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LAKE MARGARET EL 5/85**TASMANIA**

Technical Progress Report

for the period

October 1991 - September 1992

Volume I
 TEXT AND APPENDICES

Prepared by:

Rob Sharpe

R. Sharpe
 GEOLOGIST

Endorsed by:

David Wallace

D. B. Wallace
 REGIONAL MANAGER

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Vol 1 of 2

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Figure 1: Lake Margaret EL 5/85 Locality Plan.

Figure 2: Newton Creek Prospect-Sulphur Isotope Distribution

1.0 SUMMARY

Exploration activity on EL 5/85 Lake Margaret during the 1991-1992 field season concentrated on the Newton Creek Prospect. A programme of geological mapping and geochemical sampling was undertaken.

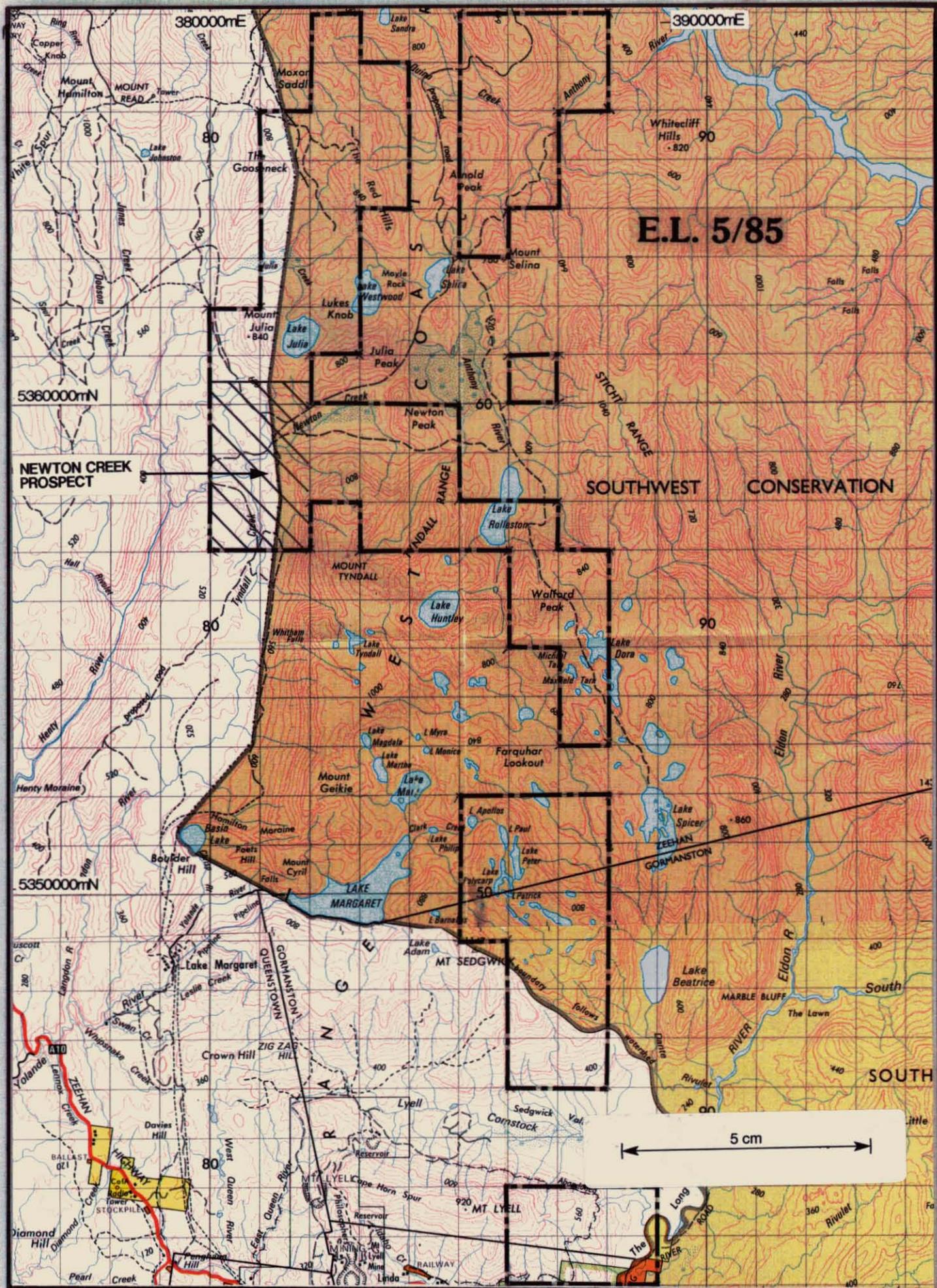
The prospective stratigraphy comprises felsic lavas with intercalated volcanoclastics ascribed to the Central Volcanic Complex (CVC). Included in this stratigraphy is outcrop at Newton Dam Spillway, which hosts massive sulphide clasts. The source of these sulphide clasts was not identified. Interfingering with the CVC are the Anthony Road Andesites (ARA). They are less extensive than previously identified and predominate in the southern part of the prospect area. A thickening of CVC dacitic to rhyodacitic volcanics to the north is interpreted, where dacite is conformable to overlying rhyolitic Tyndall Group volcanics.

Alteration identified at Howards Anomaly, DDHs HA7 and HA8 and on the Newton Dam Access Road show differing mineral assemblages associated with elevated base metal values. Pb isotopic signatures for these areas and the massive sulphide clasts are similar to Hellyer and indicate Cambrian style mineralisation. Similarly, sulphur isotopic values of sulphide species indicate a reducing rock sulphur source.

2.0 INTRODUCTION

EL 5/85 Lake Margaret was granted to CRA Exploration Pty. Ltd. on the 20th October, 1985 (Figure 1). From April 28th 1988, exploration has been conducted by Aberfoyle Resources Ltd. under terms of the Mount Read Volcanics joint venture with CRA Exploration Pty. Ltd. The licence area was reduced to 73 sq. km. in October 1990.

The following report documents exploration over EL 5/85 Lake Margaret for the period October 1991-September 1992.



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Figure 1

LAKE MARGARET EL. 5/85 LOCALITY MAP

Drawn : JLR

Location Code :

Scale : 1:100 000

Date : September 1991

Plate No. : LMARG 13

3.0 NEWTON CREEK PROSPECT

3.1 Introduction

Situated between the Great Lyell Fault and South Henty Fault, the Newton Creek Prospect extends along the western side of the Tyndall Range (Figure 1). A Programme of geological mapping and geochemical sampling integrated with re-evaluation of previous exploration data was undertaken in the Newton Creek area, principally to locate the source of massive sulphide clasts.

3.2 Previous Exploration

Mineral exploration by Rio Tinto, Gold Fields and CRA, located mineralised alteration within Cambrian volcanics. Alteration spatially defines the boundary between volcanics of an andesitic/dacitic composition and those lavas/volcaniclastics of a rhyolitic nature. This zone of alteration is historically known as Howards Anomaly. In years subsequent to the discovery of Howards Anomaly, mineral exploration included numerous geophysical surveys (IP, ground EM, gravity and ground magnetics) and geochemical surveys (soil, costeaning, rock chip; Purvis et al., 1983). The focus of these surveys was Ag and Pb/Zn mineralisation associated with Howards Anomaly alteration. Consequently the aerial extent of these previous surveys is limited. In addition, eight diamond drill holes were aimed to test mineralisation at Howards'. A complete summary of all work in the Newton Creek area prior to 1985 is documented by Fitzgerald (1987).

CRA Exploration carried out a UTEM survey over the entire Newton Creek prospect (Sheppard, 1986). No conductors of significance were indicated in the area.

In 1991, a student with the CODES Key Centre completed a study of stratigraphy, volcanology, sedimentology and geochemistry of the Newton Creek Area as part of an Honours project (Gibson, 1991).

Previous work by Aberfoyle includes detailed mapping of the Newton Dam Spillway where several massive sulphide clasts were identified in a breccia volcanoclastic horizon.

3.3 Geology

Geological Mapping at 1:5000 scale (Plate L.MARG 50) was carried out at the Newton Creek Prospect. Recent excavations by the HEC, as part of the Henty-Anthony hydroelectric scheme, have exposed sections of the geological record. These outcrops together with information from pre-existing outcrops and drill core have been integrated in the following documentation of stratigraphy. Petrographic investigations of selected samples are included as Appendix I, with sample locations indicated on Plate L.MARG 50.

All reported compass bearings are relative to magnetic north.

3.3.1 Regional Setting and Stratigraphy

The Newton Creek Prospect is situated between two significant north to northeast trending, steeply west dipping, Cambrian structures; the South Henty Fault and Great Lyell Fault (GLF). Rock units steeply dip and face east and are largely conformable. Three regionally recognised volcanic Cambrian units exist in the area and include the Central Volcanic Complex (CVC), Anthony Road Andesite (ARA) and Tyndall Group. Ordovician sediments either unconformably overly or are faulted against Cambrian volcanic units by the GLF.

3.3.2 Central Volcanic Complex

Units ascribed to the CVC show variable characteristics. Massive feldspar rich dacitic lavas are exposed in the Henty Canal west of 380000mE and are in direct contact with rhyolitic Tyndall Group lavas. DDHs HA7 and HA8 show a thick massive sequence of feldspar quartz phyric dacitic to rhyodacitic lavas intercalated with volcanic sandstones and polymict medium to coarse grained lithic volcanoclastics (623036, 623039, 623044 and 623042).

In DDH HA6 (623783), an unusual plagioclase hornblende dacite with a holocrystalline quartzofeldspathic groundmass occurs. It contains numerous magnetite granules, underlies alteration associated with Howards Anomaly and is suggestive of a shallow intrusive. The mineral assemblage of sample 623783 is unusual in the Mount Read Volcanics.

Massive cohesive feldspar and/or quartz phyric dacitic to rhyolitic lavas and breccias are exposed in lower portions of the Newton Dam Spillway. Quartz feldspar monomict to polymict volcanic sandstones, breccias and siltstones are exposed in upper portions of the Spillway. The Newton Dam Spillway sequences are well documented by Gibson (1991); refer also Plate L.MARG 39. Gibson (1991) tentatively classified Spillway sequences as Tyndall Group based upon a widespread occurrence of rhyolitic clasts. However due to an abundance of dacitic lavas, clasts and volcanoclastics with a feldspar porphyritic nature, in conjunction with the relative stratigraphic position, Newton Dam Spillway sequences are assigned to the CVC.

The upper breccia unit, Unit A, contains clasts that include dacite, rhyolite, andesite, chert, massive sulphide and mudstone in decreasing order of abundance. Dacite clasts are feldspar to feldspar quartz phyric. Rhyolitic lava clasts are feldspar-quartz phyric and often flow banded. Basaltic andesite clasts are amygdaloidal and pervasively sericite+chlorite altered (623081). Matrix material of Unit A is a sandstone, frequently rich in tabular feldspar and quartz crystals.

Fine grained, siliceous laminated cherts appear stratigraphically

conformable to Unit A. Examination of samples 623076 and 623078 indicate cherts to be detrital shales and siltstones likely derived from felsic volcanics and subject to late silica, sericite and calcic alteration. Fluid fractured siltstones includes a significant component derived from pelitic metamorphics (623076). Disseminated sulphides include abundant pyrite and minor sphalerite.

Two dome shaped areas, that form topographic highs, are thought to be intrusives. The first is a pale green grey feldspar phyric massive dacitic body that is broadly concordant with an irregular contact (Unit B). It outcrops immediately south of the Newton Dam Spillway (GR 380200mE, 5358250mN). Similarity exists between Unit B and dacitic clasts in DDH HA7, DDH HA8 and Unit A. A second intrusive forms a massive cream grey feldspar quartz agglomerate rhyolite. This rhyolitic porphyry adjoins the abovementioned dacite to the east and is poorly exposed (GR 380350mE, 5358220mN).

3.3.2 Anthony Road Andesites

Anthony Road Andesites (ARAs) outcrop in southern portions of the Newton Creek Area. They are interpreted to form a wide massive unit that trends north-south, contiguous to Howards Anomaly. ARAs are generally grey to green, massive to autobrecciated lavas/hyaloclastites as exposed along the Anthony Road and in DDHs HA1 and HA2. These andesites characteristically show a feldspar hornblende phyric nature often with minor quartz, clinopyroxene and/or apatite (623069 and 623113). Hornblende, which occurs as a distinct phenocryst phase, is frequently pseudomorphed by a chlorite+calcite+magnetite assemblage, with opaques (pyrite?) forming at crystal margins. Alteration in the form of calcite+chlorite+epidote is often present (623069). Columnar joints, exposed in massive andesite below Newton Dam indicate slow cooling and solidification of hot andesitic lavas.

An observed dominance of felsic rocks in northern portions of the project area and the apparent lack of andesites associated with Howards Anomaly alteration is suggestive that ARAs may not necessarily be as extensive as previously thought. ARAs show a faulted contact south of Howards Anomaly with Tyndall Group volcanics in the east. In the Henty Canal 3 km. to the north, massive dacites of the CVC are in direct contact with Tyndall Group volcanics in the absence of ARA. In DDHs HA4 and HA5, ARAs are conformably overlain by a sequence of dacitic breccias. An interfingering stratigraphic position close to the top of the CVC is therefore indicated for the ARA.

The most northern observed occurrence of ARA is 380000mE 5358350mN, at the base of Newton Dam Spillway. A northeast trending photolinear is interpreted to coincide with termination of ARAs, north of which felsic units of CVC affinity dominate the stratigraphy.

3.3.4 Tyndall Group

Tyndall Group volcanics and related sediments are characteristically of a glassy quartz feldspar phyric nature. Predominantly rhyolitic in composition and conformable to underlying stratigraphy, the Tyndall Group is well exposed along the Anthony Road, HEC Powerline Road, Howards Road and the Henty Canal

Stratigraphically lower portions of the Tyndall Group exposed along the Anthony Road and Henty Canal show dark purple/grey, thick, massive to graded volcanoclastics with variable abundances of volcanic fragments and intercalated massive flow banded lavas/breccias. Flow banding is highlighted by preferential chlorite and albite/silica alteration along flow planes. In volcanoclastic breccias, cohesive quartz phyric lava fragments show haloes of albite/silica or chlorite altered matrix material, frequently with a patchy distribution. Minor feldspar phyric felsic units outcrop in the Henty Canal. Disseminated pyrite (up to 1%) occurs in the host rock matrix of volcanoclastic units.

Fine to medium grained massive siltstones and sandstones are abundant in stratigraphically upper portions of the Tyndall Group. Typically light green to grey, they are thickly to thinly bedded and exhibit sorting with facing indicators that include cross bedding, bedding scour and grading. Sediments consistently face and dip steeply east with occasional exceptions of overturned beds close to the GLF.

Exposures in the Henty Canal show sediments to be interbedded with polymict breccia volcanoclastics (623089) and minor lavas. Volcanoclastics show variable clast size, shape, sorting and abundance. Clast lithologies include: siliceous fine grained laminated cherty clasts, cream/pink or green quartz crystal rich rhyolitic lava fragments and pervasively chlorite altered pumiceous clasts. Matrix material was observed to frequently contain abundant feldspar fragments and is usually quartz crystal rich. In upper portions of the Tyndall Group exposed along the Anthony Road, a fine grey laminated pyritic mudstone is present.

The highly variable distribution and occurrence of cohesive lavas/breccias with intercalated volcanoclastics indicates rapid deposition of Tyndall Group sequences. Deposition of thick sequences of finely bedded units within the Upper Tyndall Group, likely represent periods of waning volcanism.

A massive purple grey quartz feldspar phyric glassy rhyolite lava (lava dome?) outcrops along the Access Road and parallels a photolineament that transects the former Tyndall Mine. A poorly developed cleavage exits through 125°. A chilled irregular contact margin of this cohesive rhyolite lava against a polymict volcanoclastic is exposed. Minor syn-intrusive faulting and albite/silica alteration is present.

3.3.5 Late Cambrian-Early Ordovician

Dark grey finely laminated to coarsely bedded siltstones to sandstone outcrop along Howards Road. This basal unit of the Owen Conglomerate is the Newton Creek Sandstone member. The Newton Creek Sandstone is in faulted contact with underlying sandstones and volcanoclastics of the Upper Tyndall Group, by the GLF. Minor siliciclastic pebble conglomerates occur in the Newton Creek Sandstone, which itself dominates geological outcrop in the eastern portions of the project area.

3.3.6 Quaternary

Unconsolidated Pleistocene glacial till unconformably overlies much of the northern portion of the prospect area. In areas with extensive glacial deposits, little stratigraphic information is available.

3.4 Alteration and Mineralisation

Widespread local calcic alteration is observed throughout the Newton Creek area. Calcite development as veins and matrix replacement is a late stage alteration.

3.4.1 Howards Anomaly Alteration

Outcrop of this alteration is poor and generally intensely weathered. Drill core intersections in DDHs HA3, HA4, HA5 and HA6, test mineralisation associated with alteration over a 1.2 km. strike length. A strike length of up to 2.6 km has been postulated for Howards Anomaly alteration. Stratigraphic correlation between existing drill holes identify this altered unit to be conformable to underlying stratigraphy. The zone itself is highly altered and sheared.

Howards Anomaly alteration is a dark grey to purple sequence of intense pervasive haematite+calcite and/or chlorite alteration. Less intense patchy alteration styles present include sericite, silica, pyrite and barite. True maximum thickness of the unit is estimated at 50 metres. Host lithologies to alteration and mineralisation include: quartz crystal rich units, quartz feldspar crystal units, medium to fine grained banded (bedding?) lithic volcanoclastics, horizons containing chlorite+haematite altered pumice flattened parallel to foliation and a generally open framework. Magnetite is present as small subrounded inclusions in host rock matrices. Disseminated pyrite (up to 2% modal) is similarly present and may form thin bands parallel to foliation.

Host rocks to alteration are of a felsic nature (623783), with dacitic clasts distinctly comparable to lithologies in DDH HA7 (623042). Alteration assemblages indicate relatively oxidising conditions.

3.4.2 Access Road Alteration Zone

A 30 metre thick zone of light green/grey highly altered feldspar and/or quartz phyric lavas/volcaniclastics outcrop in the Access Road to Newton Dam (GR 5359130mN, 380050mE). Intense pervasive sericite alteration coupled with patchy silica and chlorite alteration lends a "false brecciation" texture; likely the result of fluid fracture, silica healing and followed by sericite deposition (623031, 623032 and 623033). Cleavage (165/85°E) is strongly developed proximal and subparallel to a normal fault plane (175/85°E; refer Plate L.MARG 50). Away from this fault the intensity of both alteration and cleavage decrease. Pyrite (up to 2% modal) is present as large euhedral grains in the host rock matrix, or as wispy veinlets and schistosity plane coatings. Minor mineralisation including galena, chalcopyrite and rare sphalerite was observed in a dark grey sericite+chlorite altered irregular siltstone horizon (623118). Chalcopyrite is also infrequently associated with pyrite as minor veinlets and nodules.

3.4.3 Henty Canal Alteration Zone

A 110 metre thick alteration zone within predominantly felsic epiclastics is exposed in the Henty Canal (GR 5360080mN, 380300mE). A hydrothermal alteration assemblage of sericite+silica+chlorite+pyrite shows variable intensity. Cleavage is strongly developed (320/80°E). Pale to dark green feldspar phyric dacites (623082, 623084, 623090, 623091 and 623092) display textures indicative of autobrecciated lavas. Pyrite is abundant, forming up to 5% modal, occurring as disseminations in the host rock matrix and as wispy veinlets. Occasional narrow (<10cm) irregular hematite+quartz+sphalerite (623083) veins are present.

This alteration sequence (Plate L.MARG 50) is in faulted contact to the west against a feldspar quartz phyric polymict vitric crystal volcaniclastic sequence of rhyolitic composition. Alteration and cleavage are most intense close to this boundary. The eastern margin of the Henty Canal alteration zone grades to a relatively unaltered well sorted, bedded volcanic sandstone that contains sparse feldspar crystals. Here alteration is least intense. Cleavage however, remains well developed throughout. Petrographic investigations (Appendix I) support an order of events as follows: silica-chlorite alteration early in time followed by silica-sericite alteration and subsequent hydrofracturing by silica solutions giving altered rocks a "false breccia" appearance. In context, hydrothermal alteration appears strongly fault related.

As this Henty Canal alteration zone is bounded in the east (conformable) and in the west (faulted) by rhyolitic volcaniclastics of Tyndall Group affinity, it is stratigraphically categorised as a felsic dacitic unit within the Tyndall Group.

3.4.4 DDH HA8

DDH HA8 shows a massive sequence of pale green-grey lavas and intercalated volcanoclastics. Lavas are feldspar quartz phyrlic dacites to rhyodacites. Volcanic sandstones show bedding and are well to poorly sorted with infrequent grading, abundant quartz crystals and angular feldspar fragments which are sericite altered and stretched parallel to foliation. Polymict volcanic breccias contain quartz phyrlic clasts and fine grained siliceous fragments that are poorly sorted and subrounded to angular. In these volcanoclastics, matrix material is pervasively sericite and/or silica altered. Pyrite is abundant, forming up to 5% modal. Pyrite occurs as fine to coarse euhedral disseminations in host rock matrices, as bands associated with intense sericite alteration parallel to foliation and as wispy veinlets. Minor narrow lenticles of carbonate+chlorite+haematite likely indicate altered finer pumiceous units in the sequence.

Mineralisation as recrystallised galena, sphalerite with minor chalcopyrite is hosted in occasional carbonate silica veins. Disseminated galena is also observed in altered quartz crystal volcanic sandstones (623043). At 143 metres, a 5 centimetre fine grained banded angular sulphide clast occurs. The sulphide clast, predominantly pyrite, is elongate parallel to foliation hosted by a fine grained quartz feldspar crystal matrix. Infrequent subrounded magnetite inclusions are also present (623044).

The lithology and alteration features in DDH HA8 are similar to those observed in DDH HA7.

3.5 Structure

Map patterns are dominated by a north-south trending stratigraphy, that parallels west dipping GLF and South Henty Faults. The surface trace of the South Henty Fault is gently sinuous following the Henty River Gorge. Thus in southern localities, mappable units and cleavage trend north, whilst in northern portions units and cleavage trend northwest. Cleavage is subvertical and flow banding in Tyndall Group rhyolite lavas is subparallel to cleavage.

Bedding indicators are infrequent in the CVC, with the exception of Spillway sequences, where Unit A is south facing and subvertical. Within this unit a pervasive NW-SE trending cleavage is evident, to which alignment and flattening of clasts is parallel. A complex array of faults are exposed in the Spillway, mostly with changes in lithofacies across them.

Aerial photograph interpretation delineates a number of major structures. Interpretation of these structures has been integrated with geological information and is presented as Plate L.MARG 51.

3.6 Geochemistry

Previous work by Crawford et al. (1992) has geochemically classified Cambrian volcanic units in western Tasmania. Reference fields as defined by Crawford et al. (1992) are used to classify units within the Newton Creek Prospect throughout the following geochemical investigations of lithophile elements.

3.6.1 Rock Chip Geochemistry

A rock chip sampling programme was conducted in association with geological mapping. Primarily rock chip geochemistry was directed to aid in the definition of stratigraphic units and identify potential host rock lithologies and/or anomalous alteration zones. Geochemical results are included as Appendix II and sample locations shown on Plate L.Marg 50.

Samples were analysed for Cu, Pb, Zn, Ag, Au, As and Ba. A limited number of samples were submitted for whole rock analysis and analysed for a suite of lithophile elements including: Cr, Zr, Ti, Al₂O₃, SiO₂, TiO₂, Fe₂O₃, MnO, CaO, K₂O, MgO, P₂O₅, S and K₂O.

3.6.1.1 Base and Precious Metal Values

5 continuous rock chip samples (623076 to 623080 inclusive) were collected from laminated pyritic cherts outcropping in the Newton Dam Spillway. Cherts contain relatively low base metal values; <250ppm Pb and <282ppm Zn. Precious metal levels were below detection limit.

Gossanous float (623049) from the former Tyndall Mine site returned 225ppm Pb and 883ppm Zn, with no associated Au or Ag. Residue from ferrous precipitates at the Tyndall Mine Adit (623087) showed relatively elevated base metals with 1595ppm Cu, 1305ppm Pb and 2095ppm Zn.

Continuous chip samples over the Henty Canal alteration zone (623801 to 623810 inclusive) showed no elevation in precious metals and poor base metal values. Best interval assayed 15ppm Cu, 249ppm Pb and 869ppm Zn (623806). Zn levels were consistently higher than Pb.

Continuous chip samples from Access Road alteration showed elevated levels of Pb and Zn. Best interval returned 103ppm Cu, 660ppm Pb, 1553ppm Zn and 0.069ppm Au (623813). Zn values were also elevated relative to Pb values.

Remaining rock chip samples indicated relatively minor to background base and precious metal levels.

3.6.1.2 Lithophile Elements

Due to widespread calcic alteration and mobility of Na_2O , K_2O and MgO during weathering processes, alteration indices ($\text{A.I.} = \frac{\text{K}_2\text{O} + \text{MgO}}{\text{K}_2\text{O} + \text{Na}_2\text{O} + \text{CaO} + \text{MgO}}$) of rock chip samples were not considered.

Spillway cherts show silica levels up to 75.8%. Silica enrichment is likely the product of silicification processes during alteration of the sediment pile.

Henty Canal alteration has Ti/Zr ratios between 9.0 and 14.5. $\text{P}_2\text{O}_5/\text{TiO}_2$ ratios range between 0.07 and 0.26. A felsic composition or Suite I (Crawford et al., 1992) classification of this unit is indicated.

By comparison, Access Road alteration shows Ti/Zr values ranging from 12.0 to 18.0 and $\text{P}_2\text{O}_5/\text{TiO}_2$ values from 0.11 to 0.30. Although compositionally similar to Henty Canal alteration rocks, in that they can be categorised as felsic Suite I volcanics, ratios are broadly higher. Elevated levels of barium are consistently present in this zone.

ARA rock chip samples (623081 and 623113) show high Cr, 70ppm to 120ppm, and Ti/Zr ratios between 16.5 and 23.0. $\text{P}_2\text{O}_5/\text{TiO}_2$ ratios are relatively elevated at 0.37 and 0.39. Thus ARA samples are consistent with Suite II lavas (Crawford et al. 1992), and geochemically distinct from felsic endmembers associated with CVC or Tyndall Group.

Remaining rock chip samples of dacitic to rhyodacitic volcanic CVC affinity fit well into Suite I. These samples have depleted Cr, variable Ti/Zr ratios and $\text{P}_2\text{O}_5/\text{TiO}_2$ values below 0.32.

3.6.2 Drill Core Geochemistry

19 selected samples from existing Howards Anomaly drill core were submitted for base metal and whole rock analysis (Appendix III). DDH HA8 was core ground and grinds submitted for metal analysis.

3.6.2.1 Base and Precious Metals

In selected drill core samples, base and precious metal levels were generally low, with the exception of samples from DDH HA5 (623788 and 623787). Sample 623788 returned 42ppm Cu, 245ppm Pb, 1600ppmZn, 10ppm Ag, 0.03ppm Au and 2.97% Ba. In this particular example mineralisation is associated with intense haematite+carbonate alteration.

DDH HA8 was drilled by RGC during the 1983-1984 field season. Sited on an IP anomaly coincident with a zinc soil anomaly thought to be of local derivation, DDH HA8 was drilled to a depth of 251.5 metres (Purvis et al., 1983). 17 core grind samples from DDH HA8 were submitted to Analabs for analysis of

Cu, Pb, Zn, Ag, Au, Ba and As. Grind intervals correspond to 15 metres or lithological/alteration boundaries where applicable.

Geochemical results for core grinds are included as Appendix IV. Elevated base metal values were recorded over the entire length of the drill hole (Plate L.MARG 52). Best interval assayed 252ppm Cu, 1050ppm Pb, 3590ppm Zn, 4ppm Ag, 0.105ppm Au and 1800ppm Ba between 96.5 metres and 112.0 metres.

3.6.2.2 Lithophile Elements

Three samples from DDH HA7 (623036, 623039 and 623042) show affinities with Suite II volcanics, with relatively elevated P_2O_5/TiO_2 ratios from 0.3 to 0.6 and Ti/Zr ratios between 12 and 25. Low Cr levels from 7 to 30ppm are indicated. Alteration indices are elevated between 70 and 80 indicating relatively intense alteration. A sample from DDH HA8 at 180 metres (623044) is geochemically similar to samples from HA7.

DDH HA2 samples (623061, 623064, 623065 and 623069) show well constrained P_2O_5/TiO_2 ratios between 0.35 and 0.47 and Ti/Zr ratios between 22 and 23. These samples are categorically Suite II correlates. Samples 623061 and 623046 from 24.6 and 89.9 metres represent dacitic members with low Cr (30 to 35ppm). By comparison true hornblende feldspar phyric ARAs occurring stratigraphically lower in DDH HA2, show Cr levels between 75 and 95ppm. By inference, dacitic samples from HA2 show distinctive geochemical affinities with samples 623039 and 623036 in HA7. Alteration indices vary between 30 and 40.

Samples from DDH HA6 have P_2O_5/TiO_2 ratios that range between 0.30 and 0.43 and Ti/Zr ratios between 20 and 33. Cr levels are between 30 and 50ppm with the exception of sample 623780 with a Cr level of 5ppm. P_2O_5/TiO_2 and Ti/Zr ratios suggest Suite II lava correlates. Samples 623783 to 623785 inclusive are geochemically similar to 623061 and 623064 in HA2.

Remainder drill core samples are from highly haematite+ carbonate+silica+chlorite altered zones associated with Howards Anomaly mineralisation. With low P_2O_5/TiO_2 ratios between 0.14 and 0.3 and variable Ti/Zr ratios between 14 and 50, they are of Suite I affinity. Occasional elevated Ba (623788: 2.9% Ba) and As (623787: 0.36% As) also occur.

3.6.3 Soil Geochemistry

A soil geochemical survey (560 samples) was conducted over the Newton Creek grid. 'C' horizon soil samples were collected at 25 metre intervals using a power auger. Sample locations are included as Plate L.MARG 59 and results in Appendix V.

Previous soil geochemistry by Gold Fields Exploration Pty. Ltd. was centred around Howards Anomaly (Fitzgerald, 1987). Aberfoyles' soil geochemistry programme aimed to sample the

entire Newton Creek prospect, with line spacings of 200 metres.

Results show mildly elevated to background base metal values. Preliminary elemental distributions are presented as Plates L.MARG 53 to 58 inclusive for Cu, Pb, Zn, Ag, Ba and As respectively. Image processing of this dataset is anticipated and interpretation will follow.

3.7 Lead Isotopes

Pb isotopic compositions of seven massive sulphide clasts were previously reported in Richardson (1991). A final report has since been received and is included as Appendix VI. Carr (1992) reports a bimodal population of Pb isotopic ratios for the massive sulphide clasts; Hellyer and Que River type. No relationship between the spatial distribution of these sulphide clasts and isotopic composition of lead was observed. In addition, two samples of altered wallrock fragments contain Pb likely derived insitu. A genetic association between Pb in the massive sulphide clasts and Pb in the altered volcanics is suggested.

A further 10 samples from the Newton Creek area were submitted to CSIRO Division of Exploration Geoscience for Pb isotope analysis. Results are reported by Dean (1992) and included as Appendix VII.

Galena from DDH HA8 and Howards Anomaly alteration in DDH HA5 (623043 and 623097 respectively) are similar in isotopic composition to the Hellyer signature. A similar conclusion can be drawn for sample 623031 from sericite+chlorite+pyrite alteration in the Access Road, which has identical isotopic composition to Hellyer.

Henty Canal alteration samples (623813, 623815, 623806 and 623807) have similar ratios but plot outside the 95% confidence ellipse for Hellyer. Higher $^{206}\text{Pb}/^{204}\text{Pb}$ ratios are likely the result of radiogenic addition.

Spillway chert sample 623076 has a low Pb content (250ppm) but shows similarity to altered wall rocks fragments from Unit A in both Pb content and isotopic ratios. This may indicate a metallogenic association.

Tyndall Mine samples of residue from ferrous adit drainage (623087) and gossanous float are radiogenic when compared to Cambrian VHMS targets and thus probably related to Devonian hydrothermal activity.

In conclusion, similarities between Pb in massive sulphide clasts, galena in felsic altered CVC lavas, Howards Anomaly alteration and the Hellyer isotopic signature is evidence for a similar Cambrian metallogenic event.

3.8 Sulphur Isotopes

Eighteen rock chip and drill core samples were submitted to CSIRO Division of Exploration Geoscience for sulphur isotope analysis of pyrite. Samples included pyrite within: Newton Dam Spillway cherts, alteration zones along the Henty Canal and Access Road, pyrite associated with haematite+carbonate alteration in drill core (DDH HA4 and HA5) and pyrite present in felsic rocks. Results and sample locations are included as Appendix VIII. A wide and varied distribution from isotopically light sulphur to isotopically heavy sulphur is evidenced (Figure 2).

