EL 14/85 MT CATTLEY, TASMANIA

QUARTERLY REPORT

AUGUST 21 1986 TO NOVEMBER 20 1986

by

Pancontinental Mining Limited
Sydney

K.O. Airas
Manager, Pancon-Outokumpu Exploration Joint Venture

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2. Report on Sub-Basalt Drilling Program at Mt Cattley EL 14/85, Tasmania, September/October 1986, Report No 86/35 by W Herrmann.

3. A memorandum: Basin Road, Gravel Pit Area by W Herrmann, dated 2 October, 1986.

1. SUMMARY

The first stage of the designated exploration program for the Mt Cattley EL 14/85 has been completed.

As a result of this program a sequence of felsic to intermediate pyroclastics or lavas interbedded with micaceous greywackes or siltstones has been indicated in the eastern part of EL. This sequence is either outcropping or only relatively thinly (<200m) covered by Tertiary basalts.

No obvious anomalies showing characteristics of VMS-deposits were obtained. However, weak alteration within volcanics will be a target of an isotope (O and S) and whole rock geochemical study with the aim of determining whether it represents a halo to mineralised VMS deposits or barren regional alteration.

Given a positive indication from this study the recommended next stage of exploration is a geophysical EM (EM-37 or SIROTEM) survey with drill testing of significant conductors.

2. INTRODUCTION

This report describes work carried out on the Mt Cattley EL (14/85) during the period 21/8/1986 - 21/11/1986. It also summarises results of the Stage I exploration on the area.

The objective of the Mt Cattley project has been to explore for VMS-deposits analogous to the Hellyer deposit. When the EL was applied for, it was considered very likely that stratigraphic equivalents to the Hellyer mine sequence may lie within the tender area under a variable but unknown thickness of Tertiary basalt. The basalt was known to cover most of the EL area but silty volcaniclastics with overlying rhyolitic to dacitic tuffs and flow banded lavas of Cambrian age were exposed on the eastern boarder of the EL in windows of basalt. It was suggested, therefore, that at least within a portion of the tender area the basalt cover would be shallow enough to effectively explore the Cambrian sequence underneath the basalt.

The exploration licence was granted on 21/8/1985. The objectives of the Stage I exploration carried out since then has been:

1. To determine the thickness of the basalt cover.

2. To obtain information from the sub-basalt basement for mapping the lithostratigraphy of sequences overlain by the basalt.

3. To explore for conductive orebodies beneath the basalt.

Exploration carried out to meet these objectives has included:

1. Reconnaissance geological mapping at 1:20,000 scale (Appendix 1.).

2. Geochemical stream sediment sampling of the Leven River drainage.

3. SIROTEM survey on a grid with 1km line spacing.

4. Sub-basalt drilling program (Appendix 2).

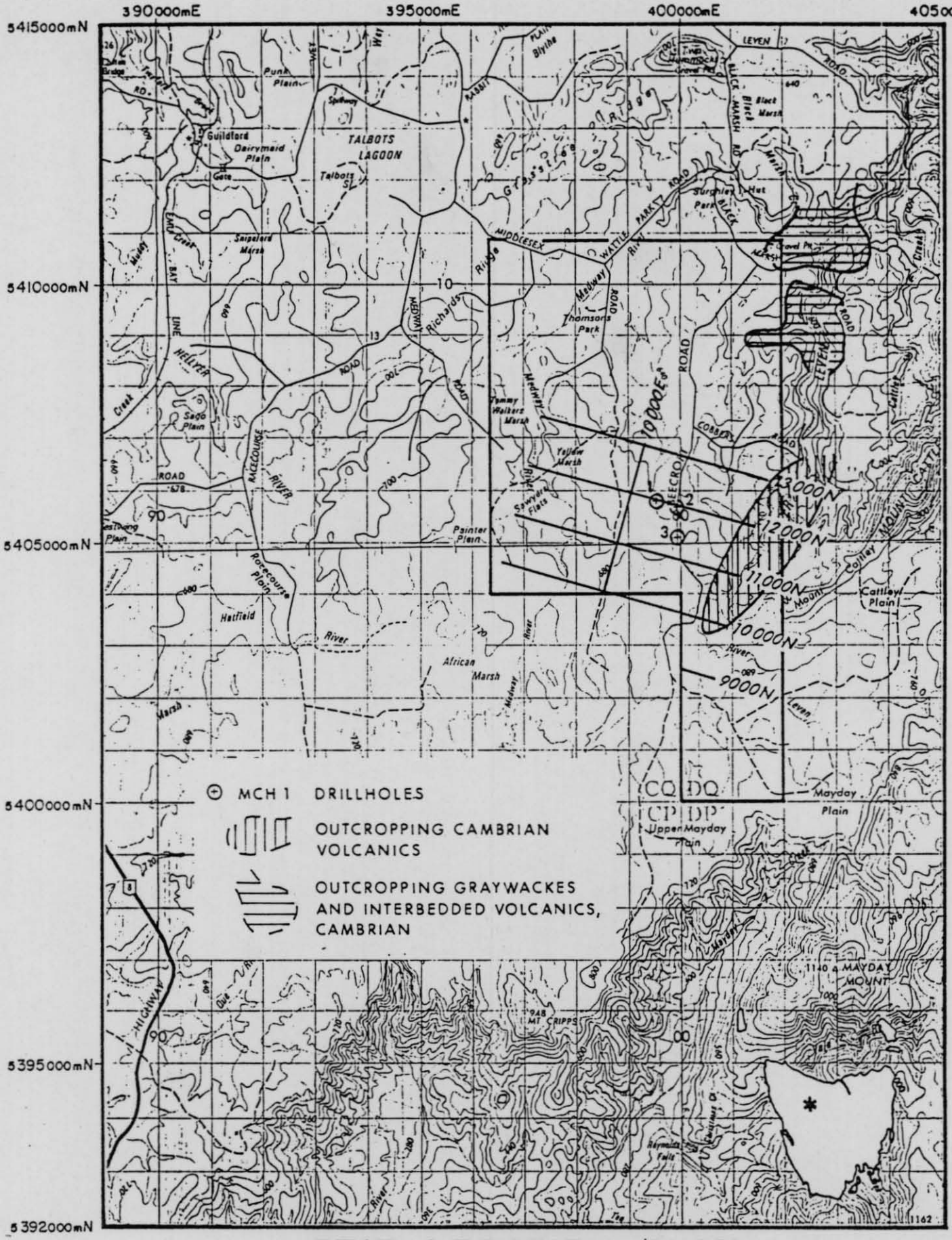
5. Detailed mapping of the Basin Road "window".

Only the drilling and the detailed mapping have been carried out during this quarterly period. The others have been reported previously.

This report summarises the geology and the exploration results attained. Detailed reports of the mapping and the drilling program are attached as appendices. Reports describing the SIROTEM survey were included in previous Quarterly Reports.

3. LOCATION AND ACCESS (see Figure 1.)

The Exploration Licence is located approximately 10km southeast of Guildford and 55km south of Burnie. Access is either via the Murchison Highway and Guildford, or via Hampshire and then by private roads of Australian Forest Holdings. Within the licence area there is a well developed network of all-weather 2-wheel drive logging roads constructed and maintained by Australian Forest Holdings. A permit is required to use these roads and some have locked gates.



GRID LOCATION PLAN

MOUNT CATTLEY E.L. 14/85 - TASMANIA

5 cm

Scale 1:100 000

2 1 0 2 4 6

KILOMETRES

FIGURE 1

4. TITLE

Exploration Licence 14/85 was granted to Pancontinental Mining Limited on 21 August 1985 for a period of one year. The licence has been since then renewed for another one year period and will now expire on 20 August 1987.

The exploration work was carried out by Pancontinental on behalf of Pancontinental Mining Limited - Outokumpu Oy Exploration Joint Venture.

5. WORK COMPLETED

5.1. Summary of the Geology of the Mt Cattley area.

This summary is based on two reports written by Mr Walter Herrmann as a contract geologist. Reports are enclosed as Appendices 1 and 2.

Approximately 95% of the Mt Cattley EL (14/85) is covered by Tertiary basalts and minor associated fluviolacustrine sediments. Pre-Tertiary basement rocks are exposed in several small "windows" in the basaltic cover near the eastern boundary of the EL. Basement lithologies have also been intersected by three drillholes drilled through the 60-90m thick basalt cover to the west of the "windows". As a result of a SIROTEM survey conducted on the area, a 2-3km wide, NNE trending zone of relatively thin cover rocks is suggested to prevail over the central portion of the EL (Wilson, 1986).

Plate 1 is a uncoloured plan of the geology. A coloured version is included in Appendix 2.

The basalt is typically dark grey in colour, fine grained with small olivine phenocrysts and locally vesicles. Interbasalt sediments are exposed in one outcrop and in a drill intersection in Hole 2.

Pre-Tertiary basement rocks in outcrops consist of micaceous greywackes, siltstones, tuffaceous siltstones and minor shales and cherts inter-layered with variable extrusives and pyroclastics of dominantly rhyolitic composition (see Appendix 1.).

Basement lithologies underneath the Tertiary basalt cored in the three drill holes comprise amygdaloidal or porphyritic andesites interlayered with flowbanded rhyodacite or felsic lithic tuffs and micaceous greywacke and siltstone (see Appendix 2.).

Speculative stratigraphic and structural cross-sections are presented, but data is too sparse to draw any firm conclusions. The initial suggestion that stratigraphic equivalents to the Hellyer mine sequence occur within the EL is not supported by recent results of mapping in the Hellyer-Mt Charter area by the Tasmanian Mines Department (Komyshan, 1986). However some simplistic stratigraphic correlations can be drawn from similarities between the association of micaceous greywackes, felsic pyroclastics and lavas in the area of the EL and those of the Hellyer mine sequence. The Mt Charter-

Hellyer stratigraphy appears to cut out to the north-east approaching the Mt Cattley area. The major Henty Fault Zone (HFZ) appears to cross through the area between the Mt Cattley EL and Hellyer, and according to the Mines Department mapping, sediments and volcanics to the east of the HFZ (e.g. Mt Cattley area) belong to the Tyndall Group (the youngest member of the Mt Read Volcanics).

The basement sequence in the Mt Cattley EL may correlate to sequences of the Cambrian Mt Read Volcanics (Corbett, 1986), but it is not justified to try to draw any further correlations out of the present data.

The basement rocks intersected by the drilling are essentially unmineralised and do not show obvious signs of hydrothermal alteration associated with volcanogenic sulphide mineralisation. Intense argillic alteration or low grade alteration to assemblages including the phases chlorite-albite-quartz-(carbonate-sericite) is interpreted to be related to low grade burial metamorphic modifications of the volcanic rocks (Appendix 2.).

A restricted silica + pyrite + sericite alteration zone of quartz porphyritic rhyolite lithologies outcrops in the Basin Road gravel pit area in the southern part of the EL. Detailed mapping and sampling of the outcrops did not distinguish whether the alteration represents a volcanic hydrothermal system or a structurally controlled zone which has localised sericitisation. The altered rocks are not base metal anomalous (Appendix 3.).

5.2. Summary of the exploration results.

The exploration conducted so far has indicated that:

1. basalts cover 95% of the area of the EL; the thickness of the cover is increasing to the west.

2. a basement association of felsic to intermediate volcanics and sediments is correlated with the Cambrian Mt Read Volcanics.

3. basement lithologies outcrop in windows of the Tertiary basalt cover along and close to the eastern border of the EL.

4. three diamond drill holes within a 2-3km wide zone of shallow (<200m) Tertiary basalt cover in the central southern part of the EL have intersected basement Cambrian volcanics and sediments.

5. suggested initial correlation of the basement rocks to the Hellyer mine sequence is no longer valid.

6. argillic alteration or low grade alteration to the phase assemblages chlorite-albite-quartz-(carbonate-sericite) occurs in the cored volcanics, but there is no associated significant basemetal anomalism.

7. an alteration zone in quartz porphyritic rhyolite rock is present in one area (Basin Road), also without any anomalous content of basemetals.

8. weak anomalism of zinc and gold occurs in stream sediments just outside of the NE corner of the EL.

6. CONCLUSIONS AND RECOMMENDATIONS

The first stage of the outlined exploration programme has been carried out and some of the objectives of the Stage 1 program have been achieved. A zone of outcropping or relatively thinly (<200m) covered volcanic-sedimentary sequence has been indicated in the eastern part of the EL. Five, 1km spaced lines of SIROTEM survey do not show conductors that might indicate orebodies. Indications of potential VMS mineralisation are restricted to low grade alteration in volcanics intersected by the drilling, and to one outcropping alteration zone. Whether these represent an alteration zone to mineralising processes or regional metamorphism remains an open question. A study of the whole-rock geochemistry and oxygen/sulphur isotopes will be carried out by the Tasmanian Mines Department, to determine whether the alteration zone within cored volcanics represents a halo around a mineralised massive sulphide deposit or a barren regional alteration.

Although significant exploration anomalies have not been defined, further exploration is justified by the prospective volcanic sequence outlined in Phase I exploration. The sequence lies within the depth range of EM techniques underneath the basalt cover. This enables the use of a large fixed loop EM survey (EM-37 or SIROTEM) as a method of further exploration. A program of 70km survey lines is recommended for definition of conductors as drilling targets beneath the basalt cover.

7. REFERENCES

CORBETT, K.D., (1986), The Geological Setting of Mineralisation in the Mt Read Volcanics. in: Large, R.R. (ed.) The Mt Read Volcanics and Associated Ore Deposits (Symposium Abstracts Volume) Geo. Soc. Australia, Tasmanian Division.

KOMYSHAN, P., (1986), Geology of the Hellyer - Mt Charter Area. in: Large, R.R. (ed.) The Mt Read Volcanics and Associated Ore Deposits (Symposium Abstracts Volume) Geol. Soc. Australia, Tasmanian Division.

WILSON, D.R., (1986), Interpretation of Mt Cattley SIROTEM Data. in: EL 14/85 Mt Cattley, Tasmania. Annual Report 21.8.1985-10.8.1986 Pancontinental Mining Limited, Exploration Division Report 86/27.

8. **EXPENDITURE**

The expenditure for the quarter totalled $41,981 which was made up as follows:

	$
Manning	4,963
Materials and Supplies	493
Consultants and Contractors	29,353
Travel, Freight and Equipment	1,507
Administration Expenses	927
Fees - Corporate	54
Overheads	4,684
	$41,981

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MEMORANDUM

TO: PANCONTINENTAL MINING LIMITED.
(Exploration Division)

FROM: WALTER HERRMANN DATE: 2-10-86

SUBJECT: MT CATTLEY EL 14/85 TASMANIA
BASIN ROAD, GRAVEL PIT AREA

At Basin Road, in the south eastern part of EL 14/85, there is a small "window" of Palaeozoic basement rocks, about 100 x 350m in extent, surrounded by Tertiary basalt cover.

During the course of the recent drilling Program at EL 14/85 I spent some time geologically mapping the Basin Road exposure in an attempt to subdivide the litho types and to obtain representative rock chip samples for geochemical analysis.

A geological sketch plan at 1:2500 scale was produced and is enclosed with this note.

Offcuts of some representatives specimens collected at rock chip sample locations (shown on the plan) are also enclosed with this note.

These are sample numbers: 19804, 19805, 19806, 19808, 19810, 19811, 19812, 19813.

Geology

The dominant rock type is a quartz phyric acid volcanic which I consider to represent a rhyolitic extrusive. It usually consists of small (1-2mm) transparent quartz phenocrysts sparsely scattered (~5%) in a pale creamy to pinkish grey fine grained matrix.

In the northern and southern parts of the window the rocks (as typified by specimens 19806, 19804) are essentially fresh with locally developed fracturing or fracture cleavage (weak) but without penetrative cleavage/foliation. These rocks are quite unaltered and mineralised except for occasional veins of white transparent rughy-dogtoothed quartz veins. These are most notable at the northern end (19807) but do <u>not</u> appear to constitute a very intense vein network. They are probably fairly late stage (tectonic) tension gash fillings.

Over about the central 150m of the window, adjacent to the gravel pit and gravel heaps, the porphyritic rhyolite generally displays a moderate penetrative cleavage associated with partial sericitization of the felsic matrix. Specimen no 19805 is a typical example. It can be seen that the sericitization and cleavage principally occurs in wavy/anastomozing zones interstitial to small domains of relatively unaltered/uncleaved quartz porphyritic rhyolite.

This suggests (to me) some form of earlier brecciation, possibly volcanic autobrecciation which has allowed sericitisation and foliation development in the more permeable breccia matrix.

