

485001 001

D of M.	A.O.	C.G.	E.O.	D.S.M.E.
Received		13 DEC 1983		
Answered				
REF. No.		DE 11,790/83		

ELECTROLYTIC ZINC COMPANY OF AUSTRALASIA LIMITED  
Mineral Resources Division

**OPEN FILE**

EXPLORATION LICENCE NO. 12/72 BULGOBAC

Progress Report on Exploration Activity

4th May to 15th November, 1983

Report No. T174 MD

R.A. Sainty,  
November, 1983

TABLE OF CONTENTS

<u>TABLE OF CONTENTS</u>	i
<u>LIST OF PLANS, APPENDICES</u>	ii
<u>1. INTRODUCTION</u>	1
<u>2. PREVIOUS EXPLORATION</u>	1
<u>3. ABBREVIATIONS</u>	1
<u>4. EXPLORATION UNDERTAKEN 4.5. - 15.11.'83</u>	1
<u>4.1. Work Completed</u>	2
<u>4.1.1. Diamond Drill Holes</u>	2
<u>4.1.2. Drill Core Geochemistry</u>	3
<u>4.1.3. Track Construction</u>	3
<u>4.1.4. Geophysics - UTEM III Survey</u>	3
<u>4.1.5. Abandoned Vertical Percussion Hole</u>	
<u>Programme</u>	4
<u>4.2. Results Received</u>	5
<u>4.2.1. Drill Core Geochemistry</u>	5
<u>4.2.2. Diamond Drill Holes</u>	6
<u>4.2.3. Drill Core Geochemistry BBP 242</u>	10

LIST OF PLANS

A2-521-0100 1:5,000 scale Drill Hole Locations Plan  
AO-521-0101 Summary Sheet BBP 242  
AO-521-0102 Summary Sheet BBP 246 (+247)

APENDICES

APPENDIX 1. Drill Core Geochemical Analysis  
APPENDIX 2. Petrological Report C.M.S. 83/9/20

1.

## 1. INTRODUCTION

This report covers work on Exploration Licence No. 12/72 by Electrolytic Zinc Company of Australasia Limited between 4th May and 15th November, 1983.

The work was carried out on behalf of a Joint Venture between E.Z. and Getty Oil Development Co. Ltd., which was initiated in April, 1976. A description of the Licence can be found in E.Z. Report No. 128 - "Exploration undertaken in E.L. 12/72 during 1976-77".

## 2. PREVIOUS EXPLORATION

Details of all previous work on E.L. 12/72 have been reported in E.Z. Geology Department Report No's 128 (1977), 129 (1978), 130 (1979), 132 (1980), 137 (1981), 145 (1982), 149 (1982), 153 (1982), 159 (1982) and 165 (1983).

## 3. ABBREVIATIONS

Standard symbols and terminology used on geological plans and sections are detailed on Plate 1 of E.Z. Report No. 137 - "E.L. 12/72 Progress Report on activity July, 1980 to June, 1981".

## 4. EXPLORATION UNDERTAKEN 4TH MAY TO 15TH NOVEMBER, 1983

Exploration undertaken in this period consisted of the first part of a programme of systematic diamond drill hole traverses angled across the buried quartz-sericite-pyrite alteration zone in the Boco area. This programme follows the failure of a grid percussion vertical hole programme of bedrock sampling due to the nature and 100m depth of the glacial overburden.

4.1. Work Completed (Refer to A2-521-0100 1:5,000 Drill Hole Location Plan)

4.1.1. Diamond Drill Holes (total 1,900m)

Three diamond drill holes, BBP 242, BBP 246 and BBP 247 were completed on traverses 1 and 2 and a fourth, BBP 248 was close to completion depth on traverse 3.

Hole parameters are:

BBP 242 on Traverse 1

Collar Co-ordinates (A.M.G.) : 383,226.7mE 5,386,203.1mN  
: 358.8 R.L.  
Dip : -60°  
Azimuth (A.M.G.) : 110° (approx.)  
Total Depth : 457.5m

BBP 246 on Traverse 2

Collar Co-ordinates (A.M.G.) : 383,116.8mE 5,385,952.7mN  
: 363.2 R.L.  
Dip : -50°  
Azimuth (A.M.G.) : 105°  
Total Depth : 525.0m

BBP 247 on Traverse 2

Collar Co-ordinates (A.M.G.) : 383,276.8mE 5,385,941.3mN  
: 374.4 R.L.  
Dip : -45°  
Azimuth (A.M.G.) : 105°  
Total Depth : 382.2m

BBP 248 on Traverse 3

Collar Co-ordinates (A.M.G.) : 383,698.4mE 5,386,378.6mN  
: 376.3 R.L.  
Dip : -50°  
Azimuth (A.M.G.) : 285° T  
(Total Depth : 577.5m)  
Depth at 15.11.'83 : 535.0m

A 50° dip is the shallowest hole angle permitted by the thick fluvioglacial cover. The 45° angle of BBP 247 was made possible by the siting of this hole on the flank of the southern hill of the alteration outcrop, where the cover proved to be only 4m thick. BBP 248 encountered major difficulties and consequent delays. The hole could not be advanced beyond 52m on the first of two attempts that were required to reach bedrock and subsequent repeated cementing and redrilling over a further one week period failed to reach that depth again. In each case the redrilled hole wedged off the pre-existing hole due to the ingress of cobbles and boulders. The drill rig was shifted approximately 30m east to a newly bulldozed site for the second attempt. A total of four weeks drilling was required over the two attempts to reach bedrock at 90.5m depth.