Samples from DDH HA7, DDH HA8 and the Access Road alteration zone returned sulphur isotopic values between +1.5 and +8.4 per mil, indicating an igneous rock sulphur source with pyrite deposition under reducing conditions.

Isotope results obtained by Gibson (1991) for massive sulphide clasts similarly indicate a reducing rock sulphur source with a range of $\delta^{34}\text{S}_{\text{mixed sulphides}}$ values from +2.5 to +6.5 per mil. A massive sulphide deposit would have sulphur isotope signatures within this range.

Very light sulphur is observed in spillway cherts (samples 623007, 623009, 623011: mean $\delta^{34}\text{S}_{\text{pyrite}}$ value = -6.47 per mil). Comparatively light sulphur is also observed in samples with hematite+carbonate+chlorite alteration of felsic volcanoclastics at Howards Anomaly (samples 623099, 623787, 623788; $\delta^{34}\text{S}_{\text{pyrite}}$ = -8.8, -4.4 and -0.2 per mil respectively). Sulphides which precipitate from a rock sulphur dominated fluid will have an isotopically light signature (Gemmell and Large, 1991), however very light isotopic signatures may be interpreted to have formed from the bacterial reduction of seawater sulphate (Rand, 1990).

Isotopically heavy sulphur in pyrite is observed in the Henty Canal alteration zone. The source of sulphur is interpreted to be from a hydrothermal fluid that contains a high proportion of partially reduced seawater sulphate, indicating pyrite deposition under relatively oxidising conditions.

It is plausible therefore to interpret an evolution of the hydrothermal fluid depositing pyrite due to differing sulphur isotopic signatures; from a rock sulphur dominated reducing fluid in felsic rocks to that with very light sulphur associated with oxidising conditions and the presence of carbonate+haematite+chlorite alteration of lithic-rich volcanoclastics (hangingwall style?).

Sulphur Isotope Distribution

Newton Creek Prospect

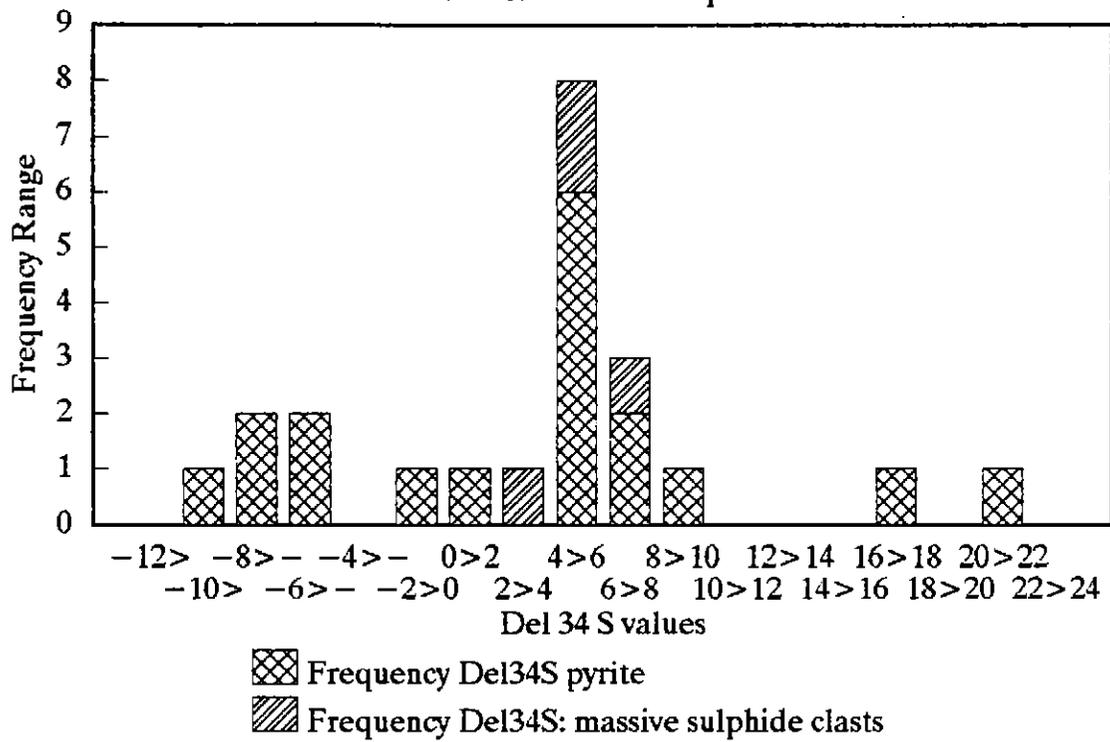


Figure 2.

3.9 Conclusions and Recommendations

Alteration in DDH HA7, DDH HA8 and along the Access Road are associated with elevated base metal values and hosted by felsic lavas with intercalated volcanoclastics of CVC affinity. Pb isotope results for these areas indicate a Cambrian Hellyer type isotopic signature, whilst sulphur isotopes indicate deposition of pyrite from a reducing rock sulphur source. Both Pb and S isotope signatures are comparable to signatures derived for the massive sulphide clasts. The source of these clasts was not identified during this exploration programme, however a further massive sulphide clast in DDH HA8 was identified.

Internal stratigraphy of the CVC at Newton Creek remains problematical. It is not clear where DDH HA8, DDH HA7, Access Road alteration and spillway sequences lie with respect to each other or within the CVC. Distinctive lithological similarities exist between Unit A and DDH HA8; indeed DDH HA8 may represent a northern extension of Unit A, however further geochemical work would be required to test this. Refinement of an internal stratigraphy within CVC lithologies is necessary if a host lithology and source of the massive sulphide clasts is to be identified.

Detailed magnetics over the prospect area would aid in the interpretation of stratigraphic and structural complexities addressing: the distribution of ARAs, the distribution of Howards Anomaly alteration and delineation of syn-volcanic Cambrian structures. In addition, ongoing geochemical studies, aimed to further define an internal stratigraphy within the CVC is recommended.

Identification of syn-volcanic Cambrian structures from magnetic data in association with further geologic and geochemical indicators may aid the delineation of a host lithology and ultimately a drill target.

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APPENDIX I

PETROGRAPHIC REPORT**ROCKS FROM HOWARDS ANOMALY - NEWTON CREEK
AREA****For Aberfoyle Exploration (Attn Robina Sharpe)****Tony Crawford
Dept of Geology
University of Tasmania
817192**

SAMPLE NUMBER: 623001

SUMMARY:

This is a massive, formerly glassy plagioclase-phyric felsic lava with weak chlorite-sericite alteration.

HAND SPECIMEN:

This is a grey-green altered plagioclase-phyric felsic lava.

THIN SECTION:

This is a petrographically simple plagioclase-phyric felsic lava. It consists of around 5 modal% of blocky albitized plagioclase phenocrysts mainly less than 2mm long, with quite strong sericite alteration, and uncommon leucoxenitized FeTi oxide microphenocrysts, in a formerly glassy groundmass.

The groundmass of this rock is composed of a quite coarse-grained quartzo-feldspathic mosaic typical of that growing from devitrified felsic glass. It is riddled with sericite and quite common chlorite, and has anhedral patches of polycrystalline quartz growing from the alteration assemblage. The degree of alteration is probably a little greater than typical for regional burial metamorphism of massive glassy felsic lavas, as judged by the quite common chlorite in the alteration assemblage. However, the intensity of the hydrothermal alteration probably responsible for this is quite low.

This was a massive, sparsely plagioclase-phyric dacitic to rhyolitic lava.

SAMPLE NUMBER: 623002

SUMMARY:

This is a plagioclase+quartz±hornblende-phyric dacitic lava with strong hydrothermal alteration-related chloritization.

HAND SPECIMEN:

This is a dark grey-green chloritic felsic lava.

THIN SECTION:

This is a very weakly foliated strongly plagioclase-phyric felsic lava with less abundant quartz phenocrysts, and occasional stretched and totally altered former hornblende(?) phenocrysts. The plagioclase phenocrysts make up around 15-20 modal% of the rock, and are totally albitized tabular to blocky prisms around 1mm long on average. They are lightly flecked with sericite but otherwise unaltered. Quartz phenocrysts are subhedral and rather rounded and reacted, and many crystals are broken up in the foliation. They probably only make up about 1 modal% of the rock. An even smaller modal amount of this sample is made up of elongate chlorite-calcite aggregates with minor leucoxene grains and blebs of albite. It is impossible to diagnose with certainty the precursor mineral of these alteration clots, but several of the least deformed grains seem to be more typically hornblende shaped; although given the extent of alteration it cannot be ruled out that they were originally biotite phenocrysts.

The groundmass of this rock is composed of a rather inhomogeneous very fine-grained quartzo-feldspathic material with fine-grained but pervasive chlorite alteration. Chlorite mainly occurs evenly distributed through the groundmass, but sometimes concentrates into seams and veinlets that wrap around phenocrysts. Minor calcite overprints areas of groundmass. The intensity of the chlorite alteration far exceeds that normally produced by low-grade regional metamorphic degradation of felsic lavas, and implies that the sample has suffered significant hydrothermal alteration.

This sample is probably a plagioclase+quartz±hornblende-phyric dacitic lava that suffered quite strong chloritization during local hydrothermal alteration.

SAMPLE NUMBER: 623005

SUMMARY:

This is a volcanogenic sandstone composed largely of detritus from quartz+plagioclase-phyric felsic glassy volcanics and tuffs; it contains a small detrital component from pelitic metamorphics, and a quite strongly chloritized formerly glassy ash matrix.

HAND SPECIMEN:

This is a grey-green volcanogenic sandstone with clasts of very fine-grained lava and abundant feldspar and quartz crystal debris.

THIN SECTION:

This is a petrographically simple rock, being a fairly well-sorted volcanoclastic sandstone derived almost entirely from felsic volcanics and tuffs. It is almost framework supported, and dominated by crystal debris of 0.5-2mm sized plagioclase and quartz. The quartz is clearly of volcanic origin, but is rarely well-formed crystals; rather, it is mainly quite angular crystal fragments, typical of quartz in crystal tuffs and ashes. The plagioclase crystal debris, however, is dominated by well-formed euhedral blocky crystals of albite that are almost entirely sericitized. Leucoxene+chlorite-altered former FeTi oxide phenocrysts and microphenocrysts are quite common.

Lithic fragments make up less than 10 modal% of the rock, and are mainly devitrified formerly glassy felsic lavas; a few show quartz or albite phenocrysts in the lithic fragments. A very small percentage of the lithic fragments are muscovite-quartz schists derived probably from the pelitic metamorphic sequence of the Tyennan Region. Several lithic fragments are of totally chloritized formerly glassy lava, although it is not possible to determine if they were felsic or more mafic.

The matrix of this sample makes up about 20-30 modal% of the rock, and was probably felsic ash, but it has totally altered to very fine-grained quartzo-feldspathic material that is quite strongly chloritized.

This is a volcanogenic sandstone derived almost entirely from quartz+plagioclase-phyric felsic lavas and tuffs, but with a small contribution from a pelitic metamorphic source.

SAMPLE NUMBER: 623031

SUMMARY:

This rock was either a vitric tuff, or a shaley siltstone composed entirely of felsic vitric ash that has recrystallized; the rock contains weak sericite± disseminated pyrite alteration.

HAND SPECIMEN:

This is a pale grey weakly foliated sericitic lithic vitric tuff or very fine-grained sericitized sediment with a coarser band including a few lithic clasts up to almost 1mm long.

THIN SECTION:

This is not an easy sample to diagnose with certainty. More than 95 modal% of the sample is composed of a very fine-grained, fairly uniform-textured quartz-sericite intergrowth, with occasional chlorite spots, not uncommon disseminated pyrite, and absolutely no sign of any original bedding or shard textures (or anything....it's just horrible). Two or three 1mm-sized lithic clasts of unambiguous formerly glassy felsic lava are present, and in this part of the rock, the fine-grained material is much more inhomogeneous and recrystallized, with diffuse pockets and seams of recrystallized polycrystalline quartz and coarser-grained disseminated idiomorphic pyrite.

I think that this sample was either a primary vitric tuff, containing the odd small lithic fragment, or a shale to silty sediment composed entirely of vitric ash. In either case, the vitric component has totally recrystallized and the rock has suffered mild sericite alteration.

SAMPLE NUMBER: 623032

SUMMARY:

This sample was probably an autobrecciated glassy felsic lava that suffered intense silica alteration, followed by further fracturing and strong sericite development during foliation development.

HAND SPECIMEN:

This is a pale grey-green quite strongly sericite-altered felsic lava breccia with some fragments up to at least 1cm long.

THIN SECTION:

This sample is terminally altered, and almost impossible to diagnose. It consists of an exceptionally heterogeneous-textured quartz-sericite intergrowth with a moderate foliation in places. A few former plagioclase phenocrysts are still recognizable, despite their having been totally pseudomorphed by very fine-grained sugary silica. The remainder of the rock consists of fragments of quartz-sericite or simply polycrystalline quartz, of remarkably variable grainsize and degree of sericitization. A few fragments have diffuse chlorite speckling, but chlorite is not a significant component of this rock.

I would say that this was an autobrecciated glassy felsic lava originally, and that it has suffered intense silica-sericite alteration in a hydrothermal system, that involved flooding and replacement by silica and further granulation and weak foliation development accompanying sericite alteration of the already highly altered rock. The obvious brecciation in the hand specimen almost certainly is more of a false brecciation due to intense fluid fracturing, silica healing and further fracturing and sericite meshing through the sample.

SAMPLE NUMBER: 623033

SUMMARY:

This sample is similar in most respects, including mode of formation, to the preceding sample. It is an intensely hydrothermally altered and brecciated formerly glassy felsic lava replaced almost totally by silica and sericite.

HAND SPECIMEN:

This is a cream to green very strongly sericitized felsic lava or false breccia with at least one large fragment of more silica-chlorite alteration surrounded by intensely sericitized material.

THIN SECTION:

This sample is petrographically and genetically not very different from the previous sample 623032. It is essentially a totally recrystallized former plagioclase-phyric glassy lava that has suffered intense silica flooding and replacement, with extensive fracturing and 'false brecciation', followed by very strong sericitization. A single fragment, now composed almost exclusively of variably-sized polycrystalline quartz aggregates and minor pale green chlorite, appears to have resisted sericite invasion, and is probably an example of the rock in the state it was in before the sericite alteration. It shows only weak sericite veining along the margins.

This sample was formed in the same manner as described for the preceding sample, and clearly results from intense silica-sericite alteration of a formerly glassy lava or lava breccia.

SAMPLE NUMBER: 623036

SUMMARY:

This rock is a strongly foliated and intensely sericitized former plagioclase+quartz-phyric felsic lava, that probably recrystallized in a fault zone.

HAND SPECIMEN:

This is a foliated, sericitic brown felsic lava or pyroclastic.

THIN SECTION:

Intense sericitization accompanying strong foliation development has obliterated the original texture of this rock. Stretched and almost totally sericitized albite phenocrysts make up about 10-15 modal% of this sample, but are smeared out into the foliation. A few clear former biotite phenocrysts are also totally replaced by sericite and very fine-grained magnetite. About five or six small, slightly stretched and fractured quartz phenocrysts, mainly less than 1mm long, are also present. Two other types of 'clasts' occur in this strongly foliated matrix. One is rather irregular in outline, broadly parallel to the foliation, but cutting across it in places, almost a cm long in places, and composed of abundant chlorite and calcite, with common very fine-grained magnetite. These appear to be an alteration feature rather than a direct replacement of a primary phenocryst phase. The second is elongate aggregates of fine-grained magnetite, rarely longer than 1-2mm; they may be altered and recrystallized former FeTi oxide phenocrysts. Perfectly preserved apatite microphenocrysts are not uncommon in this rock.

This rock was probably a plagioclase+quartz-phyric felsic lava, possibly originally glassy. It has suffered intense sericitization and strong foliation development, presumably in a high strain fault zone.

SAMPLE NUMBER: 623039

SUMMARY:

This rock is a formerly glassy quartz+plagioclase-phyric rhyolitic lava with moderate sericitic alteration and minor disseminated pyrite and magnetite(?).

HAND SPECIMEN:

This is a brown, quite quartz-phyric sericitized felsic lava or crystal vitric tuff.

THIN SECTION:

This rock is composed of about 10 modal% of slightly rounded and reacted quartz phenocrysts, some up to 5mm across, set in an altered formerly glassy groundmass. The quartz phenocrysts contain common chloritized melt inclusions and are weakly fractured and slightly strained. Former plagioclase phenocrysts are less evident than the quartz due to the strong sericite alteration of both them and the groundmass. They probably made up a similar amount of this rock as the quartz phenocrysts, but were mainly smaller than 2mm long. Several mm-sized chlorite-magnetite-sericite-quartz pseudomorphs after biotite phenocrysts are present, and dusty apatite microphenocrysts are quite common.

The groundmass of this sample was almost certainly formerly glassy. It devitrified and during low-grade regional metamorphism has commenced to recrystallize, leading to patchy development of anhedral quartz from the exceptionally fine-grained quartzo-feldspathic matrix. Very fine-grained sericite occurs riddled throughout the groundmass as tiny speckles, but it also occurs as discontinuous meshworks and veinlets defining a weak foliation. Patchy calcite overprinting the groundmass is quite common. A few small silica-magnetite(?) concentrations are present, and sparse disseminated pyrite is also present.

This is an altered, formerly glassy quartz+plagioclase-phyric rhyolitic lava.

SAMPLE NUMBER: 623042

SUMMARY:

This is a texturally well-preserved plagioclase+quartz-phyric dacitic to rhyodacitic lava.

HAND SPECIMEN:

This is a brown, uniformly-textured plagioclase-phyric felsic lava

THIN SECTION:

This is a well-preserved plagioclase+quartz-phyric felsic lava with a slightly coarser-grained groundmass than the previous sample. The plagioclase phenocrysts are mainly blocky prisms, totally albitized and speckled with sericite; many show a slight rounding due to reaction with the magma in a magma chamber or conduit. The quartz phenocrysts make up about 1-2 modal% of the rock, and are rounded, and strongly fractured and disaggregated, often with chlorite along the fractures. There appears to have been no mafic phenocrysts in this section, although a few chloritized former mafic phenocryst sites are evident in the hand specimen. Several small inclusions composed almost exclusively of small euhedral tabular plagioclase crystals are likely to be cognate, and were probably plucked from the walls of the magma chamber or conduit during passage to eruption.

The groundmass of this sample was vitrophyric, with abundant small laths of albitized plagioclase and leucoxenitized FeTi oxide grains set in a messy very fine-grained and irresolvable quartzofeldspathic material probably crystallizing from devitrified glass. The groundmass is meshed by very fine sericite, but chlorite is not common. Small granular spots of yellow epidote and abundant very fine-grained hematite are dispersed through the groundmass, although epidote is quite rare.

This is a plagioclase+quartz-phyric dacitic to rhyodacitic lava with the typical low-grade regional metamorphic alteration assemblage albite-sericite-quartz-leucoxene-epidote-chlorite.

SAMPLE NUMBER: 623044

SUMMARY:

This is a 'false brecciated' formerly glassy quartz+ plagioclase-phyric rhyolitic lava that has suffered intense silica-sericite±pyrite alteration.

HAND SPECIMEN:

This is a very strongly sericite+silica-altered felsic lava with narrow veinlets of pyrite and/or magnetite and an unusual blebby alteration texture.

THIN SECTION:

This rock was probably originally a quartz+plagioclase-phyric felsic glassy lava. It contains about 3-5modal% of rounded, reacted and highly strained quartz phenocrysts to about 3mm across, with scalloped edges due to reaction with the groundmass during hydrothermal alteration. Less evident due to alteration, but probably less abundant are blocky totally sericitized plagioclase phenocrysts to about 2-3mm long. Two distinct phenocrysts of former biotite are still obvious, now replaced by sericite and magnetite.

The groundmass of this rock has been all but completely recrystallized, and is now a silica stockwork with disseminated sulphides, all pervaded by a meshwork of sericite. A few regions of less altered and silicified groundmass have textures indicative of former devitrified glass. The patchy nature and highly variable grain size of the silica alteration and the quite intense vein network have produced what is basically a 'false brecciation' texture in this rock. The albite component of the groundmass of typical formerly glassy felsic lavas in the Mount Read Volcanics has been totally leached during silica alteration. The intense silica-sericite-pyrite alteration is obviously of local hydrothermal origin rather than being due to pervasive regional burial alteration.

SAMPLE NUMBER: 623056

SUMMARY:

HAND SPECIMEN:

This is an autobrecciated or false brecciated felsic lava with jigsaw fit pale grey fragments to 1-2cm long with a darker, rather coarser-grained matrix and disseminated pyrite.

THIN SECTION:

The lava fragments in this rock are texturally well-preserved formerly glassy dacite composed of 1mm-sized phenocrysts of albitized plagioclase that make up around 5-8 modal% of the sample, with occasional totally chloritized small former augite microphenocrysts and leucogenitized FeTi oxide microphenocrysts. The groundmass of the lava fragments was largely glassy, but has recrystallized to an even quartzo-feldspathic mosaic in which diffuse areas of coarser-grained silica and calcite have grown. These lava fragments also contain not uncommon small cognate inclusions of gabbro (albitized plagioclase + chloritized augite), probably plucked from the magma chamber roof or conduit during passage to eruption. Several other lava fragments show essentially identical lithology, but have an almost trachytic groundmass texture, including abundant subparallel albitized plagioclase microlites. These are slightly less rapidly cooled than the more glassy fragments, and may come from interior portions of the same flow(s).

The matrix of this rock is actually volcanoclastic, and composed of abundant detrital albitized plagioclase phenocrysts and devitrified and recrystallized formerly glassy lava fragments in a very fine-grained matrix composed of silica, sericite and chlorite.

SAMPLE NUMBER: 623057

SUMMARY:

This is a volcanoclastic sandstone derived from local quartz+plagioclase-phyric mainly glassy felsic lavas; it has probably suffered some chloritization during local hydrothermal alteration.

HAND SPECIMEN:

This is a dark green chloritic volcanoclastic sediment with occasional clasts of fine-grained felsic lava to almost 1cm long in a sandy matrix.

THIN SECTION:

This is a petrographically simple volcanogenic sandstone. It is framework supported and quite well sorted, with an average grain size around 1-2mm. Matrix probably makes up less than 20 modal% of this rock. The framework grains are dominated by subequal amounts of detrital volcanic quartz and albitized plagioclase phenocrysts. The blocky albite phenocrysts are typical of those in felsic lavas in the Mount Read Volcanics, and show fairly extensive sericite+minor calcite alteration. Quartz phenocrysts are mainly angular crystal fragments, although rounded and reacted grains typical of quartz phenocrysts in felsic lavas also is present. The habit of much of the detrital quartz is more typical of broken crystals formed during explosive pyroclastic eruptions producing crystal vitric tuffs. Former FeTi oxide phenocrysts are replaced by aggregates of sericite with euhedral epidote and sphene crystals growing into it. Five or six lithic clasts are present, all but one being devitrified formerly glassy felsic lava. The exception is a small clast composed of quartz and minor muscovite that strongly resembles pelitic schist from the Tyennan region metamorphics. The matrix of this sandstone was probably originally a silty ash but has been quite strongly chloritized.

This is clearly a volcanoclastic sandstone derived almost totally from the quartz+plagioclase-phyric mainly glassy felsic lavas such as those described above. It has probably suffered some local hydrothermal alteration, producing the more than typical chlorite in the matrix of this rock.

SAMPLE NUMBER: 623060

SUMMARY:

This is a plagioclase-phyric, slightly chloritized dacitic lava.

HAND SPECIMEN:

This is a dark brown quite plagioclase-phyric felsic lava.

THIN SECTION:

This rock is composed of about 25modal% of blocky 1-2mm sized phenocrysts of albitized plagioclase, speckled with fine sericite, and set in an almost holocrystalline groundmass. The plagioclase phenocrysts are rather ragged subhedral crystals and often occur in multi-crystal clots. A small number of former mafic phenocrysts are present, now altered to magnetite-calcite-chlorite and sometimes containing small albite laths. Although the extent of alteration precludes certain identification, at least several of these seem to have hornblende shapes and cleavage traces.

The groundmass of this rock is a relatively coarsely crystalline quartzo-feldspathic intergrowth (compared with most of the preceding samples). It consists of small plagioclase laths in a chlorite-magnetite-leucoxene-riddled quartzo-feldspathic matrix. It is difficult to judge whether the finer-grained quartzo-feldspathic material in this groundmass has grown from devitrified glass, but it is reasonable to say that groundmass of this rock reflects somewhat slower cooling than the dominantly glassy samples noted above. This does not preclude this rock having been a lava. Styloitic concentrations of insoluble opaque minerals and leucoxene reflect limited pressure solution of the groundmass. A few calcite-quartz veinlets transect the rock, and there is a significant amount of chlorite in the groundmass.

This was probably a plagioclase-phyric dacitic lava; it is significantly different from the other samples described above in that this rock lacks quartz as a phenocryst phase.

SAMPLE NUMBER: 623061

SUMMARY:

This was probably a plagioclase-phyric dacitic lava breccia that was quite strongly chloritized, then weakly silica-altered and leached of chlorite in diffuse zones through the rock.

HAND SPECIMEN:

This is a dark brown-green plagioclase-phyric autobrecciated and chloritized felsic lava with dark finer-grained fragments to at least 1cm long in a lighter coloured and coarser-grained matrix.

THIN SECTION:

This rock is difficult to diagnose. It consists of poorly defined fragments of plagioclase-phyric dacitic lava with diffuse margins set in a matrix that is paler, more silica-rich and less chloritic, but otherwise texturally little different. The plagioclase phenocrysts are blocky slightly rounded albitized crystals mainly 0.5-2mm long; surprisingly, chlorite alteration of the albite is more abundant by far than the sericite speckling. There were apparently no mafic phenocrysts in this sample. Several areas of the section show what look very convincingly to be lithic fragments of devitrified and chloritized very fine-grained formerly glassy felsic lava.

The texture of the groundmass is very variable and puzzling. In the darker areas it is composed of laths of albitized plagioclase with chlorite cores in a matrix composed almost solely of chlorite, possibly replacing former glass or devitrified glass. In the lighter coloured areas of groundmass, that make up probably 40modal% of the rock and spread in quite diffuse fashion through it, chlorite is considerably reduced in volume and anhedral quartz is growing from the microcrystalline quartzo- feldspathic matrix; plagioclase laths and microlites are still present in these areas. Leucoxene and minor fine-grained epidote are scattered through both the chloritized and the chlorite-leached areas.

I think that the best interpretation of this sample is that it was a fairly glassy dacitic lava breccia, with occasional almost totally glassy small fragments(?) possibly spalled off flow margins or pillow rims. The sample was quite strongly chloritized in a hydrothermal alteration system, and subsequently leached of chlorite and perhaps weakly silicified in diffuse channels cutting the rock.

SAMPLE NUMBER: 623064

SUMMARY:

This is a foliated strongly sericite+calcite-altered plagioclase-phyric probably formerly glassy felsic lava.

HAND SPECIMEN:

This is a dark grey-green weakly foliated and strongly sericitized plagioclase-phyric felsic lava.

THIN SECTION:

This is a quite strongly sericite+calcite-altered plagioclase-phyric felsic lava in which the degree of alteration of the groundmass totally precludes any assessment of its original nature and significance. The albitized plagioclase phenocrysts make up about 5-8modal% of the rock and are mainly blocky prisms with common chlorite inclusions. There were no mafic phenocrysts in this section and the not uncommon FeTi oxide microphenocrysts have altered entirely to leucoxene.

The groundmass of this rock is quite foliated and composed of a quartzo-feldspathic matrix that has been intensely overprinted by sericite and calcite, with subordinate chlorite and granular epidote. Veins of calcite, and calcite+quartz cut the sample, and one calcite vein contains both epidote and magnetite in its core.

This rock was probably a plagioclase-phyric glassy felsic lava. It was probably weakly chloritized, as indicated by the common chlorite in the albitized plagioclase phenocrysts, before being strongly sericite+calcite-altered in a fault zone. The apparent abundance of fine-grained epidote is unusual in a rock that I would suggest was originally dacitic. Epidote in the Mount Read Volcanics is usually restricted to andesitic and more basaltic lavas, yet this sample has no convincing petrographic features of a former andesitic lava.

SAMPLE NUMBER: 623069

SUMMARY:

This is a quite well-preserved plagioclase+hornblende-phyric andesitic lava similar to the Anthony Road and Crown Hill hornblende andesites.

HAND SPECIMEN:

This is a dark grey plagioclase-phyric lava breccia with angular fragments up to several cm across separated by lighter coloured zones of more intense alteration.

THIN SECTION:

This is a texturally well-preserved plagioclase+hornblende-phyric andesitic lava. Albitized plagioclase phenocrysts are up to 3mm long, and are mainly slightly rounded tabular prisms that make up about 10-15 modal% of the rock. They are breaking down to a variety of different alteration assemblages. Some crystals show the unusual diffuse mottling reminiscent of myrmekitic textures, whereas most show strong alteration to abundant chlorite, yellow granular epidote, and sericite. Former hornblende phenocrysts are up to 3mm long, and make up probably only 1-2 modal% of the rock. They are totally pseudomorphed by chlorite-calcite-epidote-leucoxene-magnetite assemblages, often with localization of the opaques at former crystal margins. Euhedral microphenocrysts now composed only of chlorite have shapes more typical of augite than hornblende. Both leucoxene-altered FeTi oxide microphenocrysts and microphenocrysts of apatite are common.

The groundmass of this sample is quenched vitrophyric, with devitrified glass, albitized plagioclase microlites, and some fan-spherulitic material that may have been quench-grown augite. The groundmass is now composed of fine-grained quartzo-feldspathic material with common chlorite, and a few epidosite patches composed almost solely of yellow granular epidote and minor quartz and chlorite. This was a plagioclase+hornblende andesite, typical of those (mainly fresher, thank goodness) exposed in the Crown Hill and Anthony Road areas.

SAMPLE NUMBER: 623076

SUMMARY:

This is weakly-bedded shaley siltstone with detrital contributions derived probably in major part from pelitic metamorphics, but with unambiguous detritus from felsic volcanics.

HAND SPECIMEN:

This is a grey, very fine-grained, weakly-bedded volcanogenic sediment.

THIN SECTION:

This section shows poorly defined, dominantly shaley beds with a few slightly coarser-grained silty beds only 2-5mm thick. The shaley beds contain occasional detrital muscovite flakes in a matrix of almost irresolvably fine-grained quartzo-feldspathic material riddled with sericite and chlorite. Polycrystalline quartz has grown from the altered shale in places, forming schleiren-like segregations parallel to the bedding. A few modal percent of the shaley beds consist of 1mm-sized stretched aggregates composed of abundant small opaque (pyrite) grains that have clearly formed diagenetically rather than being detrital grains. These may be slightly stretched and deformed framboids.

The siltier beds contain occasional identifiable albitized plagioclase phenocrysts or phenocryst fragments, and detrital quartz grains (mainly <0.1mm sized) that appear to be deformed polycrystalline metamorphic quartz rather than quartz phenocrysts from felsic volcanics. Small lithic clasts are either chalcedonic silica or exceptionally fine-grained quartzo-feldspathic mosaics after devitrified glass. Somewhat coarser-grained detrital muscovite is also present in the silty layers, but they are dominated by the same irresolvable material that makes up the shale beds in this rock. Stylolitic concentrations of insoluble material transect the rock parallel to the bedding.

SAMPLE NUMBER: 623078

SUMMARY:

This rock is a brecciated siltstone including a significant detrital component from pelitic metamorphics that has been intensely sericite altered, with disseminated magnetite(?) aggregates and minor calcite veining and overprinting.

HAND SPECIMEN:

This is a brecciated dark grey rock with large fragments to several cm of siltstone or shale, and smaller fragments of the same material in a strongly altered (sericitic) matrix.

THIN SECTION:

The large dark clasts or fragments in this rock are micaceous siltstone with quite strong calcite-sericite alteration. The only identifiable detrital grains are small angular quartz grains of indeterminable origin, and common small detrital flakes of muscovite. The matrix of this siltstone is too fine-grained and messy to resolve, and is quite strongly overprinted by calcite and sericite, the latter pervading the entire fragments.

The remainder of this rock is composed almost entirely of sericite and subordinate green chlorite; some of the sericite is quite coarse-grained. There is no textural information available from these intensely sericitized domains to determine whether they are replacements of a pre-existing lithology, or simply fracture fillings or reaction products of hydrothermal fluids with the siltstone. However, there do appear to be a few ghost outlines of former plagioclase phenocrysts, now composed entirely of sericite. Amorphous patches and aggregates of an opaque mineral, possibly magnetite, are common in the coarse sericite domain.

This rock might be better diagnosed from outcrop information. However, it appears to be petrographically a fluid fractured, brecciated and replaced siltstone that includes a significant component derived from pelitic metamorphics. It has suffered extensive sericite alteration, and later overprinting and weak veining by calcite.

SAMPLE NUMBER: 623081

SUMMARY:

This is a very sparsely plagioclase-phyric almost holocrystalline dyke rock, probably andesitic, that has suffered strong and pervasive sericite alteration.

