.58	2.07	99.97				
3	624920	0.050	0.011	2.90	3.73	99.82				
4	624921	0.125	0.010	2.58	4.28	99.79				
5										
6										
7										
8										
9										
10.										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	0.005	0.005	0.05	0.01	0.01				
24	UNITS	%	%	%	%	%				
25	METHOD	OX408	OX408	OX408	OX408	OX408				

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
– = element not determined

AUTHORISED OFFICER Gary Lindberg

APPENDIX III

ABERFOYLE **MEMORANDUM**

Date	14 December 1993	Ref	JS:AAI
To	Steve Richardson	From	J Silic
At	Burnie	At	Hawthorn
Copies to		Keep	ELLIOTT BAY GROUP

Subject **Elliot Bay EM**

Attached are the comments on the Elliot Bay EM.

1) Downhole EM in EB2

A three loop data set was collected in EB2. Before proceeding with the discussion of these results, some considerations on the expected nature of the response need to be exposed.

It was understood from the surface surveys that the EB1 response was dominated by current gathering effects. This essentially means that no response from the conductor is expected if it is in the middle of the loop and at late times its effect should increase as the loop edge is moved further away from the conductor. This latter effect is a direct result of the "background current" maximum moving out from the loop edge from "early" to "late" time.

On analysing the Loop 3 downhole response, the two effected are evident. The increase in the signal strength towards the top of the drillhole is outlining a current system enclosing a drillhole and extending close to the surface. This effect presumably is due to the broad near surface conductor identified by the surface EM surveys. Down from 160 metres however the signal strength begins to increase and is interpreted due to a source in front of the drillhole, and could correlate with the current gathering target identified within a broader near surface conductor.

Loop 1 data set, is outlining similar effects, except that in this data set with Loop 1 being on the other side of the conductive source in comparison to Loop 3, at medium to early times, the effect of the current gathering source in front of the drillhole is now a fall-off in signal strength rather than a rise in the signal strength.

Loop 2 data however, shows no such effects, as Loop 2, encloses the conductive sources, and therefore as discussed previously no current gathering effect is expected to be noted in this data set.

Conclusion

DHEM data set confirms the existence of a broad near surface source identified in the surface data, and a current gathering conductor within this or beneath this broad source, and which has not been reached by the drillhole.

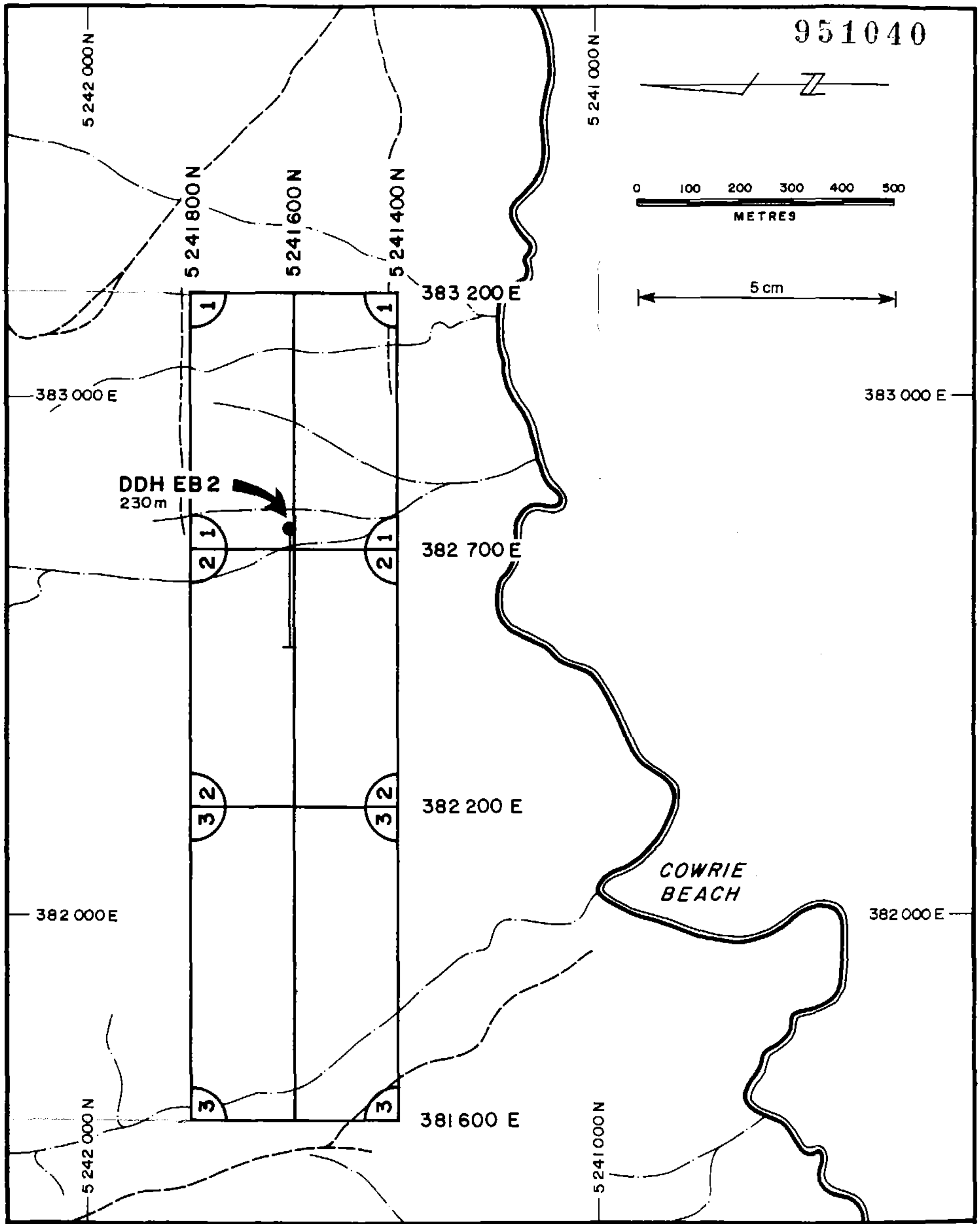
On examining the geology, it is now understood that the broad conductive source identified by the surface surveys is most likely water filled fault broken ground, and the "inhomogeneity" at depth interpreted from the ground data is a more conductive patch of this fault zone.

2) Surface Surveys EBY

A one loop three line survey over the EB4 conductor was conducted. However, on analysing the vertical component data, it was obvious that the source of the airborne EM response is a broad near surface conductor, whose edges are marked by sudden changes in the slope of the vertical component profile.

JOVAN SILIC

951040



Aberfoyle Resources Limited

EXPLORATION DIVISION

REVISIONS			
Init.	Date	Init.	Date

SOUTH WEST TASMANIA

ELLIOTT BAY E.L. 40/85

DDH EB - 2
DHEM LOOP LOCATIONS

Compiled : S. R.

Drawn : J.M.S.

Traced :

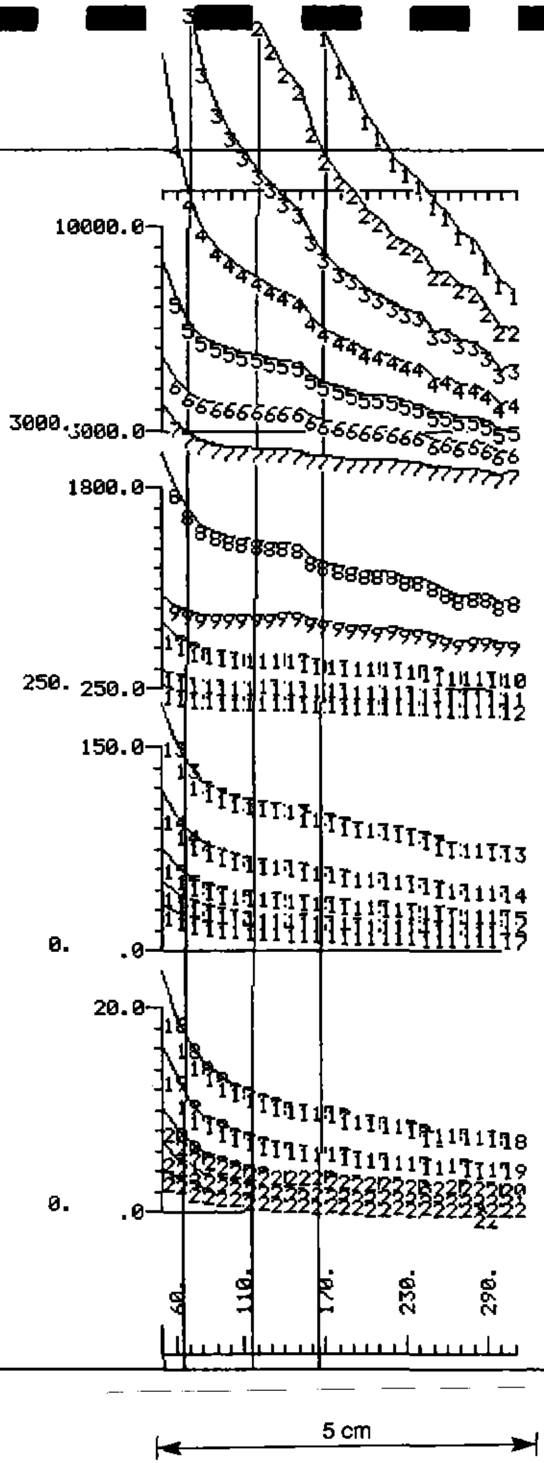
Checked : S. R.

Location Code :

Scale : 1 : 10 000

Date : November 1993

Plate No. : EB 27



ELLIOTT BAY DHEM SURVEY

SURVEY DATE MARCH 1993

LOOP 1

READ BY JWH

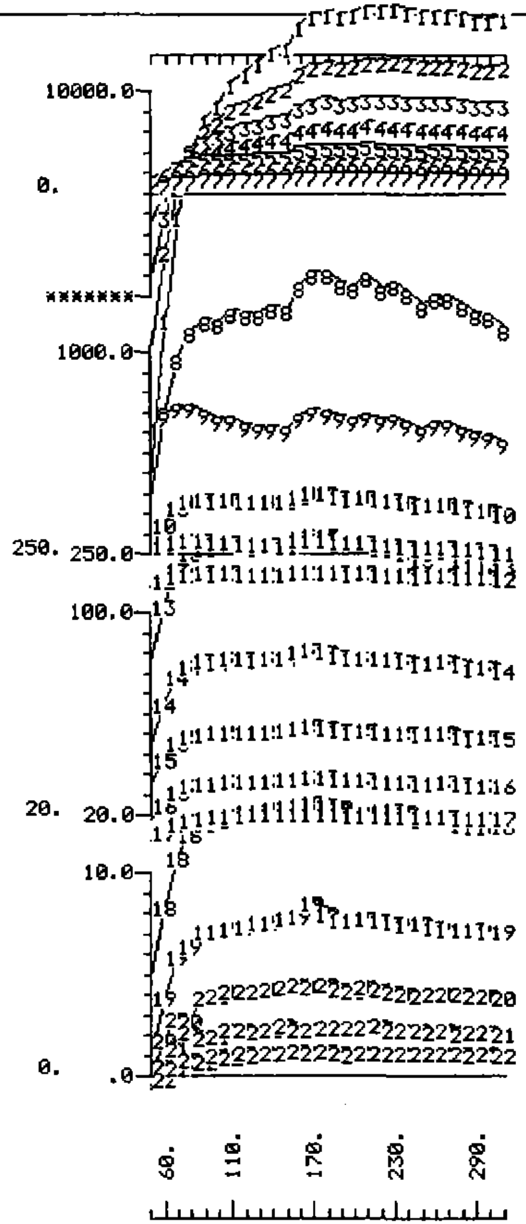
PLOTTED BY JWH

DDH EB-2

ZONGE GDP-16

Horiz scale Plot number

951041



ELLIOTT BAY DHEM SURVEY

SURVEY DATE MARCH 1993

LOOP 2

READ BY JWH

PLOTTED BY JWH

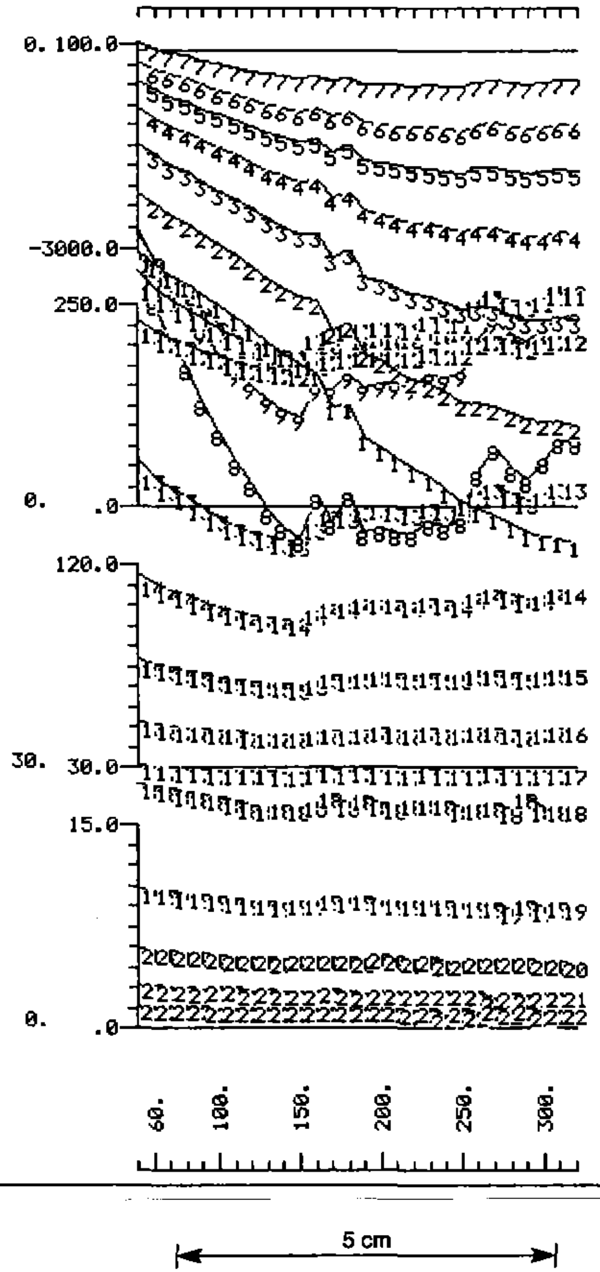
DDH EB-2

ZONGE GDP-16

Horiz scale Plot number

5 cm

951042



ELLIOTT BAY DHEM SURVEY

SURVEY DATE MARCH 1993

LOOP 3

READ BY JWH

PLOTTED BY JWH

DDH EB-2

ZONGE GDP-16

Horiz scale Plot number

APPENDIX IV

PAGE 1 OF 1

CORE GRIND SAMPLING

HOLE No. DDH EB-2

951045

DATE 16/6/93

No.	SAMPLE NUMBER	INTERVAL	ELEMENTS REQUIRED	ST	SAMPLE NUMBER	INTERVAL	ELEMENTS REQUIRED	ST
1	624901	11·0 - 14·5m						
2	624902	14·5 - 15·25						
3	903	15·25 - 21						
4	904	21 - 30						
5	905	30 - 51·5						
6	906	51·5 - 59·5						
7	907	59·5 - 80						
8	908	80 - 96						
9	909	96 - 112						
10	910	112 - 127·9						
11	911	127·9 - 137·9						
12	912	137·9 - 142·4						
13	913	142·4 - 153·3						
14	914	153·3 - 156·5						
15	915	156·5 - 178·45						
16	916	178·45 - 180·4						
17	917	180·4 - 220·1						
18	565703	STD.						
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								
32								