#### 4.1.2. Drill Core Geochemistry

Core from the alteration component of BBP 242 (258.0-457.5mTD) was filleted (i.e. a silver sawn off the side) in 3m lengths within geologically-controlled boundaries. Samples were submitted to Analabs in Coee and analysed for Cu, Pb, Zn, Ag, Fe and Mn by A.A.S. after nitric-perchloric hydrochloric and hydrofluoric acid digestion (for a total dissolution of the pyrite content), for Sr, Ba, S, SiO<sub>2</sub> and CaO by pressed powder XRF, for Na<sub>2</sub>O by wet chemical method and for Au by A.A.S. after 30g fire assay fusion. Analysis for TiO<sub>2</sub>, Fe<sub>2</sub>O<sub>3</sub> and K<sub>2</sub>O (by pressed powder XRF) were carried out by mistake in Analab's Perth laboratory and these results have been supplied at no cost.

#### 4.1.3. Track Construction (total 1,350m)

Access tracks and drill sites were prepared for the four drill holes and for two proposed drill holes to be collared on the western ends of traverses 4 and 5.

#### 4.1.4. Geophysics - UTEM III Survey

Mr. H. Rutter of Geophysical Exploration Consultants Pty. Ltd. examined the potential for a UTEM III survey of the Boco alteration area. Interest in this large ground loop, time-domain technique has been aroused by its recent success at a depth of approximately 150m for Aberfoyle Exploration at the Hellyer prospect north of Que River. This depth of penetration was achieved in an area with no surficial conductive overburden. Nevertheless UTEM apparently offers the ability to detect any substantial massive pyrite-chalcopyrite mineralisation associated with a stratiform Zn-Pb-Ag sulphide deposit if it is present at a shallow depth beneath the 100m-thick glacial cover at Boco.

If an anomaly is located the survey may allow the across-strike drilling (target definition) programme to be by-passed and enable drilling to move directly onto a target evaluation stage.

Mr. H. Rutter stated that the UTEM technique should have no difficulty in penetrating the bedrock cover at Boco. On the advice of G.E.C. a new grid was cut and pegged to allow an optimum UTEM survey to be carried out. A base-line oriented  $015^{\circ}$  A.M.G. and 2km long was cut and pegged. Twenty-one lines, 100m apart and each 800m long were cut and pegged at 25m intervals eastwards from the baseline. Two loops were cut each 1000m x 700m on the west of the baseline. This gives a total of 22.9km of cutting and 16.8km of pegging.

NB.

Although the UTEM survey began mid-October, it is only 50% complete. Delays have been caused by equipment failing twice, severe H.E.C. high tension line noise and the receiver unit being returned to Sydney for installation of a newly-developed unit ex Lamontagne Geophysics, Canada said to overcome some of the powerline effects (combined noise and periodic beating) which have dominated the survey so far. Part of the northern loop grid has been re-read with the revised instrumentation.

#### 4.1. 5. Abandoned Vertical Percussion Hole Programme

(Refer A2-521-0100 1:5,000 Drill Hole Locations Plan)

##### a. Drill holes (total 180.2m)

The final two holes in the abandoned bedrock sampling programme were drilled at the start of the reporting period. Holes 11 and 12 completed the 100m-spaced traverse along a track 400m north of the northern hill of alteration outcrop in a search for any northerly on-strike extension of the alteration horizon.

##### b. Geochemistry

Fourteen samples of drill core from Holes 1 to 10 and the 1977 DDH BBP 207, representing both strongly altered and unaltered lavas, were submitted to Analabs in Cooee and analysed for Cu, Pb, Zn, Ag, Fe and Mn by A.A.S. after nitric-perchloric acid digestion, for Rb, Sr, Y, Nb, Ba,  $K_2O$ ,  $SiO_2$ , CaO and  $Al_2O_3$  by pressed powder XRF, for  $Na_2O$  by wet chemical method and for Au by A.A.S. after 20g aqua regia digestion.

## 4.2. Results Received

### 4.2.1. Drill Core Geochemistry

(Abandoned Vertical Percussion Hole Programme and BBP 207)

(Refer Appendix 1. Drill Core Geochemical Analyses)

The alteration zone is clearly distinguished geochemically by strong depletion in  $\text{Na}_2\text{O}$  and Sr.  $\text{CaO}$  is variably depleted and  $\text{SiO}_2$  is generally slightly enriched, relative to the unaltered lavas on the western (interpreted hanging-wall) side.

$\text{Na}_2\text{O}$  values are all less than 0.2% in the altered volcanics but most are 0.1% or less. (one sample from BBP 207 (55.3m) assayed 0.16% and that from Hole 5 assayed 0.17%.) These are strongly contrasted against  $\text{Na}_2\text{O}$  contents of 2-4% in the unaltered lavas (Holes 1, 2, and 10) on the western side. This contrast is mirrored by the Sr values. The strongly altered samples from BBP 207 contained 7-15 ppm Sr and those from Hole 3 contained 9 and 15 ppm Sr. The unaltered lavas (Holes 1, 2 and 10), however, contain 140 to 220 ppm Sr.

Holes 4 and 8 recovered bedrock samples that lacked pyritic alteration, but both were described in thin-section as thoroughly sericitised±silicified rocks. (Refer C.M.S. Report 83/4/28 appended to E.Z. Report 165.) Both occur on the interpreted footwall (eastern) side of the pyritic horizon and it had been suggested (E.Z. Report 165, pg 5) that these samples may represent weaker deep-footwall-style alteration. This concept is supported by the analyses. Hole 8 assayed 0.05%  $\text{Na}_2\text{O}$ , 9 ppm Sr, Hole 4 assayed 0.17%  $\text{Na}_2\text{O}$ , 30 ppm Sr\*. Therefore these holes did not completely close off the alteration zone on the eastern side.

(\*NOTE The Sr contents for Hole 4 and Hole 5 samples are intermediate between the other altered and unaltered values, but these are the two very weathered samples obtained during the programme. It is therefore likely that these two Sr values are unrepresentative.)