Whether sericitization has accompanied deformation and cleavage development or whether cleavage development is a consequence of previous sericitic alteration is a moot but important, point.

Sericitization is most strongly developed in a small "core" area, about 50m diameter, just east of the gravel pit but may also extend northwards for about 50m in the zone covered by gravel heaps.

The rock here is quite strongly sericitically altered and generally displays a distinct northerly trending near vertical penetrative cleavage, but in most cases the relict quartz phyric fabric is quite clearly preserved. Specimen no 19811 is typical of this zone (Cva on the plan).

Contacts with the less altered quartz porphyritic rhyolite to sides and north are not actually observable but seen transitional over a few tens of metres with decreasing intensity of sericitization and cleavage outwards.

Within the sericitic "core" are several small pods or patches of pink stained, more or less silicified, altered volcanics which have slight positive topographic expression and characteristically contain minor disseminated boxworks presumably after oxidised pyrite. Former sulphide content is variable from about 0.5 to 5% but averaging about 1%. In some cases the presence of relict quartz phenocrysts indicates the parent rock type was probably similar to the porphyritic rhyolite exposed elsewhere in the window. The presence of penetrative cleavage within the silicified pods attests to considerable remaining sericite. Specimens 19812 and 19813 are representative of this type.

Despite the apparent silicification which is quite pervasive locally, and sulphide mineralization there are no obvious quartz or quartz-sulphide veinlets which might represent a stockwork system.

There is thus a crude zonal system of alteration essentially within one (quartz porphyritic rhyolite) rock type involving silica + pyrite + sericite in the central core, grading outward through pervasive sericite to patchy/incipient sericite alteration and passing eventually into quite fresh rocks. Whether this represents a volcanic hydrothermal system overprinted by anomalous (for EL 14/85 area) cleavage development during deformation as a consequence of its altered mineralogy

OR:

a breccia fabric/structurally controlled zone of increased permeability which has localized sericitization and cleavage development entirely during the tectonic stage .... remains uncertain at present.

The only other rock type observed in the window are restricted to several small outcrops close to the eastern edge of the window. These outcrops are strongly foliated/cleaved and consist of heavily hematite stained lithic tuff or volcanic-epiclastic of more or less acid composition.

Specimen no 19808 is a good example. Small flattened, irregular fragments of heavily hematite stained (purplish brown) sometimes quartz phyric volcanic rock with occasional ellipsoidal clasts of grey cherty material (siliceous volcanic?) and quartz grains occur in a distinctly foliated fine granular or glassy eutaxitic? matrix. Occasional granules of oxidised magnetite? are an accessory mineral. Grain size is generally 1-5mm with occasional cherty clasts to about 50mm.

Such hematitic rocks are unusual in the acid volcanics of the Mt Read volcanics. In the Mt Cattley area the most reminiscent are the strongly hematitic volcanolithic conglomerates and epiclastic sediments exposed along Murray's Road and which appear to concordantly underly the siliceous Ordovician Owen Conglomerate. I have tentatively correlated them with the Jukes Conglomerate/breccia - the basal member of the late Cambrian Tyndall Group in the Queenstwon area.

Since the Basin Road window is within about 500m of Owen Conglomerate outcrop on the southern end of the Cattley Ridge it is possible that these hematitic clastic rocks are also equivalent to the "Jukes" type sedimentation.

Unfortunately, the nature of the rock type (rhyolite) and the limited exposure at Basin Road does not enable me to map out the structural relationships. It may be possible that the hematitic tuff-epiclastics disconformably overly the rhyolite along the contact representing a late Cambrian erosion surface.

Geochemistry

Rock chip samples of about 1kg weight were collected at fourteen localities in the Basin Road, basement window; representing both fresh and altered/mineralised varieties of rhyolite and the hematitic volcanic/epiclastic rocks of the eastern margin.

Sample locations are plotted on the sketch plan.

Samples have been submitted to AMDEL (Burnie, TAS) for analysis as follows:

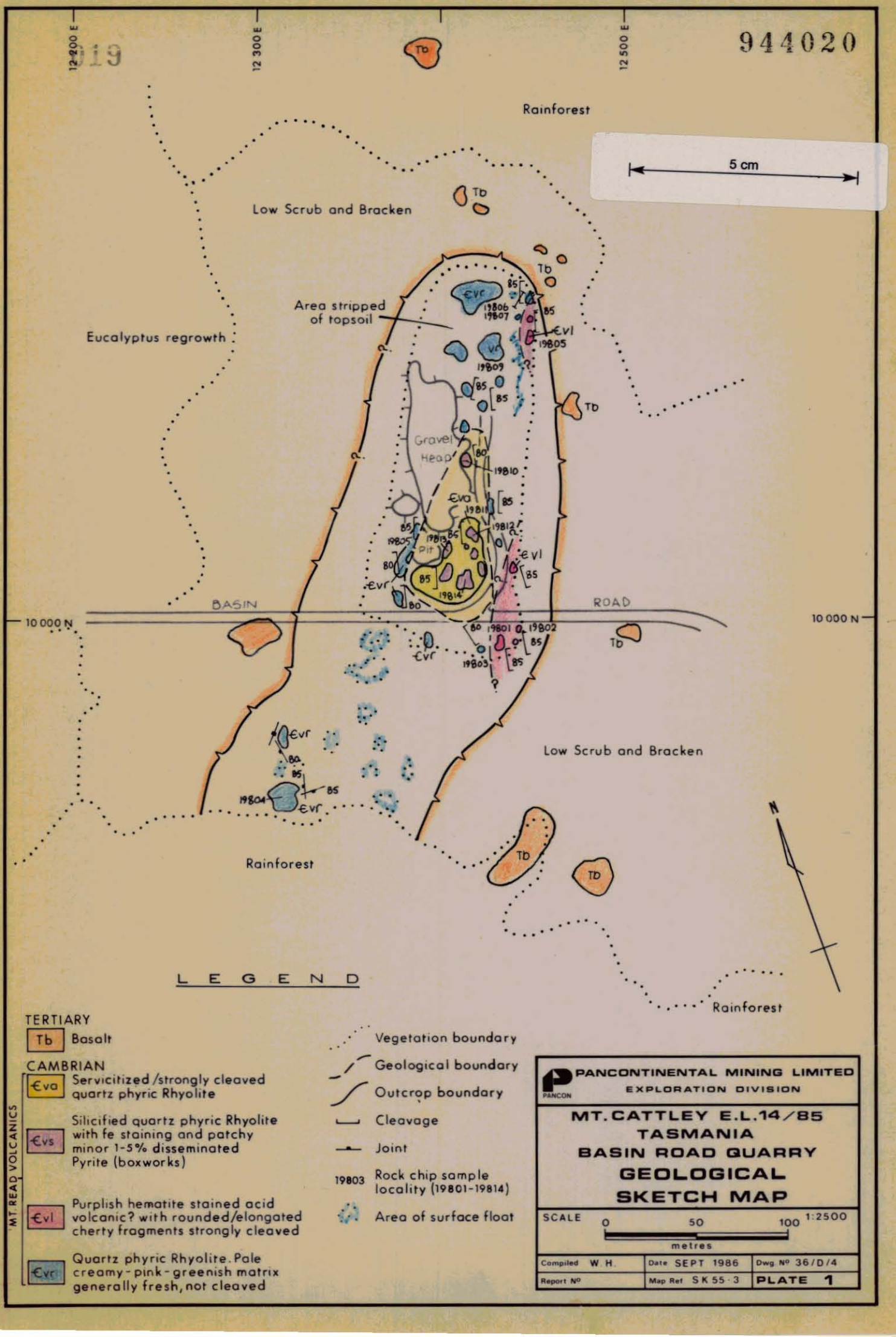
Preparation:	Crush, pulverise	
Analysis:	Cu, Pb, Zn, Fe, Mn	$A_{1/1}$
	Ag	$A_{1/2}$
	Au	$A_{2/4}$
	Ba, As	X_1

PLATES

1. Geological Sketch Map — Dwg. No. 36/D/6

APPENDICES

1. Geochemical Analysis


944020
12 200 E
12 300 E
12 500 E
Rainforest
5 cm
Low Scrub and Bracken
Tb
Area stripped of topsoil
Eucalyptus regrowth
Gravel Heap
Pit
BASIN
ROAD
10 000 N
Low Scrub and Bracken
Rainforest
Rainforest
N
LEGEND
TERTIARY
Tb Basalt
CAMBRIAN
MT READ VOLCANICS
€va Servicitized/strongly cleaved quartz phyric Rhyolite
€vs Silicified quartz phyric Rhyolite with fe staining and patchy minor 1-5% disseminated Pyrite (boxworks)
€vl Purplish hematite stained acid volcanic? with rounded/elongated cherty fragments strongly cleaved
€vr Quartz phyric Rhyolite. Pale creamy-pink-greenish matrix generally fresh, not cleaved
Vegetation boundary
Geological boundary
Outcrop boundary
Cleavage
Joint
19803 Rock chip sample locality (19801-19814)
Area of surface float
PANCONTINENTAL MINING LIMITED
EXPLORATION DIVISION
MT. CATTLEY E.L.14/85
TASMANIA
BASIN ROAD QUARRY
GEOLOGICAL
SKETCH MAP
SCALE 0 50 100 1:2500
metres
Compiled W. H.
Date SEPT 1986
Dwg. No 36/D/4
Report No
Map Ref SK 55-3
PLATE 1

020

944021

The Australian Mineral Development Laboratories

Flemington Street, Frewville, South Australia 5063
Phone Adelaide (08) 79 1662
Telex AA82520

Please address all correspondence to P.O. Box 114 Eastwood SA 5063
In reply quote:

amdel

3/698/0 - AC 1352/87
SPT 127/87

22 January 1987

NATA CERTIFICATE

Mr Kari Arias
Pancontinental Mining Limited
9-13 Young Street
SYDNEY NSW 2000

REPORT AC 1352/87

YOUR REFERENCE: Application of 1 October 1986

REPORT COMPRISING: Cover Sheet
Page X1
Page G1

DATE RECEIVED: 3 October 1986

Approved Signatory: Trevor Francis

Manager, Geo-Analytical Services: Alan Ciplys

for Dr William G. Spencer
General Manager
Applied Sciences Group

cc Mr W. Herrmann
RSD 1066
DEVONPORT TASMANIA 7310

ij

Head Office:
Flemington Street, Frewville
South Australia 5063
Telephone (08) 79 1662
Telex: Amdel AA82520
Pilot Plant:
Osman Place
Thebarton, S.A.
Telephone (08) 43 5733
Telex: Amdel AA82725
Branch Laboratories:
Melbourne, Vic.
Telephone (03) 645 3093
Perth, W.A.
Telephone (09) 325 7311
Telex: Amdel AA94893
Sydney, N.S.W.
Telephone (02) 439 7735
Telex: Amdel AA20053
Townsville
Queensland 4814
Telephone (077) 75 1377

amdel

Analysis code A1/1,2
A2/4
NATA Certificate

Report AC 1352/87

Results in ppm

Sample	Cu	Pb	Zn	Fe	Mn	Ag	Au
19801	30	12	10	3.91%	170	<1	<0.005
19802	10	28	11	12.7%	100	<1	<0.005
19803	15	<5	5	1.53%	125	<1	<0.005
19804	13	<5	9	2.61%	210	<1	<0.005
19805	9	<5	6	1.15%	105	<1	<0.005
19806	9	8	10	1.19%	98	<1	<0.005
19807	9	6	5	2.02%	185	<1	<0.005
19808	8	20	17	7.08%	105	<1	<0.005
19809	9	<5	5	1.93%	175	<1	<0.005
19810	7	6	12	1.54%	88	<1	<0.005
19811	8	<5	4	1.13%	92	<1	<0.005
19812	9	<5	5	2.50%	155	<1	<0.005
19813	8	12	7	2.11%	130	<1	<0.005
19814	8	8	8	2.50%	110	<1	<0.005
19815	13	<5	17	3.23%	375	<1	<0.005
Detn limit	(2)	(5)	(2)	(5)	(5)	(1)	(0.005)

944023

A M D E L

Analysis code X1 | Report AC 1352/87 | Page X1

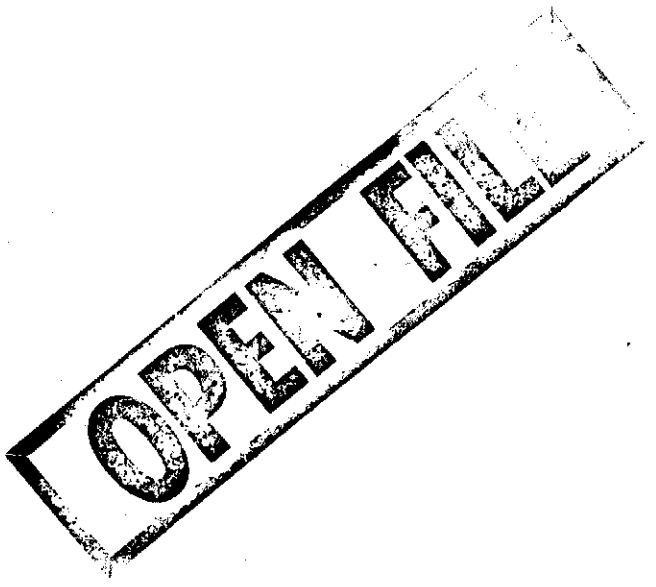
NATA Certificate | Results in ppm

Sample	Ba	As
19801	1120	8
19802	980	20
19803	270	3
19804	340	6
19805	1000	<2
19806	1860	3
19807	20	<2
19808	2200	9
19809	65	<2
19810	780	10
19811	1080	<2
19812	770	5
19813	750	11
19814	340	7
Detn limit	(10)	(2)

111

944114

85/31



NOTES ON THE GEOLOGY OF THE MT. CATTLEY AREA EL 14/85, TASMANIA

Prepared by: W. HERRMANN (RSD 1066, Devonport 7310)
Prepared for: PANCONTINENTAL MINING LIMITED
(Young Street, Sydney)

Date: January, 1986

Distribution

1. PML SYD
2. PML SYD - File
3. W. HERRMANN
4. SPARE (eventually for Mines Dept.)

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1.0 INTRODUCTION

Pancontinental Mining Limited is the holder of Exploration Licence 14/85 covering some 47 square kilometres in the Mt. Cattley area of north western Tasmania (see Figure 1).

Reconnaissance geological mapping and stream sediment sampling of the Licence area and environs was carried out by the writer, under contract to Pancontinental Mining Limited, assisted by Mr P. Lyons, an employee of Pancontinental.

This report includes Geological and Stream Sediment Sample Location Plans at 1:20,000 scale Plates 1 and 2 and a discussion of the geology of the area.

2.0 SUMMARY

Reconnaissance geological mapping and stream sediment sampling was undertaken in the EL 14/85 area and environs during ten days of field work in December 1985.

The mapping has confirmed that approximately 95% of EL 14/85 is covered by Tertiary basalts and minor associated fluvio-lacustrine sediments between mapped basalt-basement contacts at various localities near the eastern boundary of the Exploration Licence suggest that the basalt is likely to be at least 50m thick.

Pre Tertiary basement rocks are exposed in several small "windows" in basalt cover in the valleys of the Medway and Leven Rivers near the eastern boundary.

The rocks in these windows consist of micaceous greywackes, siltstones, tuffaceous siltstones and minor shales and cherts inter-layered with variable quartz-feldspar phyric and aphyric extrusions and pyroclastics of dominantly rhyolitic composition.

Lithologically they would appear to correlate with the "western volcano-sedimentary Sequence" sub division of the Cambrian "Mt. Read volcanic group".

Layering orientations in the sedimentary units imply the presence of fairly open, upright north-north-east trending folds having moderate plunges to the south.

In the far south east of the Licence area, the Cambrian (?) rocks appear to dip under south-easterly dipping siliciclastic conglomerates (correlated with The Ordovician "Owen Conglomerate") effectively precluding exploration of the Cambrian sequence south of Basin Road.

Mapping of road cuttings along Murrays Road approximately 2km north of the Hellyer Prospect (south west of EL 14/85) revealed a broadly similar group of layered micaceous greywackes, siltstones, shales and acid volcanics to those observed in the eastern windows. It is assumed that these rocks overlie the stratigraphic projection of the Hellyer deposit.

They are overlain by easterly dipping sequence of lithic-arkosic sandstones and coarse volcanolithic conglomerates which pass conformably upward to coarse siliciclastic conglomerates and sandstones north of Mt. Cripps. The former are tentatively correlated with the Late Cambrian "Jukes Conglomerate" and the later are clearly correlates of the early Ordovician "Owen Conglomerate".