951046

ANALABS

A Division of Inchcape Inspection and
Testing Services Australia Pty. Ltd.
A.C.N. 004 591 664

Phone (004) 316837

14 Thirkell St. COOEE TAS 7320

Fax (004) 318890

ANALYTICAL REPORT No. 100560.60.09615

THIS REPORT MUST BE READ IN CONJUNCTION WITH THE ACCOMPANYING ANALYTICAL DATA

INVOICE TO:
Aberfoyle Resources Limited
Exploration Division
P.O. Box 952
BURNIE TAS 7320

ORDER No.	PROJECT
4484	

DATE RECEIVED	RESULTS REQUIRED
07/07/93	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
1	22/07/93	1	18

SAMPLE NUMBERS	SAMPLE DESCRIPTION	ELEMENT/METHOD
565703,624901/17	GC Prep : GP031 (A)	Cu,Pb,Zn,Ag/GA101 Au,Au(R),Au(S)/GG309 Ba,As/GX401

RESULTS TO
Mr R de Bomford
Aberfoyle Resources Limited
Exploration Division
P.O. Box 952
BURNIE TAS 7320

RESULTS TO

RESULTS TO

REMARKS

DDH EB2 CORE GRIND ANALYSES

AUTHORISED OFFICER

951047

ANALABS

A Division of Inchcape Testing Services (Australia) Pty. Ltd.
A.C.N. 004 591 664

ANALYTICAL DATA

SAMPLE PREFIX	REPORT No.	REPORT DATE	CLIENT ORDER No.	PAGE
	100560.60.09615	22/07/93	4484	1 OF 1

UBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Au	Au(R)	Au(S)	Ba	As
1	565703~~4~~ STD	121	213	2133	<2	<0.008	–	–	1014	12
2	624901	39	238	646	<2	<0.008	–	–	902	15
3	624902	64	614	749	2	0.014	–	–	895	9
4	624903	46	368	593	<2	<0.008	–	–	865	13
5	624904	52	108	223	<2	<0.008	–	–	933	4
6	624905	58	125	304	<2	<0.008	–	–	871	<2
7	624906	41	149	242	<2	<0.008	–	–	630	5
8	624907	57	160	202	<2	<0.008	–	–	650	<2
9	624908	48	201	205	<2	<0.008	–	–	561	4
10	624909	52	209	1422	<2	<0.008	–	–	514	2
11	624910	47	77	140	<2	<0.008	–	–	446	5
12	624911	14	107	84	<2	<0.008	<0.008	–	710	2
13	624912	25	1171	474	<2	<0.008	–	–	711	21
14	624913	7	51	195	<2	<0.008	–	–	658	<2
15	624914	9	1056	585	<2	<0.008	–	–	373	<2
16	624915	56	197	428	<2	<0.008	–	–	686	42
17	624916	44	239	525	<2	<0.008	–	<0.008	296	31
18	624917	178	161	371	<2	<0.008	–	–	844	<2
19										
20										
21										
22										
23	DETECTION	4	5	4	2	0.008	0.008	0.008	10	2
24	UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
25	METHOD	GA101	GA101	GA101	GA101	GG309	GG309	GG309	GX401	GX401

Results in ppm unless otherwise specified
T = element present; but concentration too low to measure
X = element concentration is below detection limit
– = element not determined

AUTHORISED OFFICER Gary Lindberg

APPENDIX V

951049

ABERFOYLE MEMORANDUM

Date 14 December 1993
Ref JS:AAI
To Steve Richardson
From J Silic
At Burnie
At Hawthorn
Copies to
Keep ELLIOTT BAY GEOPH.

Subject Elliot Bay EM

Attached are the comments on the Elliot Bay EM.

1) Downhole EM in EB2

A three loop data set was collected in EB2. Before proceeding with the discussion of these results, some considerations on the expected nature of the response need to be exposed.

It was understood from the surface surveys that the EB1 response was dominated by current gathering effects. This essentially means that no response from the conductor is expected if it is in the middle of the loop and at late times its effect should increase as the loop edge is moved further away from the conductor. This latter effect is a direct result of the "background current" maximum moving out from the loop edge from "early" to "late" time.

On analysing the Loop 3 downhole response, the two effected are evident. The increase in the signal strength towards the top of the drillhole is outlining a current system enclosing a drillhole and extending close to the surface. This effect presumably is due to the broad near surface conductor identified by the surface EM surveys. Down from 160 metres however the signal strength begins to increase and is interpreted due to a source in front of the drillhole, and could correlate with the current gathering target identified within a broader near surface conductor.

Loop 1 data set, is outlining similar effects, except that in this data set with Loop 1 being on the other side of the conductive source in comparison to Loop 3, at medium to early times, the effect of the current gathering source in front of the drillhole is now a fall-off in signal strength rather than a rise in the signal strength.

Loop 2 data however, shows no such effects, as Loop 2, encloses the conductive sources, and therefore as discussed previously no current gathering effect is expected to be noted in this data set.

Conclusion

DHEM data set confirms the existence of a broad near surface source identified in the surface data, and a current gathering conductor within this or beneath this broad source, and which has not been reached by the drillhole.

On examining the geology, it is now understood that the broad conductive source identified by the surface surveys is most likely water filled fault broken ground, and the "inhomogeneity" at depth interpreted from the ground data is a more conductive patch of this fault zone.

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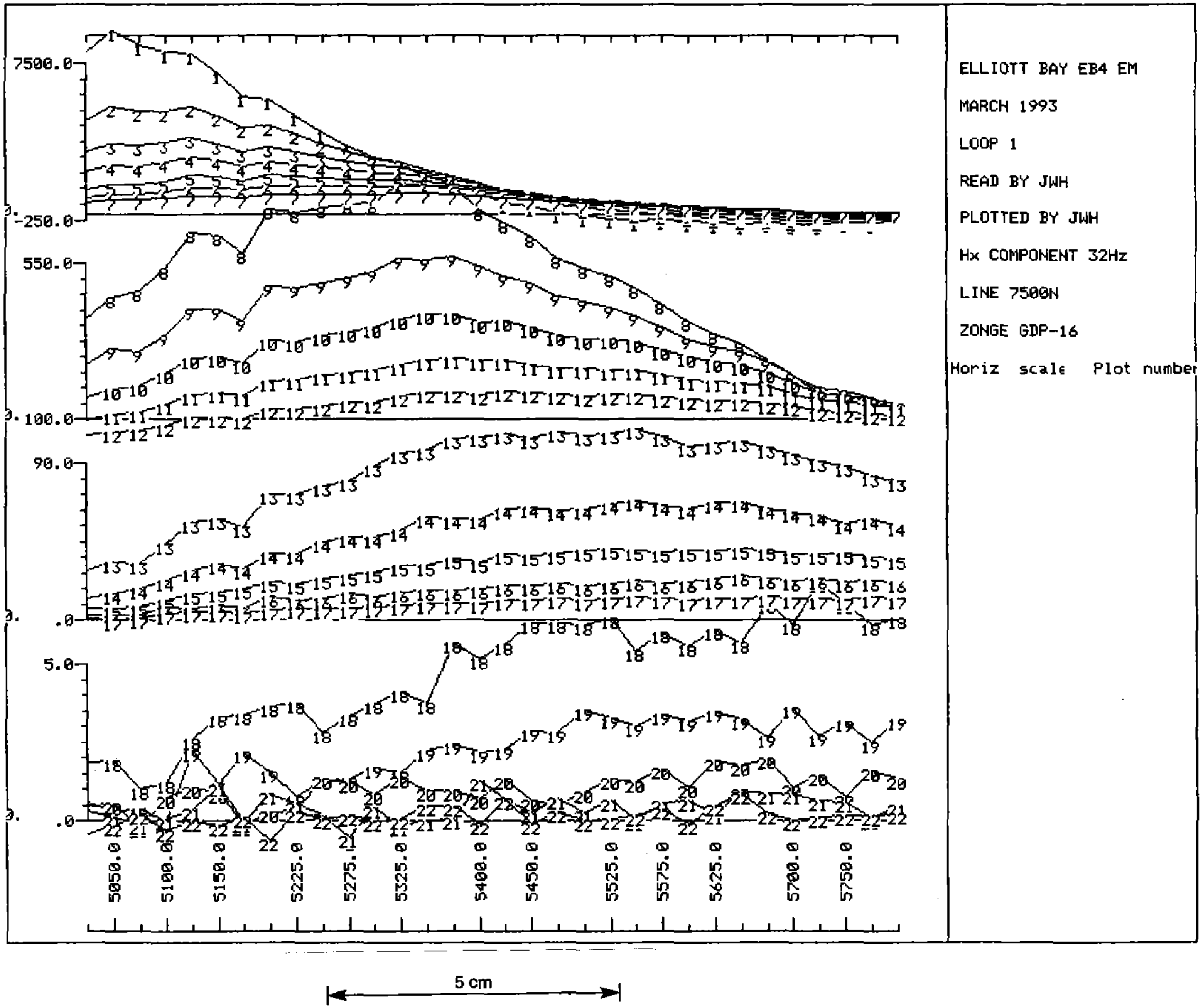
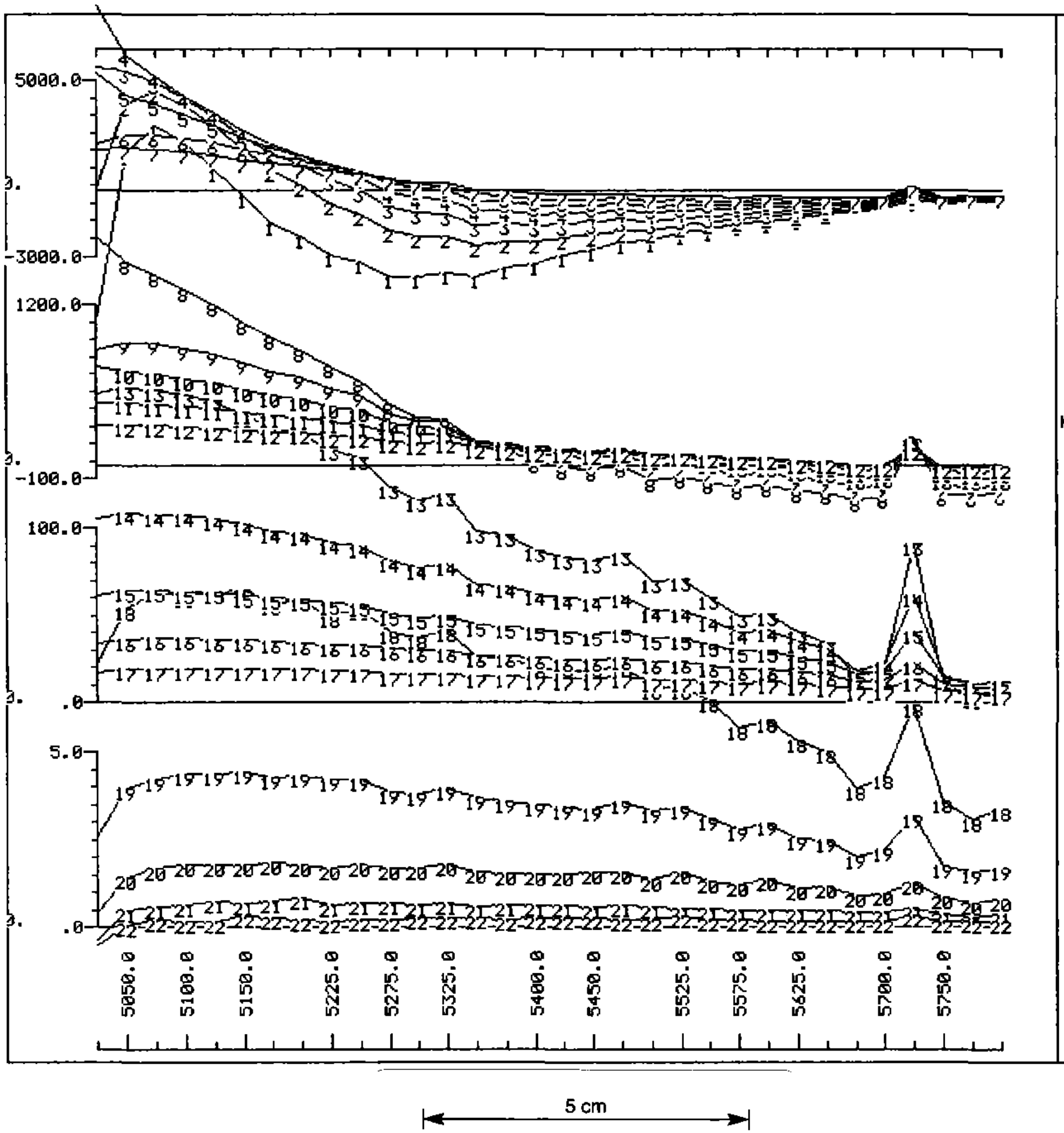
JOVAN SILIC



ELLIOTT BAY EB4 EM
MARCH 1993
LOOP 1
READ BY JWH
PLOTTED BY JWH
Hx COMPONENT 32Hz
LINE 7500N
ZONGE GDP-16
Horiz scale Plot number