The Na<sub>2</sub>O values constantly decrease westwards from Hole 4 (0.17%), through BBP 207 (0.16, 0.10, 0.07 and 0.06%) to Hole 3 (0.05 and 0.02%). This pattern is consistent with alteration increasing upwards through footwall rocks which are west-facing. The Sr values, however, did not show this systematic variation.

#### 4.2.2. Diamond Drill Holes

(Refer A2-521-0100 1:5,000 scale Drill Hole Locations Plan ;  
AO-521-0101 Summary Sheet BBP 242; -0102 Summary Sheet BBP 246 (+247);  
Appendix 2 Petrological Report C.M.S. 83/9/20)

Summary Logs for BBP's 242, 246, 247 and 248 are as follows:

##### **BBP 242 on traverse 1**

- 0 - 52.0 Fluvioglacial cover
- 52.0-256.8 Unaltered felsic intermediate lavas, regionally silicified (leuco-andesites).
- 56.8-57.5 FAULT (pug); with silicified zone up and down hole - massive quartz 52.0-55.7, pale green foliated sericite alteration 55.7-57.5, silicified and quartz-veined lava 57.5-69.3.
- 127.0-129.0 Pale green foliated sericite alteration
- 242.95-256.8 Wholly intensely silicified and brecciated lava, above fault (below)
- 256.8-258.0 FAULT (pug)
- 258.0-457.5 Strongly silicified-sericitised-pyritised dacitic chilled lavas (obsidians and pitchstones)
- 300.0-305.0 Strongly pyritic-siliceous alteration in a zone of brecciation and mild shearing
- 305.0-315.2 Brecciated and massive strongly altered lava
- 317.15-318.7 Altered pelitic vitric ash sediment
- 380.7-391.9 Strongly pyritic alteration (especially 384.0-386.2, 388.4-388.9)

##### **BBP 246 on traverse 2**

- 0 - 36.5 Fluvioglacial cover
- 36.5 -302.35 Unaltered felsic intermediate lavas, regionally silicified (leuco-andesites) and basaltic intrusives.  
Basaltic intrusives: 36.5-38.2 (in part), 155.7-187.9, 259.1-271.2

- 239.45-239.95 FAULT (pug), with silicified zone 233.1-239.95 above fault.  
 271.2-278.8, 287.2-290.1: Sporadic zones of weak sericite ± chlorite alteration.
- 302.35-525.0 Strongly silicified-sericitised-pyritised glassy acid fragmentals and lavas (obsidians and pitchstones) with minor andesitic types and possible ignimbrites.
- 302.35-479.6: Alteration is dominated by silicification and pyritisation ("grey fragmentals")
- 302.35-356.0 - pitchstone and tuff-like fragmental
  - 356.0-361.0 - dacitic lava
  - 361.0-373.0 - obsidian fragmental
  - 373.0-375.5 - dacitic lava
  - 375.5-406.4 - obsidian + obsidian fragmental
  - 406.4-416.35 - andesitic pitchstone
  - 416.35-436.7 - andesitic ?ignimbrite
  - 436.7-470.5 - pitchstone
  - 470.5-479.6 - pitchstone fragmental
- 479.6-525.0 Alteration is dominated by sericitisation ± silicification ± pyritisation
- 479.6-488.6 - various fragmentals
  - 488.6-498.65 - rhyolitic ?ignimbrite
  - 498.65-525.0 - indeterminate- FAULTS
- 503.0-507.9  
515.7-517.7  
523.0-525.0
- BBP 247 on traverse 2
- 0 - 4.0 Fluvioglacial cover
  - 4.0 -153.55 Strongly altered glassy acid fragmentals and lavas (obsidians and pitchstones) with minor andesitic types.  
Alteration is dominated by silicification, bleaching and pyritisation ("grey fragmentals")
    - 88.2-101.3 - Andesitic lava, sericitised and pyritised
    - 101.3-111.9 - Pyritic but otherwise unaltered pink-brown silicic lava, and basaltic intrusive (108.5-110.1)
  - 153.55-382.2 Less-strongly to weakly altered ?andesitic lavas and fragmentals. Alteration dominated by sericitisation-pyritisation, decreasing down-hole.

8.

- 153.55-159.0 Less altered but pyritic pink fragmental  
 159.0-193.0 Altered grey-pink fragmentals: silicified, sericitised  
 pyritised.  
 193.0-265.3 Bleached to pink pyritic silicic fine pyroclastics,  
 includes 207.1-214.2 basaltic intrusive.  
 265.3-285.9 Basaltic dolerite-textured intrusive.  
 285.9-342.0 Altered yellow-green-grey ignimbritic tuff?, sericit-  
 ised, weakly pyritised. Includes  
 323.0-324.4 brown-grey strongly pyritised tuff.  
 342.0-383.2 Unaltered to weakly altered ignimbritic tuff? with zones  
 of yellow-green-grey sericitised, weakly pyritised rock  
 (as above). Includes  
 364.4-365.2 grey strongly pyritised tuff matrix

**BBP 248 on traverse 3**

This hole was drilled from east to west (285° A.M.G. azimuth)

- 0 - 90.5 Fluvioglacial cover  
 90.5 -388.2 Unaltered to weakly altered felsic intermediate lavas,  
 regionally silicified (leuco-andesite), and basaltic intrusives.  
 Alteration (sericitic±chloritic) increasing down-hole.  
 90.5-145.2 Basaltic intrusive  
 162.6-168.8 Strongly altered (sericite±chlorite)  
 228.4-228.55 FAULT (pug); with intensely silicified zone 221-228.4  
 above fault  
 288.0-344.5 Weakly altered (sericite±chlorite)  
 344.5-353.8 Basaltic intrusive  
 353.8-376.5 Weakly altered (sericite±chlorite)  
 376.5-377.0 Strongly altered (silicified±pyritised ?fragmental tuff)  
 377.0-388.2 Weakly silicified lava  
 388.2 -431.35 Strongly altered (silicified + pyritised and sericitised±chloritised)  
 lavas and fragmentals (?pseudofragmentals) with basaltic intru-  
 sives  
 388.2-396.7 Silicified+pyritised, grey  
 Basaltic intrusives : 389.3-390.6, 391.5-391.8, 394.9-  
 395.4  
 396.7-431.35 Sericitised±chloritised, with minor silicified+pyritised  
 sections, as follows:

9.