The structural information from these scant basement exposures is insufficient to confidently predict basement rock structure and stratigraphy below the basalt cover in the central and western parts of EL 14/85.

Since the licence area is 95% basalt covered the success of exploration will depend very heavily on use of geophysical techniques to define targets beneath the basalt. Such techniques will invariably be sensitive to basalt thickness and consequently it is of prime importance that the true thickness of the basalt cover be determined.

This can only be unambiguously achieved by drilling. It is possible that techniques such as electrical sounding may be able to define the base of the basalt at moderate depths but in any case a limited drilling program would be appropriate in order to provide unambiguous data for "calibration" of the sounding method.

It is likely that indications of the feasibility of sub-basalt prospecting will emerge fairly early in a depth of basalt testing program.

3.0 METHODS

3.1 Access and Logistics

Exploration Licence 14/85 appears to fall entirely within land owned by Associated Forest Holdings Pty Ltd and managed for harvesting and growing of timber products. AFH has constructed a network of logging roads which provide excellent all weather 2-wheel drive vehicle access to all parts of the Licence Area. Prior permission must be obtained from AFH for travel in the area. AFH also maintains locked gates on Murray's Road, Middlesex Road and Beecroft Road in the southern parts of the area mapped. Keys for the gates can be obtained on payment of $50 deposit from AFH's office in Burnie.

During the course of this reconnaissance our party occupied a hastily constructed tent camp situated at the south eastern arm of Talbot's Lagoon near the north west corner of the licence.

Most of the area consists of moderately undulating light forest regrowth and scrub land with patches of plantation (trees) of various ages. The valley of the Leven River running northward near the eastern boundary of EL 14/85 is moderately incised and provides pre-Tertiary Basalt exposure in several windows.

These stream exposures are best accessed on foot when the rivers are not running full. Geological exposure is generally limited to the stream bed, rarely outcropping in the banks, and as such is sensitive to river level.

Although valley slopes in some areas are quite steep there is thin but persistent soil/moss cover and geological exposure is negligible unless the ground has been disturbed by logging or roading.

3.2 Geological Mapping

In the absence of comprehensive base maps, field plotting of geological information was carried out on transparent overlays to 1:20,000 scale airphotos (flown: 1985 January) with location fixing assisted by Topolite measurements (along streams and roads) from known points.

The data was then transferred to a semi controlled base map (traced from airphotos by the writer) also at 1:20,000 scale (Plate 1).

A total of 17 rock chip samples of possibly weakly mineralised outcrops were collected and have been submitted for analysis by AMDEL (Burnie, Tas.) as follows:

Cu, Pb, Zn, Ag	AAS method: A1/1
As, Ba	XRF method: A3
Au	Fire Assay method: A7/2

A total of 51 rock "specimens" were collected during the course of the mapping. These were numbered according to the Pancontinental sample books and the locations are recorded on the geological plan.

The rock "specimens" were sawn on a diamond saw to expose fresh surfaces and will be forwarded with this report (to Pancontinental) to assist in geological interpretation.

Rock descriptions and names used on the map are based on the author's own megascopic examinations.

3.3 Stream Sediment Sampling

Samples of active fine sediment of approximately 500 g weight were collected at nominal 200m intervals along the major streams draining areas of pre-Tertiary rocks. (Medway and Leven Rivers along the eastern boundary of EL 14/85). Additional samples were collected from most tributary streams, just above confluences with the major stream. (Due to the absence of a detailed drainage plan and the scrubby nature of the riverbanks, some tributary streams were "missed".)

A total of 74 samples were submitted to AMDEL for analysis of the -80# Fraction as follows: (Plates 3-5)

Cu, Pb, Zn, As:		AAS methods A1/1, A1/2
Au	:	Fire Assay method A7/2

A total of 5 additional Panned Concentrate samples were collected at the discretion of the sampler. These consisted of a screened (-10mm) sample of active sediment of approx. 2-3kg weight panned down to a heavy concentrate of approx. 5-10g.

These were submitted for analysis similar to -80 fraction samples above.

Stream sample locations are recorded on the accompanying 1:20,000 scale plan (Plate 2).

4.0 GEOLOGY

4.1 Tertiary Cover Rocks

Geological reconnaissance (mainly roadside geology) has confirmed that approximately 95% of the licence area is covered by flat lying basaltic extrusives of unknown thickness. The basalt is typically dark greenish-black in colour, fine grained with small (1-2mm) olivine phenocrysts or (locally) vesicles. It appears to have been deposited in thick flows, the best exposures in streamside cliffs or waterfalls displaying massive columnar jointing.

Interbasalt sediments were observed at only one locality, in the Leven River about 1600m upstream from Black Marsh Bridge. Here a near vertical cliff in the north bank exposes a weathered pale grey basalt at river level overlain by a bed of dark brown mud (approx. 0.5m thick) containing abundant lignified fragments of wood up to 30cm in length. This is sharply overlain by an unconsolidated pebbly conglomerate grading upward over about 1.5m to sandy grits containing lignified plant remains.

This is in turn sharply overlain by approximately 8m thick sequence of thinly bedded grey to dark grey siltstone and mudstone with minor pale sandy grit layers containing plant remains. The upper contact of the mudstone-siltstone sequence is obscured but appears to be overlain by a weathered vesicular basalt containing a band ? (1.5m) of pale grey mud.

All sedimentary layering, with the exception of the basal contact, is sharp, persistent and flat lying over the extent of this exposure. Sediments are generally unindurated and friable. The fine and persistent layering suggests a lacustrine environment of deposition.

Pink, pebbly siliceous conglomerates occur at several localities at the base of the (Tertiary) basalt cover marking the unconformable contact over the Palaeozoic basement. The conglomerate bears a strong resemblance to the (Ordovician) Owen type conglomerate and is best exposed near the Medway-Leven River junction. A typical specimen is 18713 which contains both acid volcanic and siliceous quartzite-conglomerate pebbles reworked (no doubt) from Ordovician conglomerate sequences similar to those existing in the Hummocks and Mt. Cattley ridge areas.

It is likely that the topography onto which the Tertiary rocks were deposited and extruded, displayed significant relief, probably at least as much as the present day relief. A cursory comparison of mapped basalt contacts with published topographic data shows that the basalt base in the Leven River area could have vertical relief of about 50m.

4.2 Palaeozoic Geology

Pre-Tertiary basement rocks are confined to several small "windows" in basalt located near the eastern boundary of E.L. 14/85 in the valleys of the Medway and Leven Rivers and also the high ridge running north-east to Mt. Cattley.

A three kilometre wide section of basement rocks is also exposed along Murray's Road, just north-east of the Hellyer Prospect, about five kilometres south of the south west corner of the E.L.

In the two northern most windows (Medway River - Blackmarsh Road area and the Leven River below Cobbers North Road) the exposure is dominated by a sequence of medium to fine grained greywackes and siltstones with lesser interbedded acid volcanics.

The sediments are mostly medium grained micaceous (and locally lithic) greywackes of dark grey colour and thick bedded to massive character. Finer grained silty greywackes and rare shales are locally prominent; these are compositionally similar but generally thinly bedded or laminated. The sediments are often quite felsic probably reflecting epiclastic sedimentation derived from dominantly acid volcanic terrain. The nearly ubiquitous presence of detrital(?) mica flakes suggest terrigenous input from the Pre Cambrian meta-sedimentary "Tyennan Nucleus", now exposed some 15 km to the south east.

Interbedded with the sediments are subordinate medium grained to very fine grained felsic crystal tuffs and tuffaceous siltstones representing fairly distal facies of acid volcaniclastic sedimentation.

The exposure in the Black Marsh Road gravel pit, shows the volcaniclastics to be locally well bedded and perfectly conformable with sedimentary layering in the enclosing greywacke-siltstone sediments.

The rocks generally strike north-easterly with moderate dips to the south east and north west implying the presence of a synclinal fold axis running north-north-east approximately through the junction of Medway and Leven Rivers. The road side exposure on Cobbers North Road suggests a moderate southerly plunge to the synclinal axis. In the northern "window" there is faint suggestion in strike orientations of a plunge to the north. A penetrative cleavage is not generally developed. No fold hinges were observed in outcrop.

The southern "window", in the Leven River upstream from Upper River Road area, exposes a great variety of Rhyolitic volcanics and pyroclastics with very subordinate chert and greywacke-siltstone sediments.

Near the Upper River Road bridge there are widespread outcrops of reddish pink, medium grained feldspar (biotite) porphyry. The rock appears to have a fine intergranular matrix of pink K-feldspar and quartz and on the basis of textural uniformity and extent may represent an intrusive phase of rhyolitic volcanism or a large domelike extrusive. It is often flanked by a pink feldspar phyric glassy rhyolite, locally displaying flow banding,

which may represent a chilled margin to the intrusion or dome extrusion.

At sample locality 18851, the pink porphyry is altered to a pale pinkish grey colour (sericitization of ground mass K-feldspar ?) and contains minor (1%) fine disseminated pyrite cubes.

Other volcanic rocks in the area include:

- very fine grained aphanitic creamy grey coloured rhyolite and/or massive "cherty" fine grained rhyolitic tuffs. These commonly contain very minor, very fine, disseminated pyrite at around 0.2% volume.

- fine-medium grained quartz-feldspar crystal tuffs of rhyolitic to dacitic composition, locally with traces of disseminated accessory pyrite.

- Coarse grained crystal lithic tuffs of rhyodacitic to dacitic composition.

- Grey quartz phyric glassy rhyolite.

All of these lithologies tend to be massive in outcrop and since the skeletal nature of stream bed exposure hardly allows continuous mapping of contacts the local structure is not well defined.

Laminated dark grey chert and cherty siltstones occur at several localities within the window. Although the layering structures show some internal complexity (suggesting soft sediment disruption or tectonic incompetence?) the chert horizon (?) generally has a steep north westerly dip. At the southern end of the window small exposures of micaceous siltstone/greywacke and cherts interbedded with tuffs confirm a south-easterly dip paralleling the layering of Ordovician conglomerates outcropping on the Mt. Cattley Ridge to the east.

This implies an anticlinal axis, probably south plunging, running north-north-east through the southern window.

A penetrative cleavage or parting is not generally well developed except in some of the cherty siltstone/tuffaceous siltstone outcrops. In these cases the cleavage generally parallels local small scale bedding.

A small window in the basalt about 500m x 100m in extent occurs on Basin Road. Exposure here consists of pale pinkish-creamy-grey quartz phyric massive rhyolite - presumably an erosion resistant rock type forming a small palaeotopographic hill under the Tertiary basalt cover.

At the northern and southern ends of the window the rhyolite is relatively fresh but closely jointed. In the central part, well exposed in a small gravel pit, the rock is intensely cleaved, indeed sheared, such that the original volcanic fabric is entirely destroyed and converted to a siliceous sericitic "schist". The imposed orientation of foliation strikes about 010° with steep westerly dip.

Patchily developed (oxidized) disseminated pyrite occurs (mainly) in two sub parallel lensoidal pods (of about 20 x 7m and 30 x 8m in size) aligned parallel to the direction of cleavage. The pyrite mineralisation within the pods is patchy, locally ranging up to a maximum of about 5% volume, generally associated with rusty or pinkish staining of sericitic matrix and fairly pervasive silicification reflected in the slight positive topographic expression of the pods.

The outcrop was chip-channel sampled along a single traverse extending westward across the exposure commencing from a point, on the gravelly track running down the eastern side of the bulldozed area, about 50m north of Basin Road.

A list of sample numbers and intervals along this traverse is given below:

Sample No.	Interval (westward from point of origin) (m)
18828	0 - 5
18829	5 - 10
18830	10 - 15
18831	15 - 20
18832	20 - 25
18833	25 - 30
18834	30 - 32
18835	32 - 34
18836	34 - 36
18837	36 - 38
18838	38 - 40
18839	40 - 45
18840	45 - 50

Lithologies along this traverse are summarised as follows:

0-10m : leached, white strongly brecciated and intensely cleaved quartz porphyritic rhyolite

10-14m: similar to above with pinkish brown staining of sericite matrix, no pyrite boxworks

14-23m: Intensely cleaved rusty brown stained siliceous volcanic (quartz porphyritic character obliterated) with minor patchy development of pyritic disseminated boxworks in range 1%-5%.

23-28m: Similar to interval 10-14m

28-36m: Similar to interval 14-23m, very strong pink-iron oxide staining of sericitic matrix by pyrite boxworks very minor, maximum around 2%.

36-50m: Intensely cleaved, pale greenish creamy quartz porphyritic rhyolite; intensity of cleavage decreasing westwards. No significant staining or pyrite observed.

The steep ridge, commencing 0.5 km east of the Basin Road window, running north east to Mt Cattley, exposes pink, hematite stained

siliceous pebbly conglomerates and coarse sandstone. These are confidently lithologically correlated with the Early Ordovician "Owen Conglomerates". The thickly bedded siliceous clastics dip moderately to steeply to the south east, forming the western limb of a broad synclinal fold. The axis of which is inferred to run NE-SW through the far south east corner of E.L. 14/85.

Murray's Road, running generally east-west about 2km north of the Hellyer Prospect, exposes a 3km wide section of basement rocks which are covered to east and west by large exposures of tertiary basalt.

At the western end of the exposure the basalt overlies weathered massive and coarse fragmental lithic tuff with abundant chloritic altered "fiamme" and occasional clasts of flow banded qtz-feldspar phyric rhyolite. Composition overall is probably dacitic.

This is limited to the east by a one metre wide shear zone which marks the contact with a sequence of gritty lithic sandstones, micaceous greywacke, siltstone and minor shale bearing considerable lithological similarity to the sedimentary rocks exposed in the north eastern windows of the Leven and Medway Rivers. The sediments in this case dip steeply to the north east, gradually swinging eastwards east of the intersection of Murrays South Road. Here the sediments are in conformable contact with coarse fragmental tuffs essentially similar to those at the western end. The sediments here are well bedded, displaying current bedded, graded bedding and suspected worm burrows indicating a younging to the east. The coarse fragmental tuffs close to the contact contain more sedimentary clasts adding further evidence that they overlie the greywacke sequence.

In the camp area on Murray's South Road, there is extensive exposure of pale grey feldspar phyric rhyolite with large (up to 2m) pods of sheared grey shale. It is not clear whether these represent dislocated beds of shale or slices of the presumably overlying greywacke/siltstone/shale sequence emplaced tectonically.

Further eastward towards Mackintosh Road intersection the coarse fragmental unit is succeded by a pink, locally flow banded quartz-feldspar phyric rhyolitic lava, which outcrops weakly along about 300m of the road section.

A break in outcrop of about 100m obscures the eastern contact of the rhyolite lava. Eastward from this there is a near continuous 700m exposure of clastic sediments dominated by coarse lithic and arkosic sandstones with minor interbedded mudstone and siltstone. These finer units indicate steep to moderate easterly dips.

The dominant coarser lithologies are generally very thickly bedded or massive and consist of moderately well sorted but immature (unrounded) particles of pink feldspar, quartz, acid volcanic fragments and various purplish andesitic fragments.

They become somewhat coarser and more lithic east of Mackintosh Road and probably pass gradationally upwards into the very coarse cobbly polymictic conglomerate lithotype which outcrops almost continuously along the next 1.5km of road section.

These are coarse volcanolithic conglomerates, extensively exposed in the road embankments and cuttings. Despite strong weathering to purplish brown clayey material the exposures clearly retain the conglomeratic fabric and indeed the porphyritic character of many of the clasts. The clasts are generally very well rounded and spheroidal, range in size from a few millimetres to about 40cm and are composed dominantly of purplish feldspar phyric andesites, pink feldspar porphyritic felsic intrusive, and creamy to pinkish coloured quartz-feldspar phyric acid volcanic rocks. The latter show a notable increase in proportion toward the eastern contact.

The clasts are generally supported in a medium to coarse sand sized matrix of lithic and crystal fragments (including feldspar and quartz) and constitute about 50% of the rock volume. Locally, and usually where clasts are very large, the matrix "sand" is sparse and clasts rest against each other with only interstitial matrix. The conglomerate fabric is generally quite monotonous with only occassional presence of thin weakly stratified lithic sandy beds.

Within about 50m of the edge of the Basalt cover to the east, the volcanolithic conglomerate (weathered) is in sharp contact with overlying pink pebbly siliceous conglomerate. The contact dips to the east at about 30° and although the volcanogenic and siliceous conglomerate units here are very poorly stratified, appears to be conformable. A few hundred metres to the south of Murray's Road (in environs of an HEC power transmission pylon) the same contact is marked by a thinly bedded reddish siltstone and sandstone unit forming the base of the siliclastic conglomerate. These finely bedded sediments again show conformity with the lithological contact although in places small steeply plunging drag folds are observable.