951050



ELLIOTT BAY EB4 EM

MARCH 1993

LOOP 1

READ BY JWH

PLOTTED BY JWH

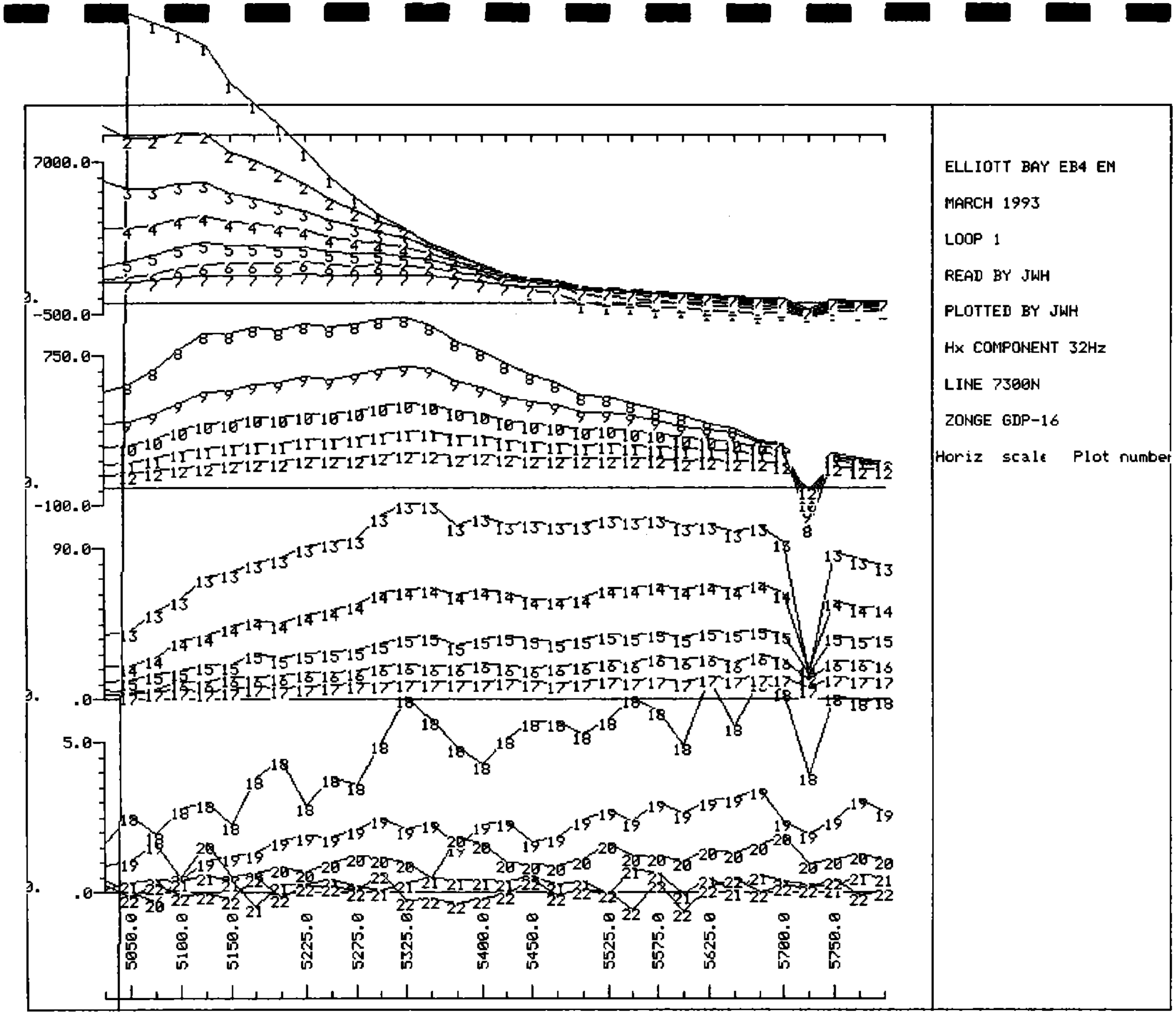
Hz COMPONENT 32Hz

LINE 7300N

ZONGE GDP-16

Horiz scale Plot number

951051



ELLIOTT BAY EB4 EM

MARCH 1993

LOOP 1

READ BY JWH

PLOTTED BY JWH

Hx COMPONENT 32Hz

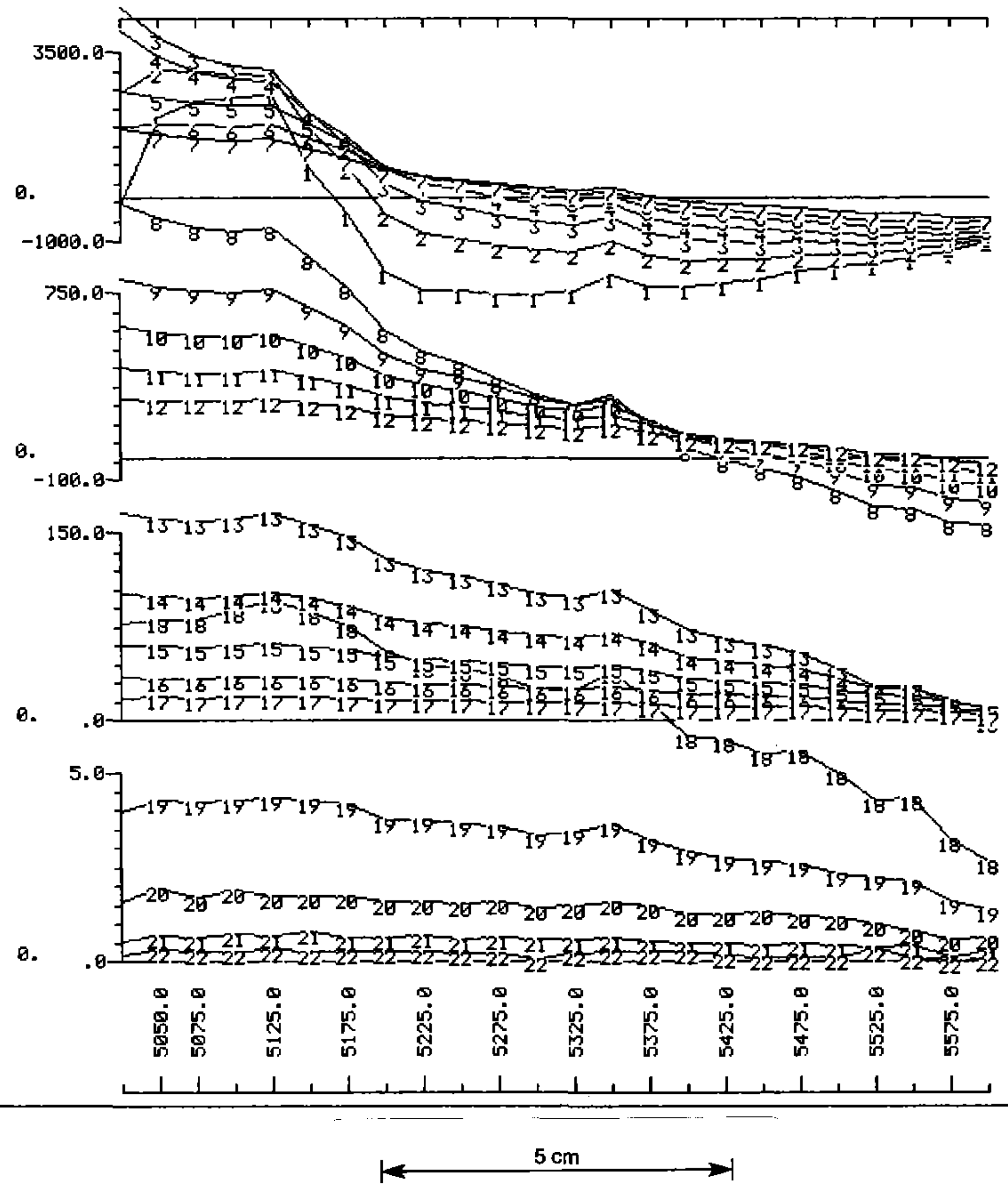
LINE 7300N

ZONGE GDP-16

Horiz scale Plot number

5 cm

951052



ELLIOTT BAY EB4 EM

MARCH 1993

LOOP 1

READ BY JWH

PLOTTED BY JWH

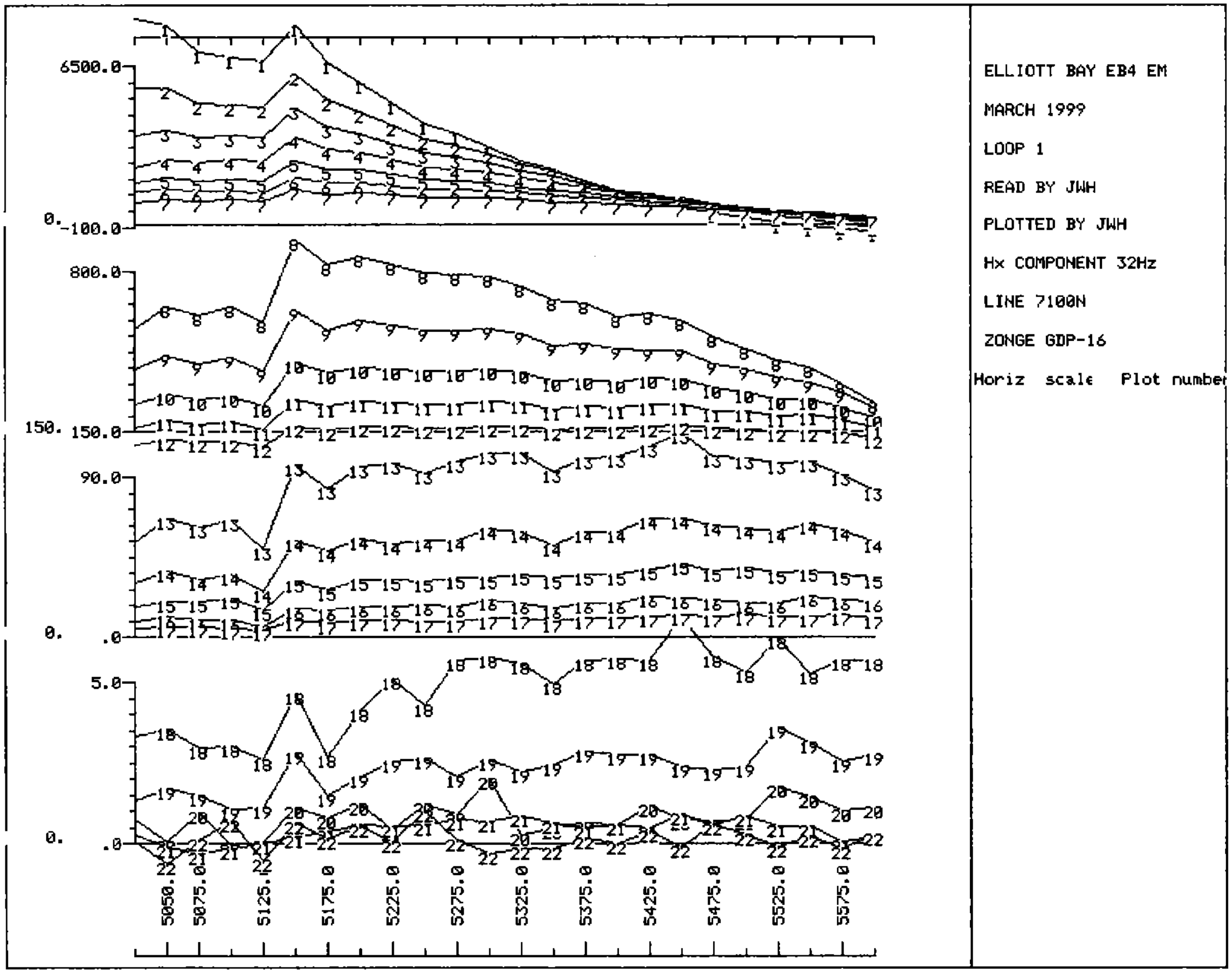
Hz COMPONENT 32Hz

LINE 7100N

ZONGE GDP-16

Horiz scale Plot number

951053



ELLIOTT BAY EB4 EM

MARCH 1999

LOOP 1

READ BY JWH

PLOTTED BY JWH

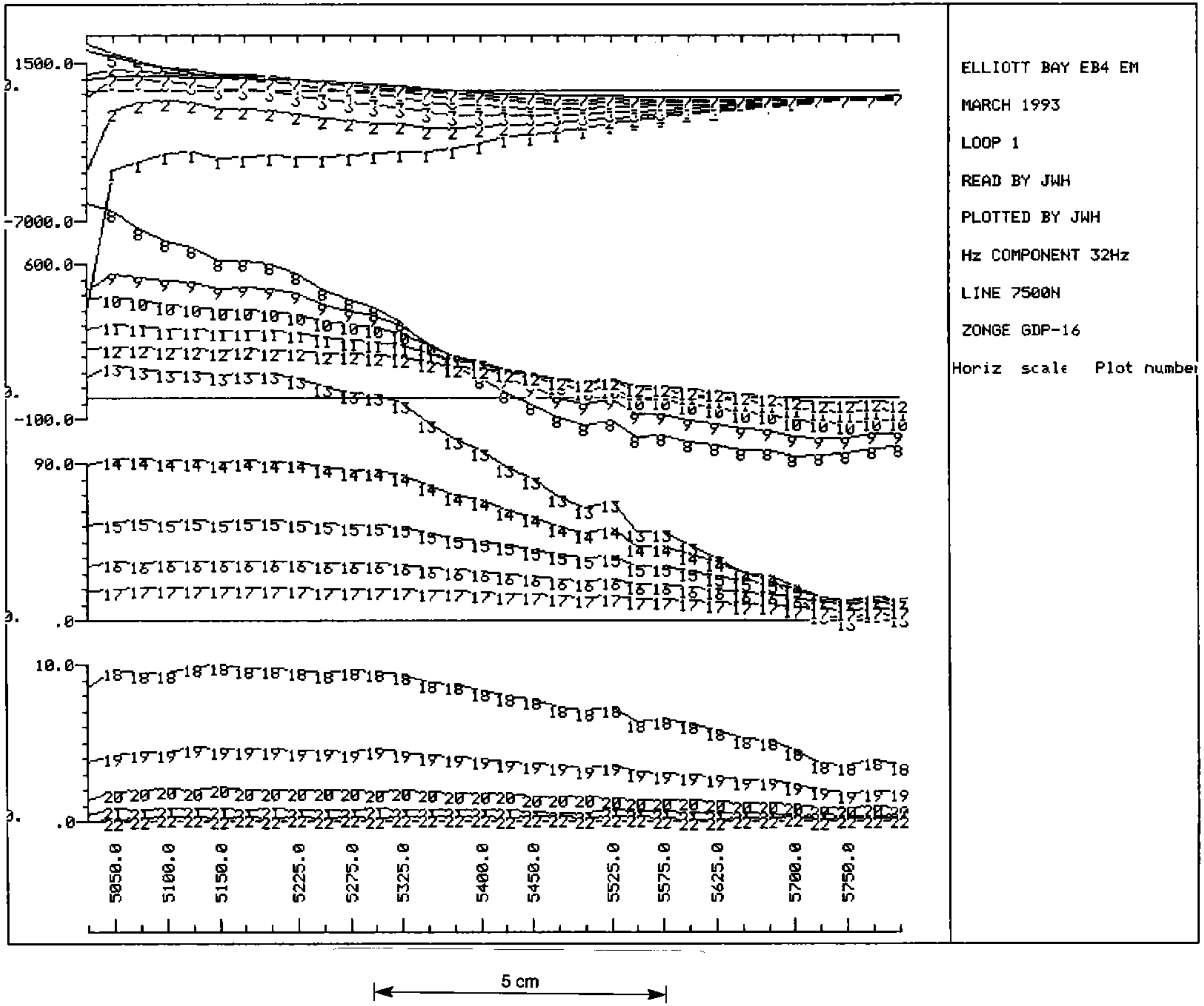
Hx COMPONENT 32Hz

LINE 7100N

ZONGE GDP-16

Horiz scale Plot number

951054



ELLIOTT BAY EB4 EM

MARCH 1993

LOOP 1

READ BY JWH

PLOTTED BY JWH

Hz COMPONENT 32Hz

LINE 7500N

ZONGE GDP-16

95105

APPENDIX VI

ELLIOTT BAY PROSPECTS

The geology and mineralisation of the Elliott Bay prospects have previously been described by Large et al. (1987), Gulson et al. (1987) and Callaghan (1989). Mineralisation in the Elliott Bay area takes the form of sulphide clasts, stringer sulphides, disseminated sulphides, massive sulphide lenses and sulphides associated with alteration. All mineralisation styles are hosted in deformed Cambrian felsic volcanics and volcaniclastics. As no general overview of the Elliott Bay geology will be given in this report, readers are referred to the above papers for background information.