HAND SPECIMEN:

This is a uniform textured, pale grey, rather porous aphyric felsic lava that has suffered quite strong sericite alteration.

THIN SECTION:

This is a holocrystalline very sparsely plagioclase-phyric andesite(?) lava that has suffered strong and evenly distributed sericite alteration. Slightly rounded subhedral phenocrysts of albitized plagioclase, mainly less than 1mm long, make up less than 1 modal% of the rock, and are almost totally replaced by sericite and minor chlorite. The remainder of the rock is composed of a very uniform textured intergrowth of randomly orientated ~0.1mm long totally sericitized plagioclase laths, and interstitial chlorite and quartz, with quite common small granules of leucoxene-altered FeTi oxides. Some of the interstitial chlorite may well be replacing bladed augite.

This rock is unlike most of the felsic volcanics in this set, and in the Mount Read Volcanics in general. It is texturally more similar to andesitic to basaltic dyke rocks that intrude the MRV, such as the tholeiitic Henty Dyke Swarm rocks from the region of the Henty Fault further north. Chemical data should be able to test the affinities of this sample better than petrography, but I suggest that it is an andesitic to basaltic almost holocrystalline dyke rock.

SAMPLE NUMBER: 623082

SUMMARY:

This is an intensely hydrothermally altered probably formerly glassy felsic lava that has been strongly silica-altered, with minor pyrite mineralization, and probably slightly later sericitization of the silicified rock.

HAND SPECIMEN:

This is a cream coloured intensely sericite altered rock with vague traces of former fragments and not uncommon small seams and aggregates of pyrite.

THIN SECTION:

This rock is completely blitzed, with hardly any trace of its original texture. A few poorly defined least-altered areas are composed of very fine-grained silica+sericite, with a few sericite concentrations probably defining former plagioclase phenocryst sites. It has suffered intense silica alteration, producing fracturing and brecciation, healing of fractures with silica, and recrystallization of large patches of groundmass to very variably coarse to fine-grained polycrystalline silica meshed by sericite. Quite common crystalline pyrite grains and aggregates of grains are disseminated through the silica-sericite mess, but make up probably less than 1 modal% of the rock.

This was probably a glassy felsic lava (autobrecciated?) that has suffered intense silica flooding and replacement, with accompanying fracturing and fracture sealing, minor pyrite development, and strong sericite meshing of the altered brecciated rock.

SAMPLE NUMBER: 623084

SUMMARY:

This was probably a weakly plagioclase-phyric felsic glassy lava that has been strongly sericite-altered and weakly foliated before being invaded and brecciated by silica-rich hydrothermal solutions.

HAND SPECIMEN:

This is a porous, highly altered (sericitized?) pale grey autobrecciated or 'false brecciated' felsic lava.

THIN SECTION:

This is an intensely altered, foliated felsic rock in which little trace of the original texture or mineralogy left. It is composed of totally sericitized, stretched and smeared out former plagioclase phenocrysts, probably making up about 5modal% of the sample, set in a sericite-chlorite mesh that pervades and overprints the very fine-grained quartzo- feldspathic matrix. Occasional almost rounded small blebs of quartz appear to have recrystallized from the altered groundmass. Messy aggregates of hematite and leucoxene represent former FeTi oxide grains. Jigsaw-fit areas of strongly sericitized rock in a few parts of the rock are separated by cleaner, much more sparsely sericitized and quartz-rich irregular seams that probably are fluid passage ways from which original sericite has been strongly leached.

This may have been a glassy sparsely plagioclase-phyric felsic lava. It suffered strong sericite alteration before hydrofracturing or 'false brecciation' by silica solutions.

SAMPLE NUMBER: 623089

SUMMARY:

This is a vitric crystal tuff with lithic clasts of devitrified felsic lava, and probably formed from a hot ash flow. It is reminiscent of an ignimbrite in some respects.

HAND SPECIMEN:

This is a mottled cream and green coarse volcanoclastic, with lava fragments of highly altered plagioclase-phyric lava to several cm long.

THIN SECTION:

This rock is composed of angular crystal debris made up largely of quartz and albitized plagioclase phenocryst fragments, and common lithic fragments of formerly glassy felsic volcanic rocks, in a recrystallized, formerly glassy groundmass. The quartz crystal fragments are present in greater abundance than the plagioclase fragments, and are up to 3mm across; they probably make up around 5 modal% of the rock, whereas albitized plagioclase may be closer to 5 modal%. Lithic fragments are all devitrified and partially recrystallized felsic lavas, with plagioclase and quartz phenocrysts. A few appear to have curved chlorite concentrations picking out former perlitic cracks.

The groundmass of this sample is about 50modal% devitrified glass that has a pale brownish colour under uncrossed polars. Secondary quartz is growing from the devitrified glass as anhedral small grains, and patches and streaks of finely recrystallized quartzo-feldspathic mosaics make up the remainder of the groundmass; chlorite and sericite are not common.

This rock was probably formed from a hot ash cloud of rhyolitic composition, and although it has no clear fiammae preserved, it has many petrographic similarities to an ignimbrite, although perhaps more so in thin section than hand specimen.

SAMPLE NUMBER: 623090

SUMMARY:

This sample was probably a plagioclase-phyric formerly glassy felsic lava that has suffered intense hydrothermal alteration, first involving silica+chlorite, then a pervasive and intense silica-sericite alteration.

HAND SPECIMEN:

This is a pale grey, strongly sericitized plagioclase-phyric felsic lava (?) or lava breccia from the Henty Canal alteration zone.

THIN SECTION:

This is a very strongly altered former felsic lava with intense sericite alteration. Remnant albitized plagioclase phenocrysts are not uncommon, although they are only preserved in core of less altered areas (fragments?). In most of the rock, they are replaced by aggregates of extremely fine-grained silica and sericite that is no different petrographically to the fine-grained silica aggregates that have been produced by recrystallization of the originally glassy groundmass. There were probably no quartz or mafic phenocrysts in the protolith of this rock.

The sample has a poorly defined, patchy brecciated texture in both hand specimen and thin section. However, this is probably better attributed to 'false brecciation' associated with the intense fluid activity that produced the hydrothermal alteration in this rock. Groundmass areas are mainly very fine-grained sugary quartz flooded by massive to weakly foliated sericite; some areas with abundant quite coarse-grained blebby quartz growing from the silicified groundmass occur adjacent to areas of groundmass still very fine-grained. The texturally best-preserved areas contain quite abundant disseminated chlorite, suggesting that the original alteration assemblage may have been quartz+chlorite, and that this has further recrystallized and been overprinted by extensive sericite-silica, with fairly sparse disseminated pyrite.

SAMPLE NUMBER: 623091

SUMMARY:

This sample is a formerly glassy plagioclase-phyric felsic lava with an earlier silica-chlorite alteration overprinted by intense sericite alteration; it is very similar to the preceding sample.

HAND SPECIMEN:

This is a pale grey plagioclase-phyric felsic lava (?) that has been intensely sericite altered through most of its volume, but leaving irregular patches of darker less altered rock to produce a weak 'false brecciated' texture.

THIN SECTION:

This sample has a fine-scale brecciated appearance in thin section, but, as for the previous sample, this is better interpreted as due to the effects of fluid fracturing and extensive recrystallization in an intense hydrothermal alteration system rather than as a primary volcanic feature. I think the original rock was a plagioclase-phyric felsic lava. Best preserved areas have totally sericitized plagioclase phenocrysts to about 2mm long set in a very fine-grained groundmass composed of silica and chlorite. These areas occur as angular to rounded 'fragments' set in an intensely sericitized matrix. Disseminated pyrite or magnetite grains are scattered through the more sericitized areas of the rock, but are volumetrically insignificant.

This rock is probably very similar to the preceding sample, being a formerly glassy plagioclase-phyric felsic lava that suffered an initial weaker silica-chlorite alteration that was strongly overprinted by intense sericite alteration in a zone of significant hydrothermal alteration.

SAMPLE NUMBER: 623092

SUMMARY:

This sample may originally have been a very glassy and sparsely plagioclase-phyric felsic lava or lava breccia that suffered intense fluid fracturing and related recrystallization to microcrystalline silica, followed by intense sericite development.

HAND SPECIMEN:

This is a pale grey-green strongly sericitic felsic lava breccia with a few fragments of darker green lava to about 2cm long.

THIN SECTION:

This is a very nasty, strongly altered, foliated rock with few clues left from which to gauge an idea of its original lithology. My feeling is that it was a sparsely plagioclase-phyric glassy lava breccia. Two major petrographic domain types are represented in this rock, and are evident in the hand specimen. Darker green 'lithic fragments' are composed of very fine-grained quartzo-feldspathic material, with abundant interstitial chlorite mostly as elongate flakes formed along an original foliation direction, and sericite forming weak veinlets and webs parallel to the dominant foliation in this rock. Many fragments of this type have jigsaw fit margins with nearby fragments of the same material, and were probably the original lithology. Subsequent fluid fracturing led to leaching of chlorite, and extensive recrystallization to almost microcrystalline silica that was thoroughly pervaded by sericite, that forms a weak foliation in this sample.

SAMPLE NUMBER: 623093

SUMMARY:

This is a strongly chlorite+silica-altered formerly glassy plagioclase-phyric dacitic lava.

HAND SPECIMEN:

This is a very weathered grey felsic or intermediate lava with a quite brecciated appearance.

THIN SECTION:

This is an autobrecciated, strongly chloritized formerly glassy felsic to intermediate lava. It has suffered strong alteration and weathering of both phenocrysts and groundmass, making estimation of the original abundance of plagioclase phenocrysts quite difficult. However, the rock probably contained around 10 modal% of tabular 1-2mm long albitized plagioclase phenocrysts that are largely altered by weathering to clay, sericite and chlorite, and have been plucked out during sectioning. Some plagioclase phenocrysts show the unusual mottling that looks like myrmekitic intergrowths of quartz and feldspar that are quite common in strongly hydrothermally altered lavas. A few chloritized mafic phenocrysts were probably small augite prisms.

The groundmass of this lava is very heterogeneous; fragments are clearly formerly glassy, and were mosaics of reasonably (what's reasonable, Tony, you may ask ?) coarse-grained quartzo-feldspathic material after glass, that has been strongly overprinted by chlorite-silica alteration producing blebs of quartz and masses of fine-grained quite bright green and unusual yellow chlorite. Between the small lava fragments, which appear in hand specimen and thin section to be basically jigsaw fit, the matrix is a much cleaner, much finer-grained quartzo-feldspathic material with scattered green chlorite.

This rock was probably a glassy plagioclase-phyric dacitic lava that has suffered strong chlorite-silica hydrothermal alteration and associated false brecciation (fluid fracturing and healing with silica). It contains minimal disseminated pyrite.

SAMPLE NUMBER: 623094

SUMMARY:

This is a plagioclase-phyric dacitic lava probably very similar originally to the previous sample. It has suffered strong chlorite±silica±sericite hydrothermal alteration.

HAND SPECIMEN:

This is a grey weathered and altered plagioclase-phyric felsic to intermediate lava, very similar to the previous sample except for less autobrecciation.

THIN SECTION:

This sample is composed of around 10 modal% of well-formed albitized plagioclase phenocrysts containing abundant chlorite inclusions and more limited sericite speckling. They are mainly less than 2mm long and commonly occur in multi-crystal clots. There were apparently no mafic phenocrysts in this rock, but leucoxene-altered former FeTi oxide phenocrysts are not uncommon.

The groundmass of this rock contains abundant quench plagioclase microlites in a matrix of very strongly chloritized devitrified glass; abundant disseminated and unorientated (rather than seam- or vein) sericite is intergrown with chlorite in the altered groundmass. Blebs of quartz are growing in the chlorite, as in the previous sample. The rock is cut by a 4mm-wide zone of microcrystalline silica, almost free of the coarse chlorite and sericite that riddle the groundmass; it probably represents a late stage fluid flow zone.

SAMPLE NUMBER: 623101

SUMMARY:

This is a sparsely plagioclase-phyric vitric crystal tuff with significant silica-chlorite-sericite \pm sphalerite alteration.

HAND SPECIMEN:

This is a dark grey-green sparsely porphyritic and strongly altered felsic lava or tuff.

THIN SECTION:

This rock is composed of a few modal% of tabular albitized plagioclase phenocrysts almost totally replaced in many crystals by sericite. These are mainly less than 2mm long. There are no former mafic phenocrysts in this sample, not former FeTi oxide microphenocrysts.

The groundmass is inhomogeneous and strongly recrystallized. In many places it has a texture suggestive of a silty ash composed of glass shards, although no former shards shapes are preserved. The groundmass texture is far more variable and inhomogeneous than typically developed from a uniform devitrified groundmass of a glassy felsic lava. The groundmass of this rock is now composed of quartzo-feldspathic mosaics heavily riddled with very fine-grained sericite and chlorite. Small patches much less than 1mm across of yellowish sphalerite are not uncommon, but make up a volumetrically insignificant part of this rock.

This is an unusual rocktype in my experience in the Mount Read Volcanics, being a very sparsely plagioclase-phyric vitric tuff; it has suffered quite strong alteration producing sericite-chlorite \pm sphalerite.

SAMPLE NUMBER: 623113

SUMMARY:

This is a well-preserved plagioclase+hornblende-phyric andesitic lava with chlorite-pseudomorphed hornblende phenocrysts.

HAND SPECIMEN:

This is a dark brown plagioclase+mafic-phyric andesitic lava.

THIN SECTION:

This is an andesitic lava consisting of around 10 modal% of blocky to tabular albitized plagioclase phenocrysts, and much less abundant totally altered hornblende phenocrysts, in a vitrophyric groundmass. The plagioclase phenocrysts range probably continuously in size from phenocrysts of about 3mm max long, down to microlites. They are only weakly speckled with sericite. Former hornblende phenocrysts make up about 2-4 modal% of this sample, and are pseudomorphed by chlorite, with subordinate opaques, calcite and epidote. Many contain small albite inclusions, and all are stretched and smeared out into a weak foliation. A number of small totally chloritized euhedral microphenocrysts were probably augite rather than hornblende. Similar presumed former augite phenocrysts were seen in hornblende andesite 623069, for example. Apatite and FeTi oxide microphenocrysts are quite common.

The groundmass of this rock is quite crystalline, compared with many of the formerly glassy lavas in this set. It originally probably had a vitrophyric texture, in which abundant plagioclase microlites and laths were set in interstitial but quite abundant glass. The glass has been altered to chlorite and dotted with magnetite, and blebby secondary polycrystalline silica is growing from the altered glass. Microshear zones are common parallel to (and defining, in places) the weak foliation in this rock, and are defined by chlorite, which also forms as pressure shadows and fringes on some plagioclase phenocrysts.

This is a well-preserved plagioclase+hornblende-phyric andesite lava, similar to those from Crown Hill and Anthony Road, and the other former hornblende-bearing andesites in this set. Alteration is regional pervasive rather than local hydrothermal style.

SAMPLE NUMBER:623115

SUMMARY:

This sample was a formerly glassy plagioclase-phyric rhyolitic to dacitic lava that has suffered moderately strong sericite-chlorite alteration.

HAND SPECIMEN:

This is a grey-green, quite strongly sericitized, plagioclase-phyric felsic lava.

THIN SECTION:

This is a moderately plagioclase-phyric felsic lava that has suffered strong sericite alteration. The plagioclase phenocrysts are mainly 0.5-2mm long, and are blocky albitized subhedral to euhedral crystals that commonly occur in multi-crystal clots. They make up about 5-8 modal% of the rock and show fairly intense sericite overprinting. There are no quartz or former mafic phenocrysts in this rock.

The groundmass of this sample was probably originally glassy. It has recrystallized to a fairly uniform and relatively coarse-grained quartzo- feldspathic mosaic that is pervaded by sericite and quite abundant chlorite.

This rock was a glassy plagioclase-phyric dacitic to rhyolitic lava.

SAMPLE NUMBER: 623118

SUMMARY:

This is an intensely hydrothermally altered former felsic glassy lava dominated by the alteration assemblage quartz+chlorite+pyrite, with less abundant sericite and probably post-hydrothermal calcite overprinting.

HAND SPECIMEN:

This is a grey chloritized and weathered felsic lava or lava breccia with disseminated pyrite from the Newton Creek Dam access road alteration zone.

THIN SECTION:

The original texture of this sample has been entirely obliterated by recrystallization associated with intense hydrothermal alteration. It is difficult to say much more than that the protolith was probably a glassy felsic lava with occasional plagioclase phenocrysts, the ghosts of which are sometimes visible as aggregates of fine-grained polycrystalline quartz. One goes piece of evidence supporting this is the presence of well-formed and unaltered apatite microphenocrysts. The remainder of this rock consists of a background or matrix of very fine-grained, in places almost microcrystalline silica, apparently lacking intergrown feldspar, but riddled by chlorite and more streaky sericite. Segregations of coarser-grained polycrystalline quartz varying in shape from irregular and anhedral patches through to well-defined veinlets are abundant. Some of the quartz veins merge or grade into veins of quite coarse-grained chlorite in which large pyrite crystals have grown, together with another more anhedral and patchy sulphide, and minor calcite. The most intensely developed sericite alteration forms seams that border and parallel the chlorite veining. Irregular patches and veins of coarser-grained calcite are not uncommon, and in places contain partly altered bladed hematite crystals. Quite fine-grained pyrite, and possibly magnetite, is disseminated throughout this sample, and has dissolved in places, and recrystallized in concentrations forming along fractures.

This rock was probably a felsic lava. It has suffered intense hydrothermal alteration, leading to near-total recrystallization dominated by the assemblage quartz+chlorite+pyrite, with subordinate sericite and calcite. The calcite may post-date the main hydrothermal alteration.

SAMPLE NUMBER: 623780

SUMMARY:

This is a foliated and intensely calcite+sericite-altered felsic lava or tuff.

HAND SPECIMEN:

This is a weakly foliated grey highly carbonate-altered plagioclase-phyric felsic lava.

THIN SECTION:

This sample is so intensely calcite-sericite-altered that almost all trace of its original mineralogy and texture have been obliterated. Several 1-2mm-sized phenocrysts of albitized plagioclase are present, along with a single small anhedral quartz phenocryst(?), and a few small fragments of devitrified felsic glass (?). The remainder of this rock is a well-foliated intergrowth of quite coarsely crystalline calcite, including numerous 1-2mm-sized porphyroblasts in a finer-grained matrix composed of calcite crystals immersed in a matrix of well-crystallized sericite that forms seams and wavy concentrations that define the foliation. Stringers of tiny opaque grains aligned along the foliation may have been former altered FeTi oxide microphenocrysts, or may simply be concentrations of magnetite or pyrite formed during the foliation development.

It is not possible to say whether this was a felsic lava or a felsic crystal vitric tuff; whatever it was, it has suffered near-terminal calcite-sericite alteration probably in major fault zone.

SAMPLE NUMBER: 623783

SUMMARY:

HAND SPECIMEN:

This is a dark green mottled plagioclase-phyric felsic rock with hematite veining, and common calcite and chlorite veins.

THIN SECTION:

This is a quite strongly plagioclase-phyric felsic lava with about 15-20 modal% of tabular to blocky euhedral to subhedral prisms of albitized plagioclase to about 2-3mm long with abundant chlorite and sericite flecking. There were no mafic phenocrysts in this sample, but microphenocrysts of pale brownish apatite and altered FeTi oxides are not uncommon. An unusual feature of this sample is the presence of several small (2-4mm long) cognate inclusions composed of abundant tabular small plagioclase crystals with interstitial chlorite, and secondary magnetite; these are probably crystal aggregates plucked from the magma conduit during passage to eruption. Very similar inclusions are present in 623042.

The groundmass of this sample was probably vitrophyric, composed of small laths and microlites of plagioclase in glass. However, the rock has suffered strong alteration, with recrystallization of the entire groundmass to an inhomogeneous intergrowth of silica and albite, pervaded by abundant disseminated and vein chlorite, patchy and vein calcite, and particularly abundant granular disseminated magnetite; altered to red hematite in some places. The style and intensity of alteration in this rock is typical of localized hydrothermal alteration rather than regional burial degradation. The rock was a plagioclase-phyric dacite or rhyodacite. It could be checked from the mapping whether it could be from the same flow unit as the originally petrographically almost identical, but considerably less hydrothermally altered sample 623042.

SAMPLE NUMBER: 623784

SUMMARY:

This is a volcanogenic fine sandstone derived entirely from plagioclase+sparse quartz-phyric felsic and intermediate lavas; it includes abundant chlorite+sericite-altered formerly glassy lithic fragments, and has been quite strongly sericite+chlorite+hematite-altered, with development of a weak foliation.

HAND SPECIMEN:

This is a dark grey volcanogenic fine sandstone with a weak foliation.

THIN SECTION:

This is clearly a volcanoclastic sediment, dominated by 0.5-1mm- sized grains of detrital plagioclase phenocrysts. The sandstone is almost framework supported, although this may be due to dissolution of matrix during deformation and foliation development. Detrital albitized plagioclase phenocrysts are mainly fragments, often angular, of blocky euhedra typical of those in felsic Mount Read Volcanics. They are strongly sericitized, and some have small pale yellow granular epidote inclusions. Considerably less abundant are angular fragments of quartz phenocrysts, mainly less than 0.5mm long, and occasional detrital apatite microphenocrysts. Perhaps the most puzzling feature of this rock is the presence of abundant stretched and flatted hematitic lithic fragments composed mainly of foliated sericite, abundant extremely fine-grained hematite and some chlorite, and not uncommon small grains of epidote. These fragments often have sericitized former plagioclase microphenocryst sites, and were probably originally sericitized glassy lithic fragments, or even pumice fragments. They have enough chlorite and epidote in them to suggest that they may have been more andesitic than felsic, and are often difficult to discern from the matrix, which is also foliated sericite and chlorite containing streaky lineations of very fine-grained hematite(?), as well as small grains of epidote.

This is a volcanogenic sandstone derived from felsic and intermediate lavas and tuffs; it has suffered quite strong sericite+chlorite+hematite alteration and weak foliation development.

SAMPLE NUMBER: 623785

SUMMARY:

This is a greenschist facies plagioclase+hornblende-phyric dacite lava or shallow intrusive.

HAND SPECIMEN:

This is a well-preserved plagioclase+hornblende-phyric felsic lava.

THIN SECTION:

This is a texturally well-preserved quite plagioclase-phyric felsic lava with about 15 modal% of albitized plagioclase phenocrysts that vary continuously from about 3mm across down to microlite size, and about 3 modal% of partially altered hornblende phenocrysts. The latter are mainly euhedral crystals 0.5-2mm long, with small albite inclusions, and are largely replaced by fibrous actinolite and very pale green chlorite, totally riddled by very fine-grained granular magnetite. A few cores of pale brown to clear pleochroic hornblende are preserved, and most of the pseudomorphed crystals have typical hornblende shapes. Perfectly euhedral microphenocrysts of apatite are quite common, and FeTi oxide microphenocrysts have narrow alteration rims of leucoxene.

The groundmass of this sample was almost holocrystalline. It consists of randomly orientated laths of albitized plagioclase and subordinate actinolite-altered hornblende, in a quartzo-feldspathic matrix riddled with tiny magnetite granules and common chlorite. Veins of coarse-grained calcite intergrown with anhedral polycrystalline quartz contain a few modal % of bladed elongate hematite crystals.

This is a plagioclase+hornblende-phyric dacite, probably from the core of a thick flow or a shallow intrusive body judging from the rather crystalline groundmass. It contains a greenschist facies regional alteration assemblage that is unusual within the Mount Read Volcanics.

SAMPLE NUMBER: 623792

SUMMARY:

This is a strongly plagioclase-phyric dacitic lava with quite strong chlorite alteration and a low greenschist facies recrystallization assemblage.

HAND SPECIMEN:

This is a dark green weakly foliated plagioclase-phyric felsic lava or tuff.

THIN SECTION:

This rock consists of around 30 modal% of albitized plagioclase phenocrysts in a foliated recrystallized groundmass. The plagioclase phenocrysts are up to 3mm long, and occur commonly in multi-crystal clots. Many of the albitized plagioclase phenocrysts have recrystallized in their core regions to a rather amorphous, mottled albite with minor chlorite speckling. There were no mafic phenocrysts in this rock.

The groundmass of this sample is unusual, in being composed of a weakly foliated quartzo-feldspathic mosaic pervaded by abundant sericite, chlorite and fibrous actinolite, and granular to almost euhedral sphene crystals. The latter make up a few modal % of the rock and are quite distinctive due to their crystal habit and deep orange-brown colour. These have probably recrystallized from leucogenitized FeTi oxide microphenocrysts and groundmass granules. Calcite veinlets cut the rock and contain minor amounts of chlorite, and calcite occurs as small patches and blebs overprinting both albitized plagioclase phenocrysts and groundmass.

This is a plagioclase-phyric dacite or rhyodacite lava that has suffered quite strong chlorite alteration before recrystallization under low greenschist facies conditions.

Co-Ordinates		Sample No:
Easting	Northing	
379990	5358625	623001
379980	5358565	623002
380649	5359756	623005
380000	5359112	623031
380098	5359165	623032
380046	5359188	623033
DDH HA7 @ 128.8m		623036
DDH HA7 @ 200.1m		623039
DDH HA7 @ 25.5m		623042
DDH HA8 @ 180m		623044
DDH HA3 @ 23.5m		623056
DDH HA3 @ 45.4m		623057
DDH HA3 @ 209.3m		623060
DDH HA2 @ 24.6m		623061
DDH HA2 @ 89.9m		623064
DDH HA2 @ 228.9m		623069
380000	5358312	623076
380000	5358311	623078
380000	5358310	623081
380340	5360070	623082
380335	5360078	623084
380275	5360052	623089
380300	5360063	623090
380310	5360060	623091
380322	5360065	623092
380341	5360083	623093
380372	5360074	623094
379879	5358440	623101
380783	5357300	623113
380000	5359140	623115
DDH HA6 @ 96.6m		623780
DDH HA6 @ 117.1m		623783
DDH HA6 @ 155.3m		623784
DDH HA6 @ 196.3m		623785
DDH HA4 @ 237m		623792
380020	5359150	623118

APPENDIX II



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045063

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14 Thirkell St. COOEE TAS 7320

Fax (004) 318890

ANALYTICAL REPORT No.

100560..60.08789

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

INVOICE TO:

Aberfoyle Resources Limited
Exploration Division
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2

SAMPLE NUMBERS

SAMPLE DESCRIPTION

ELEMENT/METHOD

23088/87

BL Pres : SP018

Co. Pb. In. Ab/6A101

Au/6B309

Pb. As/6X401

REMARKS

RESULTS

TO

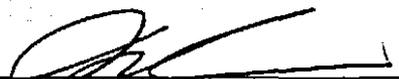
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Aberfoyle Resources Limited
P.O. Box 952
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RESULTS

TO

RESULTS

TO


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A.C.N. 004 591 864**ANALYTICAL DATA**

SAMPLE PREFIX

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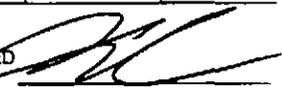
REPORT DATE

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PAGE

		100560.60.08789				29/05/92		12185		1 OF 1	
TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Au	Ba	As			
1	623086	56	279	142	<2	<0.008	1700	16			
2	623087	1595	1305	2095	<2	<0.008	4650	60			
3											
4											
5											
6											
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17											
18											
19											
20											
21											
22											
23	DETECTION	4	5	4	2	0.008	10	2			
24	UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm			
25	METHOD	GA101	GA101	GA101	GA101	GG309	GX401	GX401			

Results in ppm unless otherwise specified
 T = element present; but concentration too low to measure
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 -- = element not determined

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100560130105778

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24

SAMPLE NUMBERS

SAMPLE DESCRIPTION

ELEMENT/METHOD

53046/883

RC Prep : SP006.GP015

Cu,Pb,Zn,Ag/GA101

532801/816

RC Prep :

Zn,Ag/GA104

Au,AuR1/88309

RC Prep :

Ba,As/GA401

RC Prep :

Whole Rock Analysis/GA408

RESULTS

TO

Mr R de Bortford
Aberfoyle Resources Limited
P.O. Box 952
BURNIE TAS 7320

RESULTS

TO

RESULTS

TO

REMARKS

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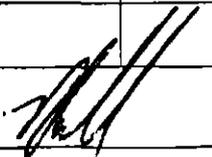
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PAGE

		100560.60.08778				15/06/92		12177		1 OF 5	
TUBE No.	SAMPLE No.	Cu	Pb	Zn	Zn	Ag	Ag	Au	Au (R)	Ba	
1	623046	10	42	57	-	<2	-	<0.008	-	445	
2	623049	97	225	883	-	<2	-	<0.008	-	100	
3	623076	36	250	154	-	<2	-	<0.008	-	700	
4	623077	22	22	48	-	<2	-	<0.008	-	105	
5	623078	36	49	188	-	<2	-	<0.008	-	91	
6	623079	21	39	98	-	<2	-	<0.008	-	70	
7	623080	25	76	282	-	<2	-	<0.008	-	70	
8	623083	142	3000	231000	21.7	43	44	<0.008	-	25	
9	623801	15	59	398	-	<2	-	<0.008	-	110	
10	623802	11	38	206	-	<2	-	<0.008	-	140	
11	623803	11	28	109	-	<2	-	<0.008	-	125	
12	623804	43	39	118	-	<2	-	<0.008	<0.008	155	
13	623805	20	59	92	-	2	-	<0.008	-	175	
14	623806	15	249	869	-	2	-	<0.008	-	140	
15	623807	13	198	288	-	3	-	<0.008	-	105	
16	623808	28	158	157	-	<2	-	<0.008	-	90	
	623809	31	43	58	-	<2	-	<0.008	-	105	
18	623810	28	36	43	-	<2	-	<0.008	-	50	
19	623811	86	260	1201	-	2	-	<0.008	-	85	
20	623812	327	244	844	-	<2	-	0.059	0.117	85	
21	623813	103	660	1553	-	2	-	0.069	0.073	57	
22	623814	27	288	261	-	<2	-	<0.008	<0.008	105	
23	623815	40	665	766	-	2	-	<0.008	-	110	
24	623816	45	94	223	-	<2	-	0.017	0.024	135	
25											

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

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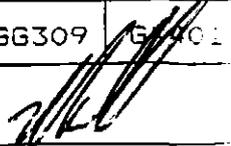
SAMPLE PREFIX REPORT NUMBER REPORT DATE CLIENT ORDER No. PAGE

100560.60.08778 15/06/92 12177 2 OF 5

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Zn	Ag	Ag	Au	Au (R)	Be
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
18										
19										
20										
21										
22										
23	DETECTION	4	5	5	0.1	2	10	0.008	0.008	1
24	UNITS	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm
25	METHOD	GA101	GA101	GA101	GA104	GA101	GA104	GG309	GG309	GA101

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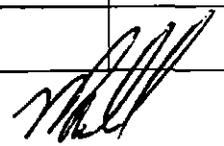
REPORT DATE

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PAGE

		100560.60.08778				15/06/92		12177		3 OF 5	
TUBE No.	SAMPLE No.	As	Cr	Zr	S	Al2O3	SiO2	TiO2	Fe2O3	MnO	
1	623046	140	85	55	-	-	-	-	-	-	
2	623049	230	170	35	-	-	-	-	-	-	
3	623076	90	110	160	0.83	10.28	75.9	0.34	4.56	0.05	
4	623077	9	8	240	0.02	15.52	59.0	0.53	3.60	0.05	
5	623078	40	65	200	1.05	13.30	67.1	0.43	6.02	0.05	
6	623079	20	20	190	0.29	12.66	68.7	0.41	4.34	0.11	
7	623080	35	60	190	0.74	11.66	69.3	0.33	5.63	0.11	
8	623083	65	20	45	-	-	-	-	-	-	
9	623801	6	12	260	0.42	16.18	67.5	0.59	5.45	0.11	
10	623802	4	10	260	0.26	16.57	66.5	0.63	5.25	0.11	
11	623803	8	7	240	0.61	12.92	75.1	0.42	3.02	0.11	
12	623804	16	30	230	0.38	15.30	70.5	0.49	3.49	0.11	
13	623805	9	7	230	0.08	15.42	70.6	0.50	3.61	0.11	
14	623806	210	35	200	1.45	14.09	70.4	0.46	4.44	0.11	
15	623807	120	14	230	0.40	14.06	72.7	0.42	3.51	0.11	
16	623808	25	14	250	0.18	16.41	70.0	0.52	2.75	0.11	
	623809	7	<5	260	0.06	16.07	70.6	0.46	2.65	0.05	
18	623810	10	30	300	0.06	16.89	70.0	0.45	2.34	0.11	
19	623811	17	25	270	0.39	15.96	69.0	0.60	3.00	0.11	
20	623812	55	17	230	2.32	14.21	65.5	0.46	6.95	0.11	
21	623813	90	70	100	2.19	8.14	80.0	0.30	3.81	0.05	
22	623814	12	25	240	0.21	15.71	72.2	0.54	2.90	0.05	
23	623815	9	20	240	0.21	15.64	70.7	0.53	4.11	0.05	
24	623816	25	19	230	0.34	15.86	65.2	0.62	8.43	0.11	
25											

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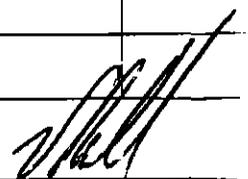
12177

5 OF 5

TUBE No.	SAMPLE No.	CaO	K2O	MgO	P2O5	Na2O	LOI	TOTAL		
1	623076	0.48	2.92	0.87	0.068	0.69	2.57	99.57		
2	623077	1.03	3.51	1.04	0.165	2.65	2.51	99.64		
3	623078	2.25	3.56	1.52	0.089	1.26	3.16	99.84		
4	623079	3.27	2.38	1.18	0.110	2.59	3.50	99.53		
5	623080	2.92	2.60	1.50	0.068	1.76	2.97	99.62		
6	623801	0.19	4.25	1.23	0.154	0.48	3.63	100.07		
7	623802	0.15	4.49	1.49	0.140	0.19	3.84	99.55		
8	623803	0.05	4.03	0.84	0.061	0.15	2.90	99.88		
9	623804	0.07	5.73	1.12	0.075	0.17	2.88	100.16		
10	623805	0.02	5.67	1.08	0.034	0.10	2.72	99.89		
11	623806	0.07	5.14	0.75	0.063	0.15	3.44	100.49		
12	623807	0.06	5.25	1.03	0.060	0.11	2.70	100.31		
13	623808	0.04	6.03	0.95	0.054	0.09	2.80	99.85		
14	623809	0.04	6.17	0.94	0.051	0.19	2.85	100.09		
15	623810	0.03	5.55	1.06	0.044	0.22	3.31	99.97		
16	623811	0.14	5.24	0.50	0.120	0.23	3.25	99.56		
	623812	0.16	4.34	0.52	0.133	0.13	4.50	99.62		
18	623813	0.02	2.69	0.27	0.033	0.15	3.24	100.85		
19	623814	0.14	4.80	0.52	0.157	0.18	2.72	100.16		
20	623815	0.16	4.56	0.71	0.148	0.33	2.77	99.89		
21	623816	0.16	4.19	1.17	0.155	0.12	3.28	99.72		
22										
23	DETECTION	0.01	0.01	0.01	0.005	0.05	0.01	0.01		
24	UNITS	%	%	%	%	%	%	%		
25	METHOD	OX408								

Results in ppm unless otherwise specified
 T = element present; but concentration too low to measure
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ANALYTICAL REPORT No.