The pink siliclastic conglomerate and sandstone is further well exposed on the ridge running south toward Mt Cripps. Dips here appear to be consistently moderate to steep to the east.

The pink siliclastic conglomerate and sandstone is clearly lithologically equivalent to the Early Ordovician "Owen Conglomerate", identical to the rocks exposed on the Mt. Cattley and Mt. Mayday ridges to the east and north east. They are generally regarded as fluviatile "fanglomerates" deposited more or less disconformably on Cambrian rocks and derived from sudden uplift and erosion of the meta-sedimentary Tyennan Nucleus (Precamb.) at the end of the Cambrian Period in Tasmania.

On the basis of apparent conformability and general similar facies of sedimentation to this Owen correlate, I am inclined to regard the underlying volcanolithic conglomerates and lithic sandstone units as possible correlates of the "Jukes Conglomerate" - a basal (?) member of the late Cambrian "Tyndall Group" which is a sequence of quartz-feldspar phyric lavas, tuffs, agglomerates and volcanolithic conglomerates which more or less conformably underlies the Owen Conglomerate and disconformably overlies volcanics of the Mt. Read group in the Queenstown area.

(See also the description of Jukes Conglomerate in Explanatory Report for Sheet 44: MACKINTOSH, Tas. Dept. Mines, 1981).

It is tempting to speculate further on the possible stratigraphic correlations of the sedimentary-volcanic rocks exposed with the subdivisions of the Mt. Read volcanics established by K.D. Corbett (1979 and 1984).

On the basis of abundant greywacke type sediments and presence of quartz-feldspar phyric pyroclastics and lavas the rocks of the EL 14/85 area would appear to have lithological similarity to Corbett's "western volcano sedimentary sequence". The "central volcanic sequence" of Corbett being principally composed of feldspar phyric lavas, cannot be directly compared, although some of the volcanics in this area (EL 14/85) do appear to be exclusively feldspar phyric. (Murray's South Road and Upper River Road areas).

5.0 REFERENCES

Collins, P.L.F. 1981; Gullin[illegible], A.B.; Williams, E: Geological Survey Explanatory Report Zone 7 Sheet 44 MACKINTOSH (1 mile series) Tasmanian Dept. Mines

Corbett, K.D. 1979: Stratigraphy correlation and Evolution of the Mt. Read Volcanics in the Queenstown-Jukes-Darwin and Mt. Sedgwick areas. Bulletin 58. Geol.Surv.Tasm.

Corbett, K.D. 1984: Stratigraphy of the Mt. Read Volcanics and associated sedimentary sequences in the Henty River - Williamsford areas, and some implications in: Baillie, P.W.; Collins, P.L.F., (Eds), 1984. Mineral Exploration and Tectonic Processes in Tasmania, November 1984. Geological Society of Australia, Tasmanian Division: Hobart. ISBN 0 7246 1907 0.

CORRIGENDUM

Re: Notes on the Geology of the Mt. Cattley Area, E.L. 14/85, Tasmania (Herrmann, 1986)

In section 3.3 Stream Sediment Sampling, Herrmann states that "additional samples were collected from tributary streams, just above the confluences with the major stream." This is not so. I took additional samples from the major stream just above its confluence with the tributary stream(s). I have corrected the location plan accordingly. Obviously I misinterpreted Herrmann's instructions. However, I never sought clarification as I thought this was a perfectly reasonable and "state of the art" method of collecting data.

P. Lyons
9.1.86

9645

392 000 E
394 000 E
396 000 E
398 000 E
400 000 E
402 000 E
404 000 E
5 412 000 N
410 000 N
408 000 N
406 000 N
404 000 N
402 000 N
400 000 N
398 000 N
5 396 000 N
TALBOT'S LAGOON
Campsite
Middlesex Road
Wattle Park Road
Blackmarsh Road
Tommy Walker Road
Medway Road
Racecourse Road
Painter Road
Medway River
Middlesex Spur Road
Yellow Marsh Road
Basalt Waterfalls
Hut
Beecroft Road
Cobbers Road
Cobbers North Road
Cobbers Sth Road
Upper River Road
Hodgett's Road
Middlesex Road
Basin Road
Celery Road
Cattley Road
Cattley South Road
Murray's Road
Murray's South Road
Mackintosh Road
HEC TRANSMISSION LINE
HELLYER PROSPECT
CAMP
gate
MT. CRIPPS
E.L. 14/85
Leven R.
18709 - dk grey chert
18708 - chloritic feldspar (qtz) xtal tuff
Pink Congl.
18707 - f.g. rhy. tuff
18706 - f.g. f xtal tuff c̄ minor diss. py.
18705 - m.g. micaceous g.wacke
18712 - lam. g.wacke/slst
18710 v.f.g. rhyolitic ash tuff
18711 - m.g. fg. xtal (lithic) tuff
18713 - Ts pink pebbly conglomerate
18714
18715 - lithic micaceous greywacke
Lithic g.wacke
18750 - f.g. rhyolitic tuff?
Ts : 15 m thick interbasalt sediments; incl. pebbly grits, silts, muds with lignified plant remains. (flat lying)
Columnar jointing in Tb
Massive m.g. micaceous gwacke
18716
18717
18718A (Rxt)
f.g. siliceous volc?
Weathered m.g. fxt or f. pyric rhyolite?
Laminated slst.
Lam slst/gwacke
18718
Massive m.g. micaceuos gwacke
(contact defined by mapping float)
Rxt
CUT GRID LINES (Bearing 135°)
10000 N
9200 N
8400 N
8200 N
7800 N
7400 N
Thick bedded gwacke
Thinly interbedded micaceous gwacke/slst.
18719
Felspathic gwacke
f.g. slst. gwacke
Micaceous gwacke minor lam. slst.
Weath. felspathic gwacke
Flat lying pink pebbly conglomerate
Pink feldspar phyric rhyolite
18720
18721
18722
18723
18724
Ryodacitic lithic xtal tuff
Laminated cherty slst
18851
18725
Creamy coloured f.g. aphanitic rhyolite c̄ patchy disseminated pyrite < 0·2 % vol.
Weath. f.g. cherty slst?
18726
Pink feldspar - biotite porphyry. Probably intrusive
18727
Locally flow banded pink feldspar phyric rhyolite (marginal intrusive phase?)
Coarse dacitic? lithic xtuff
18728
18729
18730
f - m.g. xtal tuff (dacitic) trace dissem. pyrite
qf xt. float
18731
Grey chert (30 m thick)
18732
Massive f.g. "cherty tuff"
Coarse lithic x tuff
Tb & Ts congl. float
18733
Tb float
1m grey chert band strike 80°
f.g. rhyolitic tuff
Lamigrey cherty slst
m.g. qf xtuff c̄ interbedded grey cherty/tuffaceous slst.
18734
18735
f.g. slst/minor micac. gwacke
Qtz phyric Rhyolite?, stained reddish near basalt contact
Θc pink hematitic
18747
18749
18748
Intensely cleaved qtz phyric rhyolite Patchy pink staining. Minor oxidised boxwork after pyrite ≈ 1-5% locally. Associated sericitic/siliceous alteration? (Rock Chip Samples 18828-40)
Close jointed qtz phyric rhyolite
Θc pink pebbly congl.
Θc scree
Pink hematite stained pebbly lithic quartz xtal tuff? rounded, flattened "cherty" volcanic pebbles aligned 040°, steep dip west? (probably aligned to cleavage)
Flat lying slabs Tb in waterfall
Weathered basalt float in stream bed
Θg? (sinkholes)
Θc - bouldery unconsolidated gravel/colluvium Residual deposit on Tb?
Dk. grey slst float
Lithic qfxt
q.p. R. hy.
Pebbly congl.
Intensely clvd. hem. st. qtz. phyric rhyolite
Rhyolitic agglomerate
hematite stained qpR.
R.aggl.
Cross bed. sst. & congl.
Silic. q.p.Rhy. c̄ minor pyrite
Lithic ignimbrite?
Cse g. volcanolithic sst.
Pink q-f phyric rhyolite (ignimbrite?) (c̄ magnetite accessory?)
Pink q-f phyric rhyolite (note: magnetite accessory)
Arkosic volcano-lithic sandstone
Pebbly congl.
Pink arkosic sst.
Θj - Coarse polymictic (volc.) conglomerate, generally dominantly andesitic, q-f-phyric rhyolite clasts prominent near eastern contact
Coarse fragmental dacitic lithic tuff c̄ small pods/clasts of grey shale at eastern end of exposure
Gritty lithic sst, minor shale
pebbly grits/gwacke/slst/shale
18746
1m. wide shear zone
lam. grey shaly slst.
Small contorted folds near contact
Pale grn - grey feldspar phyric rhyolite with pods sheared grey shale
Θs - m.g. arkosic - lithic sandstone, minor interbedded mudstone, slst.
(contact not exposed)
0·5m sandy bed
18736
18737
18738
18739
18740
18741
18742
18743
18744
18745
Basal 10m thick red slst/sst overlain by coarse pink siliceous congl./congl. sst.
Small folds plunge steep to south
Pink q-f phyric flow
Coarse dacitic lithic tuff, locally silicified. Rare silty sedimentary clasts
Thickly interbedded micaceous gwacke/slst/shale, facing east. Shales increasing to east
Weakly stratified arkosic - lithic sst.
Boulder congl.
Stratified m.g. arkose

LEGEND

TERTIARY	Tb	Basalt
	Ts	Interbasalt grits, silts, carbonaceous muds. Sub-basaltic pink siliceous conglomerate
ORDOVICIAN	Θg	Limestone (GORDON LIMESTONE CORRELATE)
	Θc	Siliceous pink conglomerate, sst, minor slst (OWEN CONGLOMERATE CORRELATE)
	Θj	Coarse polymictic (volcanic) conglomerate — JUKES CONGLOMERATE CORRELATE ?
	Θs	Coarse - med. grained arkosic - lithic sandstone, minor interbedded slst, mudstone — JUKES CONGLOMERATE CORRELATE ?
CAMBRIAN		Fine grained slst and shale. Generally laminated — MT READ VOLCANICS
		Med. grained micaceous greywacke, occasionally lithic, generally massive or thickly bedded — MT READ VOLCANICS
		Chert, cherty siltstones and tuffs — MT READ VOLCANICS

CAMBRIAN — MT READ VOLCANICS

- Very fine grained siliceous tuffs
- Fine to med. grained qtz - feldspar xtal tuff
- Med. grained feldspar xtal tuff
- Coarse lithic tuff / volcanic breccia - rhyolitic
- Coarse lithic tuff / volcanic breccia - dacitic
- Very fine grained aphanitic rhyolite
- Qtz - feldspar phyric rhyolite
- Feldspar phyric rhyolite
- Pink feldspar (biotite) porphyry, probably intrusive

Geological Symbols: BMR System (1978)

- 18705 — Rock specimen locality
- 18706 (underlined) — Rock chip sample locality (for analysis)
- Boundary - EL 14/85
- Geological outcrop
- Geological boundary - position approximate
- Geological boundary - position inferred
- Unconformity
- Dyke
- Strike and dip of strata
- Trend line showing dip
- Anticline - position inferred
- Syncline - position inferred
- Strike and dip of joint
- Strike and dip of cleavage
- Strike and dip of bedding and cleavage
- Strike and dip of platy flow structure
- Stream
- 7800 N — Cut grid line (BRG 135°)

944126

5 cm

PANCONTINENTAL MINING LIMITED
EXPLORATION DIVISION
PANCON

MT. CATTLEY PROJECT
EL 14/85 - TASMANIA
GEOLOGICAL PLAN

SCALE 1:20,000
0 400 800 1200 1600 2000
METRES

Compiled: W. Herrmann	Date: December, 1985	Dwg. Nº 36/D/1
Report Nº 85/31	Map Ref. SK 55-3	PLATE 1

87 - 2642

9646

392 000 E | 394 000 E | 396 000 E | 398 000 E | 400 000 E | 402 000 E | 404 000 E

5 412 000 N | 410 000 N | 408 000 N | 406 000 N | 404 000 N | 402 000 N | 400 000 N | 398 000 N | 5 396 000 N

TALBOT'S LAGOON
Campsite
Middlesex Road
Wattle Park Road
Blackmarsh Road
Leven R.
Tommy Walker Road
Hut
Medway River
Medway Road
Racecourse Road
Middlesex Spur Road
Beecroft Road
Painter Road
Cobbers Road
Cobbers North Road
Yellow Marsh Road
Upper River Road
Hodgett's Road
Cobbers Sth Road
Middlesex Road
gate
Basin Road
Cattley Road
Celery Road
Cattley South Road
Murray's Road
Murray's South Road
Mackintosh Road
HEC TRANSMISSION LINE
△ MT. CRIPPS

E.L. 14/85

18764 18763 18762 18761 18765 18759 60* 18758 18757 18756 18755 18754 18753 18751, 52* 18766 18767* 18768 18769 18770 18771 18772 18773 18774 18775 18776 18777, 78* 18779 18780 18781 18782 18783 18784 18785 18786 18787 18788 18789 18790 18791 18792 18793 18794 18795 18796 18797 18798, 99* 18800 18801 18802 18803 18804 18805 18806 18807 18808 18809 18810 18811 18812 18813 18814 18815 18816 18817 18818 18819 18820 18821 18822 18823 18824 18825 18826 18827 18841 18842

LEGEND

18751 Analysis of -80 mesh fraction

18752* Analysis of panned concentrate

944127

5 cm

PANCONTINENTAL MINING LIMITED
PANCON
EXPLORATION DIVISION

MT. CATTLEY PROJECT
EL 14/85 - TASMANIA

STREAM SEDIMENT SAMPLE LOCATION PLAN

SCALE 1:20,000
0 400 800 1200 1600 2000
METRES

Compiled: P. Lyons	Date: December, 1985	Dwg. Nº 36/F/1
Report Nº 85/31	Map Ref. SK 55-3	PLATE 2

87-2642

9647

392 000 E | 394 000 E | 396 000 E | 398 000 E | 400 000 E | 402 000 E | 404 000 E

5 412 000 N | 410 000 N | 408 000 N | 406 000 N | 404 000 N | 402 000 N | 400 000 N | 398 000 N | 5 396 000 N

TALBOT'S LAGOON

Campsite

Middlesex Road

Wattle Park Road

Blackmarsh Road

Tommy Walker Road

Hut

Medway River

Medway Road

Racecourse Road

Middlesex Spur Road

Beecroft Road

Pointer Road

Yellow Marsh Road

Cabbers Road

Cabbers North Road

Cabbers South Road

Hut

Middlesex Road

E.L. 14/85

gate

Level

gate

Cattley Road

Cattley South Road

Murray's Road

gate

Murray's South Road

Mackintosh Road

HEC TRANSMISSION LINE

△ MT. CRIPPS

0·20 | 0·08 | <0·01 | 0·03 | 0·07, <0·01* | 0·01 | 0·16 | 0·07 | 0·32 | 0·01 | 0·03, <0·01* | <0·01, 0·02* | <0·06 | 0·25 | 1·00 | 0·95 | 0·01 | <0·02 | <0·03 | <0·06 | <0·04, <0·05* | 0·01 | <0·04 | 0·03 | 0·04 | 0·04 | 0·04 | <0·01 | 0·07 | 0·27 | <0·03 | 0·06 | 0·06 | 0·03 | 0·02 | 0·01 | 0·18 | <0·01 | <0·01 | <0·01 | <0·01, <0·05* | <0·2 | 0·1 | 0·01 | <0·02 | <0·02 | <0·02 | <0·2 | <0·01 | <0·01 | <0·01 | <0·01 | 0·02 | <0·01 | <0·01 | 0·02 | <0·04 | <0·07 | 0·01 | <0·02 | <0·01 | <0·01 | <0·2 | <0·01 | <0·01 | <0·01 | <0·01 | <0·07 | <0·01 | 0·1 | <0·05

392000 E | 394000 E | 396000 E | 398000 E | 400000 E | 402000 E | 404000 E

944128

5 cm

LEGEND

0·035 — Analysis of -80 mesh fraction - g/tonne gold

0·02* — Analysis of panned concentrate - g/tonne gold

PANCONTINENTAL MINING LIMITED
PANCON
EXPLORATION DIVISION

MT. CATTLEY PROJECT
EL 14/85 - TASMANIA

STREAM SEDIMENT SAMPLING
GOLD
(ppm)