- 402.1-404.1 Silicified+pyritised, grey
- 404.1-410.7 Sericitised, scattered wispy + diss py, grey-green
- 410.7-431.35 Sericitised+chloritised, some overprinted by grey silicification.
- 431.35-577.5 Unaltered to weakly altered felsic intermediate lavas, regionally silicified (leuco-andesite) and basaltic intrusives. Sporadic strong alteration.
- 431.35-434.0 Basic intrusive
- 434.0 -435.65 Silicic massive lava
- 435.65-437.4 Basic intrusive (also 440.8-441.2; 442.7-443.2)
- 443.2 -450.4 Bleached, strongly silicified lava, minor py as narrow fracture fill and clots.
- 446.75-446.9 Intense py-filled breccia matrix.
- 450.4 -453.65 Basic intrusive
- 453.65-474.2 Bleached silicic lava
- 474.2 -490.3 Silicic massive lava
- 490.3 -499.9 Weakly to strongly silicified massive lava
- 499.9 -506.1 Strongly altered (sericitised + silicified, no py), pale green
- 506.1 -511.9 Silicic massive lava
- 511.9 -514.0 Basic intrusive
- 514.0 -517.5 Silicified + pyritised (fine py webbing in bleached, pale brown to pink lava - pseudofragmental)
- 517.5 -518.4 Sericitised + pyritised (diss py) pale yellow-green
- 518.4 -519.3 Basic intrusive
- 519.3 -520.9 Sericitised + py-webbed, with scattered bright green ?illite-hydromuscovite
- 520.9 -526.1 Silicic massive lava
- 526.1 -526.6 Basic intrusive
- 526.6 -577.5m Silicified massive lava.
- Total Depth

#### 4.2.3. Drill Core Geochemistry BBP 242

(Refer AO-521-0101 Summary Sheet BBP 242)

Assays have been received for the alteration component (258.0-457.5mTD) of BBP 242 which was drilled on traverse 1. Values for Pb and Zn are elevated at the top of the alteration interval (258-261m Zn 345 ppm; Pb 60 ppm) and gradually decrease down-hole to about 335m (Zn 100 ppm; Pb 5 ppm), beyond which background levels (Zn 10-75 ppm; Pb 0-20 ppm) persist to the end of the hole, except for a high at 346.0-349.0m of 235 ppm Zn, 75 ppm Pb. Cu values are static at 5-45 ppm mostly 5-20 ppm, except for 85 ppm (300-303m, 303-306m). Only 4 samples assayed for Ag above the limit of detection (0.5 ppm). Au peaked at 0.032 ppm at 258-261m and 6 other intervals detected Au (at 0.008 ppm). Na<sub>2</sub>O usually assays less than 0.1% throughout the altered sequence but does not readily show any systematic increase down-hole. No trends are apparent for the other oxides or rare-earths assayed for. However, CaO and Sr analyses are much higher than the samples from the vertical percussion hole series. This could be due to analytical error and will be checked.

APPENDIX 1. Drill Core Geochemical Analysis

# BOCO AREA: DRILL CORE GEOCHEMICAL ANALYSES

485015

SAMPLE No.	LOCATION	ROCK TYPE	ANALYTICAL RESULTS																
			Cu ppm	Pb ppm	Zn ppm	Fe%	Mn ppm	Ag ppm	Au ppm	SiO <sub>2</sub> %	Al <sub>2</sub> O <sub>3</sub> %	Na <sub>2</sub> O%	K <sub>2</sub> O%	CaO%	Rb ppm	Sr ppm	Y ppm	Nb ppm	Ba ppm
46380	Hole 1; 26.7m	Brown Unaltered lava	5	10	150	2.05	210	x	x	71.3	13.8	3.07	3.80	0.26	120	160	35	10	1200
46379	Hole 2; 35.0m	Brown unaltered lava	5	5	85	3.05	335	x	x	70.7	13.3	4.01	3.20	0.29	75	220	30	10	970
46378	Hole 3; 18.5m	Silica-sericite-pyrite altered volcanic.	15	115	1600	8.60	1450	0.5	x	58.9	12.6	0.02	0.74	0.13	50	15	50	7	140
46377	Hole 3; 19.8m	Silica-sericite-pyrite altered volcanic.	5	65	180	1.70	50	x	x	76.7	10.5	0.05	3.20	0.12	180	9	20	7	400
46376	Hole 4; 43.0m	Deeply weathered lava with patchy iron oxide staining	10	15	50	1.60	140	x	x	74.2	13.2	0.17	4.80	0.07	160	30	35	10	950
48301	Hole 5; 40.0m	Silica-sericite-pyrite altered volcanic	10	15	45	0.96	60	0.5	0.03	67.4	16.2	0.17	4.50	0.04	230	90	50	15	970
48397	Hole 8; 100.5m	Cream cleaved strongly sericitised ashflow	5	10	80	0.90	105	x	x	75.1	13.8	0.05	4.55	0.10	280	9	40	15	550
48398	Hole 9; 96.7m	Pink amygdaloidal lava with weak sericitisation and silicification	x	5	20	0.38	50	x	x	77.8	11.8	2.22	5.00	0.10	170	110	35	10	1000
48399	Hole 10; 99.4m	Grey moderately silicified ashflow	5	15	55	0.89	575	0.5	x	77.7	10.2	2.58	4.00	0.26	120	150	40	10	1100
48400	Hole 10; 105.7m	Green outbrecciated lava	20	10	90	1.90	715	x	x	77.6	12.3	1.99	3.05	0.20	180	150	30	10	1050
48732	B.P. 207 55.3m	Grey-green sheared strongly silicified and sericitised tuff with minor pyrite	5	15	75	1.15	40	x	x	78.3	11.2	0.16	3.35	0.13	140	10	35	10	380
48733	" " 90.4m	Grey-green fg. sheared strongly silicified tuff with patchy sericite	5	25	85	1.20	30	0.5	x	76.9	11.7	0.10	3.40	0.09	120	15	40	10	390
48734	" " 123.0m	Dark grey sheared siliceous crystal lithic tuff with pyrite and minor goethite pschalerite in quartz veins & fractures.	25	80	240	1.10	65	0.5	x	68.8	11.9	0.07	3.85	0.06	170	15	30	10	410
48735	" " 154.2m	Grey fg. strongly silicified and sericitised tuff with minor pyrite	5	30	145	1.45	85	x	x	78.2	10.1	0.06	3.35	0.06	190	7	25	8	310