100560, 60, 08827

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19

SAMPLE NUMBERS	SAMPLE DESCRIPTION	ELEMENT/METHOD
100 & others	RC Pres : GP001, GP004, GP012, GP018	Cu, Pb, Zn, Ag/BA101 Au, Au(A), Au(S)/GG30F Ba, As, Cr, Zr, Ti/SX401 Al2O3, SiO2, TiO2, Fe2O3, MnO, CaO, K2

REMARKS

*Newton ck.
Rock caps.*

RESULTS

TO

Mr R de Bontord
Aberfoyle Resources Limited
P.O. Box 952
BURNIE TAS 7320

RESULTS

TO

RESULTS

TO

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A.C.N. 004 591 664**ANALYTICAL DATA**

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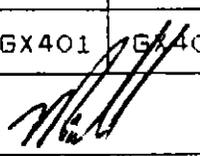
30/06/92

12200

1 OF 3

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Au	Au(R)	Au(S)	Ba	As
1	623001	7	<5	75	<2	<0.008	-	-	1150	
2	623002	9	<5	207	<2	<0.008	-	-	1200	
3	623005	5	<5	204	<2	<0.008	-	-	1050	
4	623031	28	425	1600	<2	<0.008	-	-	900	
5	623032	44	123	92	<2	<0.008	-	-	1350	
6	623033	8	100	45	<2	<0.008	-	-	1150	
7	623047	380	26	173	2	<0.008	-	-	100	
8	623081	44	17	99	<2	<0.008	-	-	750	
9	623082	17	13	21	<2	<0.008	-	-	1150	
10	623084	9	16	39	<2	<0.008	-	<0.008	1700	
11	623089	14	<5	64	<2	<0.008	-	-	680	
12	623090	35	11	34	<2	<0.008	<0.008	-	910	
13	623091	14	71	135	<2	<0.008	-	-	980	
14	623092	20	238	216	3	<0.008	-	-	840	
15	623093	8	<5	84	<2	<0.008	-	-	1550	
16	623094	13	<5	164	<2	<0.008	-	-	1350	
17	623101	13	8	61	<2	<0.008	-	-	670	
18	623113	20	16	351	<2	<0.008	-	-	1900	
19	623115	8	6	67	<2	<0.008	-	-	940	
20										
21										
22										
23	DETECTION	4	5	4	2	0.008	0.008	0.008	10	
24	UNITS	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm
25	METHOD	GA101	GA101	GA101	GA101	GG309	GG309	GG309	GX401	GA101

Results in ppm unless otherwise specified
 T = element present; but concentration too low to measure
 X = element concentration is below detection limit
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045073

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

ANALYTICAL DATA

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REPORT NUMBER

REPORT DATE

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PAGE

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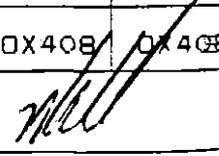
30/06/92

12200

2 OF 3

TUBE No.	SAMPLE No	Cr	Zr	Ti	TiZr	Al2O3	SiO2	TiO2	Fe2O3	MnO
1	623001	16	230	2980	13.0	14.95	70.1	0.50	4.23	0.01
2	623002	65	150	2500	16.7	14.94	61.6	0.42	6.18	0.11
3	623005	25	190	6420	33.8	17.80	58.4	1.07	8.48	0.11
4	623031	11	240	3170	13.2	15.04	73.7	0.53	1.90	0.01
5	623032	30	270	3190	11.8	15.91	70.2	0.53	3.29	0.01
6	623033	19	250	3160	12.6	15.52	73.0	0.53	2.36	0.01
7	623047	5	210	1000	4.8	12.43	78.6	0.17	0.86	0.01
8	623081	120	120	5220	43.5	19.50	58.5	0.87	9.33	0.01
9	623082	5	210	1990	9.5	11.32	78.1	0.33	3.12	0.01
10	623084	7	230	2860	12.4	14.64	72.6	0.48	3.44	0.01
11	623089	<5	220	1100	5.0	11.38	77.8	0.18	2.64	0.01
12	623090	6	240	2460	10.2	14.66	73.0	0.41	2.69	0.01
13	623091	8	260	3330	12.8	15.86	66.2	0.56	6.43	0.01
14	623092	25	210	1980	9.4	11.49	77.5	0.33	3.13	0.01
15	623093	8	270	3760	13.9	16.69	65.9	0.63	5.60	0.01
16	623094	14	310	4180	13.5	18.37	60.1	0.70	8.71	0.01
17	623101	<5	270	1570	5.8	11.32	70.9	0.26	3.67	0.01
18	623113	70	190	3150	16.6	16.78	57.8	0.52	8.75	0.01
19	623115	6	260	3100	11.9	15.44	69.4	0.52	4.83	0.01
20										
21										
22										
23	DETECTION	5	5	50	0.1	0.05	0.1	0.01	0.01	0.01
24	UNITS	ppm	ppm	ppm	%	%	%	%	%	%
25	METHOD	GX401	GX401	OX408	GX401	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

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045074

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

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REPORT NUMBER

REPORT DATE

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30/06/92

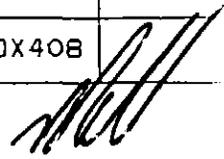
12200

3 OF 3

TUBE No.	SAMPLE No.	CaO	K2O	MgO	P2O5	S	Na2O	LOI	TOTAL
1	623001	0.17	3.47	1.29	0.142	<0.01	2.50	2.51	100.03
2	623002	3.11	1.86	2.87	0.196	<0.01	4.57	4.29	100.23
3	623005	0.20	2.98	4.36	0.134	0.02	2.43	3.93	99.98
4	623031	0.14	4.91	0.48	0.133	0.51	0.31	2.49	100.24
5	623032	0.19	4.98	0.74	0.171	0.17	0.34	2.73	99.43
6	623033	0.10	5.07	0.65	0.111	0.01	0.16	2.40	100.04
7	623047	0.04	0.14	0.14	0.017	0.17	6.92	0.44	99.98
8	623081	0.31	3.19	1.80	0.190	0.01	3.07	3.39	100.31
9	623082	0.01	3.44	0.46	0.031	1.22	0.20	3.01	101.42
10	623084	0.03	5.45	1.09	0.045	0.01	0.11	2.32	100.38
11	623089	0.02	2.11	0.93	0.021	0.01	3.16	1.40	99.75
12	623090	0.03	5.54	1.11	0.056	0.01	0.11	2.46	100.22
13	623091	0.12	5.20	1.83	0.111	0.31	0.14	3.03	99.97
14	623092	0.02	4.08	0.91	0.039	0.54	0.12	2.28	100.55
15	623093	0.19	3.93	1.47	0.174	0.17	0.95	3.48	99.45
16	623094	0.25	3.23	2.50	0.189	0.11	2.11	3.74	100.22
17	623101	3.99	2.41	0.96	0.028	0.02	2.22	4.25	100.18
18	623113	0.28	3.41	3.95	0.203	0.01	4.07	4.14	100.31
19	623115	0.15	3.70	1.05	0.136	<0.01	2.20	2.63	100.20
20									
21									
22									
23	DETECTION	0.01	0.01	0.01	0.005	0.01	0.05	0.01	0.01
24	UNITS	%	%	%	%	%	%	%	%
25	METHOD	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

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ANALABS

A Division of Incharge Inspection and
Testing Services Australia Pty. Ltd.

045075

Phone (004) 315837

14 Thirkell St. GOOEE TAS 7320

Fax (004) 318890

ANALYTICAL REPORT No.

100560.60.08688

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.

12158

PROJECT

LMG

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ASAP

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15/04/92

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SAMPLE NUMBERS

SAMPLE DESCRIPTION

ELEMENT/METHOD

17/830019

RC Pres : EP001,EP002,EP010,EP019

Cu, Pb, Zn, Ag/BA101

RC Pres :

Ag/82309

RC Pres :

Ba, As/GX401

RESULTS

TO

Mr K de Bonford
Aberfoyle Resources Limited
P.O. Box 952
BURNIE TAS 7320

REMARKS

ASSAYS ENTERED
BY HAND
22/4/92

RESULTS

TO

RESULTS

TO

AUTHORISED OFFICER

045077

APPENDIX III

045078

ANALABSA Division of Incharge Inspection and
Testing Services Australia Pty. Ltd.

Phone (004) 316837

14 Thirkell St. CODEE TAS 7320

Fax (004) 316890

ANALYTICAL REPORT No. 100560.60.08826

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.**

12199

PROJECT

LMARG

DATE RECEIVED

04/06/92

RESULTS REQUIRED

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**No. OF PAGES
OF RESULTS**

4

**DATE
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30/06/92

**No.
OF COPIES**

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**TOTAL No.
OF SAMPLES**

19

SAMPLE NUMBERS**SAMPLE DESCRIPTION****ELEMENT/METHOD**

625 & others

30 Pres : 6P006, 6P009, 6P012, 6P018

Cu, Pb, Zn, Ag/6P101

Au, Ag/R1, Au/R1/6P309

Ba, As, Cr, U, V/6P401

Al2O3, SiO2, TiO2, Fe2O3, MnO, CaO, K2

RESULTS**TO**Mr & de Bourford
Aberfoyle Resources Limited
P.O. Box 952
BURNIE TAS 7320**RESULTS****TO****RESULTS****TO****REMARKS**H. A.
DRILL CORE
AUTHORISED OFFICER

045079

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

ANALYTICAL DATA

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REPORT NUMBER

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PAGE

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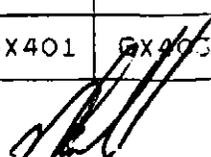
30/06/92

12199

1 OF 4

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Au	Au (R)	Au (S)	Ba	Ba
1	623036	35	<5	224	<2	<0.008	-	-	2750	-
2	623039	38	39	85	<2	<0.008	-	-	1950	-
3	623042	17	11	101	<2	<0.008	-	-	1050	-
4	623044	52	226	679	2	<0.008	-	-	2150	-
5	623056	18	12	56	<2	<0.008	<0.008	-	1150	-
6	623057	17	<5	293	<2	<0.008	-	-	1250	-
7	623060	15	<5	72	<2	<0.008	-	-	330	-
8	623061	90	5	303	<2	<0.008	-	<0.008	460	-
9	623064	71	43	424	<2	<0.008	-	-	1850	-
10	623065	350	39	34	2	0.097	0.101	-	>5000	0.74
11	623069	46	47	337	<2	<0.008	-	-	730	-
12	623099	31	19	36	<2	<0.008	-	-	2050	-
13	623780	62	57	235	2	<0.008	-	-	350	-
14	623783	13	<5	94	<2	<0.008	-	-	430	-
15	623784	21	5	114	<2	<0.008	-	-	1000	-
16	623785	13	9	173	<2	<0.008	-	-	1250	-
17	623787	61	2175	1350	14	<0.008	-	-	500	-
18	623788	42	245	1600	10	0.030	-	-	>5000	2.92
19	623792	16	<5	98	<2	<0.008	-	-	1050	-
20										
21										
22										
23	DETECTION	4	5	4	2	0.008	0.008	0.008	10	0.005
24	UNITS	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

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

ANALYTICAL DATA

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REPORT NUMBER

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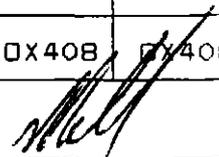
CLIENT ORDER No.

PAGE

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TUBE No.	SAMPLE No.	As	As	Cr	Zr	Ti	TiZr	Al2O3	SiO2	TiO2	
1	623036	15	-	35	200	4250	21.2	20.50	50.5	0.72	
2	623039	15	-	30	160	1910	11.9	14.34	66.5	0.32	
3	623042	10	-	7	180	4510	25.1	20.39	58.2	0.75	
4	623044	55	-	14	140	1790	12.8	11.93	67.5	0.36	
5	623056	40	-	14	310	4690	15.1	19.46	61.2	0.75	
6	623057	3	-	30	160	6090	38.1	18.79	51.1	1.02	
7	623060	15	-	35	160	3330	20.8	17.78	54.6	0.55	
8	623061	4	-	35	150	3240	21.6	18.09	58.3	0.55	
9	623064	40	-	30	180	3900	21.7	19.42	53.3	0.55	
10	623065	45	-	95	160	3660	22.9	18.73	44.2	0.55	
11	623069	16	-	75	150	3460	23.1	17.85	47.9	0.55	
12	623099	35	-	25	180	2590	14.4	11.11	75.6	0.45	
13	623780	7	-	5	110	3720	33.8	11.26	29.8	0.55	
14	623783	17	-	30	120	2730	22.8	13.73	52.3	0.45	
15	623784	19	-	50	140	3400	24.3	16.01	54.8	0.55	
16	623785	17	-	30	140	2860	20.4	15.59	58.7	0.45	
17	623787	>2500	0.36	50	140	2250	16.1	12.25	58.7	0.35	
18	623788	130	-	20	170	6040	35.5	20.23	47.9	1.02	
19	623792	6	-	9	130	6420	49.4	20.55	47.5	1.02	
20											
21											
22											
23	DETECTION	2	0.01	5	5	50	0.1	0.05	0.1	0.01	
24	UNITS	ppm	%	ppm	ppm	ppm	%	%	%	%	
25	METHOD	GX401	GX404	GX401	GX401	OX408	GX401	OX408	OX408	GX408	

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

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A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.

A.C.N. 004 591 664

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REPORT NUMBER

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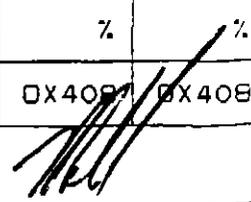
CLIENT ORDER No.

PAGE

		100560.60.08826				30/06/92		12199		3 OF 4	
TUBE No.	SAMPLE No.	Fe2O3	MnO	CaO	K2O	MgO	P2O5	S	Na2O	LOI	
1	623036	9.64	0.97	1.76	6.53	1.95	0.420	0.14	2.74	3.95	
2	623039	4.90	0.78	1.44	6.10	0.84	0.158	0.71	0.30	3.71	
3	623042	6.07	0.06	2.11	1.98	1.46	0.185	0.11	6.91	1.77	
4	623044	5.26	0.25	1.36	7.81	0.35	0.178	2.86	0.16	3.65	
5	623056	4.25	0.06	1.02	1.88	1.65	0.209	0.59	6.37	2.55	
6	623057	10.53	0.37	3.98	4.15	2.02	0.164	0.34	1.28	6.61	
7	623060	6.28	0.08	4.76	1.21	2.52	0.225	0.15	7.71	4.12	
8	623061	10.30	0.31	0.71	1.39	2.11	0.188	0.15	4.99	2.91	
9	623064	5.77	0.16	5.39	4.76	1.24	0.298	0.80	3.65	5.47	
10	623065	16.57	0.03	0.38	7.43	1.37	0.285	4.71	0.13	9.64	
11	623069	9.99	0.31	6.02	1.34	6.04	0.213	0.70	3.40	6.42	
12	623099	2.90	0.06	0.57	2.57	0.99	0.068	0.72	4.16	1.30	
13	623780	4.89	1.17	16.62	4.15	8.37	0.186	0.17	0.17	21.57	
14	623783	6.83	0.13	9.69	1.05	1.75	0.182	0.02	5.74	8.51	
15	623784	12.14	0.15	3.32	3.06	2.37	0.202	0.02	3.44	4.00	
16	623785	6.51	0.13	3.48	3.11	3.00	0.206	0.03	5.81	3.27	
17	623787	6.48	0.17	6.56	2.29	1.48	0.055	2.44	2.93	8.49	
18	623788	5.74	0.84	2.15	9.67	1.66	0.188	2.62	0.75	6.36	
19	623792	6.70	0.12	6.06	3.63	2.49	0.316	0.02	4.76	6.82	
20											
21											
22											
23	DETECTION	0.01	0.01	0.01	0.01	0.01	0.005	0.01	0.05	0.01	
24	UNITS	%	%	%	%	%	%	%	%	%	
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

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A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.
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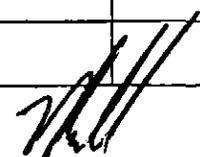
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4 OF 4

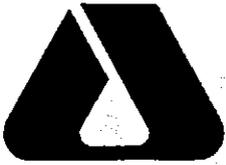
TUBE No.	SAMPLE No.	TOTAL							
1	623036	100.10							
2	623039	100.31							
3	623042	100.12							
4	623044	101.86							
5	623056	100.16							
6	623057	100.50							
7	623060	100.06							
8	623061	100.00							
9	623064	101.09							
10	623065	104.89							
11	623069	100.85							
12	623099	100.76							
13	623780	99.45							
14	623783	100.39							
15	623784	100.20							
16	623785	100.43							
17	623787	102.26							
18	623788	100.44							
19	623792	100.19							
20									
21									
22									
23	DETECTION	0.01							
24	UNITS	%							
25	METHOD	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

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APPENDIX IV



ANALABS

A Division of Incharge Inspection and Testing Services Australia Pty. Ltd

045084

Phone (004) 316837

14 Thirkell St. COOEE TAS 7320

Fax (004) 318890

ANALYTICAL REPORT No.

100560.60.08E08

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

12190

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RESULTS REQUIRED

25/05/92

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OF COPIES

TOTAL No.
OF SAMPLES

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12/06/92

1

17

SAMPLE NUMBERS

SAMPLE DESCRIPTION

ELEMENT/METHOD

23751/787

DB Pres : SP018

Cu,Pb,Zn,Ag/BA101

DB Pres :

Au,Au(8),Au(8)/88309

DB Pres :

Ba,As/SX401

REMARKS

RESULTS
TO

Mr R de Somford
Aberfoyle Resources Limited
P.O. Box 952
BURNIE TAS 7320

HA-8
CORE GRINDS

RESULTS
TO

Empty box for results recipient

RESULTS
TO

Empty box for results recipient

AUTHORISED OFFICER

ANALABS

045085

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

ANALYTICAL DATA

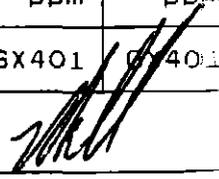
SAMPLE PREFIX REPORT NUMBER REPORT DATE CLIENT ORDER No. PAGE

100560.60.08808 12/06/92 12190 1 OF 1

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Au	Au(R)	Au(S)	Ba	As
1	623751	56	46	313	<2	<0.008	-	-	1500	15
2	623752	141	298	1030	<2	0.031	-	-	1850	70
3	623753	98	486	1040	3	0.012	-	-	1800	85
4	623754	185	479	1350	3	0.020	-	-	1250	70
5	623755	121	477	1740	3	0.017	-	-	1200	65
6	623756	137	1200	3800	6	0.033	-	-	2000	140
7	623757	252	1050	3590	4	0.105	-	0.097	1800	60
8	623758	114	446	1610	3	0.011	-	-	1400	55
9	623759	216	400	1420	4	0.030	-	-	1550	75
10	623760	260	483	2260	4	0.062	-	-	1350	60
11	623761	171	475	1850	3	0.026	-	-	1050	60
12	623762	119	709	2380	5	0.010	0.010	-	1100	50
13	623763	169	614	2410	5	0.014	-	-	1550	70
14	623764	186	795	1680	5	0.023	-	-	2100	100
15	623765	110	381	1500	3	<0.008	-	-	1900	60
16	623766	111	409	1660	3	<0.008	-	-	1700	150
17	623767	96	461	1790	2	<0.008	-	-	1850	25
18										
19										
20										
21										
22										
23	DETECTION	4	5	4	2	0.008	0.008	0.008	10	1
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
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 - = element not determined

AUTHORISED OFFICER



045087

APPENDIX V



ANALABS

A Division of Incharge Inspection and Testing Services Australia Pty. Ltd.

045088

Phone (004) 316837

14 Thirkell St. CODEE TAS 7320

Fax (004) 318890

ANALYTICAL REPORT No.

100560.60.08770

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

12173

DATE RECEIVED

RESULTS REQUIRED

11/05/92

ASAP

No. OF PAGES OF RESULTS

DATE REPORTED

No. OF COPIES

TOTAL No. OF SAMPLES

12

29/05/92

1

274

SAMPLE NUMBERS

SAMPLE DESCRIPTION

ELEMENT/METHOD

623126/623474

50 Pres : 8F015

Cu,Pb,In,As/SR101

Ba,As/SX401

REMARKS

RESULTS

TO

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

RESULTS

TO

RESULTS

TO

AUTHORISED OFFICER

ANALABS

045089

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

ANALYTICAL DATA

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TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Ba	As			
1	623126	23	32	73	<2	1200	16			
2	623127	38	37	89	<2	1250	<2			
3	623128	9	12	28	<2	1550	8			
4	623129	28	17	144	<2	410	8			
5	623130	43	23	94	<2	570	11			
6	623131	15	6	59	<2	550	7			
7	623132	10	9	12	<2	210	11			
8	623133	15	18	37	<2	650	16			
9	623134	12	11	28	<2	150	25			
10	623135	9	12	12	<2	150	8			
11	623136	7	10	6	<2	75	2			
12	623137	7	11	9	<2	100	4			
13	623138	29	44	39	<2	390	4			
14	623139	7	6	6	<2	20	2			
15	623140	7	5	5	<2	18	3			
16	623141	8	<5	14	<2	110	2			
17	623142	12	16	33	<2	190	3			
18	623143	15	10	121	<2	520	7			
19	623144	8	14	8	<2	85	5			
20	623145	45	54	92	<2	1050	25			
21	623146	8	9	8	<2	55	3			
22	623147	8	7	7	<2	14	2			
23	623148	8	<5	<4	<2	13	2			
24	623149	8	<5	11	<2	50	5			
25	623150	22	30	77	<2	360	18			

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TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Ba	As			
1	623151	14	20	55	<2	290	25			
2	623152	7	11	13	<2	180	4			
3	623153	4	11	11	<2	140	4			
4	623154	8	10	15	<2	180	4			
5	623155	6	9	9	<2	100	3			
6	623156	13	39	55	<2	230	40			
7	623157	6	7	<4	<2	<10	3			
8	623158	6	<5	<4	<2	35	2			
9	623159	5	7	6	<2	65	2			
10	623160	5	<5	5	<2	25	2			
11	623161	5	8	17	<2	60	<2			
12	623162	17	32	47	<2	210	4			
13	623164	7	6	13	<2	140	4			
14	623165	13	18	216	<2	630	5			
15	623166	6	<5	18	<2	65	<2			
16	623167	6	<5	6	<2	25	<2			
17	623168	5	<5	<4	<2	12	3			
18	623169	17	16	25	<2	200	3			
19	623176	26	10	15	<2	400	5			
20	623177	30	17	26	<2	820	5			
21	623179	41	16	57	<2	2000	10			
22	623180	34	50	121	<2	490	12			
23	623181	13	15	40	<2	630	5			
24	623182	23	15	55	<2	220	16			
25	623183	40	24	102	<2	300	14			

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TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Ba	As			
1	623184	23	11	141	<2	230	15			
2	623185	36	15	143	<2	490	7			
3	623186	59	41	101	<2	640	8			
4	623187	54	28	112	<2	470	12			
5	623188	39	20	63	<2	360	8			
6	623189	8	9	16	<2	240	5			
7	623190	13	14	126	<2	460	7			
8	623191	20	19	93	<2	550	2			
9	623192	11	7	42	<2	110	10			
10	623193	5	15	7	<2	75	2			
11	623194	5	<5	6	<2	25	3			
12	623195	6	5	6	<2	11	4			
13	623196	5	<5	4	<2	30	<2			
14	623197	6	<5	6	<2	35	4			
15	623198	5	7	7	<2	60	3			
16	623199	10	16	23	<2	150	2			
17	623200	25	44	111	<2	310	14			
18	623201	8	16	14	<2	110	3			
19	623202	7	7	10	<2	40	<2			
20	623203	5	<5	8	<2	40	4			
21	623204	6	7	8	<2	40	<2			
22	623205	10	10	22	<2	170	2			
23	623206	7	20	37	<2	150	2			
24	623208	11	31	21	<2	190	2			
25	623209	10	12	13	<2	190	3			

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TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Ba	As				
1	623210	50	21	58	<2	560	5				
2	623211	13	15	14	<2	310	6				
3	623212	47	16	60	<2	520	12				
4	623213	23	13	125	<2	780	8				
5	623214	10	11	13	<2	150	3				
6	623215	40	57	73	<2	1050	25				
7	623216	8	10	12	<2	260	2				
8	623217	10	10	35	<2	330	<2				
9	623218	8	5	31	<2	450	<2				
10	623219	10	6	13	<2	340	<2				
11	623220	8	9	8	<2	90	<2				
12	623221	29	8	41	<2	1000	4				
13	623222	52	48	78	<2	1750	3				
14	623223	56	72	61	<2	500	15				
15	623224	10	16	25	<2	220	2				
16	623225	7	14	71	<2	450	5				
17	623226	16	25	53	<2	250	14				
18	623227	12	9	39	<2	270	3				
19	623228	19	16	56	<2	380	4				
20	623229	30	14	100	<2	220	4				
21	623230	6	6	8	<2	65	<2				
22	623231	17	19	119	<2	390	7				
23	623232	23	18	210	<2	1050	17				
24	623233	64	19	87	<2	830	4				
25	623234	70	24	338	<2	230	5				

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TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Ba	As			
1	623235	53	20	109	<2	170	18			
2	623236	177	129	302	<2	270	20			
3	623237	129	168	879	<2	270	210			
4	623238	402	690	2012	3	1200	60			
5	623239	17	57	885	<2	1050	75			
6	623240	27	52	1459	<2	650	70			
7	623241	12	17	150	<2	510	4			
8	623242	9	40	59	<2	360	11			
9	623243	50	104	100	<2	1000	25			
10	623244	9	35	59	<2	200	6			
11	623245	14	89	71	<2	480	35			
12	623246	9	13	17	<2	110	<2			
13	623253	53	25	101	<2	350	4			
14	623254	7	33	34	<2	300	3			
15	623255	10	8	83	<2	160	<2			
16	623256	9	11	28	<2	160	3			
17	623257	6	<5	4	<2	30	<2			
18	623258	5	<5	19	<2	790	4			
19	623259	6	6	94	<2	240	2			
20	623260	5	<5	7	<2	40	4			
21	623261	6	8	5	<2	55	<2			
22	623262	6	5	27	<2	390	4			
23	623263	9	<5	13	<2	380	2			
24	623264	6	6	16	<2	310	2			
25	623265	6	11	14	<2	330	<2			

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TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Ba	As			
1	623266	7	6	12	<2	610	4			
2	623267	8	9	13	<2	370	<2			
3	623268	9	9	14	<2	380	<2			
4	623269	14	8	14	<2	100	<2			
5	623270	7	7	9	<2	320	<2			
6	623271	12	6	18	<2	390	<2			
7	623272	89	9	67	<2	960	<2			
8	623274	18	11	53	<2	990	<2			
9	623275	7	6	6	<2	190	<2			
10	623276	8	6	14	<2	490	<2			
11	623277	6	5	7	<2	160	<2			
12	623278	7	5	13	<2	570	<2			
13	623279	6	<5	6	<2	50	<2			
14	623280	27	<5	116	<2	890	3			
15	623282	31	24	100	<2	300	16			
16	623283	16	44	71	<2	160	13			
17	623284	13	13	33	<2	190	6			
18	623285	8	9	144	<2	120	2			
19	623286	12	16	26	<2	190	5			
20	623287	57	31	198	<2	1500	8			
21	623288	122	126	267	<2	1000	25			
22	623289	94	67	47	<2	560	25			
23	623290	30	59	157	<2	900	14			
24	623291	53	424	90	<2	1550	75			
25	623292	45	319	179	<2	1450	50			

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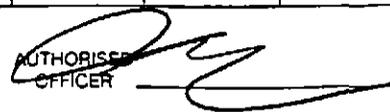
TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Ba	As			
1	623293	534	105	297	<2	3750	70			
2	623294	41	93	159	<2	1250	8			
3	623295	144	112	170	<2	690	30			
4	623296	133	396	100	<2	1350	65			
5	623297	165	416	152	<2	1150	45			
6	623298	66	269	153	<2	900	25			
7	623299	24	74	160	<2	390	45			
8	623300	84	192	177	<2	1100	50			
9	623301	55	831	147	3	2800	160			
10	623302	62	1394	186	<2	1800	1000			
11	623316	96	10	52	<2	170	3			
12	623317	7	<5	15	<2	260	<2			
13	623318	7	12	9	<2	410	<2			
14	623319	14	<5	29	<2	1000	<2			
15	623320	6	<5	6	<2	55	<2			
16	623321	12	<5	65	<2	1050	<2			
17	623322	9	11	14	<2	230	<2			
18	623323	39	48	109	<2	690	7			
19	623324	19	19	65	<2	630	17			
20	623325	7	6	14	<2	400	<2			
21	623327	9	11	7	<2	150	<2			
22	623328	20	17	24	<2	360	<2			
23	623329	14	9	38	<2	250	90			
24	623330	19	18	48	<2	760	11			
25	623331	11	23	44	<2	880	4			

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TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Ba	As			
1	623333	17	29	4	<2	750	6			
2	623334	8	10	11	<2	160	4			
3	623335	39	25	76	<2	810	11			
4	623336	146	105	223	<2	1450	40			
5	623338	19	36	62	<2	170	9			
6	623339	55	33	74	<2	1200	5			
7	623340	13	10	138	<2	630	2			
8	623341	20	28	116	<2	620	8			
9	623342	76	91	160	2	540	25			
10	623344	53	26	180	<2	1200	20			
11	623345	42	18	94	<2	340	11			
12	623346	4	26	15	<2	1000	6			
13	623347	44	19	44	<2	550	50			
14	623348	34	28	130	<2	630	110			
15	623349	23	57	71	<2	420	120			
16	623350	54	71	112	<2	370	30			
1	623351	28	34	141	<2	200	45			
18	623352	57	41	128	<2	540	170			
19	623353	14	27	83	<2	390	730			
20	623369	38	25	35	<2	740	<2			
21	623370	18	22	116	<2	1100	10			
22	623371	41	23	115	<2	960	17			
23	623372	7	<5	30	<2	890	3			
24	623373	4	<5	30	<2	860	3			
25	623374	6	<5	92	<2	1050	<2			

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		100560.60.08770				29/05/92	12173	9 OF 12		
TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Ba	As			
1	623375	8	6	81	<2	1050	9			
2	623376	5	5	10	<2	700	5			
3	623377	5	<5	6	<2	300	<2			
4	623378	<4	<5	8	<2	330	4			
5	623379	5	6	46	<2	330	2			
6	623380	10	27	51	<2	670	11			
7	623382	5	<5	<4	<2	140	<2			
8	623383	15	14	27	<2	140	11			
9	623384	10	19	54	<2	370	6			
10	623385	14	23	35	<2	120	14			
11	623386	7	18	44	<2	170	6			
12	623387	6	14	21	<2	95	6			
13	623388	6	20	71	<2	70	13			
14	623389	8	14	65	<2	85	18			
15	623390	36	21	138	<2	150	16			
16	623391	16	12	32	<2	80	5			
17	623393	104	36	256	<2	220	35			
18	623395	5	<5	<4	<2	440	2			
19	623398	51	13	107	<2	1000	16			
20	623399	23	9	218	<2	430	9			
21	623400	90	28	201	<2	230	40			
22	623401	26	98	75	<2	290	40			
23	623402	45	61	120	<2	300	35			
24	623405	8	29	189	<2	1300	30			
25	623406	5	10	33	<2	750	3			

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TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Ba	As				
1	623407	4	7	<4	<2	75	3				
2	623409	5	16	21	<2	200	7				
3	623410	4	17	40	<2	180	3				
4	623422	10	14	161	<2	1050	5				
5	623423	17	27	39	<2	720	6				
6	623424	10	10	29	<2	430	<2				
7	623425	8	16	8	<2	160	2				
8	623426	5	11	11	<2	680	<2				
9	623427	5	5	11	<2	850	2				
10	623428	5	6	5	<2	410	<2				
11	623429	5	5	9	<2	910	4				
12	623430	5	5	4	<2	1050	2				
13	623431	7	15	17	<2	280	4				
14	623432	5	5	10	<2	310	3				
15	623433	8	10	39	<2	440	5				
16	623434	8	16	23	<2	840	<2				
17	623435	10	12	18	<2	190	3				
18	623437	4	5	4	<2	60	<2				
19	623438	11	7	84	<2	570	3				
20	623439	5	6	11	<2	380	<2				
21	623440	17	15	8	<2	130	<2				
22	623441	123	186	92	<2	2200	11				
23	623442	35	29	39	<2	440	12				
24	623444	72	12	69	<2	1400	18				
25	623445	75	16	64	<2	590	19				

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TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Ba	As			
1	623446	66	18	49	<2	680	20			
2	623447	73	26	29	<2	580	35			
3	623448	57	26	102	<2	810	45			
4	623449	6	5	<4	<2	25	<2			
5	623450	7	6	5	2	15	2			
6	623451	24	14	269	<2	120	15			
7	623452	94	49	257	<2	300	19			
8	623453	69	24	204	<2	690	30			
9	623456	5	61	192	<2	660	45			
10	623457	5	<5	24	<2	490	300			
11	623459	7	11	50	<2	1350	30			
12	623460	12	13	46	<2	700	14			
13	623461	10	15	15	<2	300	9			
14	623462	7	10	6	<2	75	2			
15	623465	6	<5	<4	<2	100	<2			
16	623466	6	5	<4	<2	80	<2			
17	623467	6	5	<4	<2	40	<2			
18	623468	5	10	<4	<2	20	3			
19	623469	6	<5	<4	<2	10	2			
20	623470	5	9	32	<2	240	6			
21	623471	4	6	<4	<2	45	<2			
22	623472	4	6	<4	<2	75	<2			
23	623473	4	7	<4	<2	120	2			
24	623474	4	6	4	<2	110	<2			
25										

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

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A.C.N. 004 581 664

ANALYTICAL DATA

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CLIENT ORDER No.