SCALE 1:20,000

0 400 800 1200 1600 2000
METRES

Compiled: P.L.	Date: December, 1985	Dwg. Nº 36/F/2
Report Nº 85/31	Map Ref. SK 55-3	PLATE 3

97-2642

9648

392 000 E | 394 000 E | 396 000 E | 398 000 E | 400 000 E | 402 000 E | 404 000 E

5 412 000 N | 410 000 N | 408 000 N | 406 000 N | 404 000 N | 402 000 N | 400 000 N | 398 000 N | 5 396 000 N

TALBOT'S LAGOON
Campsite
Middlesex Road
Wattle Park Road
Blackmarsh Road
Tommy Walker Road
Hut
River
Medway
Medway Road
Racecourse Road
Middlesex Spur Road
Beecroft Road
Painter Road
Cobbers North Road
Cobbers Road
Yellow Marsh Road
Cobbers Sth Road
Middlesex Road
Leven
gate
Cattley Road
Cattley South Road
HEC TRANSMISSION LINE
Murrays Road
Murrays South Road
MacIntosh Road
△ MT. CRIPPS

E.L. 14/85

28,12 | 25,8 | 27,12 | 23,14 | 25,12 | 29,14* | 13,16 | 23,10 | 25,12 | 19,16 | 35,16 | 28,16 | 22,12 | 21,10:22,42 | 13,16 | 15,12* | 22,12 | 26,18 | 20,18 | 24,20 | 11,18 | 23,20 | 30,20 | 19,14 | 23,20:24,18* | 15,14 | 26,22 | 16,18 | 7,10 | 17,20 | 14,20 | 11,14 | 9,14 | 15,22 | 17,22 | 13,16 | 23,26 | 13,20 | 14,20 | 15,22 | 13,18 | 15,16 | 13,18 | 15,16 | 17,12 | 13,12:15,8* | 25,18 | 28,18 | 9,12 | 21,22 | 11,16 | 13,16 | 15,16 | 8,14 | 14,14 | 11,14 | 22,26 | 18,20 | 16,16 | 21,20 | 24,22 | 22,22 | 9,20 | 20,16 | 13,10 | 9,10 | 15,18 | 15,12 | 16,12 | 17,14 | 17,12 | 11,8 | 32,14 | 11,8 | 43,16 | 30,12

LEGEND

21,22 Analysis of -80 mesh fraction - ppm Cu, Pb

29,14* Analysis of panned concentrate - ppm Cu, Pb

944129

5 cm

PANCONTINENTAL MINING LIMITED
PANCON
EXPLORATION DIVISION

MT. CATTLEY PROJECT
EL 14/85 - TASMANIA

STREAM SEDIMENT SAMPLING
COPPER AND LEAD
(ppm)

SCALE 1:20,000
0 400 800 1200 1600 2000
METRES

Compiled: P.L.	Date: December, 1985	Dwg. Nº 36/F/3
Report Nº 85/31	Map Ref. SK 55-3	PLATE 4

87-2642

3649

392 000E | 394 000E | 396 000E | 398 000E | 400 000E | 402 000E | 404 000E

5 412 000N | 410 000N | 408 000N | 406 000N | 404 000N | 402 000N | 400 000N | 398 000N | 5 396 000N

TALBOT'S LAGOON

Campsite

Middlesex Road

Wattle Park Road

Blackmarsh Road

Tommy Walker Road

Hut

Medway River

Racecourse Road

Medway Road

Middlesex Spur Road

Beecroft Road

Painter Road

Cobbers Road

Cobbers North Road

Yellow Marsh Road

Cobbers Sth. Road

Middlesex Road

Leven River

gate

E.L. 14/85

Cattley Road

Cattley South Road

HEC TRANSMISSION LINE

Murray's South Road

Mackintosh Road

△ MT. CRIPPS

175,55
135,<20
175,<20
150,<20
125,130
185,<20
145,<20:155,<20*
125,<20
185,<20
170,<20
185,<20
160,<20*
160,<20
170,<20
72,60
74,<20*
76,120
130,160
105,20
130,35
80,25
140,30
115,<20
140,30
125,<20
88,<20
100,<20
145,<20
120,<20
70,<20
120,<20
115,<20
74,<20
76,<20
66,<20
110,<20
100,<20
160,<20
110,<20
105,<20
110,<20
80,<20
74,<20
76,<20
80,<26
96,<20
76,<20
56,<20*
115,<20
110,<20
58,<20
110,<20
82,<20
94,<20
110,<20
49,<20
76,<20
66,<20
135,<20
120,<20
100,<20
115,<20
135,<20
150,<20
22,<20
94,<20
54,<20
60,<20
120,<20
68,<20
64,<20
84,<20
68,<20
54,<20
135,<20
56,<20
120,<20
30,<20

944130

5 cm

LEGEND

26,<20 Analysis of -80 mesh fraction - ppm Zn, As

155,<20* Analysis of panned concentrate - ppm Zn, As

PANCONTINENTAL MINING LIMITED
PANCON EXPLORATION DIVISION

MT. CATTLEY PROJECT
EL 14/85 - TASMANIA

STREAM SEDIMENT SAMPLING
ZINC AND ARSENIC
(ppm)

SCALE 1:20,000
0 400 800 1200 1600 2000
METRES

Compiled: P. L.	Date: December, 1985	Dwg. Nº 36/F/4
Report Nº 85/31	Map Ref. SK 55-3	PLATE 5

87-2642

944024

86/35

093

REPORT ON

SUB BASALT DRILLING PROGRAM

AT MT CATTLEY EL 14/85, TASMANIA

SEPTEMBER - OCTOBER 1986

for

PANCONTINENTAL MINING LIMITED

9-12 Young Street, Sydney 2000

by

W. HERRMANN
RSD 1066 Devonport, Tasmania 7310

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1. PML - Archives
2. PML - File
3. Outokumpu
4. W. Herrmann
5. Department of Mines, Tasmania

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1. INTRODUCTION

Exploration Licence No 14/85 covers approximately 47 square kilometres in the Mt Cattley - Surrey Hills area of North Western Tasmania and is currently being explored by Pancontinental Mining Limited primarily for volcanogenic massive sulphide deposits.

About 95% of the licence area is covered by Tertiary basalts of hitherto unknown thickness. The exceptions are confined to several small basement "windows" exposed in the valley of the Leven River along the eastern boundary of the licence.

Earlier this year Pancontinental conducted a SIROTEM survey over several one kilometre spaced lines across the southern part of the licence. Interpretation of SIROTEM data led to preparation of a contoured plan showing Interpreted Basalt Thickness in the range of about 300m to less than 100m.

Pancontinental then embarked upon a three hole drilling program designed primarily to test the accuracy of interpreted basalt thickness (in the less than 100m range) and secondarily to obtain basement lithostratigraphic information.

My task in the program, carried out on a contract basis, was to provide on site supervision of drilling progress and geological logging of recovered chips and core samples. This report represents results of the drilling program and some lithostratigraphic interpretations based thereon.

2. SUMMARY AND CONCLUSIONS

A drilling program involving three vertical percussion/core drilling holes has been conducted in the south-eastern part of EL 14/85.

The drilling program was designed to fulfil two objectives:

1. To test the accuracy of interpreted basalt cover thickness based on data from a recent reconnaissance SIROTEM survey.

2. To obtain sub-basalt basement litho-stratigraphic information.

The first objective was successfully achieved. "Interpreted basalt thickness" for the three sites drilled ranged from 64 to 110 metres; actual drilled thicknesses were in the range 60 to 87 metres.

Basement lithologies cored in the three holes, though without significant alteration/mineralisation are regarded as encouraging. They comprise:

MCPD 1: interlayered felsic lithic tuffs and amygdaloidal Andesites overlying upright micaceous greywacke and siltstone.

MCPD 2: Amygdaloidal Andesite.

MCPD 3: Porphyritic Andesites with a 15m thick interlayer of porphyritic flow banded Rhyodacite.

This assemblage appears to bear similarity to the footwall part of a published stratigraphy of the Hellyer-Mt Charter area, now ascribed to the lower part of the Mid-Late Cambrian Dundas Group. Alternative lithostratigraphic - structural models suggest that the stratigraphic equivalent of the Hellyer-Que River mineralised host horizon may lie near or just outside the southern boundary of EL 14/85 or alternatively near the south eastern boundary.

In view of and in spite of the stratigraphic and structural uncertainties it is recommended that exploration now be focussed upon selection and application of appropriate geophysical techniques for definition of volcanogenic massive sulphide drilling targets beneath the basalt cover.

3. METHODS

3.1. Siting of Drill Holes

Proposed drill sites were determined by Pancontinental's staff, presumably on the basis of fairly shallow depth to basement and stratigraphic projection of basement geology as mapped and interpreted by Herrmann (1986).

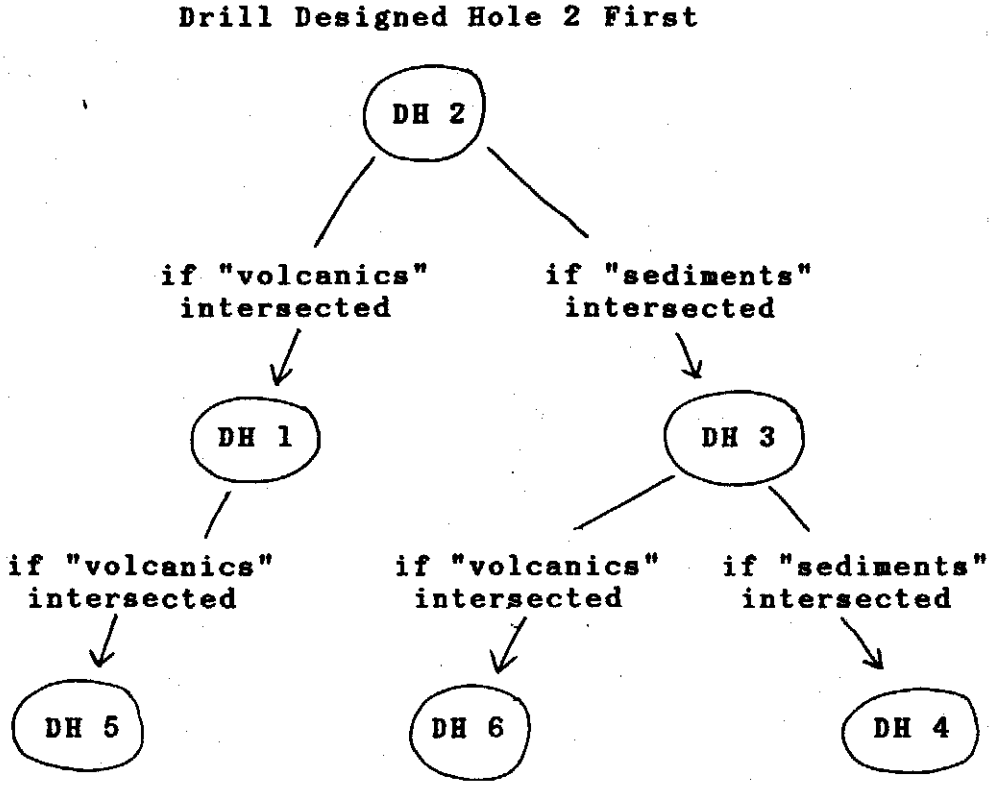
A list of six "designed drill hole" locations was provided:

(Grid co-ordinates refer to SIROTEM grid survey; see also Dwg. No. 36/E/2, "Interpreted Basalt Thickness").

Designed Hole No.	Location	Est. Basalt Thickness	Proposed Hole Depth
1.	12000N/10100E	100 + 20m	160m
2.	12000N/10500E	64 + 10m	120m
3.	12000N/10800E	100m	160m
4.	12000N/11500E	86 + 15m	140m
5.	10000N/10000E	100 + 15m	150m
6.	Beecroft Rd. 630m South of 12000N	64 + 15m	115m

028

A complex sequence of drilling was planned according to the basement lithologies to be intersected. The sequence can be best described by the following flow chart:



In accordance with these directions the sequence actually drilled was: DH 2, DH 3 and DH 6 and these were named MCPD 1, MCPD 2, and MCPD 3 respectively. (*NB: MCPD 1 (DH 2) was collared at 12000n/10485E, 15m west of proposed location, due to site conditions.

3.2. Access and Logistics

Designed hole locations 5 and 6 were on Middlesex and Beecroft Roads respectively and presented no access problems for the truck mounted drilling machinery. Designed holes 1 to 4 were located along SIROTEM grid line 12000N which had previously been cleared, through light forest and scrub, by bulldozer (in April 1986).

Access to the initial site MCPD 1 along 12000N was blocked from the west by a large swampy area and from the east by a steep creek crossing. Accordingly a bulldozer, on hire from Associated Forest Holdings, was used to construct a new track to MCPD 1, branching southward off an existing bulldozer track running east-west between Beecroft and Middlesex Roads a few hundred metres north of 12000N. The bulldozer was also required to tow both the drill truck and compressor truck most of the route into and out of site MCPD 1. The bulldozer was also required for towing into and out of site MCPD 2, in this case directly along line 12000N from Beecroft Road.

Ground conditions during September-October were relatively firm but very slippery, especially following surface disturbance.

3.3. Drilling

Drilling was carried out by Stacpoole Enterprises of Launceston, using a Fox-Mobile Drill B80, top drive dual purpose rig mounted on a Mack truck. Compressor, for percussion precollaring, was a Sullair 750 CFM/350 P.S.I. unit mounted on a Bedford 4 x 4 truck.

All drillholes were vertical. Holes were precollared to solid rock using a 6 1/2" diameter down hole hammer, then cased with 150mm pipe. Drilling through the basalt was achieved by 4 1/2" downhole hammer. All holes were subject to heavy water inflow and foaming agents were required to assist in maintaining circulation. Some problems were experienced, especially in MCPD 2, due to loose gravelly sediments (intrabasalt) caving into the hole during rod changes, causing the hammer to become clogged. This was eventually overcome be resting the hammer at the bottom of the hole during rod changes.

Down hole hammering was continued into the weathered basement until the limit of hammering or fairly solid basement rock was reached. Holes were then cased in HQ casing and NQ core drilling carried on until several tens of metres of unoxidised basement had been recovered.

At conclusion of coring all casing was recovered, including 150mm coring and the holes capped with whatever old oil drum or log of timber was handy. Holes were not cased with PVC.

3.4. Sampling

Percussion chips from 4 1/2" diameter hammer (i.e. beyond the depth of 150mm casing) were sampled and logged in 3 metre intervals. Approximately 1kg of material from each interval was bagged, labelled and retained.

NQ core recovery was generally good; below the level of oxidation virtually 100%.

Selected intervals of core were sawn in half (axially) to provide sample material for lithogeochemical analysis and petrographic descriptions.

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List of Core Samples:

Sample No	Hole No	Depth Interval	Rock Type (m)
19816	MCPD 1	128.8 - 129.1	Felsic Crystal lithic Tuff (Ox)
19817	MCPD 2	83 - 84	Vesicular Andesite (Ox)
19818	MCPD 2	105 - 106	Amygdaloidal Andesite with abundant qtz.-carb. veins
19819	MCPD 2	107.6 - 107.8	Amygdaloidal Andesite (v. low intensity veins)
19820	MCPD 3	106 - 107	Porphyritic Andesite
19821	MCPD 3	110 - 111	Porphyritic Rhyodacite
19822	MCPD 3	126 - 127	Porphyritic Andesite

Petrological description of representative thin sections and lithogeochemical analyses are included as Appendices II and III.

Analyses of the rocks was carried out by AMDEL. A variety of techniques have been used:

1. Whole Rock Analysis

   Elements of SiO_2, TiO_2, Al_2O_3, Fe_2O_3 (Total Fe), MgO, CaO, Na_2O, K_2O, MnO, P_2O_5, S, LoI.

   D.L. 0.01% for all elements

   Fusion of the sample with lithium metaborate/ tetraborate flux, acidic dissolution and final determination by Inductively Coupled Plasma-Optical Emission Spectrometry (ICP-OES).

2. Elements Sb, Cr, V, Se, Zr, Nb, Y, Sr, Rb, Ba, As, Pb, Bi, Mo, W

   D.L. (ppm) 4, 10, 10, 2, 4, 4, 4, 4, 4, 10, 2, 4, 4, 4, 10

   X-ray fluorescence analysis is used according with AMDEL code X 3 + 10% accuracy.

3. Elements: Ni, Cu, Zn, Ag, Co
   D.L. (ppm) 2, 1, 1, 0.1, 2

   Perchloric/hydrochloric acid digestion with atomic absorption spectrometry determination.