G10

APPENDIX 2. Petrological Report C.M.S. 83/9/20

## Central Mineralogical Services



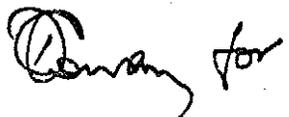
39 Beulah Road  
Norwood, S.A. 5067  
Telephone 42 5659

Mr. R. Sainty  
Geologist  
37, Beech Drive  
ROSEBERY / TAS. 7470

5th October, 1983

REPORT CMS 83/9/20

YOUR REFERENCE: Order No. 900453  
DATE RECEIVED: 15th September, 1983  
SAMPLE NOS.: 44721 - 44737  
SUBMITTED BY: R. Sainty  
WORK REQUESTED: Petrology

  
H.W. Fander, M. Sc.

REPORT CMS 83/9/20

Seventeen samples of diamond drill core from a quartz-sericite-pyrite alteration zone were received for petrological examination. The suite, as a whole, exhibits a limited range of variations and thus brief petrological descriptions were prepared in tabulated form. Individual descriptions incorporate data from petrological and stereobinocular microscopic examination of the thin-sections and respective offcuts, and include interpretative comments.

Summary

The bulk of this suite comprises devitrified and quartz-sericite-pyrite-altered intermediate to acid glassy lavas. These rocks may be classified variously as pitchstones or obsidians, dependant on the phenocryst content. The majority of pitchstones are of dacitic character with a simple feldspathic phenocrystal assemblage. Variants include rhyolitic (with quartz phenocrysts) and andesitic (with altered feldspar and ferromag silicate phenocrysts) types. Pitchstones are poorly diagnostic, consisting simply of altered felsic glass, but may be classified broadly as dacitic-rhyolitic.

On the basis of relict textural features, these rocks must be considered as lavas. A few exhibit a lithic tuff-like appearance mesoscopically due to secondary brecciation phenomena related to low-grade regional metamorphic shearing and boudinaging of microscale vein networks and/or perlitic devitrification structures. Only four strictly pyroclastic rocks are represented. Three of these are of ignimbritic character within the limits imposed by devitrification, pervasive alteration and shearing. The fourth is a similarly altered pelitic ash, subaerially transported, but probably subaqueous in terms of mode of deposition. This rock is of distal character in contrast to the vent-proximal to subproximal acid lava and psammite to lapilli grade pyroclastics complex, and may thus reflect a second, contemporaneous but distal eruptive source.

All seventeen samples are similarly altered, with pervasive development of quartz-sericite assemblages. Fine to ultrafine pyrite is more or less ubiquitous in silicified and sericitised facies. Individual rocks may reflect semi-selective silicification or sericitisation and these tend to be relatively weakly pyritised. Pre-tectonic quartz and quartz-sericite veinlets are more or less ubiquitous. These features are relatively pyritic in the selectively relatively silicified, or sericitised, host rocks. Pyroclastics tend to exhibit semi-selective silicification of lithic clasts and crystal components, and sericitisation of the matrix. Pre-tectonic quartz and quartz-sericite veinlets may be supplemented by late syn- to post-tectonic quartz-carbonate-chlorite veinlets.

The bulk quartz-sericite-pyrite assemblage is of typical deuteric or volcano-hydrothermal character. Accessories include traces of apatite, rare barite and extremely rare sphalerite.

D. Cowan, B. Sc.

REPORT CMS 83/9/20Additional Notes on Alteration

Rod Sainty's letter, accompanying the submission, contained a number of queries relating to individual samples.

44721 The weak green spotting (hand specimen) reflects the distribution of accessory alteration chlorite. Chlorite is distributed as sporadic clots in quartz veinlets, and with sericite and quartz as pseudomorphs after phenocrystal feldspar. In the latter context, chlorite is concentrated in areas marginal to the chloritic quartz veinlets.

44723 The vague laminae across the core are bedding laminations. These are well-defined on a sawn, semi-polished and wetted surface, but are rather incipient in the thin-section.

44725 As noted in the description, the darker areas in this rock reflect the distribution of veinlets and discontinuous pyritic selvages.

44727 This rock is rather typical of the altered felsic intermediate (as against intermediate-acid) lavas. A characteristic feature is the absence of phenocrystal quartz and indeed of free primary quartz in general. The relict primary mineralogy is feldspathic rather than quartzofeldspathic and can thus be contrasted with associated acid lavas and pyroclastics.

lots dark 7 - The noted 71-78 %  $\text{SiO}_2$  content must be considered a reflection of silicic alteration. Considered alone, the  $\text{SiO}_2$  analyses would indicate a rhyolitic facies with 20-30 % free quartz. Rhyolites (sensu stricto) almost invariably include phenocrystal quartz. Dacites, at the relatively "basic" end of the acid compositional spectrum, typically include traces of phenocrystal quartz consistent with their relatively low free quartz content, and with the semi-popular usage of the term quartz-andesite as a synonym for dacite.