Gulson et al. (1987) reported Pb isotope variation for the various styles of mineralisation on the surface and in two Geopeko drill holes from the Elliott Bay area. They determined that Cambrian stratiform massive sulphide mineralisation constitutes the least radiogenic group and Devonian vein style Pb–Zn–As mineralisation forms the most radiogenic group (Fig. 8). A third group with isotopic ratios mostly intermediate between the other two comes from disseminated and vein type Pb–Zn mineralisation related to the intrusion of a quartz porphyry that is considered to be later than the massive sulphide formation. Gulson et al. (1987) noted that clasts of massive sulphide mineralisation within submarine epiclastic breccias, interpreted to be a series of mass flows by Callaghan (1989), are different from the massive sulphide lenses. Clearly these variations in Pb isotope data from the Elliott Bay area need revision in order to better define the use of Pb isotopes for targeting.

Cyprus Minerals took over the exploration leases in the Elliott Bay in the middle to late 1980s and drilled a further 12 holes which resulted in a better understanding of the geology and mineralisation. In light of this increased geologic understanding, sulphide samples of the differing styles of mineralisation from the Cyprus drilling at Wart Hill were collected and analysed. Samples from a mineralised zone discovered by Aberfoyle Resources Ltd in early 1992 were also analysed.

Lead Isotope Results

Table 3 lists the Pb isotope data for the Elliott Bay samples analysed in this study. These data are plotted on standard $^{207}Pb/^{204}Pb$ vs $^{206}Pb/^{204}Pb$ and $^{208}Pb/^{204}Pb$ vs $^{206}Pb/^{204}Pb$ diagrams (Fig. 10). Locations of the samples are shown in Figure 9. For comparison the previous Pb isotope data for Elliott Bay from Gulson et al. (1987) and previously unpublished results from SIROTOPE's files are shown in Figure 11.

The new Elliott Bay data form four distinct clusters (Fig. 10; Groups A–D). Group A consists primarily of galena–sphalerite clasts (Fig. 12A–1) and is the least radiogenic. These clasts have a lead isotopic signature identical to the Voyager 19A and 19B stratiform massive sulphide lenses (Fig. 12B).

Group B also consists of sphalerite–galena clasts (Fig. 12A–2) but is slightly more radiogenic than the Voyager 19 massive sulphides. Group B clasts have the same Pb isotope signature as the Voyager 2 style of mineralisation (disseminated and fracture galena coatings in volcaniclastic units) (Fig. 11).

Group C consists of disseminated, vein and alteration-hosted galena, sphalerite and pyrite (Fig. 12A–3). These styles of mineralisation have the same Pb isotope signature as Voyager 9 (chlorite–magnetite alteration) and Voyager 34 (soil geochemical anomaly) (Fig. 11).

Group D is the most radiogenic cluster and contains disseminated and vein sulphides (mostly galena) that are clearly younger (based on core logging) than all the previous styles of mineralisation (Fig. 12A–4). This cluster has a Pb isotope signature similar to Voyager 24 (vein-style galena and sphalerite) and Voyager 31 and 33 (galena–sphalerite–arsenopyrite veins) (Fig. 11).

Several mineralised samples, and two soil samples, from a new altered and mineralised area discovered during Aberfoyle's 1992 exploration program were analysed by SIROTOPE. These results are given in Table 3. All of the exploration samples (except 5655530 and 565576) plot in the Group C field. Samples 5655530 and 565576 plot between the Group B and C fields.

The Pb isotope data from the Elliott Bay mineralisation plots in distinct groups that are related to the style of mineralisation (Fig. 10). The massive sulphide lenses (Voyager 19) and sulphide clasts of Groups A and B appear to have formed from a Pb source that was significantly different from the Pb in Groups C and D mineralisation. The spread in $^{206}Pb/^{204}Pb$ ratios for mineralisation in the Elliott Bay area is greater than the spread between Cambrian and Devonian mineralisation throughout the west coast of Tasmania (Fig. 8) as proposed by Gulson et al. (1987).

Sulphur Isotope Data

Although not included in the original proposal, sulphur isotope ($\delta^{34}S$) data have been obtained for most samples analysed for Pb isotopes. The $\delta^{34}S$ analyses were performed on the same mineral separates as used for the Pb isotope analyses in the stable isotope facility of the Central Science Laboratory at the University of Tasmania.

The $\delta^{34}S$ data are also listed in Table 3. A histogram of the $\delta^{34}S$ values for each "Group" (as defined by the Pb isotope data) is given in Figure 13. Overall each Group has $\delta^{34}S$ values that lie within a small range with the average δ34S values for each group being A — 16.1‰, B — 16.4‰, and C — 13.1‰. The two samples from Group D have very different values, 11.9‰ and −11.5‰. Analysis of the sample with the very negative value was repeated and the result was confirmed. Groups A and B have heavier $\delta^{34}S$ values than Groups C or D. The $\delta^{34}S$ values for the Group A and B sulphide lens and clast mineralisation are very similar to those reported for the Rosebery mineralisation (majority of $\delta^{34}S$ between 10 and 17‰). These values are significantly heavier than those for the Hellyer and Que River massive sulphide mineralisation ($\delta^{34}S$ between 6 and 8‰).

Figure 14 is a plot of Elliott Bay mineralisation on a $\delta^{34}S$ versus $^{206}Pb/^{204}Pb$ diagram. This type of plot highlights the differences between the different styles of mineralisation, especially Groups A and B sulphide clast mineralisation versus the Group C and D disseminated, stringer and alteration-related mineralisation.

Volcanic-hosted massive sulphides typically display narrow ranges of $\delta^{34}S$ values (Franklin et al., 1981). Phanerozoic Cu–Zn–Pb VHMS deposits also have $\delta^{34}S$ values over a limited range but they vary from 0‰ to positive values approaching that of contemporaneous seawater (Franklin et al., 1981; Ohmoto, 1986). Taylor (1987) summarised the suggested origins of sulphur in VHMS deposits. These include bacterial reduction of seawater sulphate, magmatic–hydrothermal fluids, inorganic reduction of seawater sulphate (± leached magmatic sulphide), and leaching of sulphate minerals, followed by partial reduction. It is generally considered that the two main sources of sulphur in seafloor volcanic-hosted massive sulphide systems are the reduction of seawater sulphate and magmatic sulphur, either direct magmatic emanations, and sulphur leached from igneous rocks (Ohmoto and Rye, 1979; Shanks et al., 1981; Solomon et al., 1988).

Seawater sulphate at the time of formation of Elliott Bay mineralisation (middle

Cambrian) is assumed to have had a $\delta^{34}S$ value near 30‰ (Claypool et al., 1980). Equilibrium fractionation between sulphate and sulphide at temperatures of 250° to 300°C, averages approximately 20‰ (Ohmoto and Rye, 1979). Therefore, sulphides precipitating from reduced seawater sulphate, at these temperatures, would have $\delta^{34}S$ values varying between 10 and 30‰ depending on the amount of reduction. $\delta^{34}S$ values of sulphide minerals in the Elliott Bay massive sulphide lenses and clasts (Groups A, and C) have values within this range, indicating that reduced seawater sulphate was the source of sulphur in the mineralising system. The lower $\delta^{34}S$ values for the sulphides in Group D indicate that magmatic sulphur or reduced seawater sulphur at higher temperatures is the source of sulphur in this style of mineralisation.

Genesis of the Elliott Bay Mineralisation – A Working Model

From the geology, alteration and Pb and S isotope data, a preliminary model is proposed to explain the mineralisation at Elliott Bay (Fig. 15). In the Cambrian, a VHMS deposit (Voyager 19 and Group A and B-type mineralisation), of unknown size, formed on the seafloor somewhere in the vicinity of the Wart Hill area. Shortly after the deposit formed, subaqueous debris flows incorporated fragments of this mineralisation and deposited them at the present site of Wart Hill. These fragments became one of the clast types in the debris flow deposits. Shortly after the deposition of the debris flows, and other "hangingwall" lithologies, a separate generation of hydrothermal fluids (still in the Cambrian?) passed through these rocks causing alteration (sericite, silica, chlorite, minor carbonate) and precipitation of disseminated and stringer sulphide mineralisation (Group C). Much later, possibly in the Devonian, another generation of hydrothermal fluids passed through the rocks causing minor alteration and sulphide mineralisation (Group D galena–sphalerite–arsenopyrite veins).

Gulson et al. (1987) proposed a multi-stage model, based on Pb isotope data, implying that the ultimate source of Pb in the Cambrian stratiform sulphide mineralisation at Elliott Bay, was from the Precambrian basement (Fig. 16). As the Pb isotope ratios of massive sulphide mineralisation at Elliott Bay are distinctly less radiogenic than those from Que River and Hellyer, Gulson et al. (1987) suggested a variation in the U–Th–Pb characteristics of source regions, with a northward increase in U/Pb from Elliott Bay to Que–Hellyer, or the possibility of different ages for the separate mineralising systems along the Mt Read Volcanic Belt. Gulson et al. (1987) postulated that the volcanic pile and underlying basement exhibit a vertical variation in U/Pb ratio and that solutions penetrating to different depths would concentrate Pb with different isotopic ratios.

Elliott Bay Exploration Considerations

Lead and sulphur isotope data are useful in the Elliott Bay area for discriminating different generations of mineralisation. Previously the most interesting style of mineralisation in the Elliott Bay area was the Voyager 19 massive sulphide lenses and the Group A and B clasts. Care must be taken when evaluating mineralisation and alteration in the Elliott Bay area, as it appears that the fluids that caused the alteration and the disseminated and stringer-style sulphide mineralisation (Group C) throughout the debris flows in the Wart Hill area, are not the same fluids responsible for the Group A and B clasts or Voyager 19 sulphide lens mineralisation. The hydrothermal system that formed the Group C style of mineralisation is capable of forming economic massive sulphide mineralisation and areas with this particular style of mineralisation should be explored to test their potential. The newly discovered coastal alteration and sulphide zone has the characteristics of Group C mineralisation and has the potential to be related to volcanogenic massive sulphide mineralisation.

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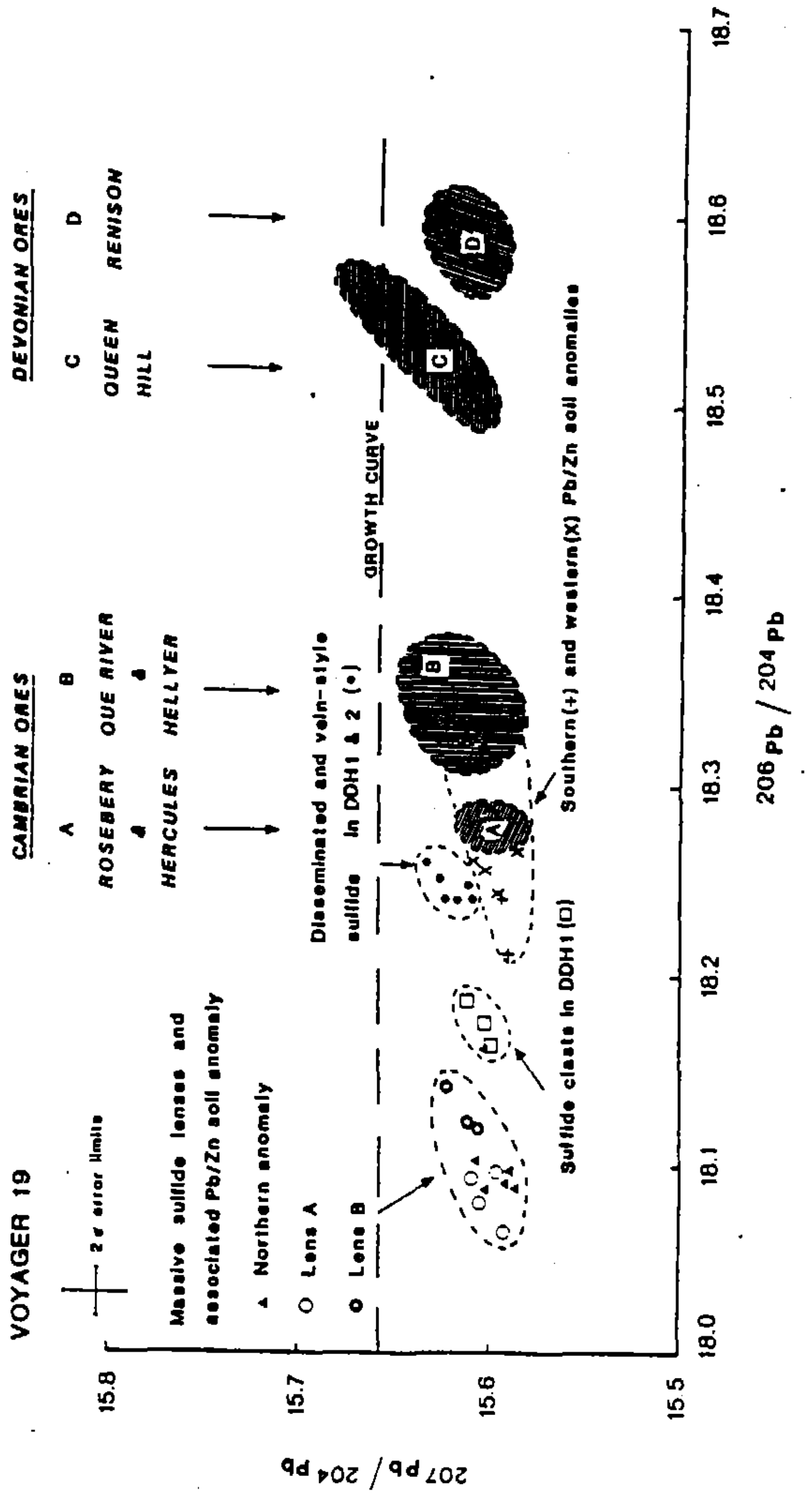

Figure 8 Lead isotope data for the Elliott Bay mineralisation from the Geopeko exploration program (From Gulson et al., 1987).