4. Element: Au
D.L. 25 gram charge 0.01 ppm
D.L. 50 gram charge 0.005 ppm

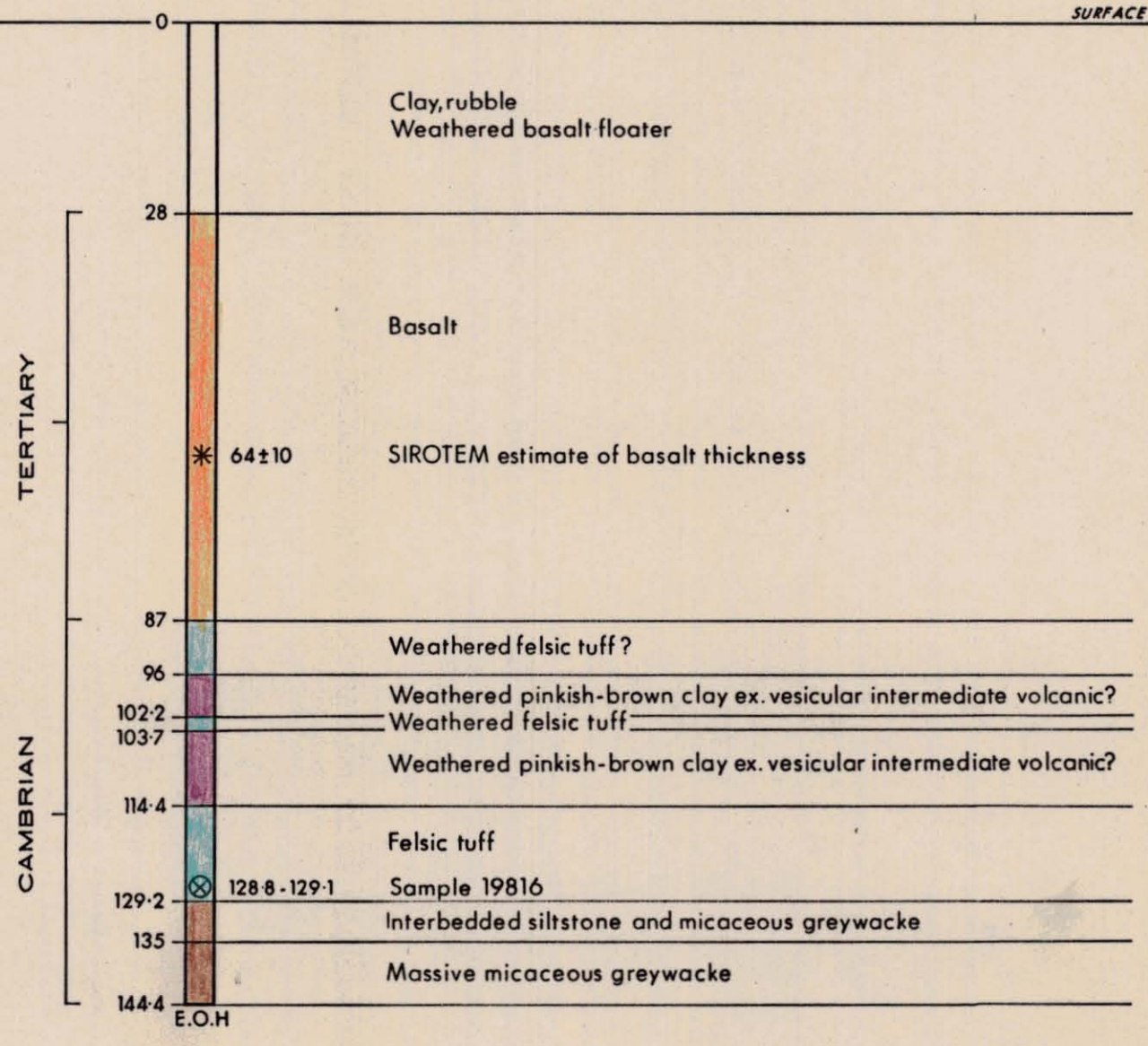
Aqua-regia digestion, organic extraction, AAS determination.

Unfortunately, no external standards were run and no internal (laboratory) standard results have been quoted.

4. GEOLOGICAL DRILL HOLE LOGS

033

944034



5 cm

LEGEND

COLLAR CO-ORDS:
12 000 N 10 485 E

VERTICAL

Hammered : 0 - 96

Cored : 96 - 144·4

- ○ SAMPLE LOCATION
- ⊘ PETROLOGICAL EXAMINATION
- ⊗ LITHOGEOCHEMICAL ANALYSES

PANCONTINENTAL MINING LIMITED
EXPLORATION DIVISION

MT. CATTLEY PROJECT
E.L. 14/85 - TASMANIA
LITHOLOGICAL SECTION
HOLE Nº MCPD 1

0 10 20 30 40 50
1:1000 METRES

Compiled W.H.	Date October, 1986	Dwg. Nº
Report Nº	Map Ref. SK 55-3	FIGURE 1

MT CATTLEY EL 14/85 TASMANIA

WALTER HERRMANN - 19.9.1986

GEOLOGICAL LOG: DRILL HOLE - MCPD1

Co-ordinates:	12000N/10485E
Drilled:	15-19/9/1986
0-20m (6.5" Perc. Hammer)	Clay and rubble (Not sampled)
22-25m (4.5" Perc. Hammer)	Brown weathered basalt and clay, some chips dark blue-black olivine basalt, possible floaters.
25-28m	Mixture red-brown and dark grey weathered fresh basalt. Olivine crystals obvious.
28-31m	As above, some chips appear vesicular.
31-34m	As above.
34-37m	Essentially fresh dark grey basalt, minor oxidised olive brown basaltic tuff?
37-40m	Dark grey fresh olivine basalt. About 1% clear calcite cleavage fragments or vesicle fillings.
40-43m	Dark grey fresh olivine basalt, insignificant calcite.
43-46m	Dark grey fresh fine grained olivine basalt. Olivine less obvious.
46-49m	Dark grey fine grained olivine basalt. Very minor calcite fragments, ex vesicle fillings?
49-52m	Fine grained glassy - dark grey olivine basalt.
55-58m	Dark grey fine grained olivine basalt with dark angular (1mm) fragments of glassy material.
58-61m	Dark grey fine grained olivine basalt, minor calcite chips.

61-64m	Dark grey - purplish grey fine grained basalt. About 1% calcite chips; also minor clear cleavage fragments of high refractive index, harder than glass material??
64-67m	As above.
67-70m	Dark grey to purplish grey semi glassy basalt; dark brown rimmed glassy fragments and shards in fine grained grey basalt.
70-73m	As Above.
73-76m	Dark purplish grey vesicular basalt, vesicles open, partly filled with blue grey botryoidal encrustations.
76-79m	Dark grey fine grained olivine basalt with crowded small (<2mm) dark glassy fragments and interstitial fillings.
79-82.2m	Dark purplish grey vesicular glassy basalt.
82.2-85.4m	Dark medium grey fine grained olivine basalt. Olivine obvious. Not glassy.
85.4-88.75m	Medium grey fine grained olivine basalt, change to pale greenish brown weathered clayey material at around 87m depth. This has fine granular vaguely "eutaxitic" fabric.
88.75-91.9m	Pale greenish khaki to greenish grey clayey weathered rock, has a very fine granular fabric, could be a fine felsic tuff, but without quartz.
91.9-96.0m	As above.
NQ CORE 96-144.4M	
96.0-102.2	Clay. Soft puggy clay varying from purplish to light olive brown. Retains fine to medium grained meshwork-granular fabric. Meshwork appears to represent original feldspars; occasional larger phenocryst feldspar grains to 3mm.

Also occasional rounded greenish grey blebs to 5mm which could represent weathered vesicle fillings, they usually occur in fine pinkish clay base.

Very rare siliceous granules or fragments appear to be broken vesicle or small fracture fillings.

102.4-103.7m — Weathered Felsic Lithic Tuff

Still completely oxidised, generally of pink to greyish brown colour.

Typically consists of small subrounded to irregular fragments (1-15mm) of pink weathered volcanic? material with internal fine vesicular or "eutaxitic" fabric fairly densely scattered in a fine to medium grained granular matrix apparently consisting of pink-cream weather feldspar and greyish green weathered glass or chlorite. There is no quartz in either clasts or matrix.

Composition appears to be intermediate but could be basaltic?

Clasts (on basis of internal lineation fabric) are disoriented and there is no indication of alignment, stratification, welding or cleavage; could equally be lapilli tuff or epiclastic conglomerate but obviously of very immature sediments i.e. mass flow pyro/epiclastic deposition.

103.7-114.4m — Clay.

Similar to lithology of interval 96.0-102.4m.

Colour generally purplish brown stained brown along joints etc.

Retains fine <0.5mm. "meshwork" fabric and commonly contains small rounded greenish grey clayey blebs which appear to be weathered vesicle fillings. At 111.4m these "vesicles" (amygdales) show linear alignment in plane at about 40^0 to LAOC.

There is generally no indication of a granular or fragmental fabric, appears to have been originally a rather glassy volcanic without phenocrysts, probably of intermediate (possibly basaltic) composition.

However, this fine purplish clay only slightly resembles the abundant fragments in above unit (102.4-103.7m) i.e. pink colour is similar but "eutaxitic" fabric is not developed here.

A few blebs of hard white silica at about 108m appear to be chalcedonic vesicle fillings.

114.4-129.2m Felsic Tuff.

Still strongly oxidised but not clayey as in above litholigies.

Generally brown or greyish brown stained darker brown locally.

Medium to coarse (1.5-4mm) grain size granular matrix composed of weathered feldspar crystals/fragments and very rare quartz grains along with small indeterminate volcanic lithic fragments. Larger fragments (5-20mm) are relatively sparsely distributed, pale to dark grey probably originally glassy with small sparse feldspar phenocrysts. Fragment shapes irregular to subround, usually equidimensional, not flattened, no indications of stratification, alignment or cleavage.

From about 128.4 to 129.0m there is a section of nearly fresh core. This is recognisably a feldspar crystal tuff with rare quartz grains and minor lithic fragments in a grey glassy partly welded matrix. It is no doubt similar to the weathered rock described above but its unusual freshness allows further definition:

- small to medium (0.5-2mm) tabular to equant feldspar crystals (weathered to white clay) constitute about 20% of

the rock; with minor weathered biotite flakes (1mm - 2%) and rare small quartz grains (<0.2%) and small weathered grey clayey ex "glassy" fragments often elongated resembling "fiamme" (to 8mm - 5%) all fairly evenly distributed in a fine grey matrix which appears to have been originally glassy and retains a wavy eutaxitic fabric suggestive of depositional welding.

There is one large, rounded, (70mm) fragment of pinkish grey quartz-feldspar-pyroxene(?) porphyry which might be termed porphyritic rhyodacite.

Minor pyrite occurs (in this fresh section) as fine disseminated specks about 0.2% vol, <0.5mm dia.

The "eutaxitic" fabric forms a very crude planar fabric running at about 40° to LAOC.

The contact between "welded" felsic tuff and stratified sediment (below) is slightly transitional over about 40mm, the planar fabric in the tuff appears to be paralleled by stratification in the sediment.

129.2-135.0m Interbedded Micaceous Siltstone and Greywacke.

A well stratified and sorted sediment varying from very dark grey, nearly black, fine siltstone to medium grained mid grey sandy greywacke. Maximum grain size in the latter is about 0.5-1.0mm. Minor carbonate occurs in the matrix. Individual grains not well rounded, probably comprise largely feldspar, some quartz and fine flaky chlorite or biotite, and ubiquitous fine pearly flakes of muscovite?

Texturally immature.

Dark fine grained siltstones, also with fine pearly mica flakes, are prominent in upper part of interval diminishing to less than 30% below 132.6m. Individual beds vary from about 150mm down to 1mm thickness.

Faint grain size grading indicates younging up the hole at 130.6 and 131.75 metre depths.

Bedding orientations as follows:

129.5m	45^0	to LAOC
131.6m	45^0	to LAOC
132.6m	35^0	to LAOC
133.6m	40^0	to LAOC
134.8m	40^0	to LAOC

Small rounded blebs of pyrite 1-5mm occur with low frequency especially in the finer sediments, these possibly represent recrystallised syn-depositional sulphide. They approach 0.5% volume in the darker fine siltstones but overall constitute less than 0.1% pyrite.

135.0-144.4m Micaceous Greywacke

A medium grained (~0.5 - 1.0mm) immature sediment similar in composition to the coarser members of the above unit except that bedding is obscure, tending to massive and uniform.

Faint bedding traces visible at ~ 142m cut core at 45^0 to LAOC.

Pyrite not present in notable quantities.

144.4m E.O.H.

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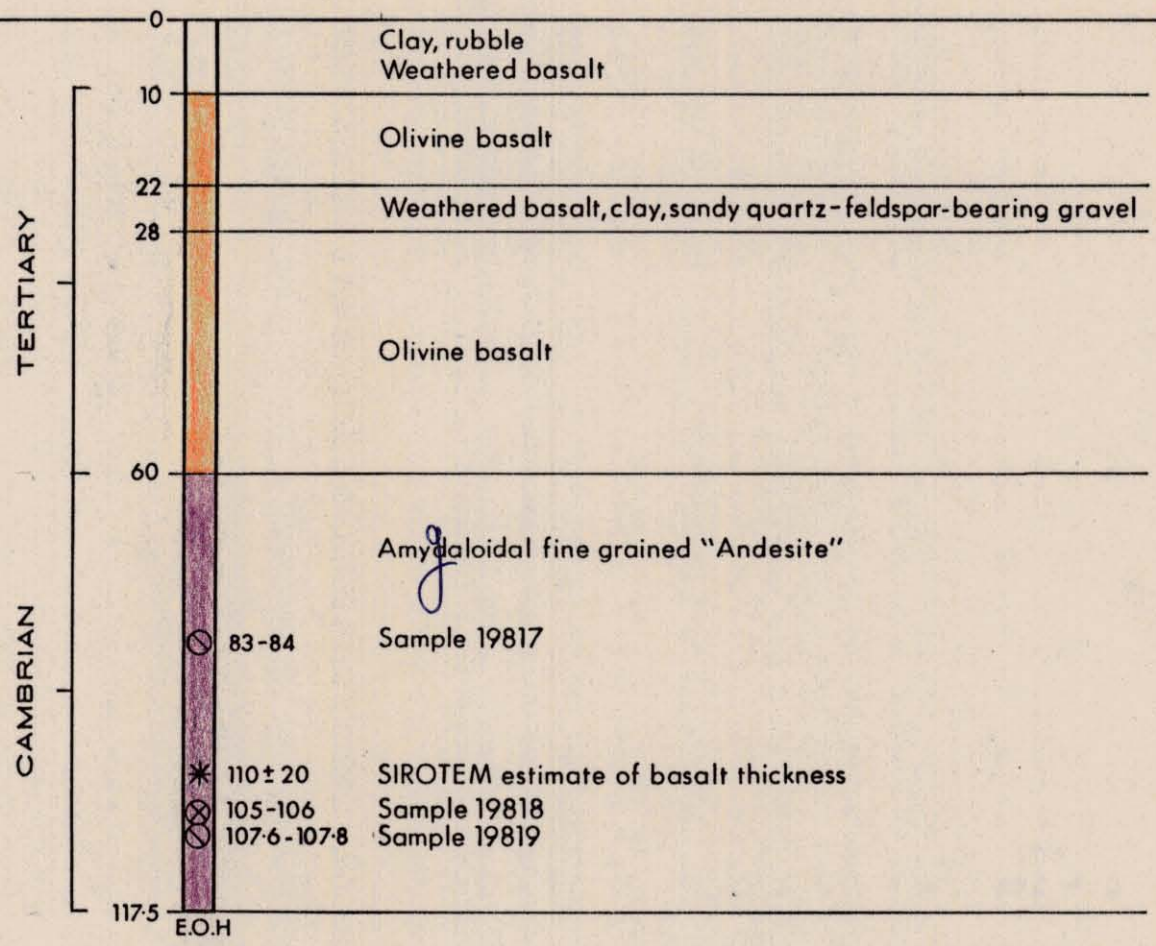


5 cm

LEGEND

COLLAR CO-ORDS:
12000N 10800E

VERTICAL

Hammered : 0-72

Cored : 72-117·5

O SAMPLE LOCATION

⊘ PETROLOGICAL EXAMINATION

⊗ LITHOGEOCHEMICAL ANALYSES

PANCONTINENTAL MINING LIMITED
EXPLORATION DIVISION

MT. CATTLEY PROJECT
E.L. 14/85 - TASMANIA

LITHOLOGICAL SECTION
HOLE Nº MCPD 2

0 10 20 30 40 50
1:1000 METRES

Compiled W.H.	Date October, 1986	Dwg. Nº
Report Nº	Map Ref. SK 55-3	FIGURE 2

944042

MT CATTLEY EL 14/85 TASMANIA

WALTER HERRMAN - 24.9.1986

GEOLOGICAL LOG: DRILL HOLE - MCPD2

Collar Co-ordinates: 12000N/10800E
Drilled: 22-24/9/1986

0-10m : 6.5" Down Hole Hammer
10-72m : 4.5" Down Hole Hammer
72-117m : NQ Core

0-10m	Brown Clay, weathered basalt, very wet. (Not sampled).
10.13m	(Dry) Dark grey medium to fine grained olivine basalt.
13-16m	(Dry) Dark grey olivine-pyroxene? basalt.
16-19m	(Dry) Fine grained grey olivine basalt with dark glassy interstitial patches and fragments.
19-22m	(Wet) Dark grey to brown partly oxidised fine grained olivine basalt. Olivine partly altered.
22-25m	As above.
25-28m	Fine grained grey olivine basalt with some dark glassy fragments or patches. Also considerable (~ 40% of sample) of coarse quartz-feldspathic sandy gravel and soft greenish clayey material. Suspected gravelly layer between basalt flows?
28-31m	Fine grained grey basalt, some dark glassy interstitial patches and pale greenish grey filled amygdales, no olivine visible.
31-34m	Fine grained dark grey olivine basalt. 2% aqua green mineral in sample ex amygdales? Also some coarse quartz-feldspathic sand suspected to be caving in from 25-28m zone. Drillers had trouble with sandy slurry bogging up hammer during rod change. Forced to pull up rods and clean hammer three times.