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29/05/92

12173

12 OF 12

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Ba	As			
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	4	5	4	2	10	2			
24	UNITS	ppm	ppm	ppm	ppm	ppm	ppm			
25	METHOD	GA101	GA101	GA101	GA101	GX401	GX401			

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A Division of Incharge Inspection and Testing Services Australia Pty. Ltd.

045101

Phone (004) 316837

14 Thirkell St. 800EE TAS 7320

Fax (004) 319890

ANALYTICAL REPORT No.

100560.60.08811

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

12191

L. PIARG

DATE RECEIVED

RESULTS REQUIRED

25/05/92

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No. OF PAGES OF RESULTS

DATE REPORTED

No. OF COPIES

TOTAL No. OF SAMPLES

12

22/06/92

1

287

SAMPLE NUMBERS

SAMPLE DESCRIPTION

ELEMENT/METHOD

62307/623679

SD Prec : SP006.SP009.SP013

Cu,Pb,Zn,Ag/BA101

Ba,Pb/BX401

RESULTS

TO

Mr R de Bonford
Aberfoyle Resources Limited
P.O. Box 952
BURNIE TAS 7320

REMARKS

Nos. 624043 AND 623679
ARE OUT OF ORDER IN REPORT.
THIS IS NOTED AND O.K.

RESULTS

TO

RESULTS

TO

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A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.

A.C.N. 004 591 664

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REPORT NUMBER

REPORT DATE

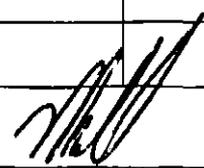
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PAGE

		100560.60.08811				23/06/92		12191		1 OF 12	
TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Ba	As				
1	623307	23	30	166	<2	290	6				
2	623308	6	6	52	<2	120	2				
3	623309	8	8	16	<2	75	3				
4	623310	7	<5	11	<2	60	<2				
5	623311	7	6	12	<2	35	<2				
6	623312	7	6	67	<2	100	8				
7	623313	11	<5	42	<2	990	7				
8	623314	7	<5	18	<2	320	4				
9	623315	7	29	22	<2	730	4				
10	623359	94	12	86	<2	570	9				
11	623360	40	32	55	<2	290	8				
12	623361	4	<5	19	<2	170	<2				
13	623362	6	<5	33	<2	130	3				
14	623363	8	15	57	<2	370	4				
15	623364	5	<5	10	<2	40	<2				
16	623365	6	6	66	<2	440	15				
17	623366	5	<5	17	<2	100	2				
18	623367	17	15	154	<2	530	6				
19	623368	4	<5	11	<2	35	<2				
20	623413	5	<5	41	<2	180	3				
21	623414	5	<5	13	<2	160	<2				
22	623415	6	5	65	<2	1050	4				
23	623416	4	<5	12	<2	13	<2				
24	623417	4	<5	12	<2	55	4				
25	623420	5	<5	21	<2	640	3				

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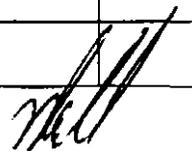
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TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Ba	As			
1	623421	5	<5	22	<2	820	3			
2	623476	7	10	52	<2	900	19			
3	623477	7	10	20	<2	490	4			
4	623478	4	<5	15	<2	460	3			
5	623479	8	14	23	<2	260	6			
6	623480	6	<5	12	<2	55	3			
7	623485	5	<5	16	<2	130	5			
8	623486	5	<5	13	<2	620	3			
9	623487	4	<5	57	<2	1100	<2			
10	623488	5	<5	22	<2	350	4			
11	623490	6	<5	14	<2	180	<2			
12	623491	7	<5	36	<2	350	9			
13	623493	6	6	19	<2	390	5			
14	623494	40	6	121	<2	340	4			
15	623495	12	9	19	<2	110	3			
16	623496	7	5	29	<2	70	6			
17	623497	6	<5	14	<2	40	5			
18	623500	6	10	22	<2	160	2			
19	623501	7	<5	15	<2	16	2			
20	623504	5	<5	14	<2	140	2			
21	623505	5	<5	<4	<2	40	4			
22	623506	5	<5	11	<2	260	5			
23	623507	6	6	46	<2	500	2			
24	623508	5	<5	9	<2	130	<2			
25	623510	5	6	8	<2	1050	<2			

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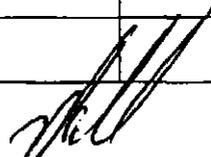
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TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Ba	As			
1	623512	5	45	28	<2	120	35			
2	623513	14	17	118	<2	480	4			
3	623514	6	14	63	<2	380	6			
4	623515	6	8	20	<2	190	3			
5	623518	7	<5	27	<2	820	3			
6	623519	5	<5	27	<2	1050	2			
7	623520	5	<5	10	<2	190	3			
8	623521	5	<5	48	<2	560	<2			
9	623523	6	9	14	<2	290	2			
10	623524	8	<5	18	<2	790	2			
11	623525	6	<5	16	<2	330	4			
12	623530	6	<5	7	<2	130	2			
13	623531	8	5	15	<2	120	3			
14	623532	9	12	13	<2	190	3			
15	623533	10	7	14	<2	270	2			
16	623534	16	5	22	<2	380	7			
17	623535	10	11	12	<2	140	<2			
18	623536	9	11	52	<2	590	5			
19	623537	9	10	14	<2	210	3			
20	623538	9	5	11	<2	65	2			
21	623539	10	6	13	<2	220	<2			
22	623540	13	9	18	<2	80	<2			
23	623544	14	182	34	<2	1100	<2			
24	623545	6	5	27	<2	460	<2			
25	623546	10	44	24	<2	540	<2			

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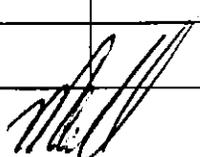
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TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Ba	As			
1	623547	12	17	85	<2	240	45			
2	623548	16	20	178	<2	500	50			
3	623550	12	15	152	<2	530	30			
4	623551	15	18	187	<2	520	50			
5	623557	8	6	29	<2	380	2			
6	623558	12	26	58	<2	560	6			
7	623559	11	<5	35	<2	1050	<2			
8	623560	7	<5	6	<2	130	<2			
9	623561	8	<5	7	<2	330	<2			
10	623562	7	<5	17	<2	480	4			
11	623563	9	12	8	<2	190	<2			
12	623569	7	<5	90	<2	340	2			
13	623570	6	<5	14	<2	410	<2			
14	623571	7	<5	18	<2	300	<2			
15	623572	8	<5	12	<2	95	<2			
16	623573	7	<5	6	<2	95	<2			
17	623575	6	5	12	<2	190	<2			
18	623576	5	8	17	<2	220	2			
19	623578	4	5	7	<2	60	<2			
20	623580	5	5	12	<2	55	<2			
21	623581	5	7	7	<2	75	<2			
22	623582	5	14	10	<2	190	<2			
23	623583	5	125	15	<2	1000	<2			
24	623587	10	25	71	<2	650	9			
25	623588	8	22	109	<2	210	8			

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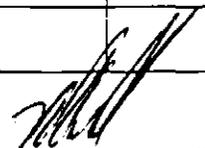
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TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Ba	As			
1	623589	17	41	152	<2	330	<2			
2	623592	18	19	119	<2	150	3			
3	623593	29	18	83	<2	140	6			
4	623594	14	22	133	<2	620	10			
5	623595	62	14	189	<2	780	14			
6	623596	6	13	17	<2	260	<2			
7	623597	5	14	12	<2	70	<2			
8	623598	10	15	33	<2	220	4			
9	623599	6	16	25	<2	210	30			
10	623601	22	43	98	<2	1050	<2			
11	623604	15	9	60	<2	1100	2			
12	623605	4	6	16	<2	510	<2			
13	623606	4	9	9	<2	65	<2			
14	623607	5	7	24	<2	670	<2			
15	623608	5	<5	22	<2	990	<2			
16	623609	4	8	12	<2	360	<2			
17	623610	7	16	42	<2	1000	<2			
18	623611	4	11	12	<2	870	2			
19	623612	5	11	20	<2	1650	<2			
20	623614	5	<5	19	<2	470	<2			
21	623615	6	8	17	<2	500	8			
22	623616	12	<5	32	<2	2050	9			
23	623617	6	<5	16	<2	85	<2			
24	623618	4	<5	21	<2	340	<2			
25	623619	5	<5	15	<2	130	<2			

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A.C.N. 004 591 664**ANALYTICAL DATA**

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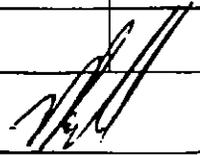
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		100560.60.08811				22/06/92		12191		6 OF 12	
TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Ba	As				
1	623620	4	<5	14	<2	200	<2				
2	623621	8	6	23	<2	420	<2				
3	623625	7	10	21	<2	100	3				
4	623626	5	5	14	<2	150	<2				
5	623627	6	13	19	<2	220	<2				
6	623629	6	12	15	<2	210	2				
7	623630	4	150	15	<2	1250	2				
8	623631	5	12	16	<2	280	<2				
9	623632	5	<5	11	<2	60	<2				
10	623633	42	15	74	<2	1150	8				
11	623634	62	8	81	<2	1350	3				
12	623635	6	<5	13	<2	55	<2				
13	623636	11	<5	10	<2	75	<2				
14	623637	82	114	58	<2	1000	<2				
15	623638	157	<5	53	<2	1450	2				
16	623639	7	<5	9	<2	140	<2				
17	623640	11	8	23	<2	280	<2				
18	623641	10	<5	10	<2	120	<2				
19	623642	6	<5	7	<2	<10	<2				
20	623643	6	<5	7	<2	17	<2				
21	623644	7	<5	8	<2	35	<2				
22	623645	9	7	10	<2	240	<2				
23	623648	9	<5	59	<2	1450	<2				
24	623655	17	17	14	<2	440	4				
25	623656	8	8	9	<2	450	<2				

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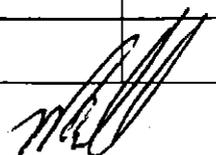
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TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Ba	As			
1	623657	12	8	21	<2	570	<2			
2	623659	8	7	16	<2	290	<2			
3	623660	7	7	27	<2	180	4			
4	623661	8	<5	13	<2	440	<2			
5	623662	9	6	13	<2	480	<2			
6	623663	8	41	74	<2	270	5			
7	623664	6	14	75	<2	250	4			
8	623665	6	5	51	<2	130	<2			
9	623666	8	7	111	<2	200	<2			
10	623667	6	<5	8	<2	60	<2			
11	623668	6	<5	9	<2	260	<2			
12	623669	7	<5	10	<2	50	<2			
13	623670	6	<5	6	<2	50	<2			
14	623674	29	31	51	<2	860	<2			
15	623675	6	13	35	<2	1200	<2			
16	623676	13	14	29	<2	740	<2			
1	623677	6	<5	8	<2	150	<2			
18	623678	5	<5	6	<2	80	<2			
19	623680	8	5	13	<2	160	<2			
20	623681	5	<5	6	<2	130	<2			
21	623682	8	6	28	<2	220	5			
22	623683	19	28	79	<2	560	10			
23	623684	19	11	90	<2	280	8			
24	623685	54	25	113	<2	510	8			
25	623686	96	21	100	<2	260	25			

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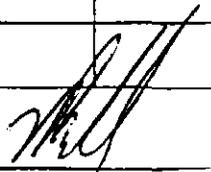
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		100560.60.08811				22/06/92	12191		8 OF 12	
TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Ba	As			
1	623687	8	5	9	<2	200	<2			
2	623689	12	14	85	<2	1300	<2			
3	623702	6	6	20	<2	780	<2			
4	623703	7	<5	18	<2	630	<2			
5	623714	8	15	39	<2	800	2			
6	623715	13	5	64	<2	520	2			
7	623716	14	6	42	<2	330	<2			
8	623717	8	<5	10	<2	110	<2			
9	623718	10	<5	20	<2	60	<2			
10	623719	10	6	54	<2	940	<2			
11	623720	7	<5	8	<2	110	<2			
12	623721	6	<5	15	<2	180	<2			
13	623722	7	<5	14	<2	140	<2			
14	623723	8	<5	10	<2	170	<2			
15	623724	9	<5	10	<2	90	<2			
16	623726	6	5	12	<2	250	<2			
17	623727	7	<5	8	<2	50	<2			
18	623728	7	<5	11	<2	60	<2			
19	623729	8	<5	8	<2	90	<2			
20	623730	7	<5	8	<2	90	2			
21	623731	7	<5	10	<2	130	2			
22	623734	7	<5	9	<2	90	3			
23	623742	10	6	9	<2	110	4			
*24	624043 *	8	<5	12	<2	300	2			
25	623746	7	<5	8	<2	45	<2			

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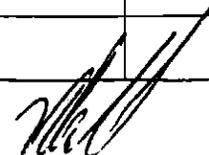
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TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Ba	As			
1	623747	7	5	8	<2	140	6			
2	624002	11	<5	10	<2	130	3			
3	624003	18	<5	11	<2	120	3			
4	624004	9	<5	11	<2	100	3			
5	624005	7	<5	9	<2	90	2			
6	624006	7	<5	7	<2	65	4			
7	624013	7	<5	8	<2	85	2			
8	624014	21	<5	7	<2	180	3			
9	624015	7	<5	9	<2	50	5			
10	624016	6	<5	9	<2	50	5			
11	624018	13	<5	9	<2	230	8			
12	624021	8	<5	23	<2	160	4			
13	624022	7	6	11	<2	230	4			
14	624023	10	15	18	<2	320	4			
15	624024	9	<5	9	<2	80	4			
16	624025	11	14	17	<2	260	5			
17	624026	15	16	14	<2	260	2			
18	624027	7	<5	9	<2	75	5			
19	624041	7	<5	9	<2	220	<2			
20	624042	9	<5	22	<2	1400	6			
21	624044	11	<5	29	<2	1050	3			
22	624045	7	<5	18	<2	710	2			
23	624046	10	<5	9	<2	690	2			
24	624048	11	<5	11	<2	100	3			
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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

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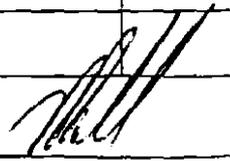
A Division of Inchcape Inspection and Testing Services Australia Pty. Ltd.
A.C.N. 004 591 564

ANALYTICAL DATA

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5	624054	4	<5	11	<2	80	4
6	624056	4	<5	19	<2	270	<2
7	624057	4	<5	10	<2	160	<2
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9	624059	4	<5	6	<2	150	3
10	624063	5	<5	11	<2	150	3
11	624066	4	<5	9	<2	80	3
12	624067	5	<5	11	<2	1350	6
13	624068	8	<5	25	<2	700	4
14	624069	4	<5	18	<2	300	2
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18	624073	5	<5	10	<2	440	4
19	624074	4	<5	10	<2	140	3
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21	624076	7	<5	10	<2	75	5
22	624077	4	<5	9	<2	170	3
23	624078	4	<5	9	<2	150	3
24	624079	<4	5	10	<2	190	2
25	624080	4	<5	10	<2	110	2

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

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REPORT NUMBER

REPORT DATE

CLIENT ORDER No.

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22/06/92

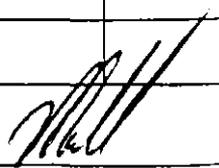
12191

11 OF 12

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2	624084	4	<5	8	<2	70	2			
3	624085	6	<5	13	<2	40	4			
4	624089	8	<5	25	<2	470	5			
5	624091	5	<5	8	<2	65	2			
6	624092	7	5	18	<2	820	6			
7	624093	6	19	9	<2	130	3			
8	624094	6	5	11	<2	240	4			
9	624095	4	7	11	<2	300	6			
10	624097	4	5	8	<2	80	<2			
11	624098	4	12	20	<2	300	<2			
12	624099	5	<5	9	<2	140	3			
13	624100	5	<5	9	<2	70	<2			
14	624101	5	<5	9	<2	170	<2			
15	624102	7	11	25	<2	330	<2			
16	624106	5	<5	11	<2	200	2			
17	624107	4	<5	9	<2	260	<2			
18	624108	4	<5	9	<2	120	<2			
19	624109	4	<5	9	<2	95	<2			
20	624110	4	<5	12	<2	550	2			
21	624112	4	<5	8	<2	100	<2			
22	624113	6	<5	9	<2	30	<2			
23	624114	4	<5	10	<2	170	<2			
24	624115	5	<5	16	<2	470	<2			
25	624118	5	<5	9	<2	65	<2			

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

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A.C.N. 004 581 664

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ANALYTICAL DATA

SAMPLE PREFIX

REPORT NUMBER

REPORT DATE

CLIENT ORDER No.

PAGE

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23/06/92

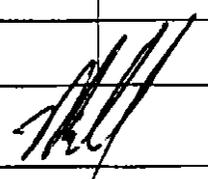
12191

12 OF 12

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Ba	As			
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2	624125	8	<5	97	<2	460	<2			
3	624126	6	<5	19	<2	340	<2			
4	624127	5	<5	8	<2	75	<2			
5	624128	14	5	19	<2	250	2			
6	624133	7	80	53	<2	840	2			
7	624134	5	<5	10	<2	90	<2			
8	624135	7	<5	34	<2	760	3			
9	624137	6	<5	17	<2	260	<2			
10	624138	10	<5	14	<2	300	3			
11	624139	5	<5	18	<2	620	<2			
12	* 623679 *	6	<5	6	<2	50	2			
13										
14										
15										
16										
17										
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19										
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22										
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Results in ppm unless otherwise specified
 T = element present; but concentration too low to measure
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 - = element not determined

AUTHORISED OFFICER



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APPENDIX VI

Sirotope



CSIRO
AUSTRALIA

045115

Division of Exploration Geoscience
Delhi Road, North Ryde, NSW Postal Address: PO Box 136, North Ryde NSW 2113
Telephone (02) 887 8666. Telex AA25817 Fax (02) 887 8909

**REPORT ON A Pb ISOTOPE STUDY OF
SULFIDE AND ALTERED WALLROCK CLASTS
FROM A VOLCANIC BRECCIA
IN THE CENTRAL VOLCANIC COMPLEX, WESTERN TASMANIA**

SIROTOPE REPORT SR 165

GRAHAM R. CARR

25/05/92

R e s e a r c h A d v a n c i n g A u s t r a l i a

1. INTRODUCTION

The aim of this study has been to compare the Pb isotope ratios of galena samples and altered wallrock clasts from andesitic breccias of the Central Volcanic Complex with the target signatures for Cambrian massive sulfide mineralization of the Mt Read Volcanics.

2. SAMPLES

Seven galena rich samples from separate sulfide clasts were provided by Robert Gibson of CODES (MS clasts 1 - 7). A single clast, provided by Dave Wallace (562358), also originates from clast 6. In addition, two altered wallrock fragments were provided for analysis (marked Fault Block 1 and 2). The samples were collected from recent exposures of andesitic breccias in an HEC spillway at approx GR 80000mE, 58500mN.

Analytical methods are described in Appendix 1.

3. TARGET Pb ISOTOPIC SIGNATURES

The target signatures for mineralization at Hellyer and Que River, established by Gulson and Porritt (1987), have been revised in this report based on recent analyses of Hellyer by Bruce Gemmell and the authors and on a reappraisal of available data from Que River. A comparison of the old and new signatures is presented in Figures 1 and 2.

The recent analyses of Hellyer ores will be reported fully elsewhere by Gemmell et al. The new data combined with the old data, indicate a much more homogeneous population than previously defined. This has been brought about by excluding two points in the original dataset (MG18 284.7m, MG18 287.4m) and a single point from the new dataset (JBG 006-1 2ASEZ) which have lower $^{206}\text{Pb}/^{204}\text{Pb}$ ratios and can be shown to be part of a different population to the majority of the data.

The revised Que River target signature is based on analyses, carried out in 1986 by G. Carr, of Que River ores from D. Whitford's collection as well as two bulk ore pulps. It is also more homogeneous, and has lower $^{207}\text{Pb}/^{204}\text{Pb}$ and $^{208}\text{Pb}/^{204}\text{Pb}$ ratios than the original signature which was also based on the Whitford collection samples (reported in Gulson and Porritt, 1987). The difference between the two signatures results both from more controlled fractionation (see Appendix 2) in the newer analyses and from the recognition of some data outliers which, like at Hellyer, represent a different, subordinate population.

It is significant that the Hellyer outliers plot within the Que River signature and the Que River outliers within the Hellyer signature. This indicates the probability that slight changes in the isotopic composition of the ore fluids occurred over the period of deposition of the ores in each deposit and that the bulk of the Pb at Hellyer and Que River were deposited at slightly different stages of development of these ore fluids.

4. RESULTS

The Pb isotopic ratios of the galena-rich clasts plot as two separate populations (Table 1, Figs 3 and 4). Clasts 1 and 5 plot within the revised Hellyer signature and clasts 2, 3, 4, 6 (including 562358) and clast 7 plots within the redefined Que River ellipse. The duplicate analyses plot well within the analytical precision.

The altered wallrock fragments contain relatively low levels of Pb (26 and 228 ppm) and are significantly more radiogenic than the massive sulfide signatures (pts 12, 13 and 14, Fig. 3)

5. INTERPRETATION

The Pb isotope ratios of galenas from all of the clasts point strongly to a Cambrian origin for the Pb. The two different populations indicate that the Pb isotopic composition of the hydrothermal fluid evolved over the period of deposition of the sulfides, in a similar manner to the evolution at Que River and Hellyer described above.

A preliminary investigation of the distribution of Pb isotopic ratios of Cambrian mineralization in the Hellyer - Mt Lyell region indicates that there is a correlation of data with respect to the stratigraphic position of the host lithologies. Mineralization in the Central Volcanic Complex has isotopic ratios which are generally similar to the Rosebery signature. However, some mineralization may have the Que River or Hellyer signature in addition to the Rosebery signature (e.g. Koonya, Mt Lyell, Red Hills, Pinnacles). In contrast, mineralization in the Dundas and Tyndall Groups has only the Que River and/or the Hellyer signatures.

The results for the clasts are thus unique, in that they are, to our knowledge, the only examples of CVC mineralization that does not contain at least some Pb with the Rosebery signature. On a purely observational level, this data might be used to question the stratigraphic correlation of the host lithologies of the sulfide breccias. However, there is only a limited understanding of the geological basis for the Pb isotope variation throughout the Mt Read Volcanics. Current Research work at CSIRO and CODES is aimed at redressing this situation by determining the association between ore and source rock initial ratios. With such knowledge it is envisaged a confident assessment will be

possible of the relationship between individual examples of mineralization and the complex hydrothermal history of the Mt Read Volcanics.

The altered wallrock fragments contain radiogenic Pb which was probably derived *in situ* since alteration. On both diagrams of Figure 3 they define linear arrays which project through the galena clast data. This is necessary, though not sufficient, evidence for a genetic association between Pb in the clasts and in the altered volcanics.

8. REFERENCES

- Cumming, G.L. and Richards, J.R. (1975). Ore lead isotope ratios in a continuously changing Earth. *Earth Planet. Sci. Letts*, 28, pp. 155-171.
- Gulson B.L. and Porritt, P.M., 1987. Base metal exploration of the Mount Read Volcanics, Western Tasmania: Pt. II. Lead isotope signatures and genetic implications. *Econ. Geol.*, 82, pp. 308-327.

APPENDIX 1

Galena was handpicked, dissolved in concentrated HNO_3 and Pb purified by micro-electrodeposition onto Pt electrodes. Analyses of duplicate handpicked galena crystal fragments were undertaken on three of the clasts.

A small amount of each powder from the pulverised wallrock fragments was weighed into a teflon beaker and digested in a hot mixture of 7N HCl and 7N HNO_3 . Lead was extracted by anion exchange methods in dilute HBr acid solutions and purified by micro-electrodeposition onto Pt electrodes.

Lead isotope ratios were determined on a VG ISOMASS 54E thermal ionization mass spectrometer run in fully automated mode. The results have been normalized to the accepted values of international standard NBS 981 by applying a correction factor of +0.08% per atomic mass unit. Precision estimates, shown as error bars in the upper left hand corner of the accompanying Figures, are based on over 1300 analyses of international standards and natural samples. Also shown are the 95% confidence ellipses for these standard data.

Lead concentrations were determined simultaneously with isotope ratios by isotope dilution techniques by adding a known amount of ^{202}Pb spike at the initial dissolution stage, and are precise to within about $\pm 5\%$ for low to moderate Pb samples. However, for high Pb samples (about > 1000 ppm), the measurement of the $^{206}\text{Pb}/^{202}\text{Pb}$ ratio becomes increasingly inaccurate so that the calculated Pb levels are only an approximation.

APPENDIX 2 - LEARNING TO COPE WITH Pb ISOTOPE DIAGRAMS

Variation of the Pb isotope ratios shown on the common XY plots ($^{206}\text{Pb}/^{204}\text{Pb}$, $^{207}\text{Pb}/^{204}\text{Pb}$, $^{208}\text{Pb}/^{204}\text{Pb}$), results principally from geological 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 $^{238}\text{U}/^{204}\text{Pb}$ (μ) and $^{232}\text{Th}/^{204}\text{Pb}$) 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 $^{206}\text{Pb}/^{204}\text{Pb}$, $^{207}\text{Pb}/^{204}\text{Pb}$ and $^{208}\text{Pb}/^{204}\text{Pb}$. 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 $^{207}\text{Pb}/^{204}\text{Pb}$ vs $^{206}\text{Pb}/^{204}\text{Pb}$ 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 ^{232}Th respectively. However with "low-Pb" samples (generally less than 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 $^{206}\text{Pb}/^{204}\text{Pb}$, $^{207}\text{Pb}/^{204}\text{Pb}$ and $^{208}\text{Pb}/^{204}\text{Pb}$ 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 $^{208}\text{Pb}/^{204}\text{Pb}$ vs $^{206}\text{Pb}/^{204}\text{Pb}$ diagram the slope of the line is dependant on the Th/U ratio of the sample, whereas on the $^{207}\text{Pb}/^{204}\text{Pb}$ vs $^{206}\text{Pb}/^{204}\text{Pb}$ 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 estimate 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.

Table 1. Lead isotope ratios of clasts and wallrock fragments.

Sample	$\frac{208\text{Pb}}{206\text{Pb}}$	$\frac{207\text{Pb}}{206\text{Pb}}$	$\frac{208\text{Pb}}{204\text{Pb}}$	$\frac{207\text{Pb}}{204\text{Pb}}$	$\frac{208\text{Pb}}{204\text{Pb}}$	Pb(ppm)
1 M.S. CLAST 1	2.0789	0.8507	18.339	15.601	38.126	
2 M.S. CLAST 1R	2.0779	0.8504	18.334	15.592	38.097	
3 M.S. CLAST 2	2.0809	0.8522	18.318	15.610	38.118	
4 M.S. CLAST 3	2.0798	0.8515	18.319	15.599	38.100	
5 M.S. CLAST 4	2.0809	0.8520	18.312	15.601	38.104	
6 M.S. CLAST 5	2.0772	0.8500	18.347	15.585	38.110	
7 M.S. CLAST 5R	2.0782	0.8504	18.346	15.601	38.127	
8 M.S. CLAST 6	2.0800	0.8521	18.300	15.594	38.064	
9 562358	2.0802	0.8521	18.298	15.581	38.063	
10 M.S. CLAST 7	2.0802	0.8521	18.291	15.585	38.049	
11 M.S. CLAST 7R	2.0803	0.8521	18.297	15.590	38.063	
12 FAULT BLOCK 1	2.0667	0.8435	18.518	15.621	38.273	228
13 FAULT BLOCK 2	2.0132	0.8031	19.535	15.689	39.327	26
14 FAULT BLOCK 2 R	2.0121	0.8032	19.516	15.675	39.269	26

Sample number prefixes refer to points plotted in the figures.
R refers to repeat analysis.