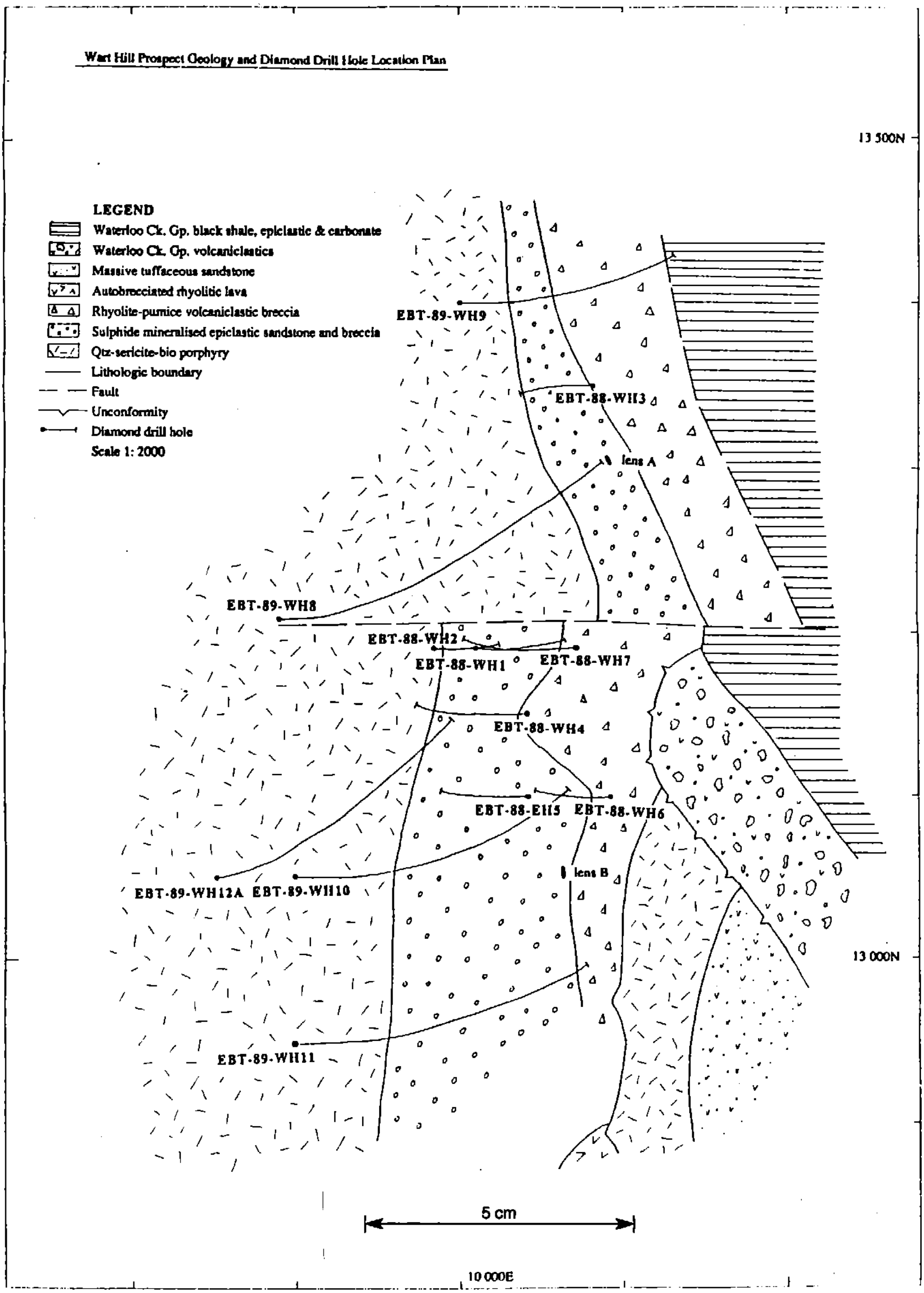

Figure 9 Location of drill holes sampled in the Wart Hill area, Elliott Bay. From Callaghan (1989).

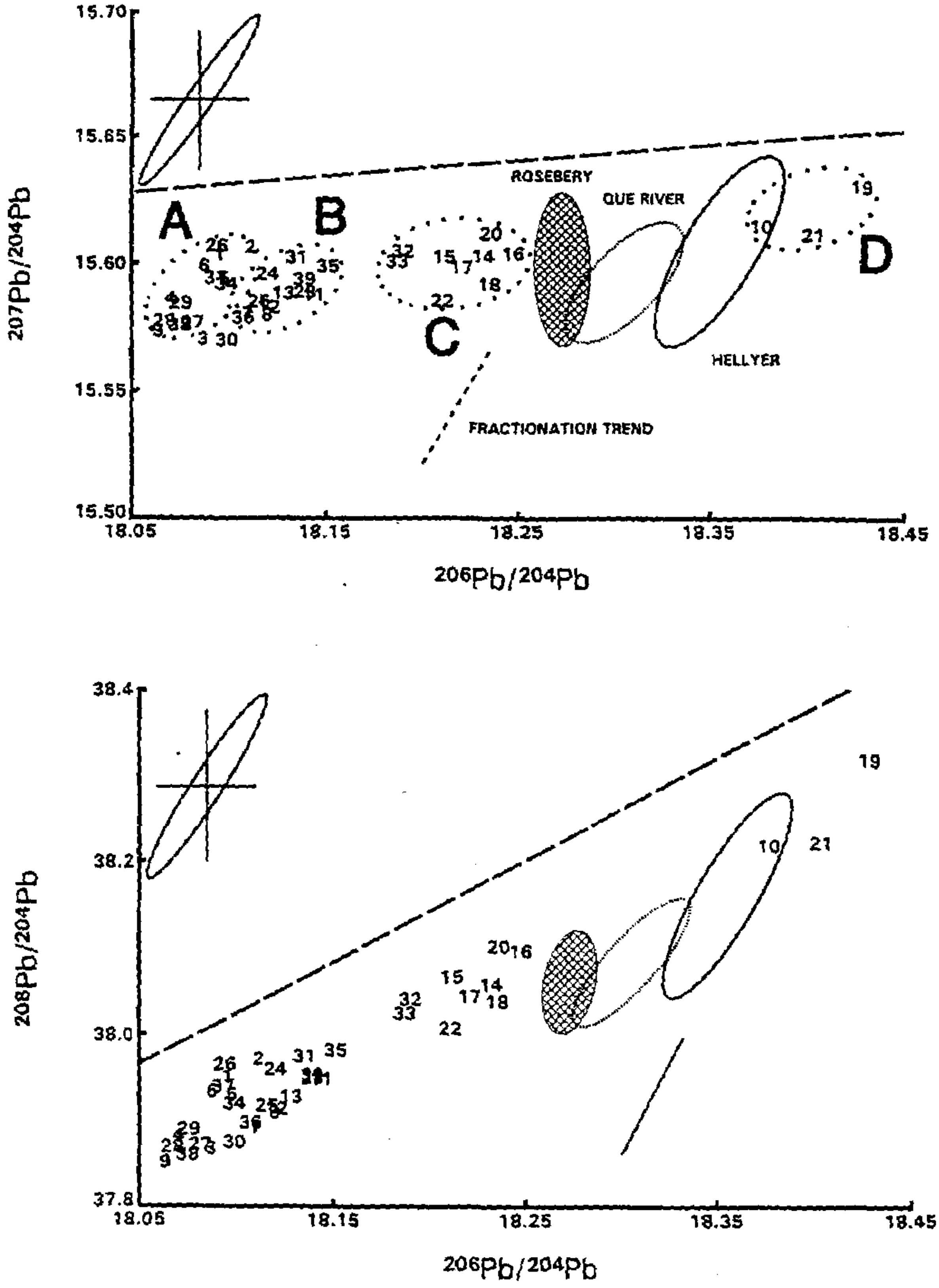

Figure 10 Elliott Bay Pb isotope data from this study. Sample numbers refer to plot # in Table 3. Groups A and B are different populations of sulphide clasts or lenses. Group C represents disseminated and vein sulphides with alteration and Group D mineralisation is late stage veins and fracture-fill sulphides. Target signatures of the Rosebery, Que River and Hellyer massive sulphide mineralisation given for reference. Dashed line is the lead evolution (growth) curve of Cumming and Richards (1975).

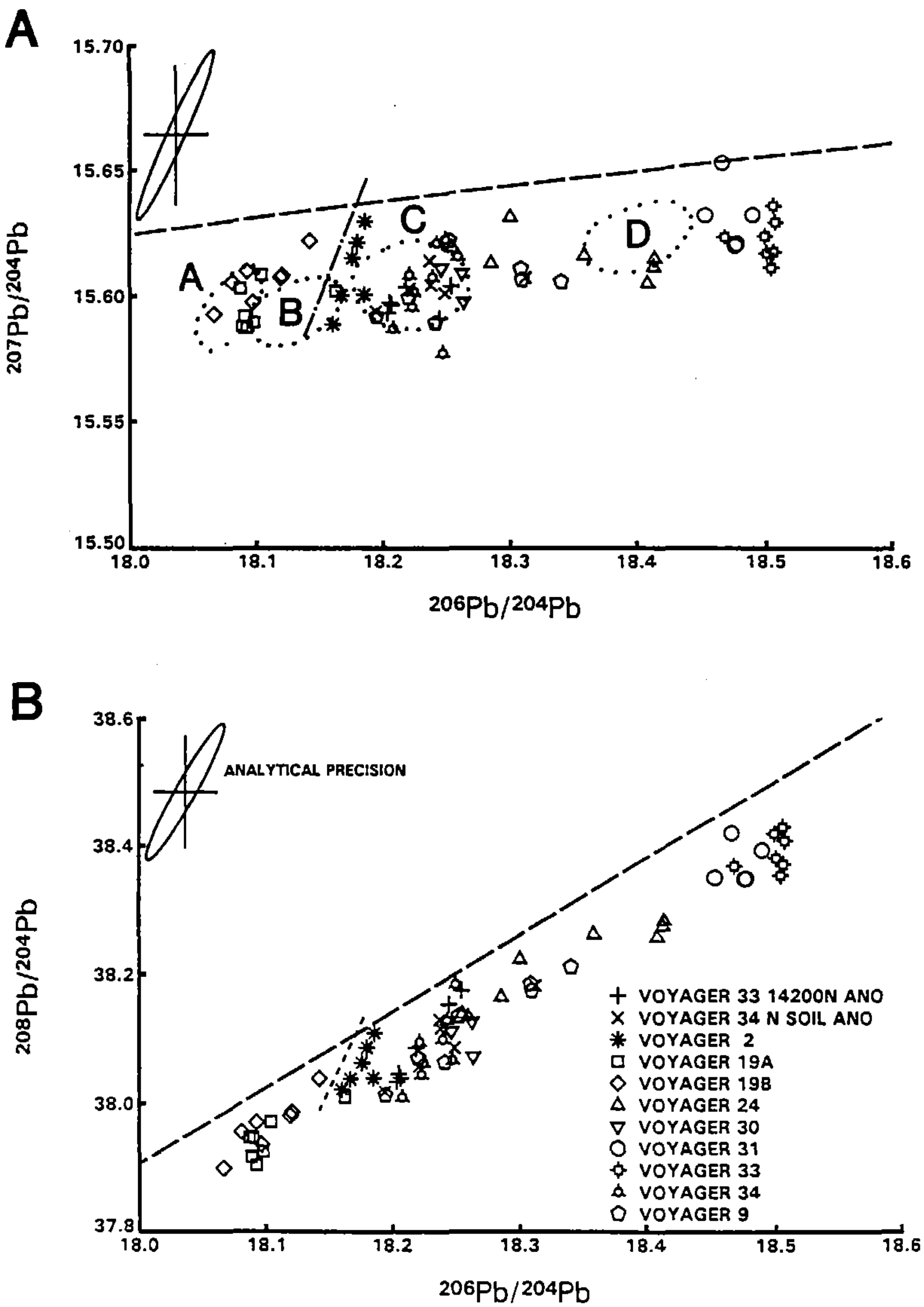

Figure 11 Comparison of lead isotope signatures of the mineralised prospects in the Elliott Bay region with data obtained in this study. Data from Gulson et al. (1987) and SIROTOPE's files. Groups A - D same as Fig. 10. Short dashed line is a representative ^{204}Pb fractionation line. Long dashed line is the lead evolution (growth) curve of Cumming and Richards (1975).

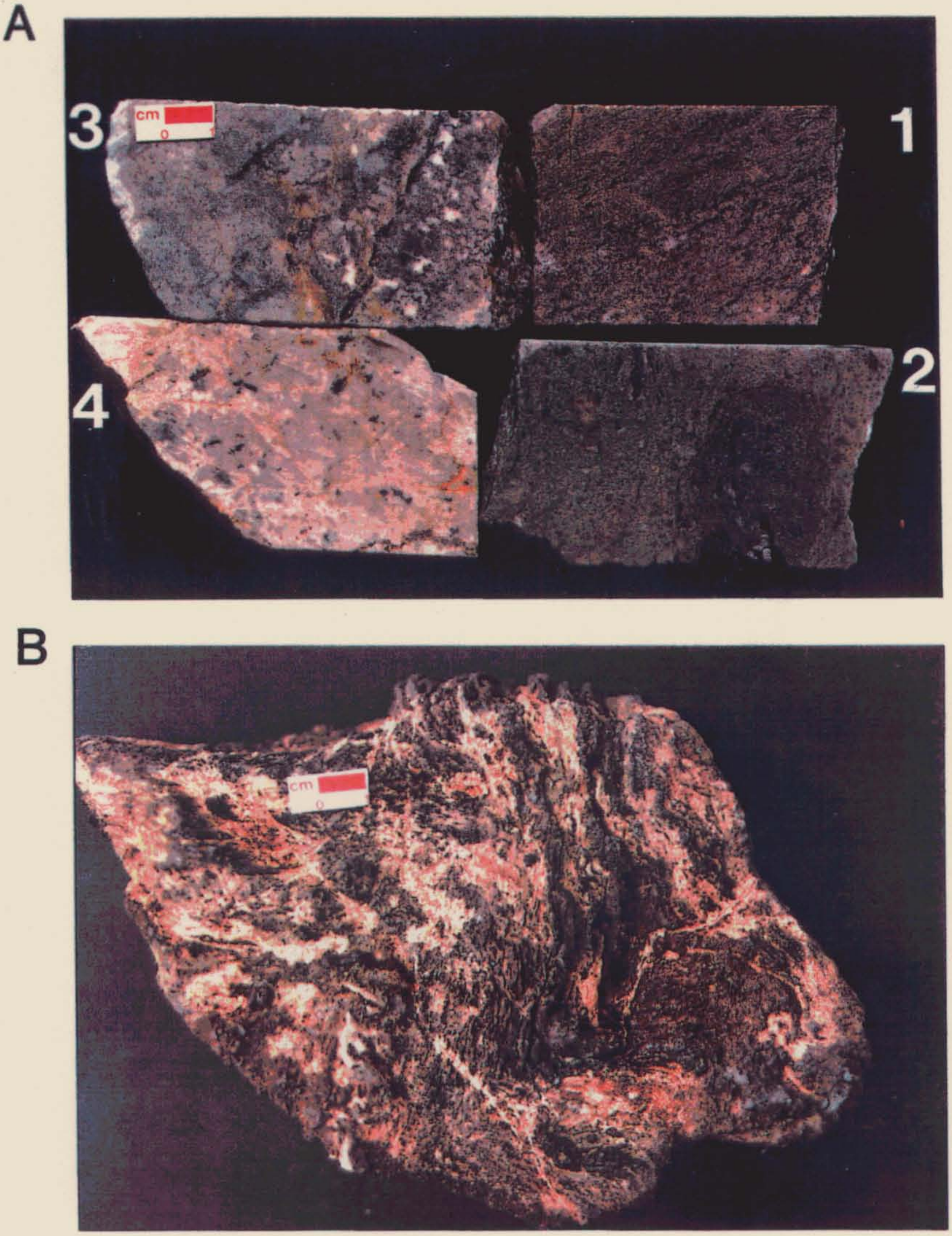

Figure 12 Photographs of various mineralisation types in the Elliott Bay area. A. Samples from groups A to D. 1-Group A, sphalerite-rich massive sulphide clast (WH-2 44.2 m) 2-Group B, galena-sphalerite-rich clast in chlorite and sericite altered debris flow deposit (WH-10, 189.3m), 3-Group C, stringers of sphalerite-galena-pyrite in sericite altered volcaniclastic (WH-8, 148.7 m), 4-Group D, disseminated galena in silicified felsic volcanic(?) (WH-8, 261 m). B. Group A, outcrop surface of sphalerite, galena and pyrite-rich massive sulphide clast, Voyager 19 prospect.