34-37m	Fine grained grey basalt. 1-2% pale green zeolite? ex amygdales. Sample contamination (~ 10%) from caving area.
37-40m	Mixture dark grey, purplish brown grey slightly oxidised basalt.
40-43m	Fine grained dark grey vesicular / amygdaloidal basalt amygdales filled with duck egg blue coloured zeolites?
43-46m	As above. About 50% of sample is contaminated from caving area.
46-49m	As above.
49-52m	Fine grained dark grey olivine basalt and dark grey partly vesicular glassy basalt. Minor contamination.
52-55m	Mixture fine grained dark grey olivine basalt and glassy vesicular basalt. Minor contamination of sample.
55-58m	As above. About 20% sample contamination.
(58-60m	Dark purplish grey vesicular basalt. Minor contamination.
(60-61m	Pale Dove grey granular weathered felsic rock resembling tuff?
61-64m	Pale dove grey weathered (?) felsic rock with very fine (<0.5 mm) granular fabric sometimes with rounded fine quartz granules? elsewhere with faint planar "eutaxitic" fabric suggesting tuff? About 20% uphole contamination of sample.
64-67m	As above.
67-70m	As above.
70-72m	As above. Fine acid tuff?
NQ CORE	
72-72.5M	A few fragments of weathered vesicular basalt, rounded by the bit, probably caved in from up the hole.

43

72.5-84.4m

Weathered vesicular (Amygdaloidal) andesite

Typically composed of small rounded to ellipsoidal amygdales (1-6 mm dia. 2.5%/vol.) enclosed in a very fine (<0.5mm) granular/meshwork matrix of olivine brown colour and probably composed of weathered plagioclase with interstitial fine ferromagnesians or altered glass.

The rock is very weathered to soft puggy clay above 76m; below this the core is firm but extensively fractured. Amygdale concentration variable from place to place but always some present.

Transition into fresh rock fairly sharp.

84.4-117.5m

Amygdaloidal Andesite.

This rock type (fresh equivalent of above) varies from a medium-dark green grey to pale green grey colour of very even density. It is very fine grained, nearly aphanitic to the hand lens and exhibits only a very fine faint meshwork fabric possibly comprising plagioclase laths. The only mesoscopically discernible texture is the presence of rounded to ellipsoidal amygdales which are present in variable proportions but usually around 2-3% of rock volume.

There are two types of amygdales:

(1) Small (<5mm) filled with dark green soft mineral, often with radiating habit, resembling chlorite + grey silica + minor white calcite. These commonly have a weak parallel preferred orientation.

(2) Larger (5-40mm) rounded to ellipsoidal amygdales filled mainly with white or pale buff coloured carbonate (calcite?) + translucent grey or clear quartz + minor chlorite. Volumetric proportion of these vesicles is very variable but no systematic variation has been noted.

044

Above about 105m the matrix colouration is mainly darker greenish grey. Below 105m the colour is mainly pale green grey although here there are some quite local variations of uncertain significance. Possibilities include slight compositional (primary) differences, separate flows?, variations in "greenschist" metamorphic alteration or even pillow margins.

Much of the rock displays a fine brecciated texture. This is not fragmental in the sense of volcanic breccia or "agglomerate" but rather an "in situ" brecciation, perhaps auto brecciation? in which milled and finely granular material fills spaces between angular-irregular splinters and fragments of more or less massive andesite. The finer interstitial material often has a paler colour reflecting abundant carbonate in the matrix cement. Similar style of brecciation occurs in the lowest andesitic unit cored in MCPD3.

The carbonate in the breccia matrix leads to speculation on association with the abundant carbonate veinlets and veins which criss cross the core generally but also cut through brecciated zones and therefore at least partly post date breccia formation.

The veins are generally filled with white or straw coloured carbonate (calcite?), grey quartz + white chalcedonic silica + traces of fine disseminated pyrite and + reddish hematite staining.

Veins and veinlets are locally quite intense to the stage of shatter zones but overall would average 50 per metre of core.

General level of sulphide mineralisation would be <0.05% and hematite much lower than this.

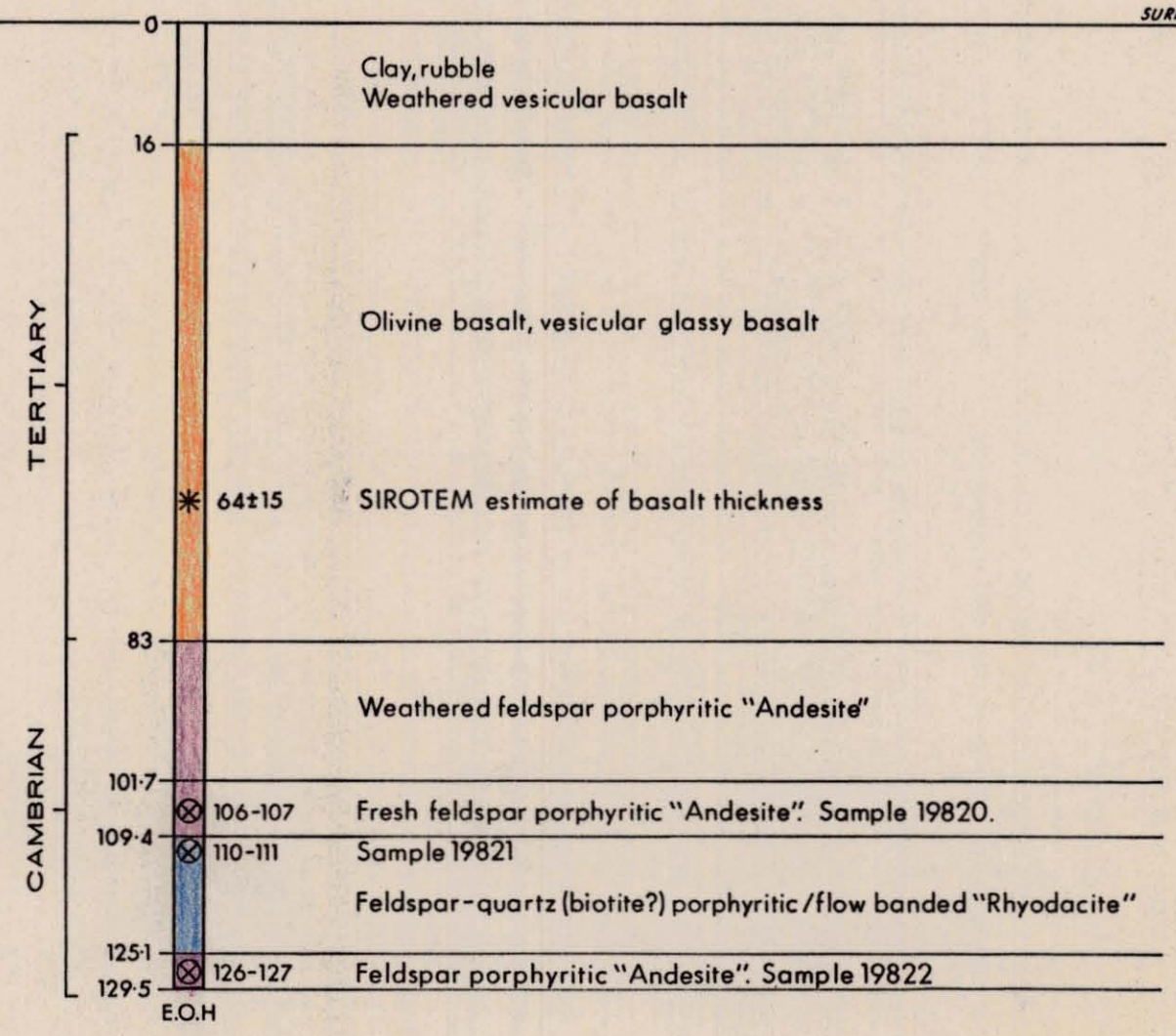
Vesicles (amygdales) locally define weak linear fabric which have been measured as follows:

90.9m	-	50^0 to LAOC
93.7m	-	20^0 to LAOC
98.4m	-	40^0 to LAOC
104.5m	-	50^0 to LAOC
108.8m	-	40^0 to LAOC

117.5 E.O.H.

045

944046



5 cm

LEGEND

Location on Beecroft Road,
630m south of line 12 000 N

VERTICAL

Hammered : 0-94·4

Cored : 94·4-129·5

- ○ SAMPLE LOCATION
- ⊘ PETROLOGICAL EXAMINATION
- ⊘ LITHOGEOCHEMICAL ANALYSES

PANCONTINENTAL MINING LIMITED
EXPLORATION DIVISION

MT. CATTLEY PROJECT
E.L. 14/85 - TASMANIA

LITHOLOGICAL SECTION
HOLE Nº MCPD 3

0 10 20 30 40 50
1:1000 METRES

Compiled W.H.	Date October, 1986	Dwg. Nº
Report Nº	Map Ref. SK 55-3	FIGURE 3

MT CATTLEY EL 14/85 TASMANIA

WALTER HERRMAN - 30.9.1986

GEOLOGICAL LOG: DRILL HOLE - MCPD3

Collar Co-ordinates: On Beecroft Road 630m South of intersection with line 12000N

Collared: 25/9/1986

0- 13.5m - 6.5" Down Hole Hammer
13.5- 94.4m - 4.5" Down Hole Hammer
94.4-129.5m - NQ Core

CHIP LOG:

0-13.5m	Rubble and clayey weathered basalt (Not sampled).
13.5-16m	Purplish brown soapy clay; chips are mixture of fresh and oxidised olivine basalt.
16-19m	Fresh dark grey fine granular olivine basalt.
19-22m	As above.
22-25m	Sloppy brown clay. Very few fine chips of fresh basalt - contamination? Some clayey weathered basalt.
25-28m	Sloppy brown clay. Abundant chips: a mixture of fine grained olivine basalt and purplish grey glassy-vesicular basalt.
28-31m	As above.
31-34m	Dark grey olivine basalt and purplish grey glassy vesicular basalt.
34-37m	As above.
37-40m	Dark grey fine grained olivine rich basalt, some small interstitial black glassy patches.

047

40-43m	Dark grey, granular olivine basalt + vesicular basalt.
43-46m	As above.
46-49m	Dark grey fine grained olivine basalt.
49-52m	Dark grey fine grained olivine basalt + purplish grey vesicular basalt. Vesicles filled (amygdales) with pale blue-green mineral.
52-55m	Dark grey fine grained olivine basalt and some very fine glassy grey to dark grey basalt.
55-58m	Fine grained bluish grey to dark grey glassy basalt.
58-61m	Fine grained grey glassy olivine basalt.
61-64m	As above.
64-67m	As above.
67-70m	Dark grey to purplish grey very fine grained olivine basalt with small black glassy interstitial patches. Some chalcedonic chips ex amygdales?
70-73m	As above; some small chalcedonic and pale blue-green "zeolite" filled amygdales.
73-76m	Dark grey finely vesicular olivine basalt and reddish very vesicular (scoriaceous) basalt.
76-79m	Reddish grey fine scoriaceous basalt, minor fine grained olivine basalt.
79-82m	As above.
82-85m	As above, also some brick red weathered volcanic of uncertain affinity. Appear to have broken through base of basalt at around 83m.
85-88m	Mixture of various basalt types as above - up hole contamination? Hammer slowed down in soft weathered basement. Chips brick red (weathered) and bluish green (oxidised) semi chloritic volcanic rock with small tabular feldspar phenocysts - possibly intermediate composition.

88-91m	As above poor chip return, sample washing away as clay. Weathered brownish-greenish grey felsic volcanic with considerable uphole contamination of basalt chips.
91-94.4m	Light brown weathered rock with fine to medium (1-2mm) granular fabric comprising crystal fragments of whitish feldspar, small bronzy flakes of altered mica and many small rounded fractured olive brown grains which might be lithic volcanic fragments? Appears to be a weathered felsic-intermediate volcanic rock, possibly a fine lapilli tuff??
NQ CORE:	Core is oxidised to about 101.7m, generally quite badly broken especially in the interval 99.1-100.3m.
99.4-101.7m	Oxidised feldspar porphyritic "Andesite" Generally a light buff brown to olive khaki colour, more or less weathered, particularly clayey down to about 95m but from then on compact and retaining relict fabric. The typical rock type consists of small (1-3mm creamy white, tabular, slightly glomeroporphyritic grains of feldspar (plagioclase?) evenly sprinkled (^10%/volume) in a light greyish brown matrix apparently consisting of tiny fractured "spheres" which are about 1mm diameter and give a close packed granular appearance to the matrix. In places the fabric appears almost metamorphic but I suspect the ground mass is composed of partly altered glassy material, perhaps but not necessarily originally "spherulitic" which has been finely fractured by quenching or deformation. The only other mesoscopically recognizable mineralogy/fabric is as amygdales which are abundant prominent and of two types: (i) Small (<1mm) elliptical or tear drop shaped, usually filled with semi clear, grey, soft mineral.

(ii) Larger, wavy elongate amygdales upto 8mm x 2mm size with distinct wavy, interstitial habit; and with strong parallel preferred orientation defining a distinct linear/planar fabric. These are usually rimmed with the pale translucent mineral as in (i) but the cores are filled with a dark green, soft mineral of radiating habit, somewhat resembling chlorite.

The overall composition appears to be intermediate; there is no quartz yet no well crystallised ferromagnesians; could be a felsic andesite tending to dacite. Presence of aligned amygdales indicates extrusive volcanic.

In places (for example as at 100.3m) there are small patches composed of closely pached tabular feldspar with sparse interstitial dark mineral which might be altered glass or altered mica? These areas or patches resemble lithic fragments and may be cognate lithics of feldspar rich crystal mush.

There are occasional (late stage?) quartz veinlets; (barren whitish-grey dog toothy veinlets upto 5mm wide) these cross cut as varying angles and are observable wavy and irregular in character. The most notable vein occurrences are at:

96-96.5m, 2-5mm, wide semi parallel to LA0C.

97.5-98.5m, 5mm, wavy, semi parallel to LA0C

99.4-99.8m, 5-10mm, irregular tending sinusoidal, faintly zoned, chalcedonic veins.?

Some rather vughy suggesting original carbonate presence.

Measured vesicle lineations are:

96m	approx.	60^0	to LA0C
97.7m	approx.	50^0	to LA0C
98.3m	approx.	50^0	to LA0C
99m	approx.	40^0	to LA0C
100.6m	approx.	50^0	to LA0C

101.7-109.4 Feldspar porphyritic "Andesite" (Unoxidised)

The transition between oxidised and fresh core is fairly sharp occupying less than 1m interval of core.

This rock type is clearly the fresh equivalent of the rock described above; it displays the distinctive vesicular and micro fractured / "granular" fabric.