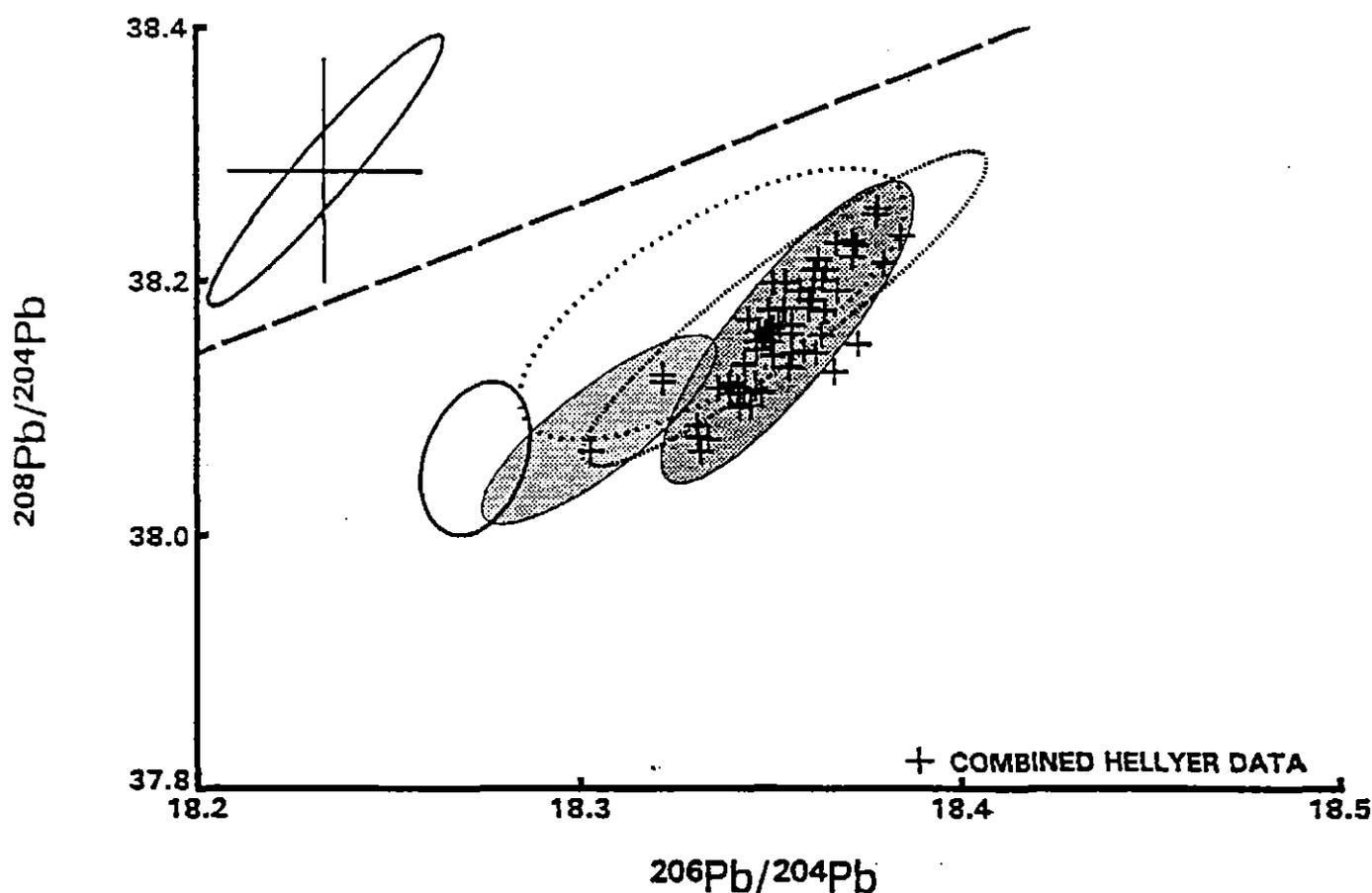
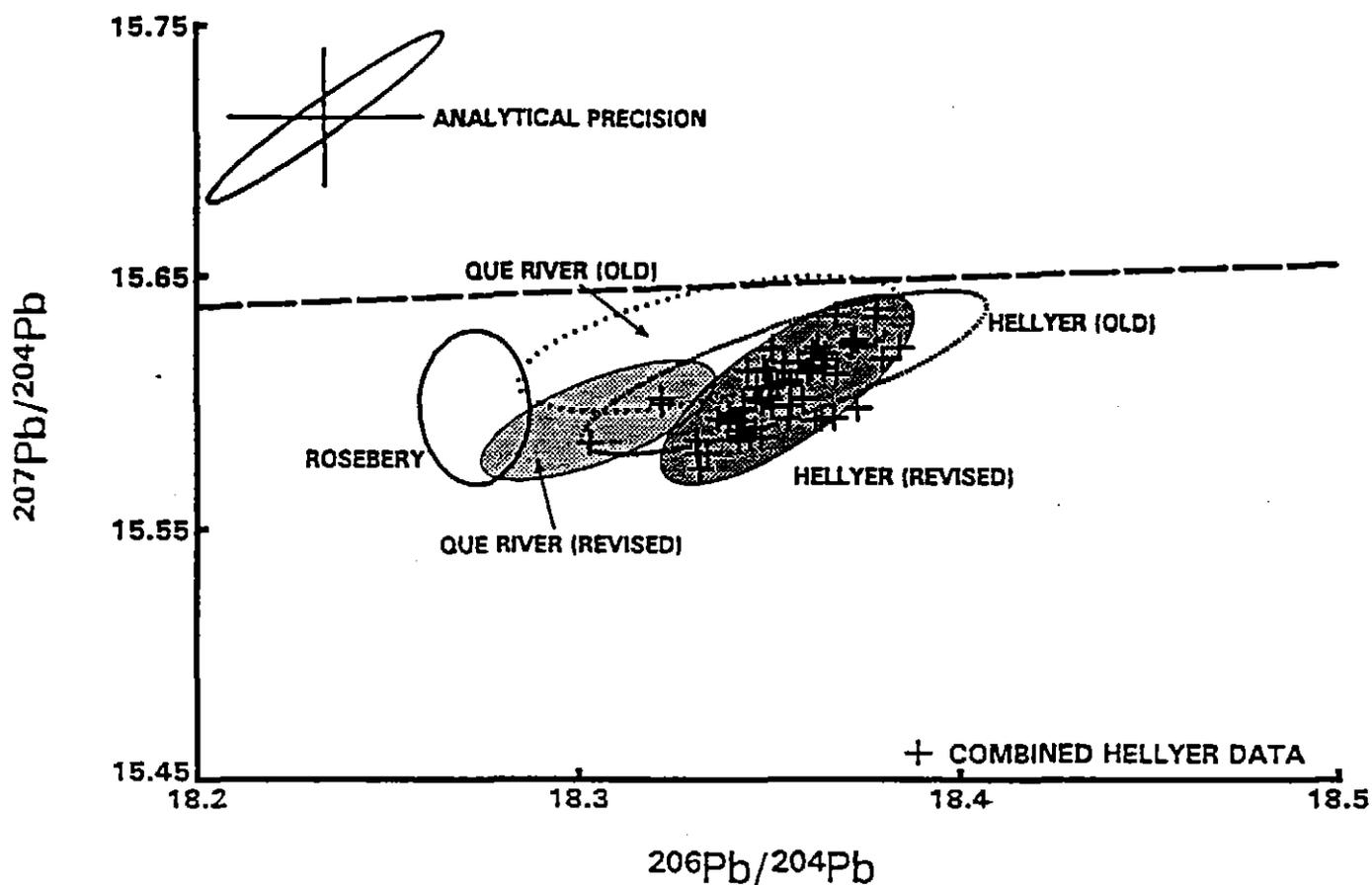


Figure 1. Lead isotope ratio diagrams comparing the 95% confidence ellipses for Hellyer (old and revised), Que River (old and revised) and Rosebery. Also shown is the complete Hellyer ore data with the three data outliers not included in the ellipse calculation. The Pb evolution curve (growth curve) of Cumming and Richards (1975) is shown for reference.

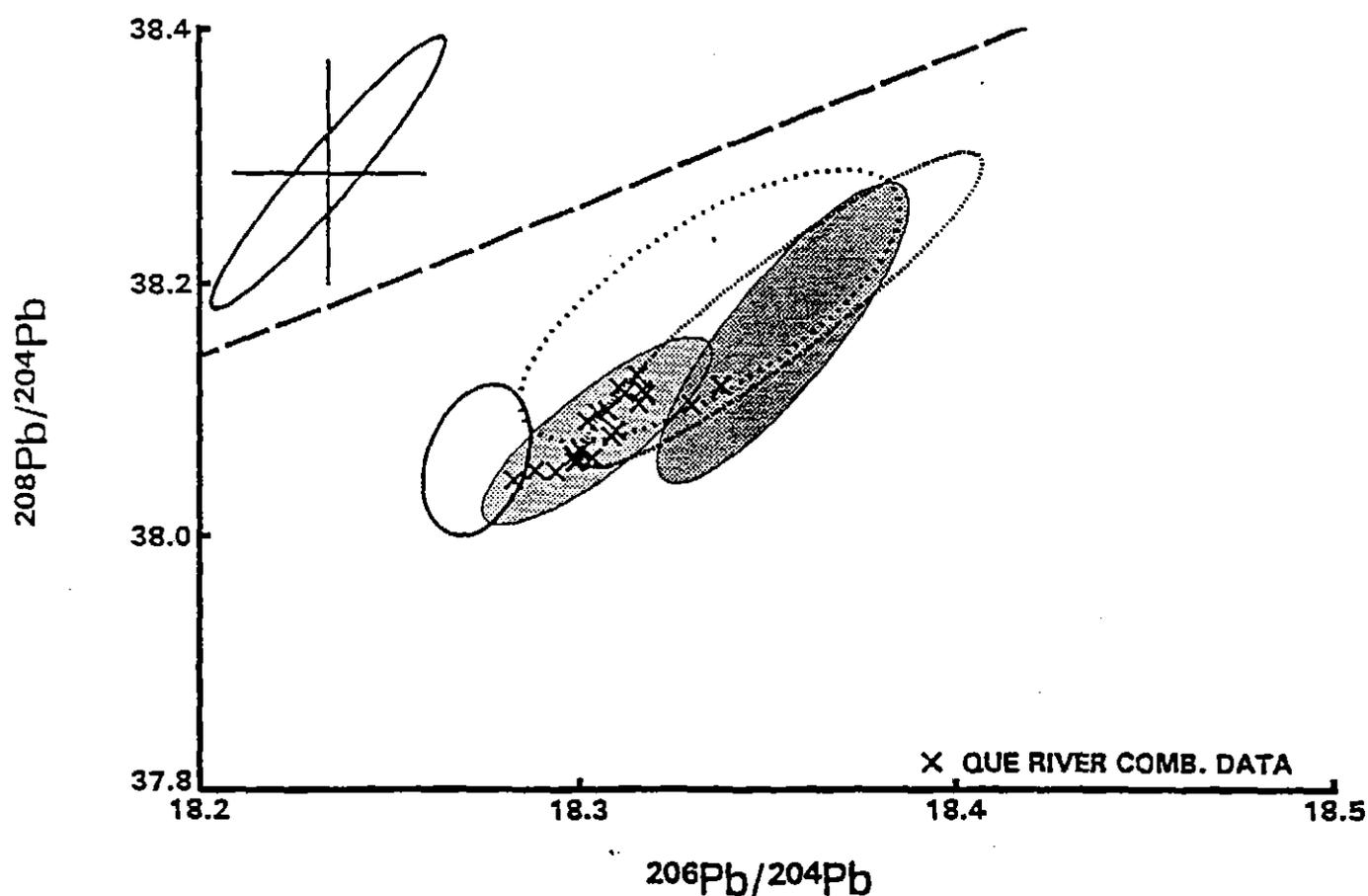
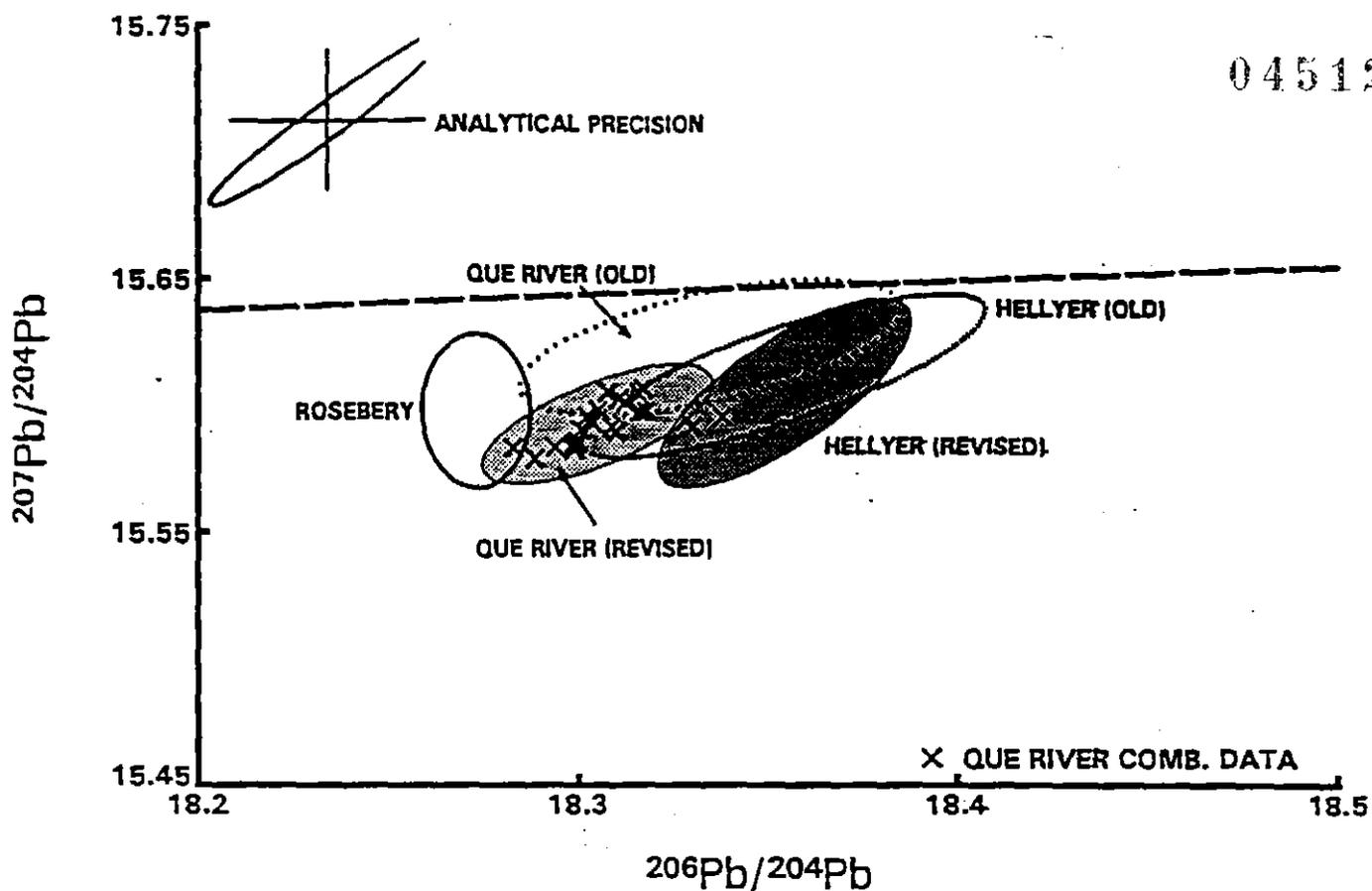


Figure 2. Lead isotope ratio diagrams comparing the 95% confidence ellipses for Hellyer (old and revised), Que River (old and revised) and Rosebery. Also shown is the complete Que River ore data with the two data outliers not included in the ellipse calculation. The Pb evolution curve (growth curve) of Cumming and Richards (1975) is shown for reference.

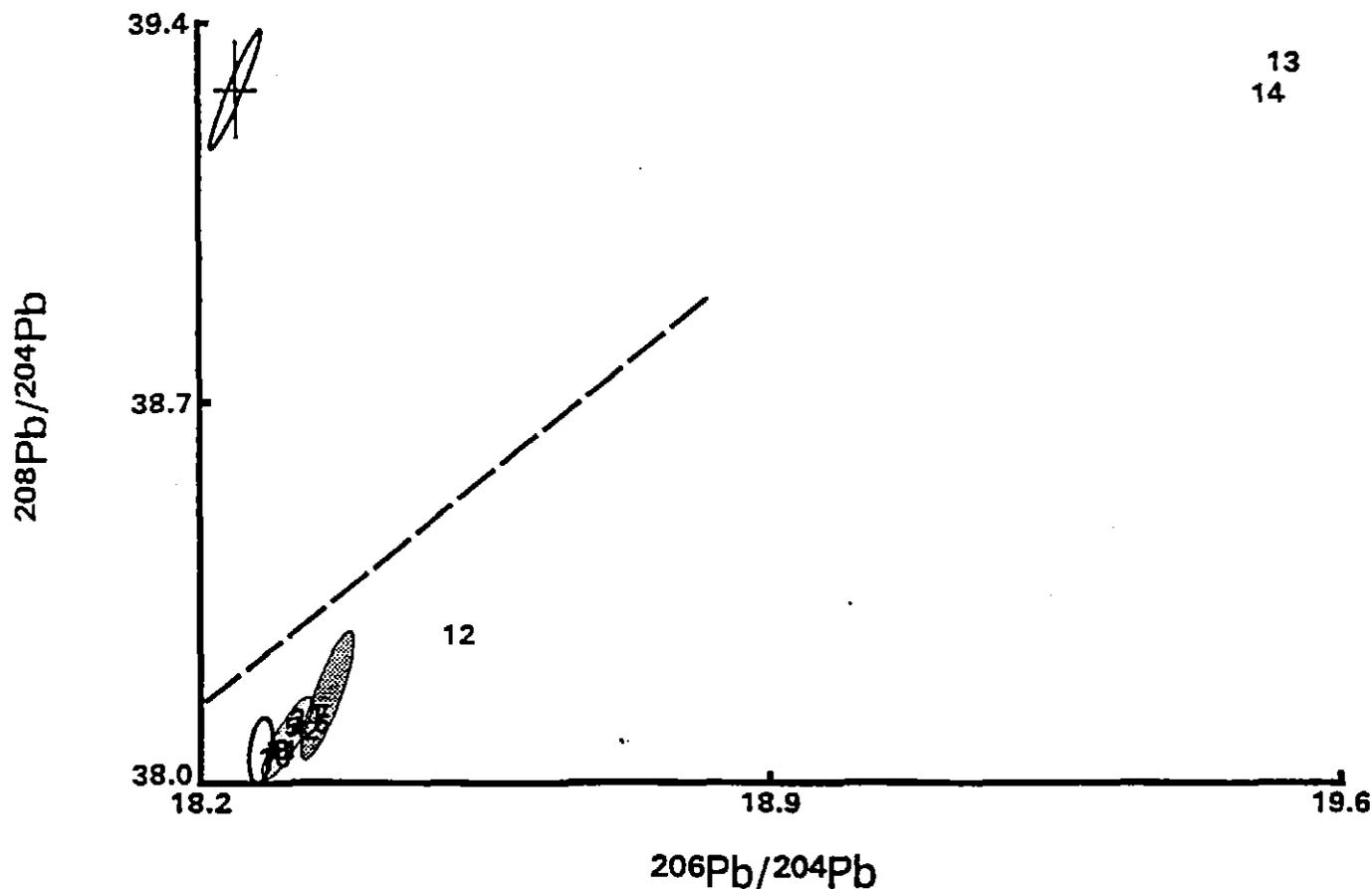
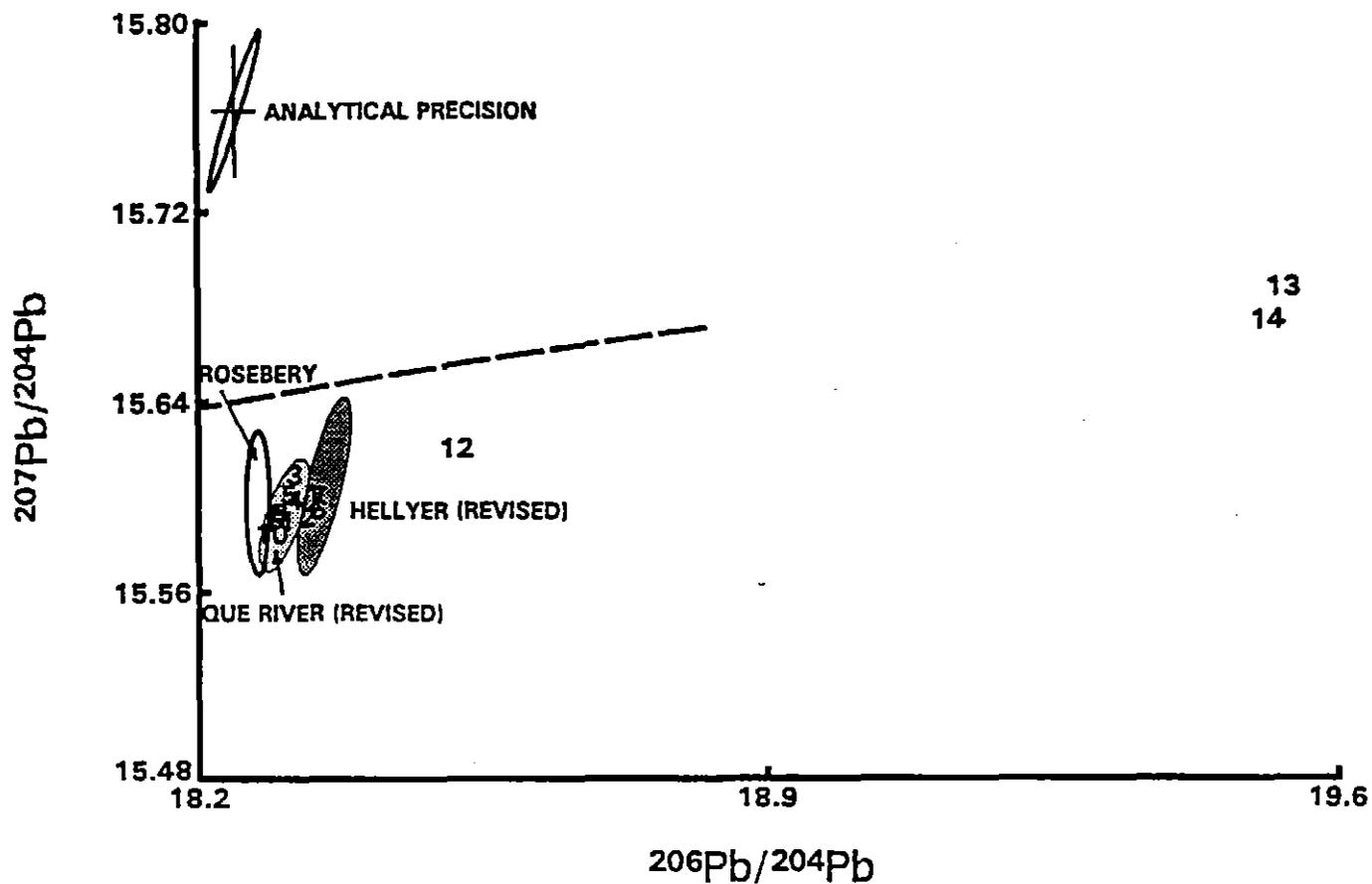


Figure 3. Lead isotope ratio diagrams of the results from this study plotted in comparison to the 95% confidence ellipses for Rosebery, Que River (revised) and Hellyer (revised). The numbered points refer to data in Table 1. The Pb evolution curve (growth curve) of Cumming and Richards (1975) is shown for reference

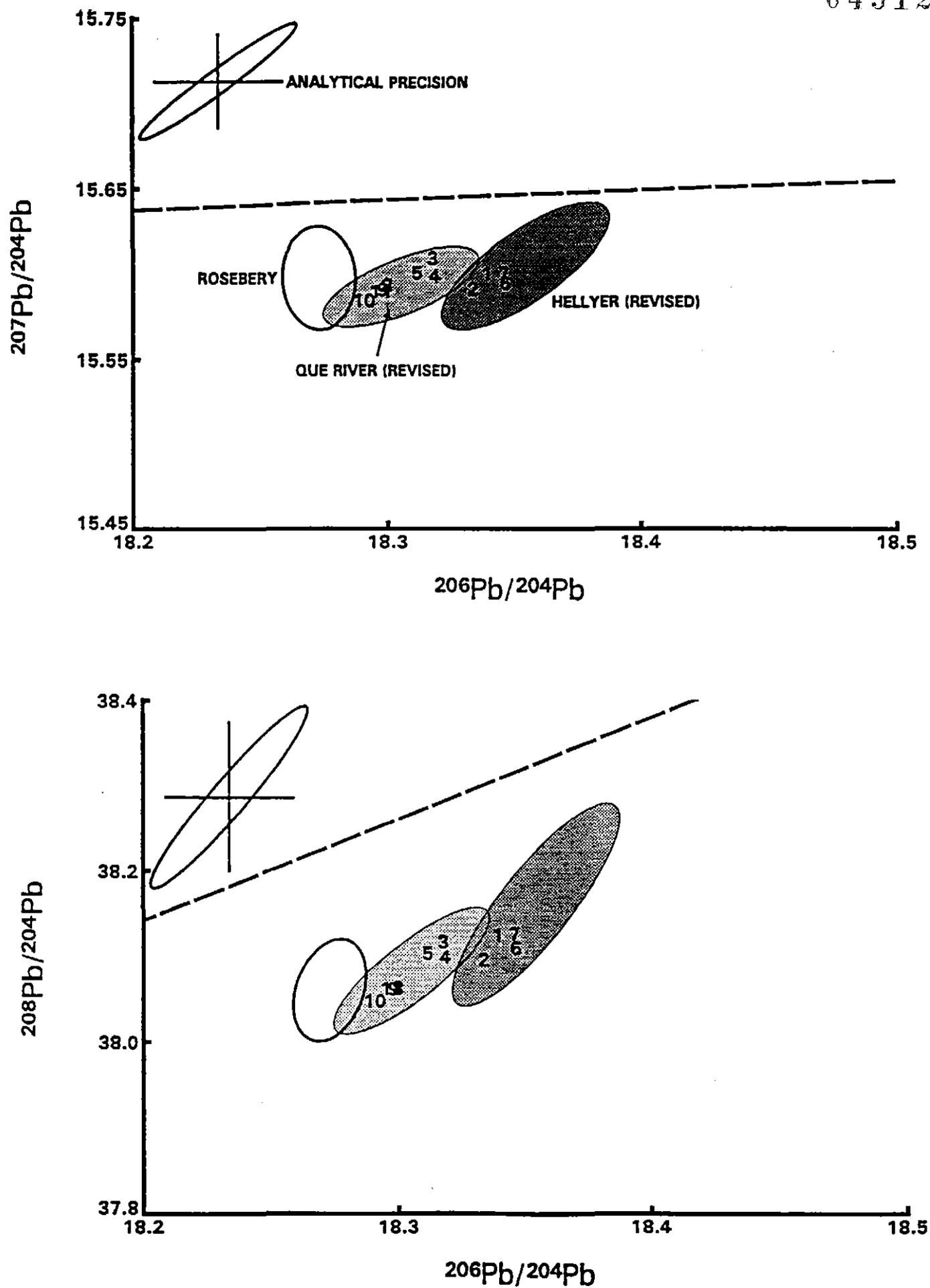


Figure 4. An expanded scale plot of Figure 3.

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APPENDIX VII



CSIRO
AUSTRALIA

045128

Division of Exploration Geoscience
Institute of Minerals, Energy and Construction
51 Delhi Road, North Ryde, NSW. Postal Address: PO Box 136, North Ryde, NSW 2113
Telephone: (02) 887 8666. Telex: AA25817. Fax: (02) 887 8909

Chief: Dr. B.E. Hobbs

**REPORT TO ABERFOYLE RESOURCES LIMITED
ON A Pb ISOTOPE STUDY OF SAMPLES FROM
THE NEWTON CREEK PROSPECT,
LAKE MARGARET E.L., WESTERN TASMANIA**

SIROTOPE REPORT SR 233

JUDITH A. DEAN
03/09/92

A u s t r a l i a n S c i e n c e , A u s t r a l i a ' s F u t u r e

Floreat Park

Location: Underwood Avenue, Floreat Park
Postal Address: CSIRO Private Bag,
PO Wembley WA 6014
Telephone: (09) 387 0200
Fax: (09) 387 8642
Telex: AA92178

Townsville

Location: Davies Laboratory, University Road, Townsville
Postal Address: Private Mail Bag,
PO Aitkenvale QLD 4814
Telephone: (077) 71 9511
Fax: (077) 25 1009

Lindfield

Location: Bradfield Road, Lindfield
Postal Address: PO Box 218
Lindfield NSW 2070
Telephone: (02) 413 7733, 413 7211
Fax: (02) 413 7202
Telex: AA26296

1. INTRODUCTION

The aim of this study has been to determine the Pb isotopic compositions of ten samples from the Newton Creek area within Aberfoyle's Lake Margaret E.L. north of Queenstown. Comparisons are drawn between the data for these samples and revised signatures for Cambrian volcanic-hosted massive sulfide (VHMS) mineralization hosted by the Mount Read Volcanics, and also to previous analyses from the Tyndall mine and Henty Fault Zone. Other data from the Lake Margaret E.L. and probable post-Cambrian mineralization in the Murchison Gorge area are also compared.

The target signatures for mineralization at Hellyer and Que River were revised by Carr and Dean (1992) based on recent analyses of Hellyer by Bruce Gemmell and the authors, and on a reappraisal of available data from Que River from Gulson and Porritt (1987) and Carr (1986). The combination of the old and new datasets indicate more homogeneous populations for Que River and Hellyer than previously defined.

2. SAMPLES

Ten samples were provided by Robina Sharpe. Sample numbers, locations and metal assays, as provided, are given in Table 1.

623031, 815, 813, 806 and 807 are from highly altered sericite, silica and chlorite zones in andesite in the Henty Canal area.

623076 is chert from a horizon which contains the massive sulfide boulders at the Newton Dam spillway.

623087 is residue from ferrous adit drainage at the site of the former Tyndall Mine and 623046 is gossanous float nearby to these workings.

623043 and 623097 are from drill holes at the Howards anomaly, close to the Newton Dam spillway near Tyndall.

Methods of Pb isotope analysis are given in Appendix 1.

3. RESULTS

Lead isotope ratios and Pb contents determined by isotope dilution are given in Table 2 and plotted in Figure 1 with reference to the average crustal Pb evolution curve, or growth curve, of Cumming and

Richards (1975), and the revised target signatures discussed above. In Figure 2, the data are compared to previous results from the Tyndall/Henty Fault Zone area (Gulson and Porritt, 1987) and mineralized clasts from the Anthony Road spillway (Carr, 1992). Data from other prospects in the Lake Margaret E.L. and the Murchison Gorge area located to the northeast are also shown. Figure 3 shows all the data on a $^{206}\text{Pb}/^{204}\text{Pb}$ vs Pb content (depicted as a logarithmic function) diagram.

Lead contents determined by isotope dilution agree well with the values provided. The data form a **heterogeneous group** with a range in $^{206}\text{Pb}/^{204}\text{Pb}$ ratios from 18.350 for 623031 (point 1) to 18.731 for 623046 (point 3). At least some of this variation can be ascribed to radiogenic addition, meaning that some of these results **do not represent initial Pb isotope ratios**. Radiogenic addition has resulted from the *in situ* radioactive decay of U and Th to Pb since the Lower Palaeozoic (^{238}U decays to ^{206}Pb , ^{235}U decays to ^{207}Pb , ^{232}Th decays to ^{208}Pb ; ^{204}Pb has remained constant throughout geological time) and depends on the initial U/Pb ratios of the rock or mineralization. Thus samples with low-Pb contents, such as 623046 with 27 ppm Pb, probably reflect a relatively large radiogenic component. However, galenas and high-Pb samples almost certainly have ratios which **have not** been modified by any post-depositional radiogenic addition and thus reflect the Pb isotopic composition of the mineralizing fluid at the time it was depositing Pb.

It is not possible to state with absolute certainty which of the samples with less than ≈ 1000 ppm Pb are likely to represent **initial Pb isotope ratios**. Samples with > 500 ppm Pb are unlikely to have a substantial radiogenic component and thus probably do reflect initial ratios. However, the data for samples with Pb contents of < 300 ppm are more difficult to interpret.

4. INTERPRETATION

Based on the reservations outlined above, the following conclusions can be made as to the metallogenic association of these samples.

Galenas from **Howards Anomaly DDH HA8 and HA5** (points 2 and 6, Fig. 1) are similar in isotopic composition and plot within, or very close to, the redefined Hellyer target. In the more immediate area, both the Mt Lyell deposit and sulfide boulders at the Anthony Road Spillway have two discrete, homogeneous Pb isotope populations (Fig. 2). These are similar to the Rosebery/Hercules and to the Hellyer signatures, and indicate the interaction of two discrete hydrothermal systems separated in space and/or time. However, at Lake Selina to the northeast, the Pb isotopic compositions are more heterogeneous and vary from less radiogenic to more radiogenic than the combined Cambrian fields. Such heterogeneity is atypical of VHMS mineralization and may indicate deeper hydrothermal activity more closely associated with the intrusion of the Murchison Granite. The Howards Anomaly results from this study thus indicate a possible close association with one of the Cambrian hydrothermal events, but with only two datapoints, it is not possible to rule out the possibility that the data are part

of a heterogeneous (Lake Selina) type signature.

A similar conclusion can be drawn from the data for sample 623031 (point 1, Fig. 1) with 530 ppm Pb from the highly altered sericite-silica-chlorite zone in andesite at **Henty Canal** which has an identical isotopic composition to Hellyer. Two others from this style of alteration 623813 and 623815 (points 9 and 10, Fig. 1) have similar ratios and Pb contents (≈ 670 ppm) to each other but plot just outside the 95% confidence ellipse for Hellyer. The metallogenic association of the other two samples from this area, 623806 and 623807 (points 7 and 8, Fig. 1) is difficult to assess because of their relatively low-Pb contents (≈ 200 ppm). Uranium contents of ≈ 4 ppm in the Cambrian would have been required to shift the ratios from the Hellyer $^{206}\text{Pb}/^{204}\text{Pb}$ value to the ratios now measured. The relationship between Pb content and $^{206}\text{Pb}/^{204}\text{Pb}$ ratios in these samples is similar to data from the Henty Fault Zone prospect (Gulson and Porritt, 1987; Figs 2 and 3).

Chert 623076 (point 4, Fig. 1) from the horizon which contains the massive sulfide boulders at the Anthony Road spillway also has a radiogenic isotopic composition compared to the target and a relatively low-Pb content (250 ppm). A previously analysed altered wallrock fragment with 228 ppm Pb from the same area is almost identical in isotopic composition to the chert sample (Fig. 3).