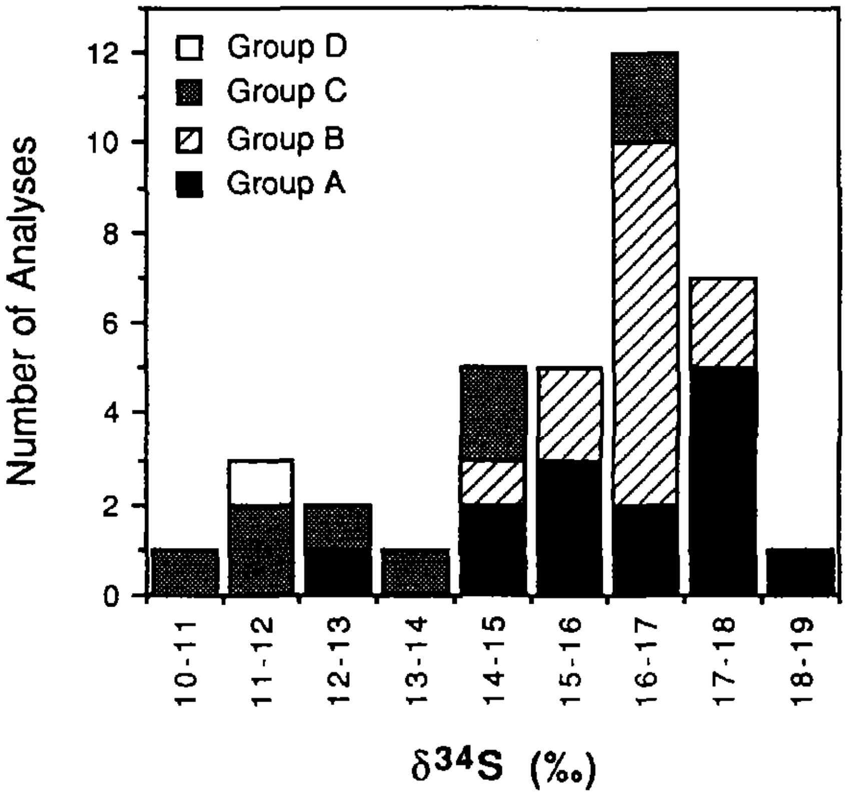

Figure 13 Histogram of $\delta^{34}S$ values (‰) for the different mineralisation Groups in the Elliott Bay area. Groups A and B have very similar $\delta^{34}S$ values that are heavier than mineralisation from groups C and D. See text for explaination of different sulphur sources.

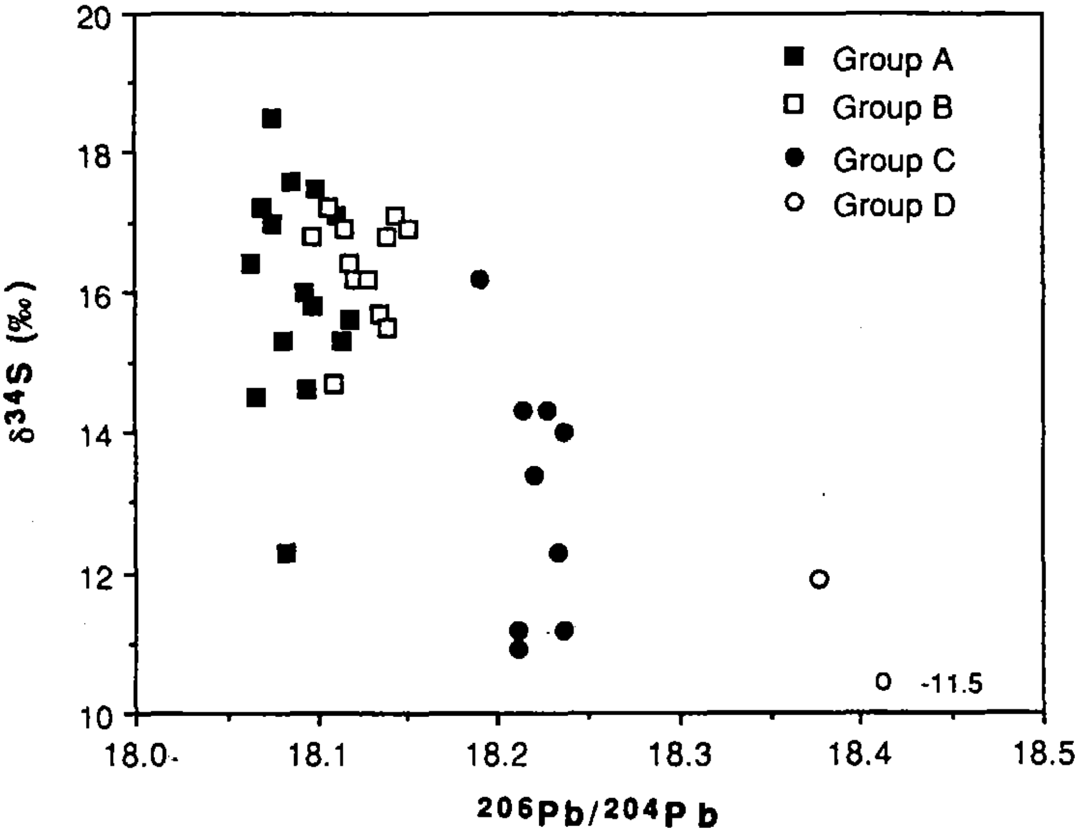

Figure 14 *Elliott Bay data plotted on a* $\delta^{34}S$ *versus* $^{206}Pb/^{204}Pb$ *diagram. The differences between Groups A and B and Groups C and D are clearly illustrated.*

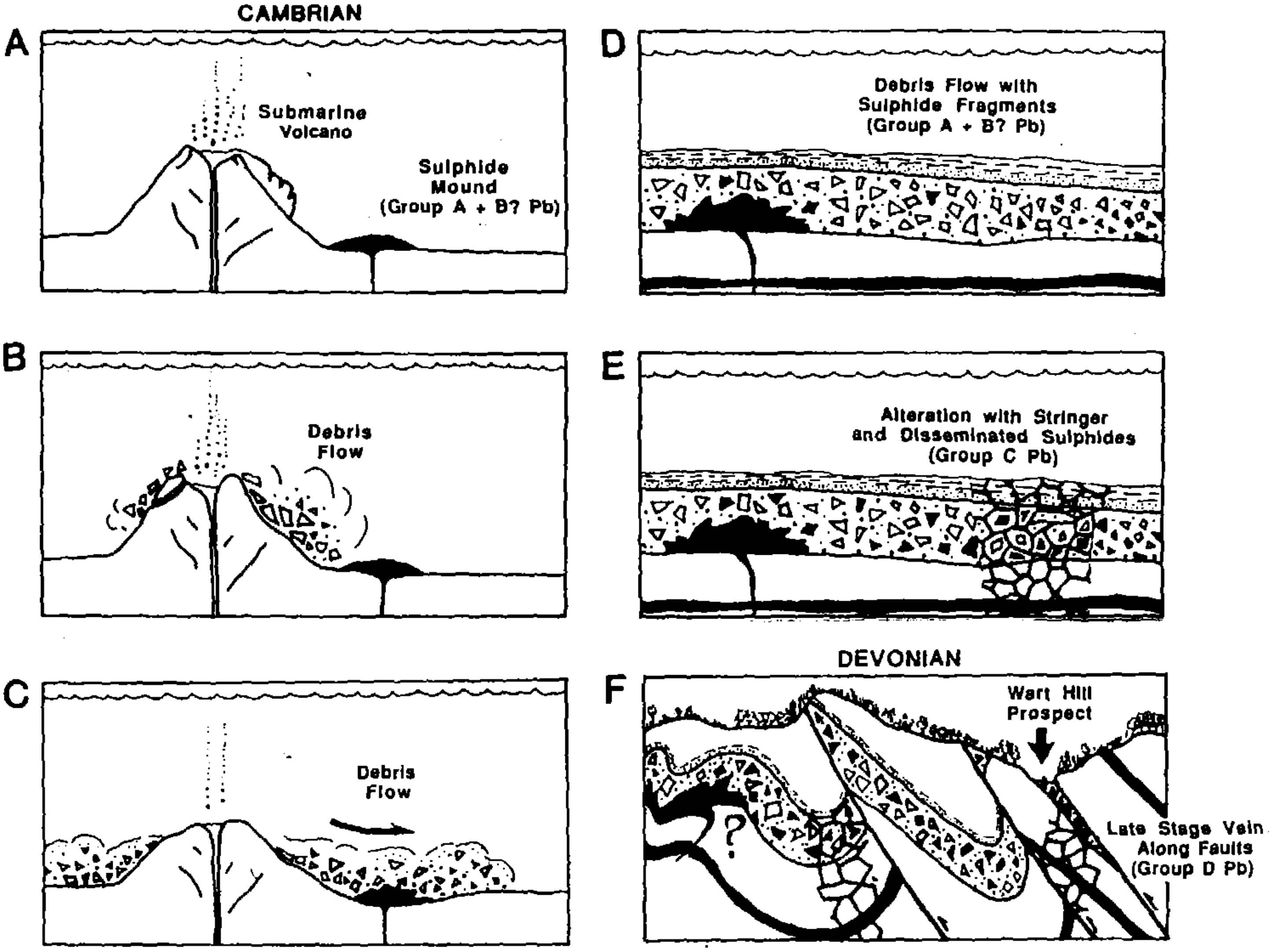

Figure 15 Working model for types of Elliott Bay mineralisation and differing Pb isotope signatures.. A. In the Cambrian a volcanogenic massive sulphide deposit (Groups A and B Pb), of unknown size, formed on the seafloor somewhere in the vicinity of the Wart Hill. B. and C. Subaqueous debris flows incorporated fragments of this mineralisation and deposited them at the present day site of Wart Hill. D. These fragments became one of the clast types in the debris flow deposits. E. Shortly after the deposition of the debris flows a separate generation of hydrothermal fluids passed through these rocks causing alteration (sericite, silica, chlorite, minor carbonate) and precipitation of disseminated and stringer sulphide mineralisation (Group C Pb). F. During, or shortly after, the Devonian deformation another generation of hydrothermal fluids passed through the rocks causing minor alteration and sulphide mineralisation along faults and fractures (Group D Pb).

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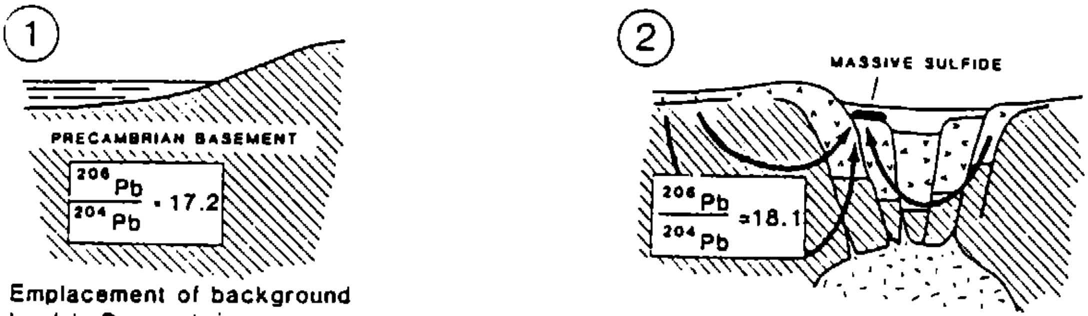
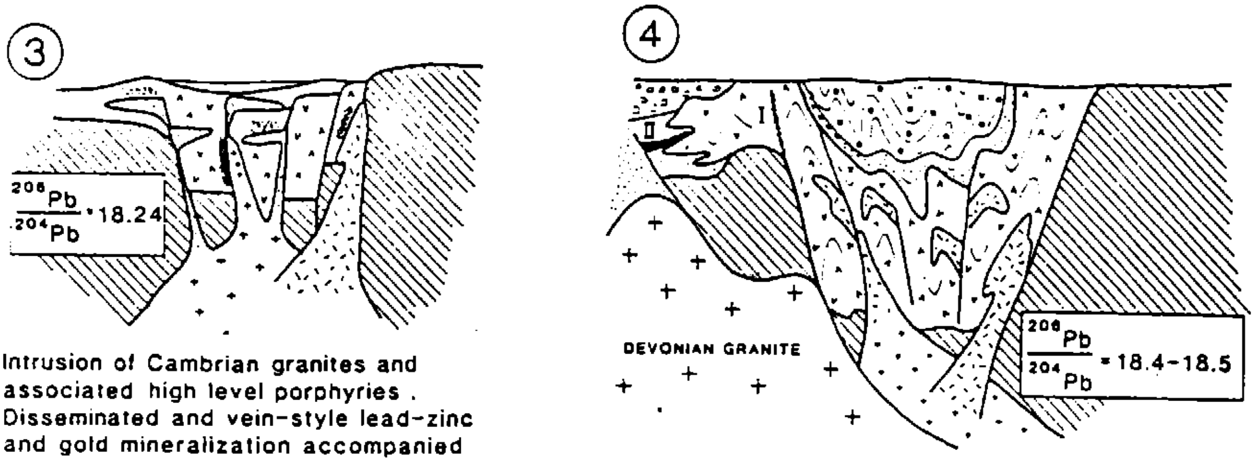


Emplacement of background lead in Precambrian source rocks at t = 1000m.y.

Cambrian volcanism in rifting environment. Hydrothermal leaching of background lead in convective cell. Concentration of lead into stratiform massive sulfide lenses.



Intrusion of Cambrian granites and associated high level porphyries . Disseminated and vein-style lead-zinc and gold mineralization accompanied by carbonate alteration.

Mid-Devonian deformation (Tabberabberan Orogeny) followed by granite intrusion. Concentration of background lead into Pb-Zn-As vein systems (I) and pyrrhotite-cassiterite replacement deposits (II).