Total  $\text{SiO}_2$  content, considered alone, is an unreliable guide to primary composition of altered volcanics. In the present context of a very fine-grained quartz-sericite rock, relative proportions of sericite and closely intergrown sericite-stained, crypto- to microcrystalline quartz are difficult to establish microscopically. In the absence of relict primary quartz, the  $\text{SiO}_2$  analytical data is consistent with a near-parity quartz and sericite content.

Previous investigations of quartz-sericite-altered Mt. Read Volcanics have indicated that primary composition can generally be assessed from comparison of partial analytical data (notably  $\text{SiO}_2$ ,  $\text{K}_2\text{O}$ ,  $\text{CaONa}_2\text{O}$  and  $\text{Al}_2\text{O}_3$ ) and, further, there is a generally good agreement with petrological data despite the reliance on relict features, particularly the presence or absence and relative proportions of relict quartz and altered feldspar and ferromag silicate phenocrysts. Simple two component plots (e.g.  $\text{SiO}_2$  against  $\text{Al}_2\text{O}_3$ ,  $\text{SiO}_2$  against  $\text{K}_2\text{O}$ , etc.) have been found particularly instructive in establishing metasomatic

(e.g. silicification) trends and reverse relationships (e.g. depletion of Ca, Na, K, Al associated with silicification of feldspar), once established and compared with norms, give a fairly reliable guide to primary composition.

44730

44731

These two rocks confirm a subtle balance between alteration trends and the distribution of pyrite. Generally in this suite as a whole, pyrite is relatively abundant in rocks exhibiting marked sericitisation and silicification (e.g. 44730), and relatively sparse in rocks exhibiting relative intense sericitisation alone (e.g. 44731). Similarly, veinlet-related pyrite is relatively conspicuous in composite veinlets (i.e. quartz-mica) in comparison to simple types (i.e. quartz-, or sericite).

44732

The distinct purple tint referred to is not apparent in this sample as received. A likely inference is that this rock contains one of the light-sensitive varieties of "sericite". These phases are generally colour-distinctive in freshly drilled core, but bleach, at varying rates, on exposure to light. Examples include the "D.G.S." (disappearing green stuff) at Renison and a purplish to green type at Savage River.

44734

Chloritic, sericitic alteration of feldspar similar to 44721.

44735

The pale green sericite reflects illite-hydromuscovite composition. In some situations, green sericites may be confused with chlorites. Stronger coloured varieties tend to bright apple green tints.

44736

The creamy, veinlet-like features are concentrations of leucoxic TiO<sub>2</sub> as closely spaced, crudely stylolitic microfilms. These are a devitrification-related phenomenon. The films are discordant to the weak flow-banding, predate the quartz veinlets, and are partly controlled by ill-defined devitrification-induced microfractures.

D. Cowan, B. Sc.

Sample No.	Classification - Composition	Fabric	Accessories	Comments
44721 242 (T.S.) 47261) 2915	<u>Altered Pitchstone.</u> Disseminated quartz, quartz-pyrite and quartz-sericite-pyrite pseudomorphed phenocrysts in a groundmass of sericite and sericite-stained quartz. Sporadic quartz veinlets.	"Andesitic" (frequent evenly disseminated phenocrysts) with a felsitic/devitrified groundmass. Weakly sheared.	Traces chlorite, evenly disseminated leucoxenised opaques. Minor late quartz-calcite veinlets.	Thoroughly sericitised/silicified "andesitic" pitchstone (chilled lava) with more or less pervasive pyrite impregnating silicified ferromag phenocrysts (biotite).
44722 BBP 242 304.2	<u>Altered Perlitic Obsidian.</u> Semi- to sericitic white mica and microcrystalline quartz with conspicuous fine to ultrafine pyrite concentrated in irregular sericite veinlets. Sporadic late quartz-sericite(-apatite) veinlets.	Perlitic-microfelsitic devitrification structures, variably massive to semi-brecciated/sericite-healed. Mildly sheared.	Evenly disseminated leucoxenised opaques, rare quartz microphenocrysts.	Perlitic, devitrified "dacitic" obsidian with zones of sericite veining grading into sericite-pyrite-healed brecciation, then "pseudofragmental". No primary pyroclastic features.
44723 BBP 242 318.5	<u>Altered Pelitic Ash.</u> Semi- to sericitic white mica and sericite-stained, cryptocrystalline, quartzofeldspathic material, disseminated fine to ultrafine pyrite. Veinlets of quartz-pyrite-sericite, sericite-quartz, quartz.	Silty vitroclastic. Weakly laminated on sub- to millimetric scale with weak concordant slaty cleavage.	Minor silt- to fine sand-sized angular quartz, sericitic feldspar grains. Rare apatite (in quartz-sericite veinlets)	Sericitised/pyritised pelitic vitric ash, subaerially transported, ?subaqueously deposited. Early pyritic and intermediate, weakly apatitic veinlets predate shearing.
44724 BBP 242 343.5	<u>Altered Pitchstone.</u> Sericite and variably sericite-stained quartz with disseminated relict quartz, sparse sericitised feldspar phenocrysts. Disseminated pyrite, concentrated in ill-defined sericitic veinlets.	Felsitic-devitrified, incipiently flow-structured and weakly sheared.	Thinly disseminated leucoxenised opaques. Sporadic late quartz veinlets.	Felsitic-devitrified, dacitic-rhyolitic pitchstone. Alteration is closely analogous to that in 44721, 44722, and 44723.
44725 BBP 242 384.5	<u>Altered Perlitic Obsidian.</u> Sericite and quartz in varying, but overall near-equant proportions with more or less pervasive fine to ultrafine pyrite. Frequent quartz-sericite (-pyrite) and late quartz veinlets.	Analogous to 44722, but relatively brecciated/quartz-sericite-healed. Stressed.	Traces cloudy epidote and siderite-pseudomorphed ?phlogopite in quartz-sericite veinlets.	Affinities with 44722, relatively silicified in comparison. Colour variations reflect distribution of veinlets with dark, relatively pyritic selvages.
44726 BBP 242 412.5	<u>Altered Pitchstone.</u> Sericite and variably sericite-stained quartz with thinly disseminated quartz (+ sericite) pseudomorphed feldspar phenocrysts, disseminated pyrite. Sporadic quartz-sericite veinlets, late quartz	Felsitic, weakly quartz-pyrite-sericite amygdaloidal. Weakly stressed.	Disseminated leucoxenised opaques. Rare clots sideritic carbonate in late quartz veins.	Felsitic-devitrified "dacitic" pitchstone with typical pervasive quartz-sericite alteration and related pyrite disseminations.
44727 BBP 246 298.4	<u>Altered "Leuco-andesite".</u> Albitised plagioclase phenocrysts in a pervasively sericitised/weakly silicified feldspar-microclitic groundmass. Frequent quartz, quartz-sericite and sporadic late quartz-siderite veinlets.	Weakly porphyritic, subtrachytic-microtextured with pervasive intersecting veinlets.	Leucoxenised opaques. Discontinuous chloritic selvages, films; rare pyrite-quartz-siderite veinlets.	Felsic intermediate lava in contrast to the intermediate-acid 44722 to 44726. Distinctly sericitic alteration with only rare vein-related pyrite.
44728 BBP 246 304.5	<u>Altered Pitchstone.</u> Sericite and sericite-stained microcrystalline quartz with disseminated quartz, silicified feldspar microphenocrysts. Disseminated pyrite, sporadic pyrite-quartz-sericite veinlets.	Flow-structured/flow-brecciated, weakly quartz-amygdaloidal, microfelsitic. Weakly sheared.	Disseminated leucoxenised opaques.	Dacitic-rhyolitic pitchstone with affinities to 44724. Pervasive sericite-quartz(-pyrite) alteration/pyritic veining predate shearing.