The **Tyndall Mine** samples 623087 and 623046 (points 5 and 3 respectively, Fig. 1) are radiogenic compared to the Cambrian VHMS targets. For the gossanous float sample with only 27 ppm Pb, the radiogeneity is almost certainly in part related to radiogenic addition. However, the residue sample probably represents an initial ratio since it has a Pb content of 1340 ppm and thus is similar to galena from the Tyndall prospect (Fig. 2; Gulson and Porritt, 1987) of probable Devonian age.

Other data shown in Figures 2 and 3 are from probable post-Cambrian galena mineralization in the Murchison Gorge are (Mount Farrell, Murchison Lode, Tullah Lode, Murchison Bridge; Gulson and Porritt, 1987). They are, with the exception of one Tullah Lode sample, enriched in ^{206}Pb and ^{208}Pb compared to the VHMS targets, and high-Pb data from Howards anomaly and the Henty Canal alteration. Lake Margaret E.L. data (Carr and Dean, 1990) generally also have higher $^{208}\text{Pb}/^{204}\text{Pb}$ ratios but similar $^{206}\text{Pb}/^{204}\text{Pb}$ ratios to Rosebery.

5. CONCLUSIONS

The similarity of the **Howards Anomaly** galenas with the Hellyer target is evidence for a similar Cambrian metallogenic event, although a Lake Selina type signature cannot be ruled out.

The three least radiogenic **Henty Canal alteration** samples have relatively high-Pb contents and since they plot within or close to the Hellyer target are also considered prospective for VHMS mineralization, with the same caveat as for Howards Anomaly. The higher $^{206}\text{Pb}/^{204}\text{Pb}$ ratios of the

other two samples are probably a result of radiogenic addition.

The high-Pb Tyndall sample probably represents an initial Pb isotope ratio and is similar to galena from the Tyndall prospect. Due to the difference of these two samples from the Cambrian targets, they are interpreted as representing a different style of mineralization, probably related to Devonian hydrothermal activity. The isotopic composition of 623046 can be explained by radiogenic addition of Pb since the Palaeozoic.

Chert from the massive sulfide boulder horizon has an enigmatic isotopic composition. Its low-Pb content and similarity to an altered wallrock fragment, both in Pb content and isotope ratios, may be evidence for a metallogenic association similar to the Anthony Road Spillway low-Pb sample.

6. REFERENCES

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TABLE 1

Pb Isotope Samples
 Newton Creek Prospect
 Lake Margaret EL 5/85

Co-Ordinates		Sample No:	Cu	CSIRO			Ag	Au
Easting	Northing			Pb	Pb ppm	Zn		
380000	5359112	I220 623031	whole rock	-	530	-	-	-
DDH HA8	at 41m	I221 623043	-	-	gn	-	-	-
380500	5359300	I222 623046	whole rock	-	27	-	-	-
380030	5358315	I223 623076	36	250	26	154	<2	<0.008
380490	5359300	I224 623087	1595	1305	136	2095	<2	-
DDH HA5	at 126.8m	I225 623097	-	-	gn	-	-	-
380330	5360070	I226 623806	15	249	231	869	2	<0.008
380320	5356065	I227 623807	13	198	148	288	3	<0.008
380030	5359140	I228 623813	103	660	670	1553	2	0.069
380050	5359180	I229 623815	40	665	657	766	2	<0.002

TABLE 2. LEAD ISOTOPE DATA FOR SAMPLES FROM THE NEWTON CREEK PROSPECT, LAKE MARGARET E.L., WESTERN TASMANIA

Sample	$\frac{208\text{Pb}}{206\text{Pb}}$	$\frac{207\text{Pb}}{206\text{Pb}}$	$\frac{206\text{Pb}}{204\text{Pb}}$	$\frac{207\text{Pb}}{204\text{Pb}}$	$\frac{208\text{Pb}}{204\text{Pb}}$	Pb(ppm)
1 623031	2.0792	0.8496	18.350	15.591	38.152	531
2 623043gn	2.0777	0.8493	18.361	15.595	38.150	
3 623046	2.0645	0.8330	18.731	15.602	38.670	27
4 623076	2.0679	0.8438	18.497	15.607	38.250	246
5 623087	2.0670	0.8411	18.547	15.600	38.337	1340
6 623097gn	2.0764	0.8485	18.375	15.591	38.153	
7 623806	2.0758	0.8467	18.445	15.618	38.288	231
8 623807	2.0716	0.8447	18.480	15.611	38.284	193
9 623813	2.0752	0.8479	18.387	15.590	38.157	677
10 623815	2.0752	0.8474	18.413	15.602	38.211	657

gn denotes galena

Pb contents determined by isotope dilution

Samples 1, 7 - 10 Henty Canal

Sample 4 chert from horizon which contains massive sulfide boulders

Samples 2 and 6 Howards anomaly

Sample 5 residue from ferrous adit drainage at Tyndall Mine

Sample 3 gossanous float near to Tyndall

SAMPLE NUMBER PREFIXES REFER TO PLOTTED POINTS IN FIGURE 1

NEWTON CREEK PROSPECT

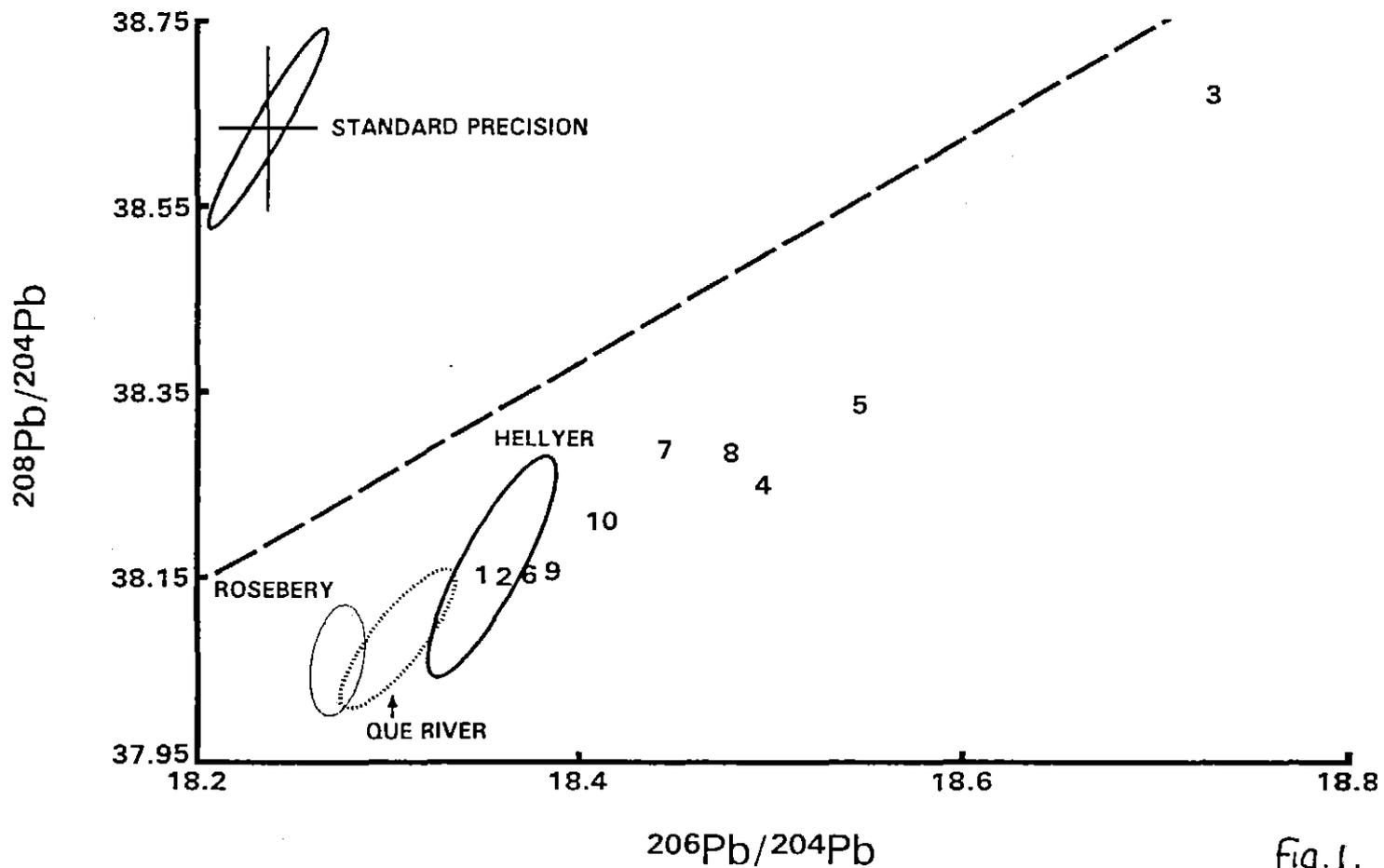
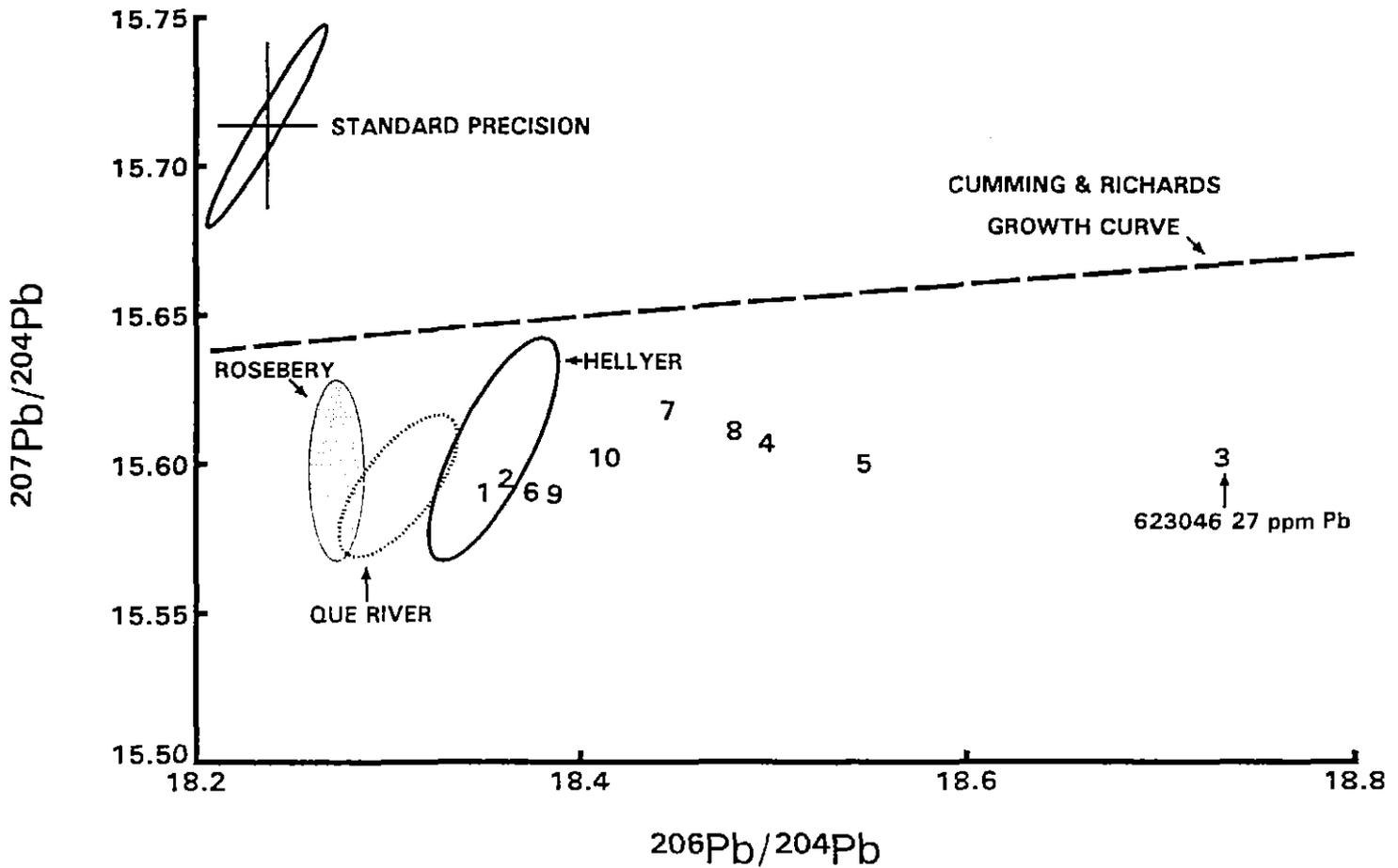


Fig. 1.

ALL DATA LAKE MARGARET E.L.

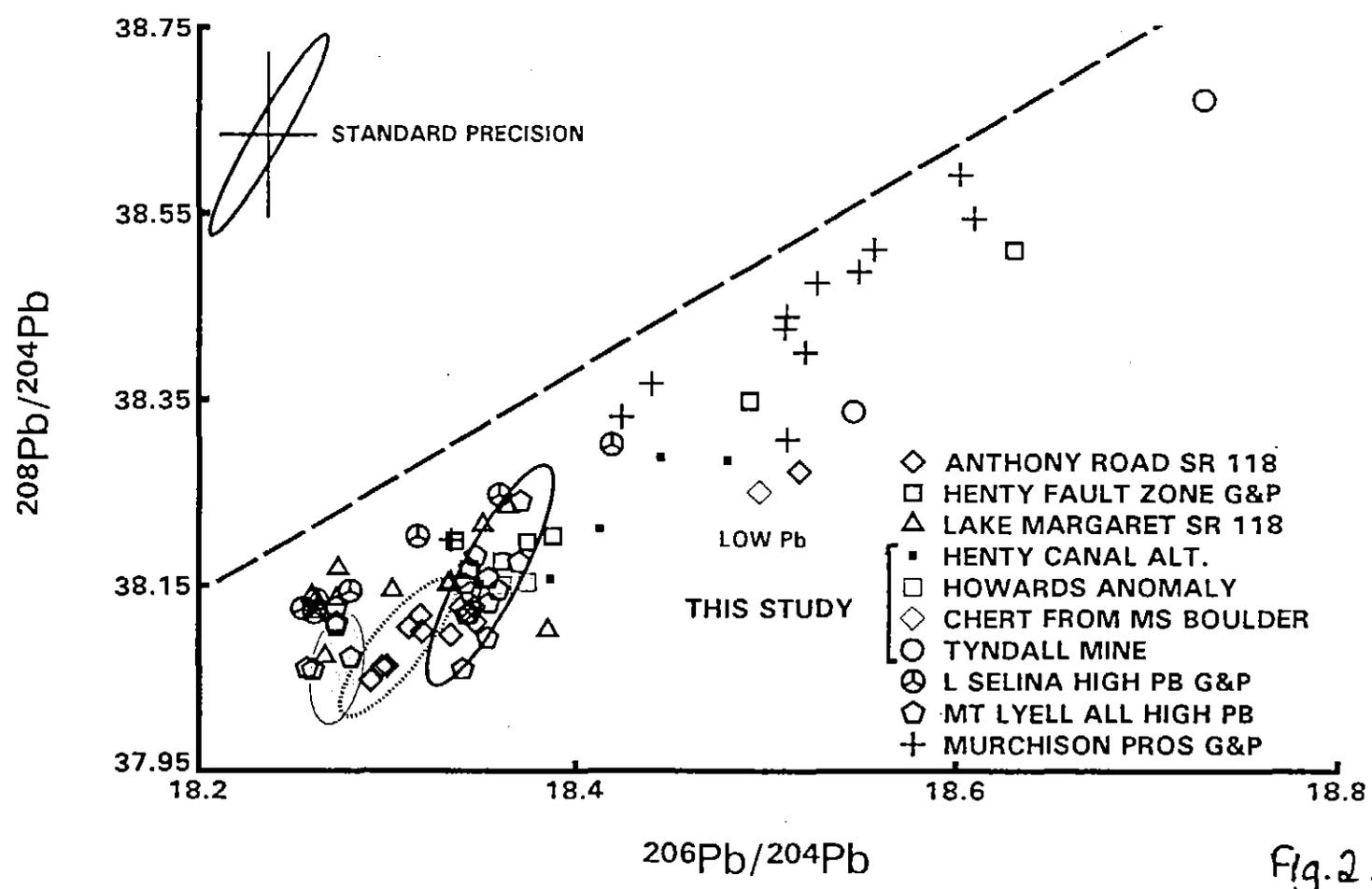
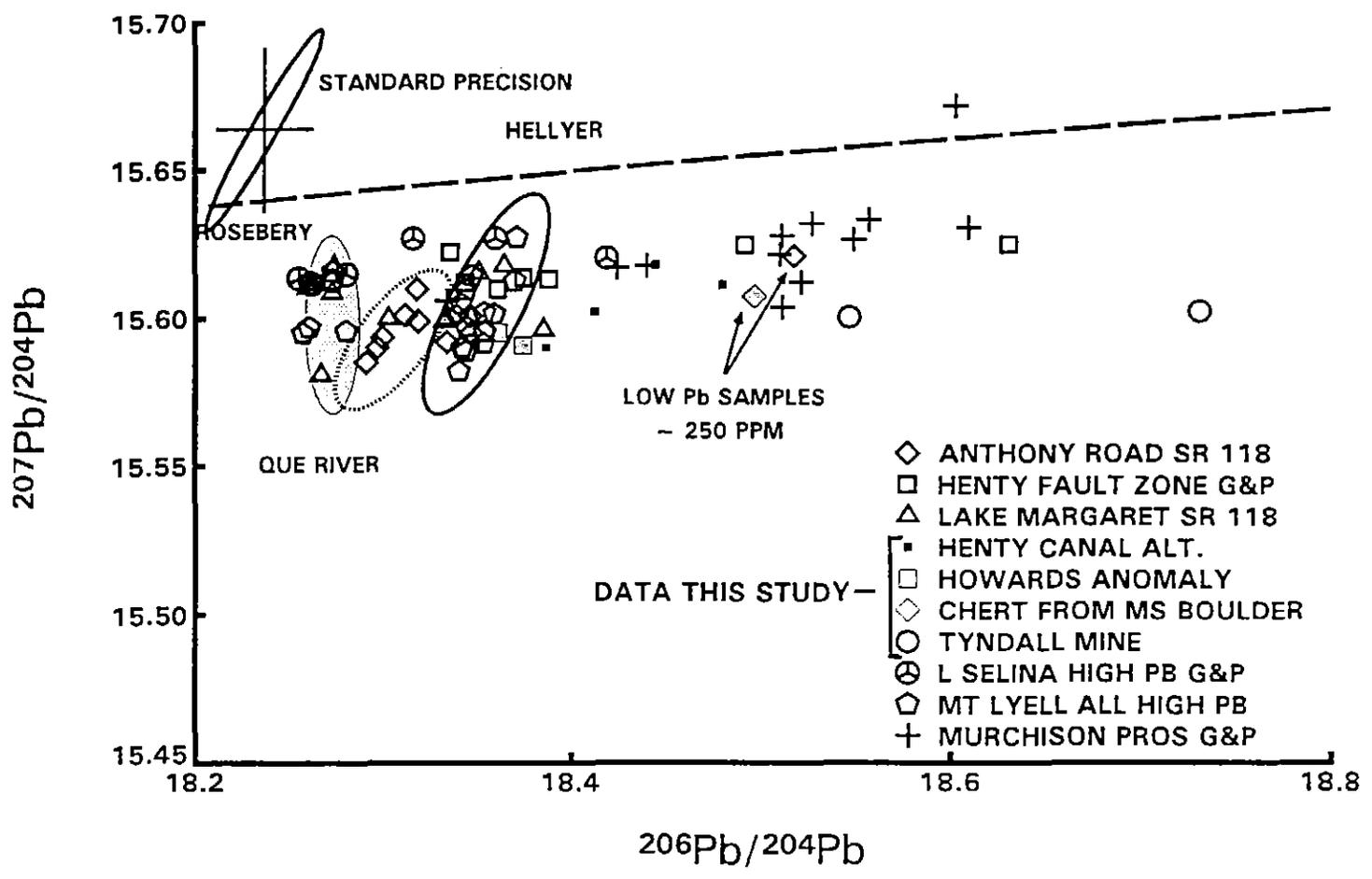


Fig. 2.

EXPANDED SCALE L MARGATET E.L.

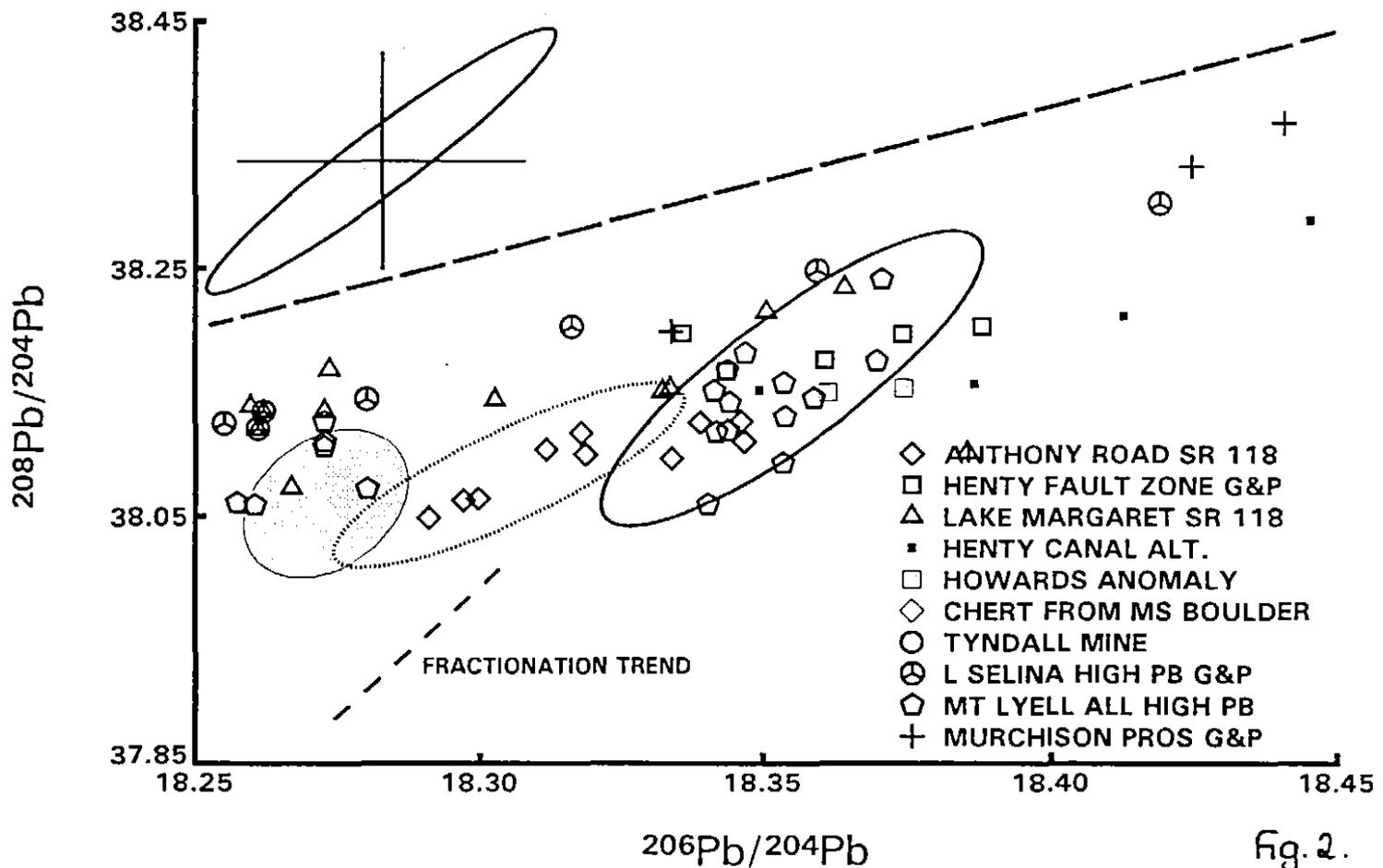
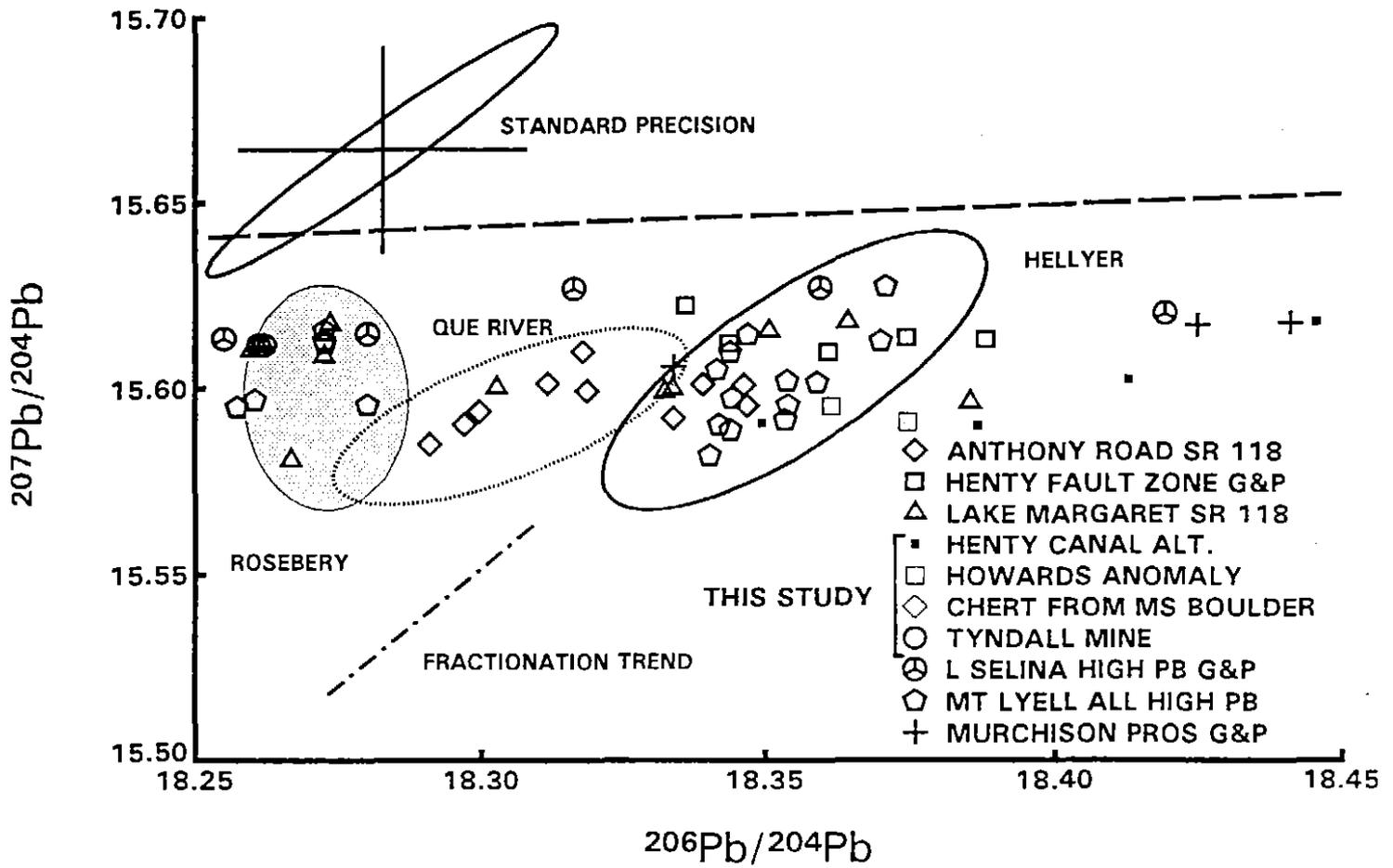
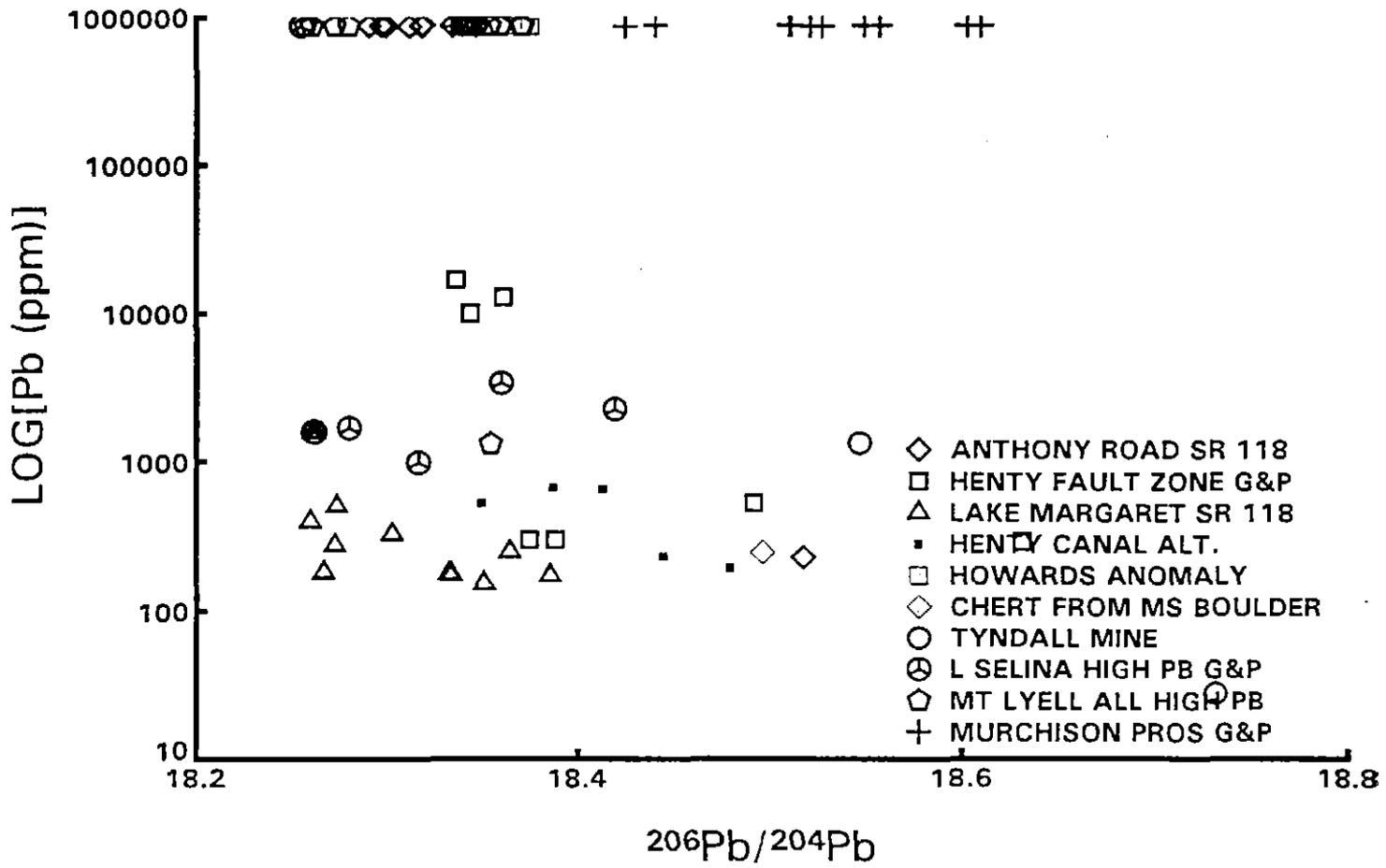


Fig. 2.



APPENDIX 1 - Pb ISOTOPE METHODS

Galena was handpicked from DDH HA8 @ 41m and DDH HA5 @ 126.8m and dissolved in concentrated HNO₃. Lead was purified by micro-electrodeposition techniques. 623031 and 623046 were crushed in a Mn-steel mill; other samples were provided as pulps. Between 50 and 100 mg of each rock pulp was weighed into a teflon beaker along with a known amount of ²⁰²Pb spike in order that the Pb content could be determined simultaneously with isotope ratios by isotope dilution techniques. The samples were digested in a hot 1:1 mixture of 7N HCl and 7N HNO₃ acids. Lead was then extracted by anion exchange methods in dilute HBr acid solutions and purified as for the galena.

Lead isotope ratios were determined on a VG ISOMASS 54E thermal ionization mass spectrometer run in fully automated mode. Data have been normalized to the accepted values of international standard NBS SRM 981 by applying a correction factor of +0.08% per atomic mass unit. Precision estimates, based on over 1300 analyses of international standards and natural samples, are shown as error bars (mean $\pm 2\sigma$) in the upper left hand corner of the accompanying diagrams. Also shown are the 95% confidence ellipses for these standard data. Lead contents determined by isotope dilution are precise to about $\pm 10\%$.