Figure 16 Gulson et al.'s (1987) model explaining the evolution of lead isotope signatures for the mineralisation and host rocks at Elliott Bay.

Table 3 Elliott Bay Lead and Sulphur Isotope Data

Plot #	Sample	Location	Mineralisation Type	Mineral	206/204	207/204	208/204	del34S	GROUP
1	EB 1000	WH 2 33.m	SUS CLAST	Gn,Sp	18.095	15.604	37.951	14.6	A
2	EB 1001	WH 2 35.9m	DISSEM IN CHL ALT	Py,Sp,Gn	18.111	15.606	37.972	17.1	A
3	EB 1002	WH 2 44.2m	MASS SUS	Sp,Gn	18.086	15.571	37.869	17.6	A
4	EB 1003	WH 2 47.3m	STRINGER IN SIL ALT	Sp,Gn	18.070	15.586	37.883	17.2	A
5	EB 1004	WH 2 48.9m	MASS SUS	Sp,Gn	18.097	15.594	37.930	15.8	A
6	EB 1005	WH 4 49.8m	SUS CLASTS	Sp,Gn	18.083	15.592	37.907	12.3	A
7	EB 1006	WH 4 53.4m	SUS CLASTS	Sp,Gn	18.109	15.581	37.893	14.7	B
8	EB 1007	WH 4 54.0m	MASS SUS	Sp,Gn	18.119	15.580	37.910	16.4	B
9	EB 1008	WH 4 84.8m	MASS SUS	Sp,Gn	18.063	15.574	37.852	16.4	A
10	EB 1009	WH 5 279.1m	LATE VEIN	Gn	18.377	15.615	38.219	11.9	D
11	EB 1010	WH 6 48.0m	SUS CLAST IN SIL ALT	Gn,Sp	18.143	15.588	37.948	17.1	B
12	EB 1011	WH 6 50.0m	SUS CLAST IN SIL/SER ALT	Gn,Sp	18.121	15.583	37.914	16.2	B
13	EB 1011re	WH 6 50.0m	SUS CLAST IN SIL/SER ALT	Gn,Sp	18.128	15.589	37.928	16.2	B
14	EB 1012	WH 6 58.5m	SUS CLAST	Sp,Gn	18.233	15.603	38.058	12.3	C
15	EB 1013	WH 7 95.1m	SUS IN ALT	Sp,Gn	18.212	15.603	38.067	10.9	C
16	EB 1014	WH 9 114.8m	SUS IN SER ALT	Gn	18.248	15.604	38.097	NS	C
17	EB 1015	WH 8 109.5m	STRINGER IN SER/CARB ALT	Sp,Gn	18.221	15.599	38.044	13.4	C
18	EB 1016	WH 8 148.7m	STRINGER IN SER/CARB ALT	Sp,Gn,Py	18.236	15.592	38.039	14.0	C
19	EB 1017	WH 8 261.0m	DISSEM SUS IN SIL ALT	Gn	18.428	15.630	38.319	NS	D
20	EB 1018	WH 10 76.4m	STRINGER	Sp,Gn,Py	18.236	15.612	38.102	11.2	C
21	EB 1019	WH 10 81.6m	DISSEM SUS IN SER ALT	Py,Gn,Sp	18.402	15.611	38.222	-11.5	D
22	EB 1020	WH 10 170.2m	STRINGER IN SIL ALT	Sp, Gn	18.211	15.586	38.007	11.2	C
23	EB 1021	WH 10 187.5m	CLAST?	Gn,Sp	18.139	15.589	37.950	16.8	B
24	EB 1021re	WH 10 187.5m	CLAST?	Gn,Sp	18.120	15.596	37.960	16.8	B
25	EB 1022	WH 10 189.3m	SUS CLAST	Gn,Sp	18.115	15.585	37.918	16.9	B
26	EB 72079	WH 2 45.5m	SUS MATRIX	Gn,Sp,Py	18.118	15.627	38.027	15.6	A
27	EB 72080	WH 8 185.0m	MASS SUS	Gn,Sp	18.081	15.577	37.873	15.3	A
28	EB 72085	WH 4 47.0m	SUS MATRIX	Gn,Sp,Py	18.067	15.578	37.870	14.5	A
29	EB 72086	13310N 10060E	MASS SUS	Gn,Sp	18.075	15.585	37.891	18.5	A
30	EB 72087	13040N 10060E	MASS SUS	Gn,Sp	18.098	15.570	37.876	16.8	B
31	EB 72089	WH 4 54.0m	MASS SUS	Gn,Sp	18.134	15.603	37.975	15.7	B
32	EB 72096	13080N 10020E	MASS SUS	Gn,Sp	18.191	15.605	38.041	16.2	C
33	EB 72096re	13080N 10020E	MASS SUS	Gn,Sp	18.188	15.601	38.024	16.2	C
34	EB 72094	WH 2 35.5m	SUS MATRIX	Py,Sp,Gn	18.099	15.592	37.920	17.5	A
35	EB 72111	WH 10 189.3m	MASS SUS	Sp,Gn	18.151	15.599	37.982	16.9	B
36	EB 72112	13040N 10060E	MASS SUS	Gn,Sp	18.107	15.579	37.898	17.2	B
37	EB 72113	13040N 10040E	SUS BRXX	Py,Sp,Gn	18.093	15.595	37.940	16.0	A
38	EB 72121	13310N 10085E	MASS SUS	Sp,Gn	18.075	15.576	37.862	17.0	A
39	EB 72075	WH 4 48.1m	SUS MATRIX	Sp,Gn	18.139	15.594	37.953	15.5	B
1992	**Exploration**								
				Pb (ppm)					
	CSN 565551	near coast	SOIL	814	18.252	15.584	38.050	NS	C
	CSN 565209	near coast	SOIL	1290	18.177	15.583	37.992	NS	C
	565531	on coast	SULPHIDE	> 1 %	18.215	15.590	38.014	14.3	C
	565531	on coast	SULPHIDE	> 1 %	18.228	15.611	38.075	14.3	C
	565532?	on coast	SULPHIDE	> 1 %	18.223	15.596	38.037	NS	C
	565530	on coast	SULPHIDE	> 1 %	18.171	15.582	37.969	NS	B-C?
	565576	on coast	SULPHIDE	> 1 %	18.181	15.606	38.040	NS	B-C?

Abbreviations: MASS=massive, SUS=sulphide, BRXX=breccia, DISSEM=disseminated, ALT=alteration, Gn=galena, Sp=sphalerite, Py=pyrite, NS=no sample, re=repeat sample

APPENDIX A

Learning to Cope With Pb Isotope Diagrams

(from Carr and Dean, 1992)

Variation of the Pb isotope ratios shown on the common XY plots (^{206}Pb/^{204}Pb, ^{207}Pb/^{204}Pb, ^{208}Pb/^{204}Pb, results principally from goeological factors. However, some variation can be ascribed to **analytical errors**. The 95% confidence ellipse of the error associated with any Pb isotopic analysis is shown in the top left hand corner of each diagram. The major axis of this ellipse indicates the strong correlation inherent in the errors which arise from a combination of **fractionation** and ^{204}Pb error. Fractionation occurs at the very high temperatures induced during mass spectrometer analysis and results from preferential emission of the lighter isotopes relative to the heavier isotopes. ^{204}Pb error results from the lower precision in estimating peak heights of this low abundance isotope.

The geological variables are:

1) The age of the sample, i.e. the time at which the Pb was incorporated into the rock/mineral.

2) The relative amounts of Pb, U and Th (expressed generally as ^{238}U/^{204}Pb (μ) and ^{232}Th/^{204}Pb) in the source rocks from which the Pb was leached prior to incorporation in the rock/mineral.

3) The U/Pb and Th/U ratios in the rock/mineral between the time the Pb was incorporated and the present.

The isotopic ratios that are presented in the common XY plots are ^{206}Pb/^{204}Pb, ^{207}Pb/^{204}Pb and ^{208}Pb/^{204}Pb. Whilst ^{206}Pb, ^{207}Pb and ^{208}Pb derive from the constant radiogenic decay of ^{238}U, ^{235}U and ^{232}Th respectively, ^{204}Pb has no parent isotope and so its abundance does not change through geological time. Thus the three ratios above are continually increasing with time according to well defined decay criteria.

A **growth curve** is a model of this variation and indicates the expected isotopic composition of Pb-rich ores at any particular stage in the Earth's history. There is no unique growth curve for the Earth, and different curves can be generated assuming source rocks with different U/Pb and Th/U ratios. **Model ages** can be determined when data from high-Pb samples plot on or near a growth curve on a ^{207}Pb/^{204}Pb vs ^{206}Pb/^{204}Pb diagram. The accuracy of model ages vary considerably and relies on the appropriateness of the chosen model. The commonly used Cumming and Richards curve is based on the assumption that the U/Pb and Th/Pb ratios in the Earth's crust have been varying continuously and is correlated with the known ages of a set of massive sulfide deposits which probably gained their Pb from hydrothermal solutions which leached large volumes of rocks through the crust. Massive sulfides and other ores which leached their Pb from mantle rocks or lower crustal rocks will not fall on this growth curve.

The Pb isotope **fingerprinting technique** is based on the fact that in any geological domain, ores forming during a particular mineralizing event from the same or similar source rocks will have the same isotopic composition. In some cases we can broadly predict the likely isotopic composition based on geological criteria such as age/rock type etc., but in general the technique relies on a library of data on known ore deposits in a region.

This isotopic "fingerprint" represents the Pb isotopic composition at the time of formation of the ore/rock - otherwise known as the **initial ratios**. If the ore/rock has relatively low U/Pb, and Th/Pb ratios, such as in galena, then these initial ratios will not change with time because insignificant ^{206}Pb, ^{207}Pb and ^{208}Pb will have been added *in situ* since the time of formation by the radioactive decay of ^{238}U, ^{235}U and and ^{232}Th respectively. However with "low-Pb" samples (generally less the about 50-100 ppm for Palaeozoic samples and less than about 500-1000 ppm for Proterozoic samples) measurable ^{206}Pb, ^{207}Pb and ^{208}Pb will have been added by *in situ* radioactive decay and so the ^{206}Pb/^{204}Pb, ^{207}Pb/^{204}Pb and ^{208}Pb/^{204}Pb ratios will increase; i.e. will be **more radiogenic**. This effect will be magnified in high-U samples and higher Pb contents than the figures quoted above are needed to guarantee that significant additional radiogenic Pb has not changed the initial ratios.

Where *in situ* radioactive decay has occurred the ratios will plot on a line on any of the diagrams commonly presented. This line will always incorporate the initial ratios. On the ^{208}Pb/^{204} vs ^{206}Pb/^{204}Pb diagram the slope of the line is dependant on the Th/U ratio of the sample, whereas on the ^{207}Pb/^{204}Pb vs ^{206}Pb/^{204}Pb diagram the slope is dependant only on the time interval over which radioactive decay has taken place. In this latter case, where it can be shown that the isotope ratios of all the points on such a line have developed under a closed system with respect to Pb and U then the line is termed an **Pb-Pb isochron**. An isochron is thus defined by the slope, m, of a linear regression through the data. An estimate of how well such a regression fit the data is gained from Mean Square Root of the Deviates or **MSWD**. This function compares the deviation of each point from the regression relative to the estimeat of analytical precision. An MSWD of 1 or less indicates that the data deviate minimally from the regression whereas higher values indicate increasing deviation.

Source rock studies involve determining, if possible, the initial Pb isotope ratios of those rocks considered to be possible source of metals for mineralization. Such studies are particularly important in areas where mineralization may result from a syngenetic event, such as a VMS deposit, or from later granite intrusion. The syngenetic signature may be well established, but it is also important to know what is the likely Pb isotopic composition of epigenetic mineralization forming in response to the intrusion. This may be done by measuring mineralization known to be associated with the intrusion, such as skarns, or by determining the Pb isotopic composition of a relatively high-Pb silicate component such as K-feldspar. Although K-feldspars may contain a significant proportion of radiogenic Pb (i.e. Pb derived from *in situ* radiogenic decay since crystallization) techniques are available that enable, in many instances, the discrimination of the initial component from the radiogenic component.

LEGEND

0 0 0	OUTCROP, SUBCROP, FLOAT
▬	AIRBORNE EM ANOMALY
● 565 567	SAMPLE NUMBER Cu/Pb/Zn/Ag/Au(ALL ppm)(ASSAY ONLY IF APPLICABLE)
●——┤	DIAMOND DRILLHOLE COLLAR AND SURFACE PROJECTION
—F—	FAULT
←—X—	FOLD AXIS
┬ 310 M 80	STRIKE AND DIP OF BEDDING
↔ 310 M 80	STRIKE AND DIP OF CLEAVAGE
—·—·—	EDGE OF FOREST
═══	BOMBARDIER TRACK
═	RIVER
—·—·—	CREEK
—50—	CONTOUR INTERVAL 10m
▬	E.L. BOUNDARY
1	GROUND EM TRANSMITTING LOOP

ABBREVIATIONS USED ARE ABERFOYLE STANDARD

951074 93-3525.