485021

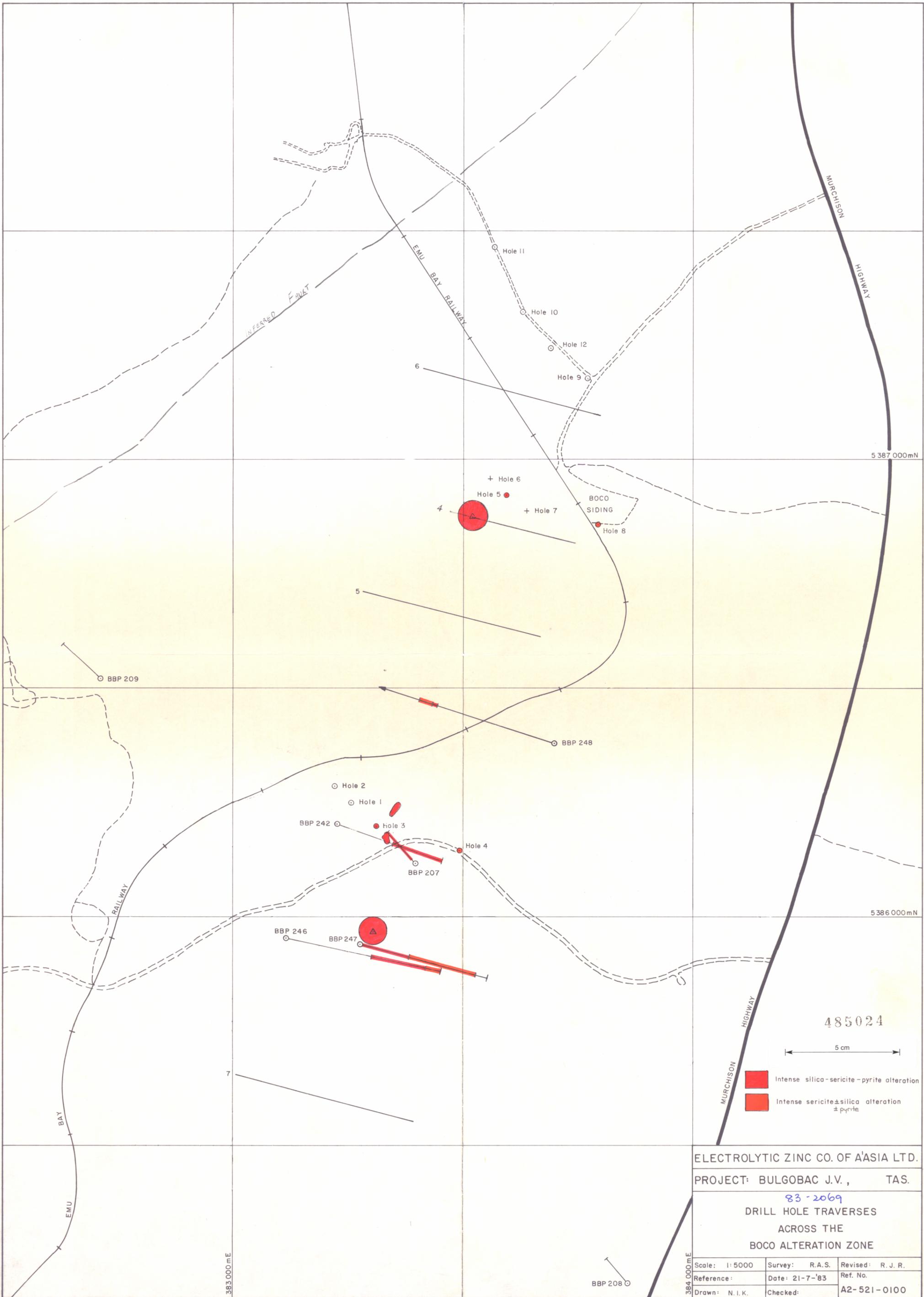
021

No.	Classification - Composition	Fabric	Accessories	Comments
4729 BBP 246 528-5	Altered Lithic-Vitric Tuff. Framework of cherty-silicified, subordinate sericitised felsitic lava, minor vitric tuff clasts; selectively sericitised matrix. Pervasive fine to ultrafine pyrite. Sporadic sericite-	Poorly sorted, weakly flow-structured fragmental with vaguely shardy sericitised matrix. Mildly sheared.	Leucogenised opaques. Minor trace chlorite in sericitic veinlets. Sparse late discontinuous carbonate films.	?Ignimbritic lithic-vitric tuff with lithic clasts selectively silicified, matrix selectively sericitised.
4730 BBP 246 341-9	Altered Pitchstone. quartz-pyrite veinlets. Sericite, subordinate recrystallized, felsitic to locally spherulitic quartz with sparse silicified feldspar, rare quartz phenocrysts. Abundant fine leucogenised opaques, conspicuous fine pyrite.	Phyllitic with vague relict, weakly porphyritic, felsitic to microspherulitic textures.	Minor sheared/boudinaged pyritic quartz-muscovite veining.	Relatively sericitic/relatively sheared acid pitchstone. Compositional affinities with 44724 etc. Lava-like but conceivably chilled marginal intrusive.
4731 BBP 246 558-7	Altered "Dacite". Muscovite-pseudomorphed feldspar phenocrysts, minor recrystallized quartz microphenocrysts in a weakly sericite-pyrite-stained microcrystalline groundmass.	Relatively sheared. Relict chilled porphyry-like fabric. Frequent discontinuous sericite films.	Disseminated leucogenised opaques.	Silicified/muscovitised "feldspar porphyry", weakly pyritic. Late shear-related "conjugate" sericite films are non-pyritic. Minor intrusive characteristics.
4732 BBP 246 577-2	Altered ?Tuff Lava. Clasts, zones of silicified/sericite-stained felsitic obsidian, marginally sericitised, with an ill-defined, relatively sericitised felsitic matrix. Frequent crosscutting sericitic foliae.	Partly obscured by sheared sericitic foliae. Millimetric to centimetric partly moulded clasts.	Disseminated pyrite, concentrated in sheared sericite veinlets. Minor leucogenised opaques.	Devitrified, silicified, sericite-veined and sheared glassy acid fragmental; tuff lava or moulded sub-aerial lapilli tuff. Relict fabric is poorly diagnostic.