APPENDIX VIII



Division of Exploration Geoscience
Institute of Minerals, Energy and Construction
51 Delhi Road, North Ryde, NSW. Postal Address: PO Box 136, North Ryde, NSW 2113
Telephone: (02) 887 8666. Telex: AA25817. Fax: (02) 887 8909

SIROTOPE

2.09.92

Page 1

Aberfoyle Resources - Robina Sharpe
Sulfur isotope analyses - Newtown Creek

Sampleno.	Mineral	Analno.	Date	$\delta^{34}\text{S}$
623007	py	S2674	28.07.92	-4.4
623009	py	S2666	27.07.92	-7.2
623011	py	S2671	27.07.92	-7.8
623013	py	S2665	27.07.92	4.7
623031	py	S2668	27.07.92	4.0
623039	py	S2673	27.07.92	4.2
623041	py	S2777	28.08.92	8.4
623047	py	S2670	27.07.92	5.1
623065	py	S2663	27.07.92	4.0
623076	py im	S2675	28.07.92	1.5
623082	py	S2676	28.07.92	16.2
623085	py	S2775	28.08.92	20.9
623092	py	S2669	27.07.92	5.0
623099	py	S2672	27.07.92	-8.8
623118	py	S2664	27.07.92	7.2
623119	py	S2667	27.07.92	7.0
623787	py	S2776	28.08.92	-4.4
623788	py	S2774	28.08.92	-.2

Sulfur isotope values are reported in permil CDT. Replicate analyses of standard material are generally within ± 0.2 permil. Samples prepared by oxidation with CuO at 1000°C and analysed on a Finnigan MAT 252 mass spectrometer.

A u s t r a l i a n S c i e n c e , A u s t r a l i a ' s F u t u r e

Floreat Park
Location: Underwood Avenue, Floreat Park
Postal Address: CSIRO Private Bag,
PO Wembley WA 6014
Telephone: (09) 387 0200
Fax: (09) 387 8642
Telex: AA92178

Townsville
Location: Davies Laboratory, University Road, Townsville
Postal Address: Private Mail Bag,
PO Aitkenvale QLD 4814
Telephone: (077) 71 9511
Fax: (077) 25 1009

Lindfield
Location: Bradfield Road, Lindfield
Postal Address: PO Box 218
Lindfield NSW 2070
Telephone: (02) 413 7733, 413 7211
Fax: (02) 413 7202
Telex: AA26296

Newton Creek Prospect

Lake Margaret EL 5/85

Co-Ordinates		Sample No	Description
Easting	Northing		
380020	5358320	623007	<u>Spillway Chert</u> : Light grey banded chert with disseminated pyrite.
380002	5358314	623009	<u>Spillway Chert</u> : Grey banded argillite/chert with disseminated pyrite.
379997	5358312	623011	<u>Spillway Chert</u> : Dark grey fine grained banded lapilli-volcaniclastic (?) with disseminated pyrite.
DDH HA8 at 141.7m		623013	Sulphide fragment (pyrite) in a grey quartz crystal silicified pyritic lapilli volcaniclastic.
380000	5359112	623031	<u>Access Road Alteration</u> : Light green/grey highly altered sericitic siliceous rock with disseminated pyrite.
DDH HA7 at 200.1m		623039	Grey green feldspar, quartz crystal matrix and fragments in fine grained matrix of andesitic origin.
DDH HA7 at 218.9m		623041	Grey quartz crystal sandstone strongly altered by silica and pyrite.
DDH HA7 at 41m		623043	Light grey banded quartz crystal, feldspar fine grained lapilli volcaniclastic, silica altered with disseminated pyrite.
380486	5359270	623047	<u>Tyndall Mine</u> : Light grey/cream pyritic quartz crystal porphyry.
DDH HA2 at 110.6m		623065	Grey quartz crystal, feldspar phyrlic hornblende pyritic medium grained lapilli volcaniclastic.
380000	5358312	623076	<u>Access Road Alteration</u> : Dark grey banded fine ground mudstone/chert with disseminated pyrite.
380340	5360070	623082	<u>Henty Canal Alteration</u> : Light grey cream sericitic/pyritic banded highly altered ?

045142

380322	5360065	623092	pyritic ? <u>Henty Canal Alteration:</u> Dark grey pyritic siliceous chert.
DDH HA5 at 137.2m		623099	Dark grey brown banded pyritic to hematitic fine grained siliceous mudstone/chert.
380020	5359150	623118	<u>Access Road Alteration:</u> Grey chloritic/sericitic lapilli volcaniclastic to chert with disseminated pyrite.
380030	5359160	623119	<u>Access Road Alteration:</u> Grey chloritic/sericitic/siliceous chert with sphalerite and pyrite.
DDH HA4 at 58.3m		623787	Fine grained grey brown banded siliceous mudstone/chert with disseminated pyrite.
DDH HA4 at 178.6m		623788	Grey purple fine grained hematitic/carbonaceous lapilli volcaniclastic.

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OPEN FILE

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EXPLORATION DIVISION

A.C.N. 004 664 108

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LAKE MARGARET EL 5/85

TASMANIA

Technical Progress Report

for the period

October 1991 - September 1992

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for covering letter		
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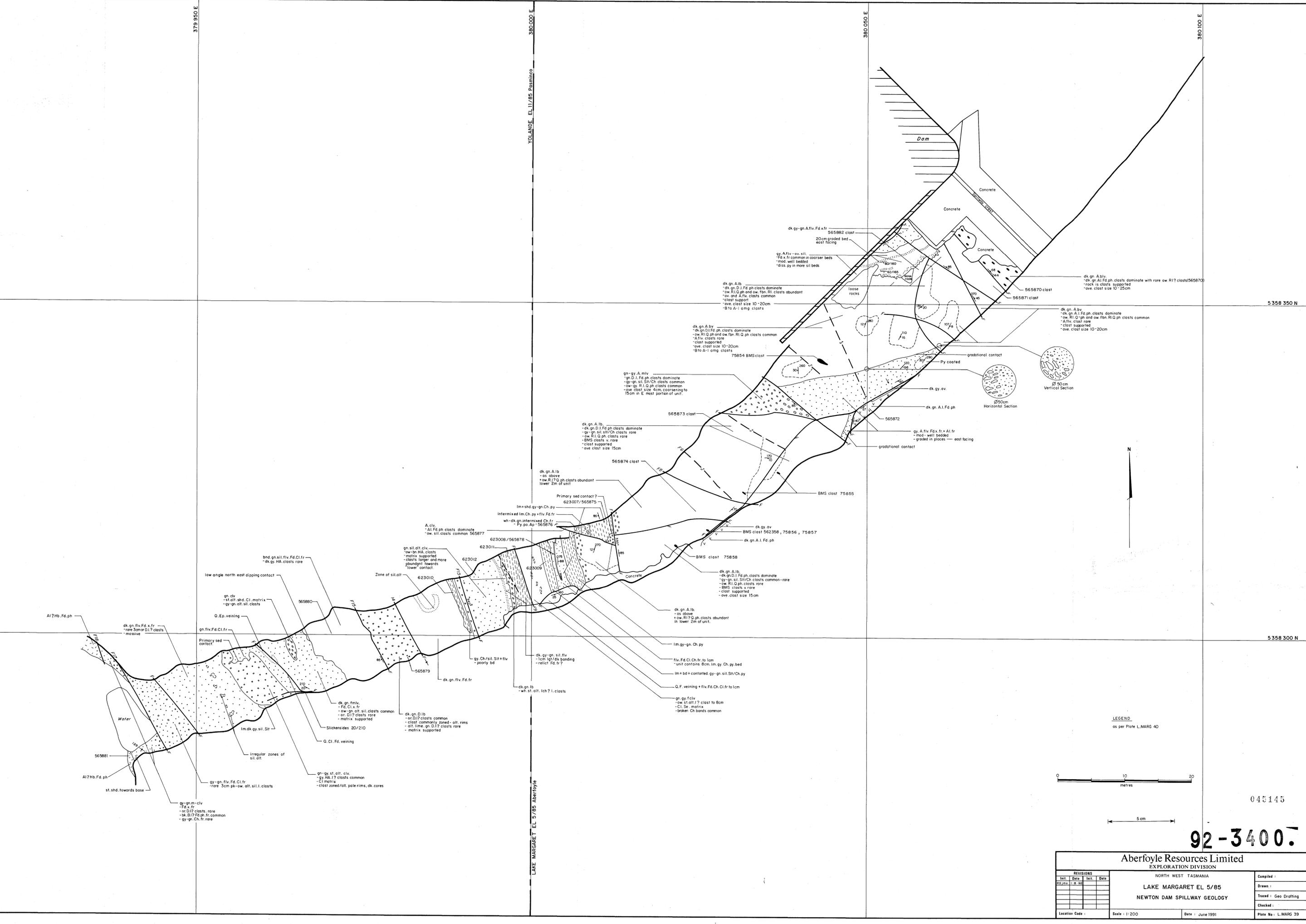
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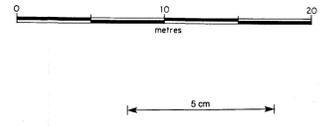
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Distribution

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- Aberfoyle - Hawthorn - (1)
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- CRA Exploration - Canberra - (1)



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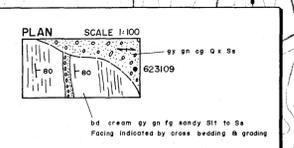
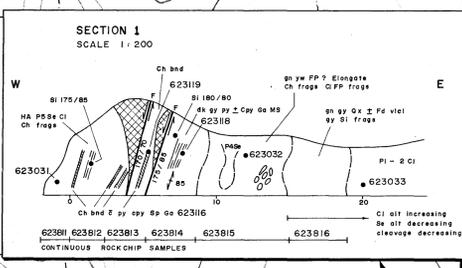
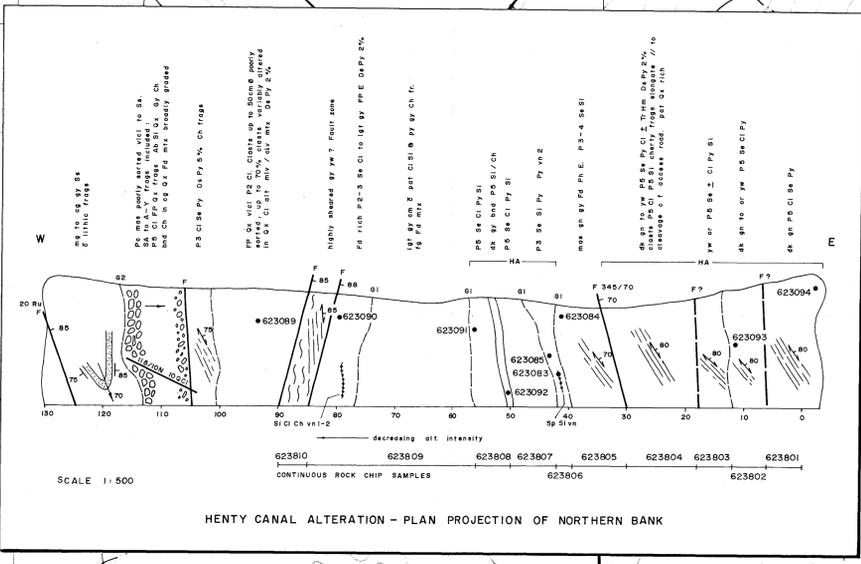
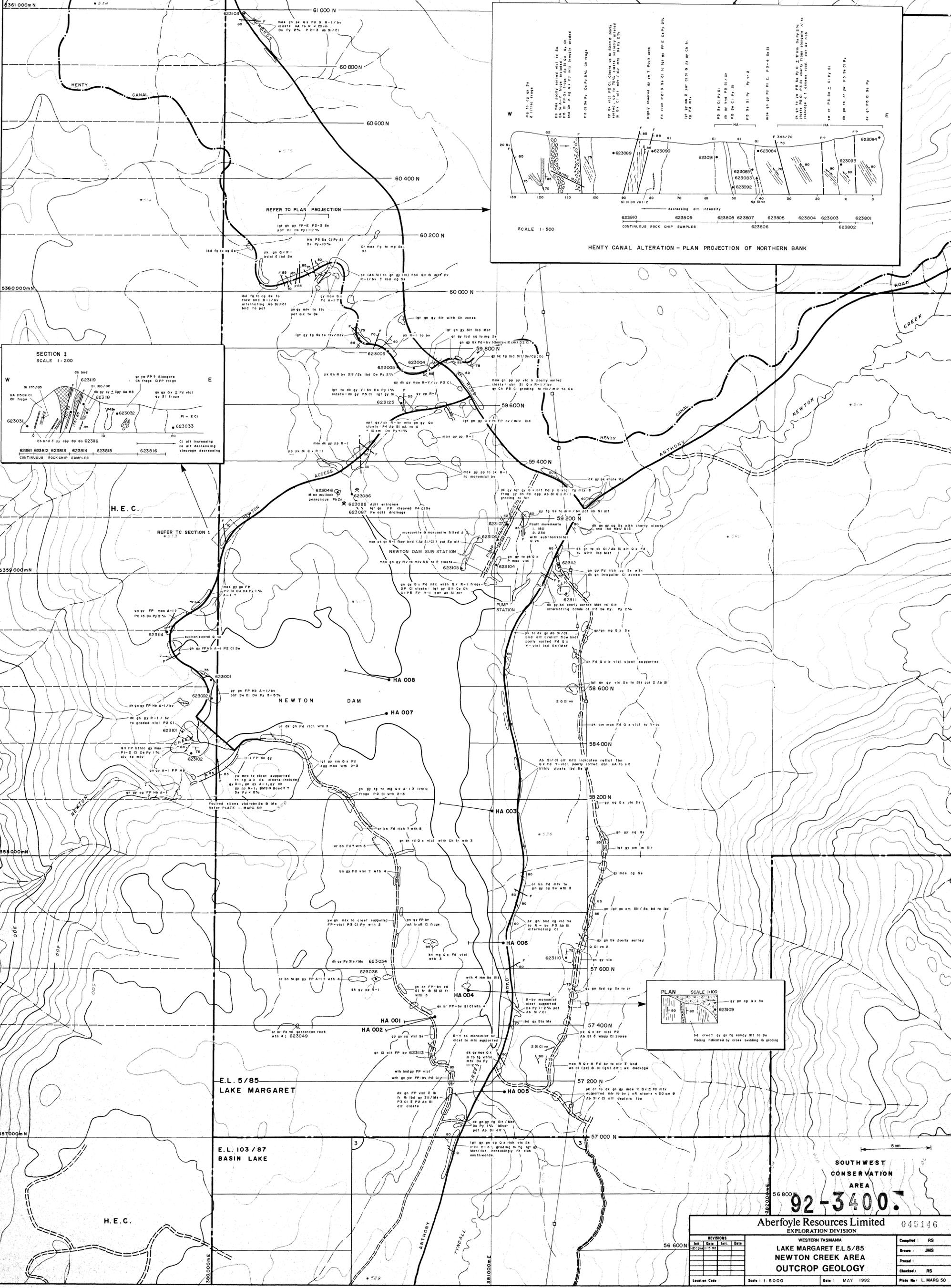
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EXPLORATION DIVISION

NORTH WEST TASMANIA
LAKE MARGARET EL 5/85
NEWTON DAM SPILLWAY GEOLOGY

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LAKE JULIA
619m



E.L. 5/85
LAKE MARGARET

E.L. 103/87
BASIN LAKE

SOUTHWEST
CONSERVATION
AREA

92-3400

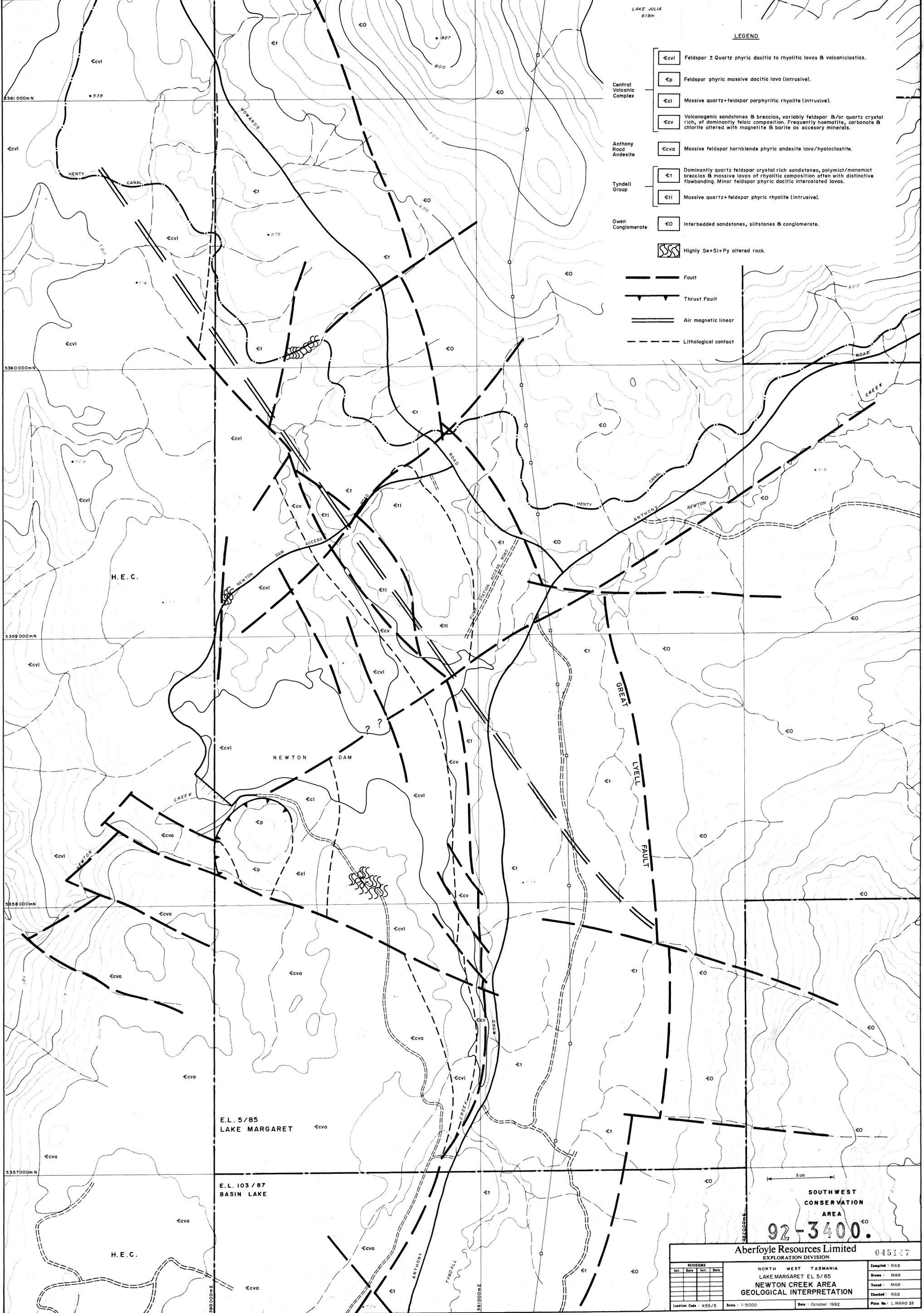
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Plate No: L.MARG 50		

LAKE JULIA
619m

LEGEND

- Central Volcanic Complex
 - €cvl Feldspar ± Quartz phyrlic dacitic to rhyolitic lavas & volcanoclastics.
 - €p Feldspar phyrlic massive dacitic lava (intrusive).
 - €cl Massive quartz+feldspar porphyritic rhyolite (intrusive).
 - €cv Volcanogenic sandstones & breccias, variably feldspar &/or quartz crystal rich, of dominantly felsic composition. Frequently haematite, carbonate & chlorite altered with magnetite & barite as accessory minerals.
- Anthony Road Andesite
 - €cva Massive feldspar hornblende phyrlic andesite lava/hyaloclastite.
- Tyndell Group
 - €t Dominantly quartz feldspar crystal rich sandstones, polymict/monomict breccias & massive lavas of rhyolitic composition often with distinctive flowbanding. Minor feldspar phyrlic dacitic intercalated lavas.
 - €tl Massive quartz+feldspar phyrlic rhyolite (intrusive).
- Owen Conglomerate
 - €o Interbedded sandstones, siltstones & conglomerate.
- Highly Se+Si+Py altered rock.
 - SSS

- Fault
- Thrust Fault
- Air magnetic linear
- - - Lithological contact



50m

SOUTHWEST CONSERVATION AREA

92-3400

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EXPLORATION DIVISION

NORTH WEST TASMANIA
LAKE MARGARET EL 5/85
NEWTON CREEK AREA
GEOLOGICAL INTERPRETATION

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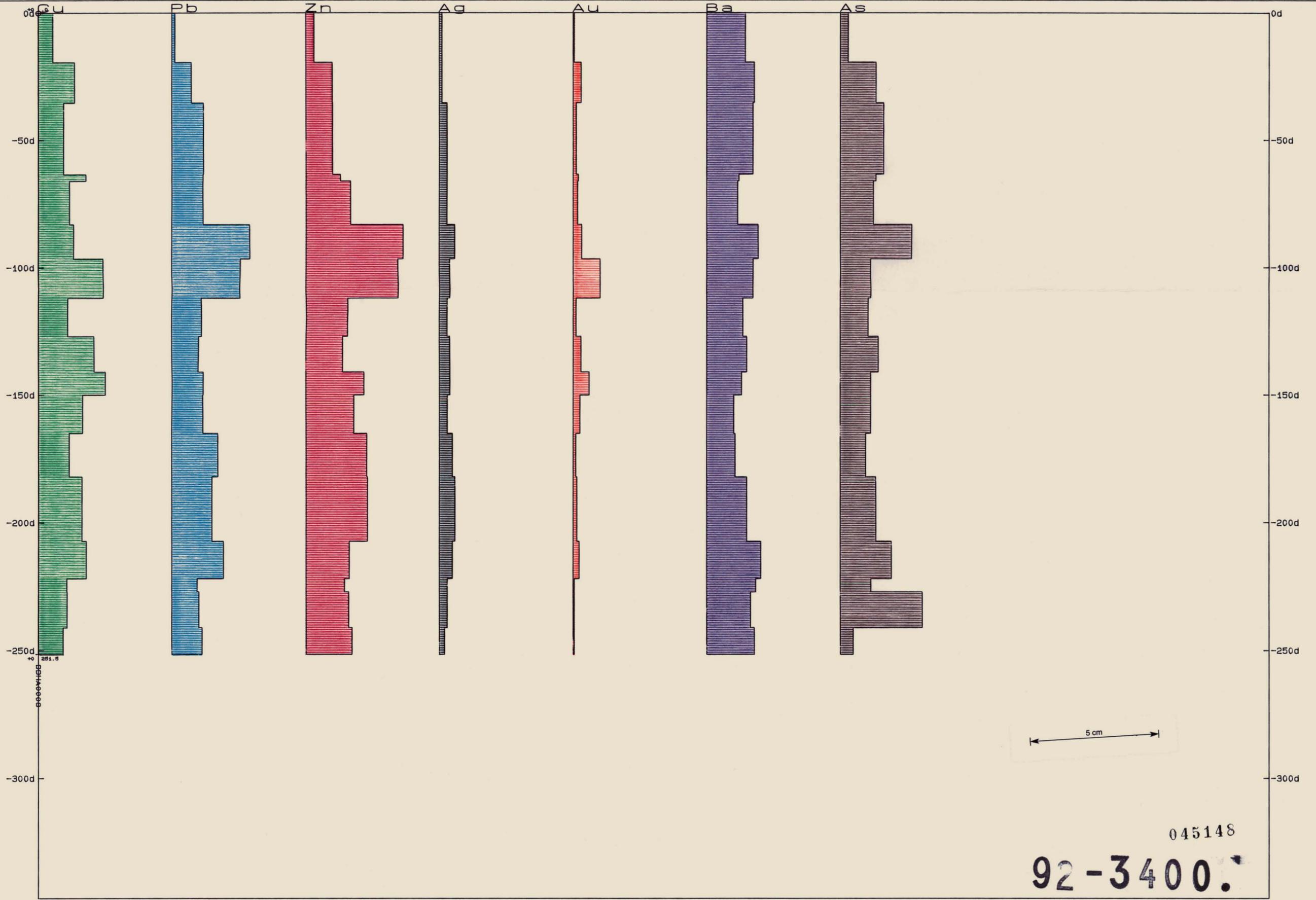
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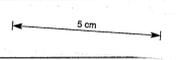
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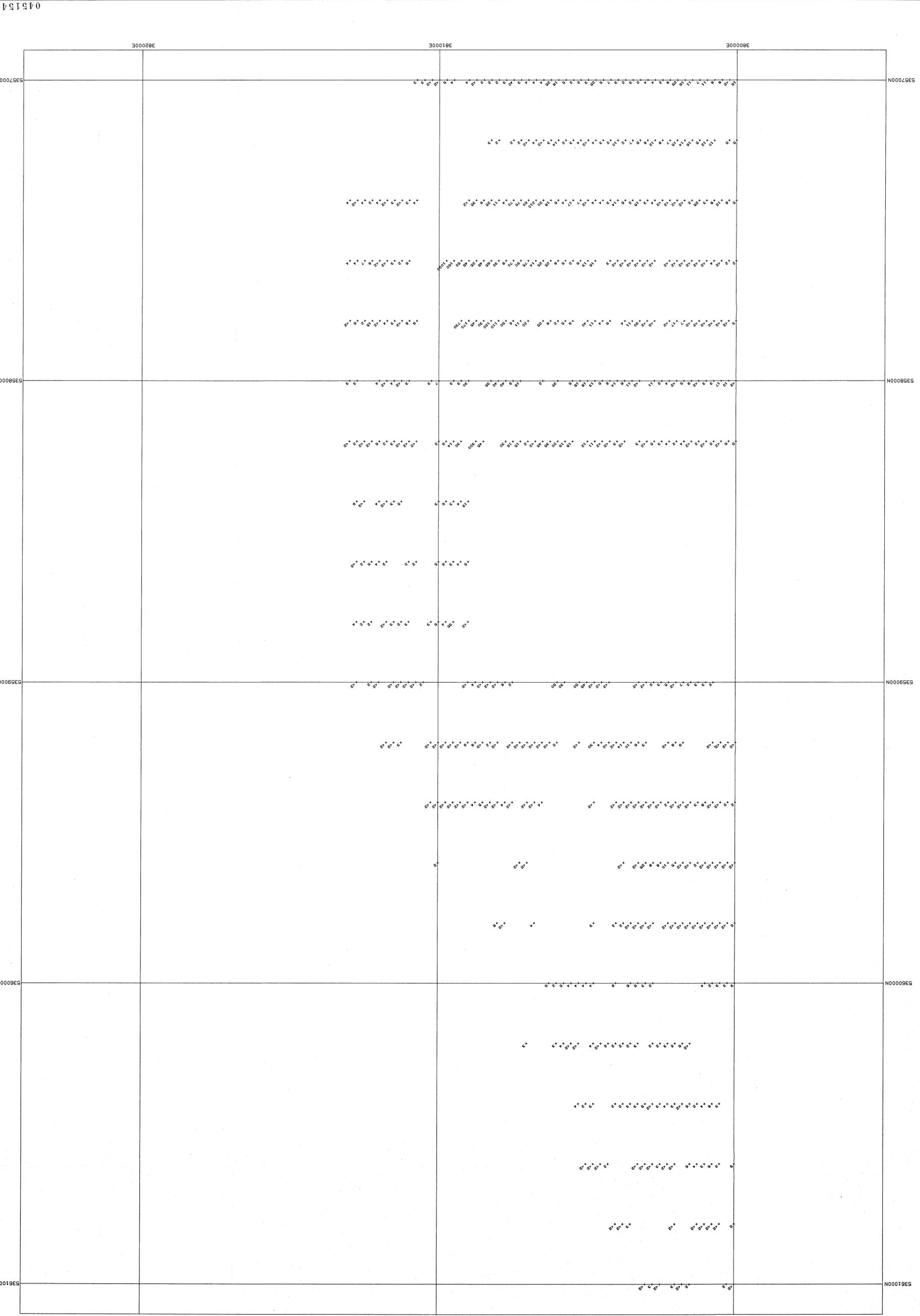
045153

5cm

Aberfoyle Resources Limited EXPLORATION DIVISION		Tasmania	Geologist: RAS
Newton Creek Prospect		5/85	Drawn:
Ba Soil Geochemistry		23/10/92	Checked: RAS
Location Code:	Scale: 1:5000	Date:	Plate No.: LMA957

92-3400.

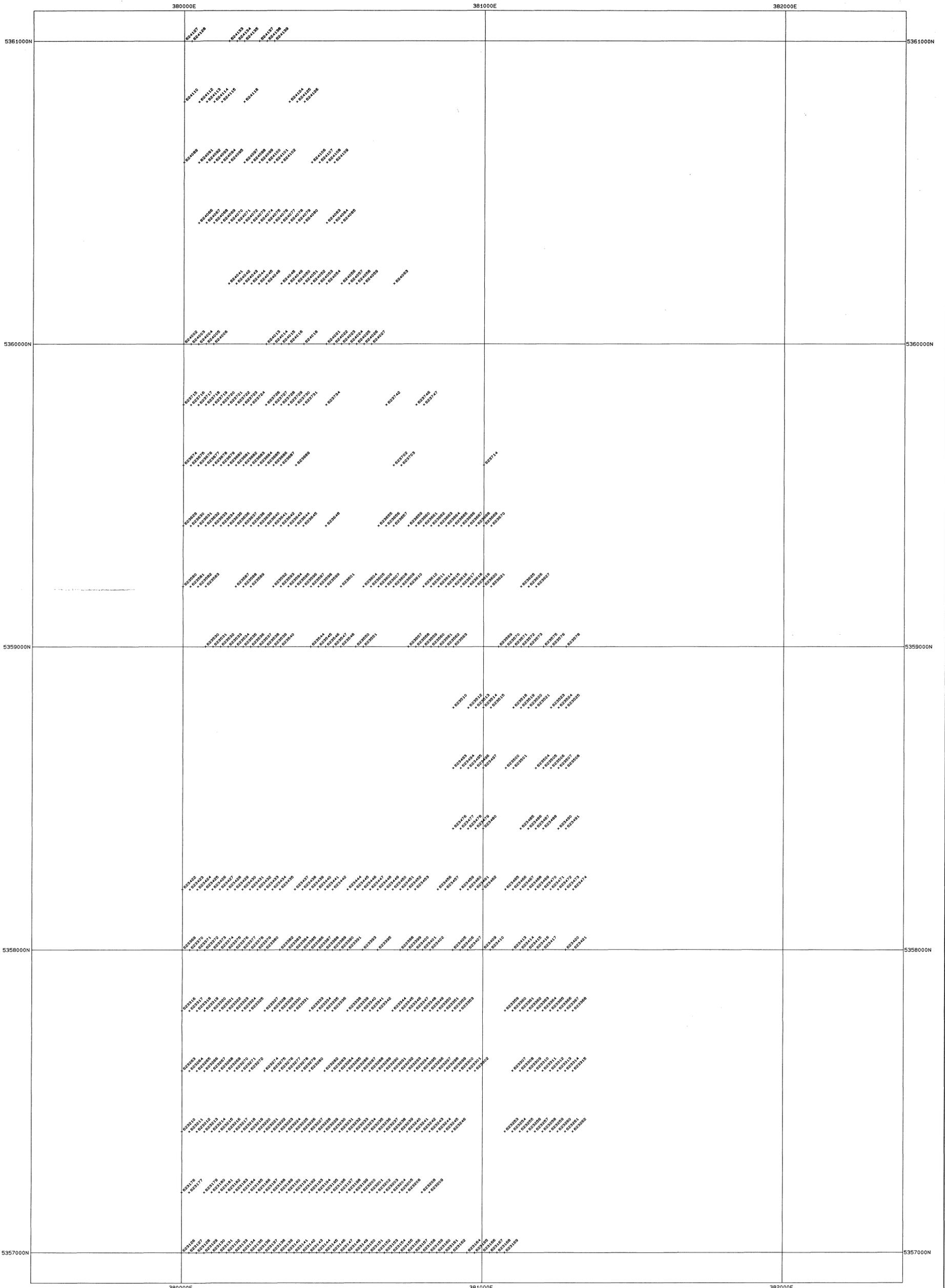
PLAN NO. 14888	DATE: 23/10/92	SCALE: 1:500	LOCATION CODE:
CHANGED BY:	AS SOIL GEOCHEMISTRY		
PROJECT:	NEWTON CREEK PROJECT		
CLIENT:	LAKE MARGARET E.L.L. S/BS		
REVISIONS:	TABERNIA		
ABERFOYLE RESOURCES LIMITED EXPLORATION DIVISION			



045154

ABERFOYLE RESOURCES LIMITED
EXPLORATION DIVISION
LAKE MARGARET E.L.L. S/BS
NEWTON CREEK PROJECT
AS SOIL GEOCHEMISTRY
23/10/92
SCALE: 1:500
PLAN NO. 14888

PROSPECT: 124
 PLAN: Definition
 E: 07/00: 08/00: 0
 N: 020000.0 081000.0
 MULTIPLE: Image.plt
 Plot option number:
 data information:
 name:



045155
 5cm

Aberfoyle Resources Limited EXPLORATION DIVISION			
Tasmania		Compiled: RAS	
Lake Margaret E.L. 5/85		Drawn:	
Newton Creek Prospect		Traced:	
Soil Sample Locations		Checked: RAS	
Location Code:	Scale: 1: 8000	Date: 27/10/92	Plate No.: LHM059

92-3400.