Aberfoyle Resources Limited
EXPLORATION DIVISION

TASMANIA
ELLIOTT BAY EL 40/85
EB-4 CONDUCTOR
EM GRID AND LOOP LOCATIONS

REVISIONS			
Init.	Date	Init.	Date

Location Code :

Scale : 1 : 2 500

Date : Febuary 1993

Compiled : R.S.
Drawn :
Traced : J.M.S.
Checked :
Plate No : EB10/J4+K4

951075

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Aberfoyle Resources Limited
EXPLORATION DIVISION

REVISIONS			
Init.	Date	Init.	Date
JMS	3·2·93		
SR jms	30·11·93		

TASMANIA
ELLIOTT BAY E.L. 40/85

EB-1 PROSPECT
OUTCROP GEOLOGY

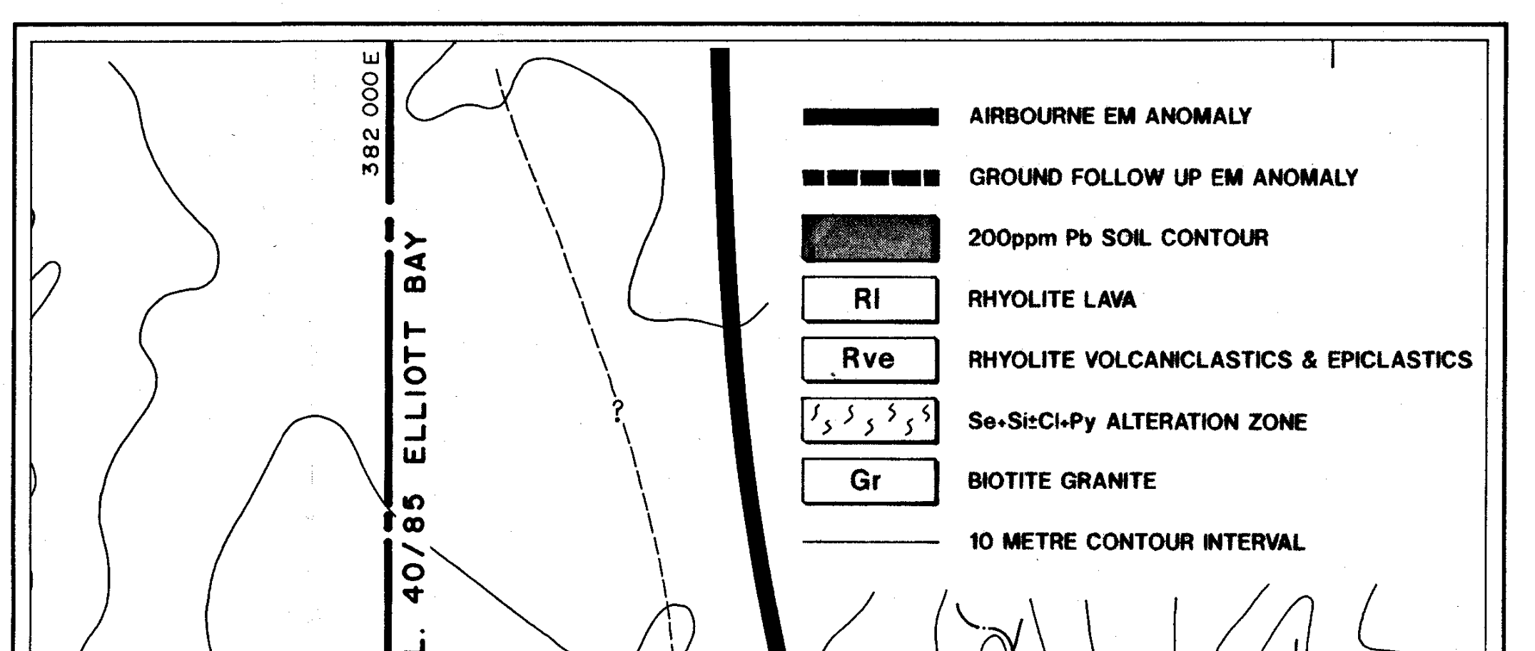
Compiled : SR
Drawn : SR
Traced : MAR
Checked : SR
Location Code :
Scale : 1:2500
Date : March 1992
Plate No : EB10/N3

LEGEND

TERTIARY	
Tg	QUARTZOSE GRAVEL
JURASSIC	
Jd	DOLERITE
LATE CAMBRIAN - EARLY ORDOVICIAN	
€Ocs	COARSE QUARTZOSE SANDSTONE TO FINE SILTSTONE, OWEN CONGLOMERATE
€Ovc	WATERLOO CREEK GROUP VOLCANICLASTIC CONGOMERATE/SANDSTONES TO SILTSTONES
CAMBRIAN	
€vu	UNDIFFERENTIATED VOLCANICS: DOMINANTLY FELSIC.
€ve	RHYOLITIC VOLCANICLASTICS, SILTSTONES, SILICEOUS CONGLOMERATES AND GREYWACKES.
€fl	FELSIC LAVAS AND INTRUSIVES.
CAMBRIAN INTRUSIVES	
€qfp	ELLIOTT POINT QUARTZ FELDSPAR PORPHYRY.
€g	GRANITE
€gm	MICROGRANITE
CAMBRIAN - WESTERN EPICLASTICS	
€c	INTERBEDDED CONGLOMERATES, SANDSTONES AND SILTSTONES, LOCALLY VOLCANICLASTIC.
CAMBRIAN - MAINWARING GROUP	
€mu	INTERBEDDED MAFIC VOLCANICS, SANDSTONES AND SILTSTONES.

GEOLOGICAL CONTACT
E.L. BOUNDARY
GRIDLINE
AIRBORNE EM ANOMALY
FAULT
RIVER
SYNCLINE
ANTICLINE
PLUNGING SYNCLINE
DIAMOND DRILL HOLE COLLAR AND SURFACE PROJECTION
LIMIT OF GEOPEKO SOIL GEOCHEMISTRY
LIMIT OF 1983 GEOPEKO UTEM SURVEYS

INSET COWRIE PROSPECT



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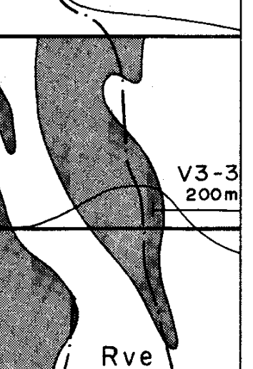
KILOMETRES

MAP LOCATION



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Aberfoyle Resources Limited
EXPLORATION DIVISION

REVISIONS			
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SOUTH WEST TASMANIA
E.L. 40/85 ELLIOTT BAY

SUMMARY PLAN

Compiled : R.S.
Drawn : J.M.S.
Traced :
Checked :
Location Code :
Scale : 1:25000
Date : JUNE 1992
Plate No : EB 14

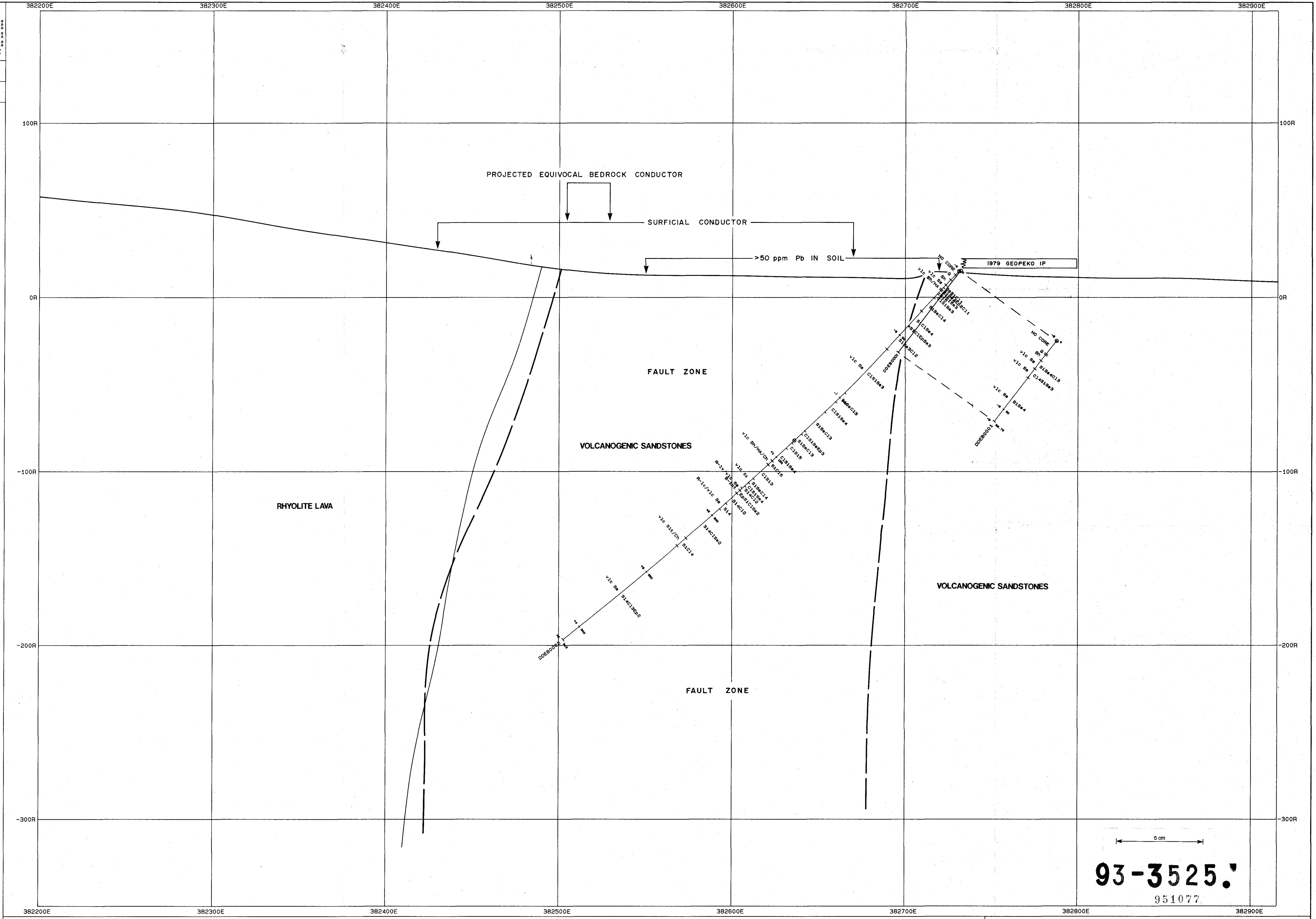
PROSPECT: eby
SECTION definition:
GRID: AMG
E: 382200.0 382915.0
N: 5241600.0 5241600.0
RL: -350.0 165.0
Forward extent : 1000.0
Backward extent: 1000.0
Section Strike: 90.0
Section Length: 715.0
PDF file: xe1000ink.pdf
PCF file: xe1000ink.pcf
PLOTfile: eb24.plt

HOLE LEGEND - RHS:

ANNOTATION
geo Alt.Comp/Inten

HOLE LEGEND - LHS:

ANNOTATION
geo Rock Type



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EXPLORATION DIVISION

REVISIONS			
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SR jms	30-11-93		

Tasmania
Elliott Bay E.L.40/85
EB-1 Prospect
SECTION 1600N

Compiled: RJI
Drawn:
Traced:
Checked: SR

Location Code:
Scale: 1 : 1000
Date: 29/11/93
Plate No.: EB24

PROSPECT: eby
SECTION definition:
E: .0 479.0
N: .0 .0
RL: -317.0 .0
Forward extent : 10.0
Backward extent: 10.0
Section Strike: 90.0
Section Length: 479.0
PDF file: sh1000eb2.pdf
PCF file: sh1000eb2.pcf
PLOTfile: eb26.plt

HOLE LEGEND - RHS:

* HISTOGRAM *
gch Cu [ppm]
Base value: .000
Units per mm: 5.000
Max dist in mm: 40
🟩

* HISTOGRAM *
gch Pb [ppm]
Base value: .000
Units per mm: 30.000
Max dist in mm: 40
🟦

* HISTOGRAM *
gch Zn [ppm]
Base value: .000
Units per mm: 40.000
Max dist in mm: 40
🟥

* HISTOGRAM *
gch Ag [ppm]
Base value: .000
Units per mm: 1.000
Max dist in mm: 40
🟫

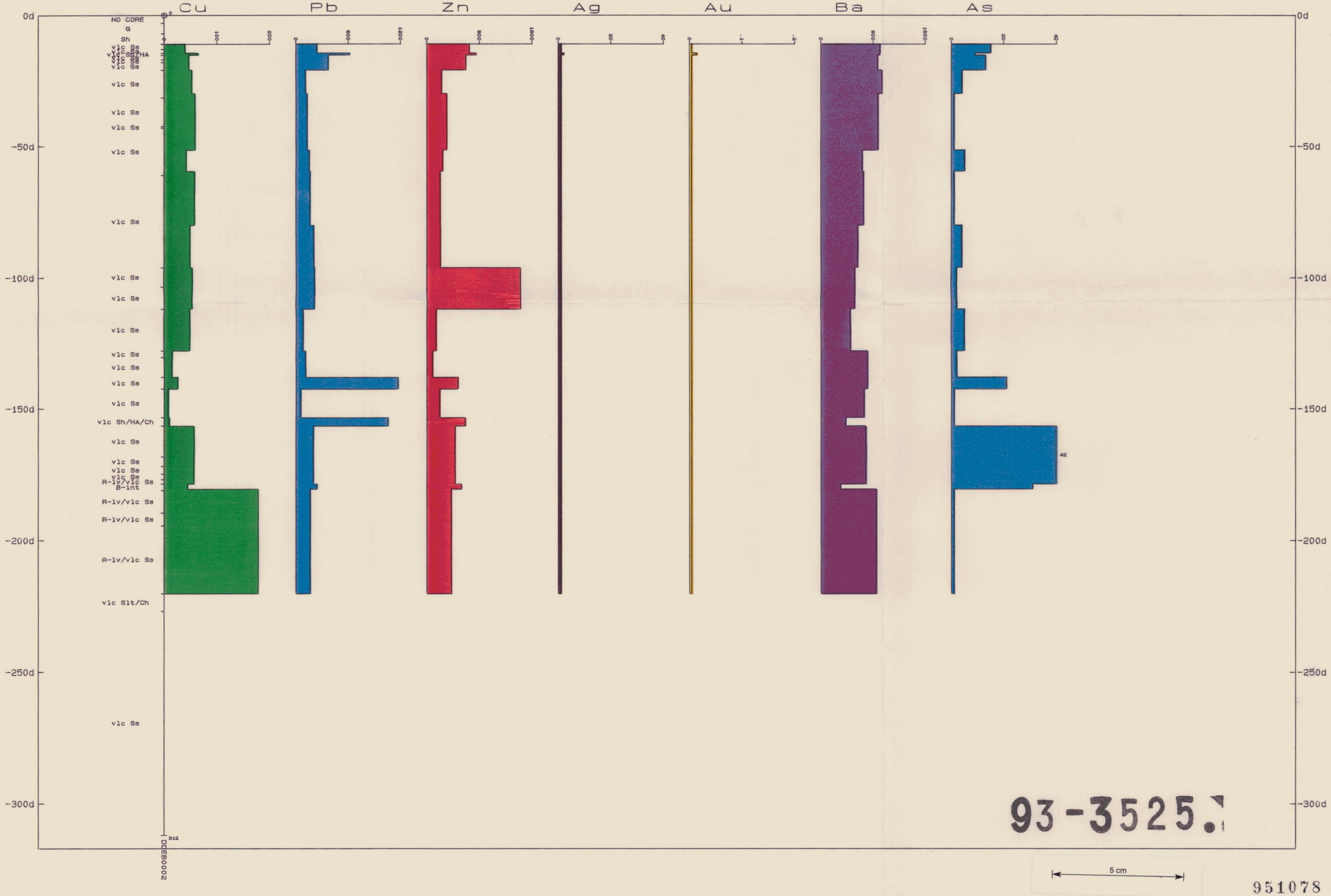
* HISTOGRAM *
gch Au [ppm]
Base value: .000
Units per mm: .005
Max dist in mm: 40
🟨

* HISTOGRAM *
gch Ba [ppm]
Base value: .000
Units per mm: 40.000
Max dist in mm: 40
🟪

* HISTOGRAM *
gch As [ppm]
Base value: .000
Units per mm: 1.000
Max dist in mm: 40
🟦

HOLE LEGEND - LHS:

* ANNOTATION *
geo Rock Type



93-3525.

5 cm

951078

Aberfoyle Resources Limited
EXPLORATION DIVISION

REVISIONS			
Init.	Date	Init.	Date

Location Code:

Tasmania
Elliott Bay E.L.40/85
EB1 Prospect
Geochemical Profiles DDH EB-2

Scale: 1 : 1000
Date: 01/12/93

Compiled: RdeB
Drawn:
Traced:
Checked: SR
Plate No.: EB26