4733 BBP 246 579-2	Altered Perlitic Obsidian. Quartz and semi-to sericitic white mica in varying proportions with disseminated fine-grained pyrite as single grains, minor clusters.	Stressed to sheared, semi-boudinaged/sericite-healed, perlitic-felsitic.	Leucogenised opaques. Thinly disseminated pyritic quartz and sericite-pseudomorphed feldspar phenocrysts.	Thoroughly silicified/sericitised, weakly pyritised "rhyolitic" obsidian. Quartz, sericite are semi-banded.
4734 BBP 246 412-0	Altered Pitchstone. Disseminated sericite-chlorite(-pyrite) and quartz-pyrite pseudomorphed feldspar and ferromag phenocrysts in a matrix of sericite and sericitic quartz. Sporadic quartz-sericite-chlorite-pyrite veinlets.	Analogous to 44721, but relatively weakly veined and relatively incipiently sheared.	Evenly disseminated leucogenised opaques. Minor traces ankeritic carbonate staining chlorite clots.	On relict textural and inferred primary compositional grounds, this altered microfelsitic-devitrified "andesite" could be correlated with 44721.
4735 BBP 246 127-3	Altered Ignimbrite. Sericite foliae interspersed with silicified/sericitised porphyritic lava and eutaxitic tuff clasts. Disseminated silicified feldspar crystals/fragments. Disseminated pyrite.	Relatively sheared lithic-vitric-crystal fragmental with eutaxitic, collapsed pumiceous fiamme components.	Leucogenised opaques, leucogene-stained silicified biotite flakes, late chloritic microfractures.	Pervasively quartz-sericite-altered ignimbritic fragmental of intermediate acid (biotite andesitic/dacitic) affinities, thus similarities to 44721, 44734.
4736 BBP 246 159-4	Altered Pitchstone. Sericite and quartz with relatively conspicuous evenly disseminated fine pyrite. Minor sericite-quartz + barite-pseudomorphed feldspar microphenocrysts. Sporadic quartz veinlets.	Incipiently banded, felsitic. Weakly stressed.	Minor sericite-pyrite clots, films at vein intersections, rare vein-sphalerite. Leucogenised opaques.	Typical sericite-quartz-pyrite-altered felsitic "dacitic" pitchstone with rare blebs barite replacing feldspar and rare vein-related blebs sphalerite.

485022

022





ELECTROLYTIC ZINC CO. OF ASIA LTD.  
 PROJECT: BULGOBAC J.V., TAS.  
 83-2069  
 DRILL HOLE TRAVERSES  
 ACROSS THE  
 BOCO ALTERATION ZONE

Scale: 1:5000	Survey: R.A.S.	Revised: R.J.R.
Reference:	Date: 21-7-'83	Ref. No.
Drawn: N.I.K.	Checked:	A2-521-0100