The typical rock consists of smallish (1-3mm) equant to tabular but generally very subhedral grains of pale greenish grey plagioclase rather sparsely distributed (<10%) in a medium to dark greenish grey ground mass. The ground mass appears to consists of very fine grey material which has a medium "granular" fabric superimposed by a continuous network of fine fractures usually having three point junctions as in foam.

The average granule size formed by these fractures is around 0.5 - 1.0mm.

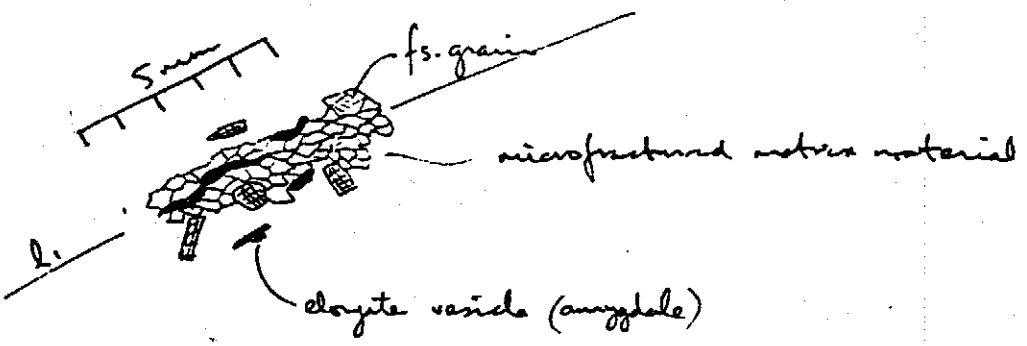
Small tear drop shaped vesicles (~ 1mm) and larger elongated vesicles (amygdales) are abundant and constitute at least 5-10% of volume.

The smaller vesicles are filled with a light grey mineral of moderate hardness (not quartz) and often have pale rims or reaction haloes? The larger elongate vesicles (amygdales) are generally filled with a dark green soft mineral of radiating habit resembling chlorite.

These have a distinct linear preferred orientation, the lineation has been measured as follows:

101.8m	-	30^0_0 to LAOC
103.5m	-	25^0_0 to LAOC
105.5m	-	20^0_0 to LAOC
107m	-	25^0_0 to LAOC
108.5m	-	20^0 to LAOC

Curiously, the vesicle (amygdale) lineation fabric seems to <u>align</u> with slight elongation in the microfracture / "granular" fabric.

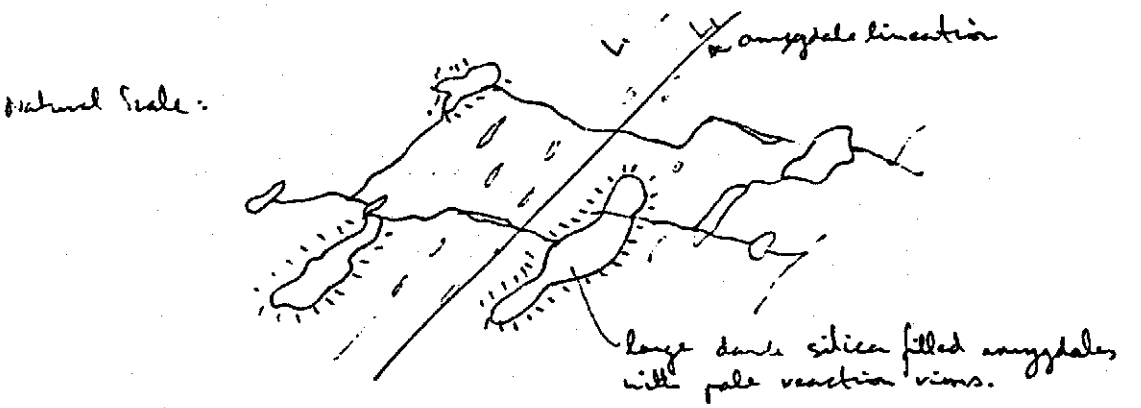


In this respect the microfracture fabric resembles a high grade metamorphic gneissosity. It may be an incipient form of cleavage development in a brittle glassy rock? This is particularly suspected in the zones 107-107.5m and 109-109.4m where the rock is affected by moderate development of fracture cleavage associated with pale green alteration of matrix material along and outward from the fractures.

The core is cut by a number of irregular veinlets, mainly composed of milky white-grey quartz and subordinate white carbonate (calcite?). The veins are generally irregular from < 1mm to about 10mm thick, often open space type tension gash fillings. They cut core at various angles and appear to post date fracture cleavage and vesicle lineation.

These veins are generally unmineralized and are without reaction envelopes. Sometimes, very minor fine pyrite and rare chalcopyrite occur as fine specks along the outer selvedges of veinlets. Intensity of veining is not high, averaging 5-10 veins / metre core.

In places e.g. 105.5m small quartz veinlets are associated with large elongated amygdales of hard dark grey fine cherty silica? and rimmed by narrow (to 3mm) envelopes of pale straw coloured bleached rock. These particular amygdales are rounded/elongate upto 10 x 40mm in size and appear to be interconnected by fine silica filled veinlets.



These veinlets and amygdales also contain minor fine specks of pyrite. It appears that these may have remained unfilled vesicles during diagenesis and were finally filled at a late stage associated with (Devonian)? deformation fracturing and vein filling.

The contact with the underlying rock is sharpish being transitional over about 50mm in which small rounded blebs (lapilli?) of the pink R.-dacite appear to be enclosed by the darker andesitic rock.

109-125.1m Feldspar - Quartz porphyritic rhyodacite.

This rock type has a generally light pinkish brown to pinkish grey colour and typically consists of equant to tabular rather subhedral phenocrysts of greyish plagioclase (1-4 mm, about 5-10% / volume) and small semi prismatic aggregates or grains of chloritised ferromagnesian (probably biotite) (1-4mm, < 5% / volume) and small rounded grains of clear quartz (1-2mm - 5% / volume) evenly distributed in a very fine pinkish matrix probably partly glassy and containing some K-feldspar.

Small elongate calcite or calcite + chlorite filled amygdales (1-10mm) 2-3% / volume) are present throughout. These and some of the more tabular feldspar phenocrysts have a weak linear preferred orientation which lies parallel to locally developed distinct grey to pink colour banding in the matrix which appears to be flow banding.

051

Page out of Order

Banding is best developed in the interval 118-124.5m. Presence of (filled) vesicles and flow banding suggests extrusive volcanic origin.

The core is criss-crossed by small veins + veinlets (< 1mm to 15mm) of quartz and chlorite + carbonate. These cut at varying angles from about 20^0 to 80^0 to LAOC, are commonly irregular and intersecting, occurring with moderate frequency, say 20-30 / metre core throughout the rhyodacite litho type. These veins, particularly the finer veinlets, carry traces of fine pyrite and rare chalcopyrite and sphalerite. (Sphalerite at 113.1m) very minor pyrite sometimes occurs in calcite-chlorite filled amygdales or chloritised ferromags. Average sulphide content well below 0.05% volume. Some of the larger veins are associated with locally pervasive pinkish bleaching (k feldspar alteration?) of the rock matrix in envelopes upto several centimetres wide, example at 118.5m.

The lower contact is fairly sharp similar to the upper contact in that small rounded pink lapilli? of rhyodacite seem to be enclosed by green andesite over a transitional zone of about 60mm. This could be contact reaction between felsic and intermediate extrusive flows; appears rather as if felsic alteration has occurred around amygdale rims within the andesite.

Measured flow banding

109.8m	-	40^0 to LAOC
117.5m	-	50^0 to LAOC
121.3m	-	60^0 to LAOC
123m	-	50^0 to LAOC
124.4m	-	60^0 to LAOC

125.1-129.5m Feldspar porphyritic "Andesite"

This rock type is compositionally similar to the interval 101.7 - 109.4m except that it is generally less amygdaloidal. The feldspar phenocrysts, feldspar rich "cognate lithic" fragments and the distinctive meshwork microfracture fabric are all present.

Page out of order - see over 2pp for p 25

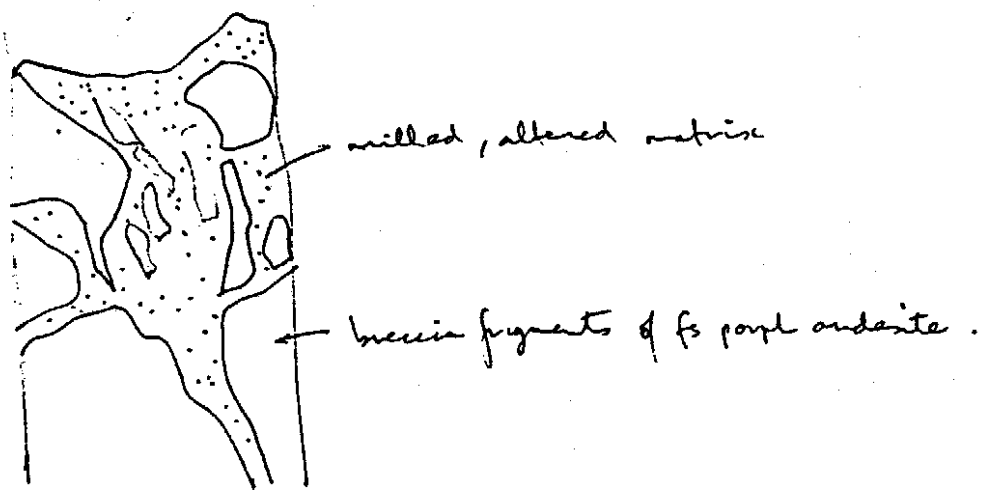
650

944051

Superimposed upon this is a coarse fragmental fabric; the rock could be termed volcanic breccia. However, the brecciation appears to have occurred "in situ" with weak pinkish green alteration of the inter fragment milled material.

Breccia fragment sizes vary from large >300mm to <10mm, are of varable irregular to splintery shapes. The interfragment matrix is finely "milled" down to 1-2mm grain size and appears to be weakly altered perhaps to epidote bearing assemblage. This alteration does not have associated sulphide mineralisation and there is no indication of alteration of the fragment margins.

Sketch of core at 127.0m



Superimposed in turn upon the breccia fabric are the usual quartz + chlorite + carbonate veins sometimes containing minute traces of fine pyrite, overall <0.05% pyrite.

Due to lower abundance of elongate amygdales the linear fabric is much less pronounced in this interval but generally appears to cut core at about 40-50° to LAOC

129.5m E.O.H.

5. GEOLOGICAL INTERPRETATIONS

In this section I will discuss the results of sub-basalt basement drilling and present some rather too speculative stratigraphic-structural models for the south eastern part of E.L. 14/86.

5.1. Lithogeochemical and Petrographical Discussion

It is fortunate that Dr Barron's petrological descriptions (Nov. 1986) of five core samples do not seriously conflict with my mesoscopically determined descriptions in the core logs.

Barron describes alteration ranging from intense argillic in 19816 to low grade assemblages amongst the phases albite + chlorite + quartz + carbonate + sericite + clay in the others. However, these are not (nor, I think, does Barron imply that they are) "hydrothermal" alteration assemblages related to "mineralisation". The argillic alteration is related mainly to oxidation and weathering. The albite + chlorite + quartz + carbonate etc. assemblages are due to deuteric - low grade burial metamorphic modifications particularly albitization of plagioclase and degradation of ferromagnesian phases, of volcanic rocks.

All the basement rocks intersected are essentially unmineralised and do not show signs of hydrothermal alteration associated with volcanogenic sulphide mineralisation.

A characteristic of volcanogenic footwall alteration is strong depletion of Na_2O. Samples 19816 and 19817 have low Na_2O but both are <u>oxidised</u>. Comparison of 19817 with 19819 which are oxidised and unoxidised representatives of identical rock type shows the strong depletion of all alkalis (CaO, Na_2O and K_2O) in the oxidised sample. This emphasises the caution required in using major element analytical data to identify "hydrothermal" alteration in rock samples collected from outcrop.

Generally speaking all the samples, except those with important carbonate veins or amygdales, are suspiciously low in CaO (19820, 19821, 19822).

5.2. Stratigraphic - Structural Speculations

The construction of geological cross sections in this case is severely hampered by the fact that the dominant lithologies intersected in subbasalt drilling - andesites - have not been observed in the nearby basement windows.

Nevertheless, the following points are important fundamentals:

1) The micaceous greywackes and siltstones in MCPD 1 young UP the hole. They are well bedded and can only be regarded as subaqueously transported and deposited sediments. Bedding/core angles indicate a regular dip of about 40° but it is a source of great regret that we have no oriented core specimens to establish the strike. Lithologically, they are said to resemble the "Animal Creek greywacke" (pers. comm.: P Collins, Tas. Dept. of Mines) which Komyshan (1986) refers to as the basal member of the Dundas Group lying with faulted unconformity upon the Central Volcanic Sequence (of Mt. Read Volcanics) south of the Mt Charter fault. Closer to home, they are identical to sediments exposed in the basement windows along the eastern margins of EL 14/85 and also occurring on Murray's Road just east of the intersection of Murray's South Road, about 2km NE of the Hellyer Prospect. (Herrmann 1986) (Petrographic description of 19845; Barron, July 1986).

2) In MCPD 1 the greywackes are transitional upward into overlying felsic lithic tuff. An identical relationship occurs at the above mentioned location on Murray's Road. (A direct along strike correlation with MCPD 1 over 8.5km to the NNE is tempting but fraught with complications arising from superimposed NNW fault and fold structures observed in Ordovician cover rocks in the intervening area).

3) In the oxidized core of MCPD 1, felsic lithic tuffs are interlayered with (completely weathered) amygdaloidal intermediate volcanics. (Essentially similar to amygdaloidal andesite of MCPD 2). This shows that there are andesites in the sequence above the greywacke. If the greywackes must be sub aqueous and they are transitional to felsic tuffs there is a fair chance that the tuffs and interlayered andesites may also be sub aqueous.

4) In MCPD 3 flow banded Rhyodacite occurs between similar units of porphyritic andesite. All appear to be extrusives. The rhyodacite is only about 15m thick. One would expect such a silicic magma (69.2% SiO_2) to be fairly viscous in a subaerial environment. I don't know if the 15m thickness is consistent with probable lava viscosity or whether a high confining pressure (deep water - subaqueous) is responsible for maintaining solubility of magmatic water and hence lowering viscosity.

Similar flow banded Rhyodacite-Rhyolite extrusives (Barron, July 1986, Sample No. 18742) outcrop on Murray's Road apparently stratigraphically above the lithic tuff/greywacke association. Rhyolites exposed at Basin Road window and in the nose of an inferred anticline in the Leven River just north of Basin Road, are of broadly similar type though not noticeably flow banded (Barron, July 1986, Sample No. 18748).

5) The inferred anticline in the river just north of Basin Road and a southerly dip in greywackes near the hinge of an inferred syncline at Cobbers North Road (Herrmann, Jan 1986) both suggest a moderate southerly plunge.

In Figures 4, 5, and 6 I have presented some possible speculative sections of line 12000N. All three are highly simplistic based on simple NNE antiform-synform structure, and therefore rather unrealistic because mapping in the area north of Murray's Road has shown structure likely to be complicated.

My personal favourite is Figure 4, with Figure 5 running in second place. Both have the andesites lying entirely above the MCPD 1 greywacke unit (although there is a thin greywacke/siltstone unit immediately underlying rhyolite in the nose of the Leven River anticline). Figures 4 and 5 are essentially similar except the latter introduces another (western) antiform to maintain a regular fold wavelength.

The speculative sequences shown in Figures 4 and 5 bear some similarity to the lower half of Komyshan's (1986, Figure 2) "Schematic Stratigraphy of the Hellyer-Mt Charter Area".

If the Figures 4 and 5 stratigraphy is analogous as above then we have not seen the Que River Shale equivalent (QRS). That is: the QRS and probably also the Que-Hellyer mineralised horizon, are "up sequence" from the present topographic surface on line 12000N. If so inferred plunge on the fold structures would suggest the (perhaps but not necessarily) most prospective horizon lies to the south west, possibly outside the southern boundary of EL 14/85.

However, if the speculative section of Figure 6 is preferred, ~~the~~ the analogy with the Que-Hellyer stratigraphy is harder to imagine. Stretching a lithological point one could suggest an equivalence between the MCPD 1 greywacke/siltstone and the Que River Shale (but this would mean we have andesite above the "QRS" in MCPD 1) and take the MCPD 2, 3 andesites for Que-Hellyer hanging wall basalts-andesites. In this speculative model the Que-Hellyer mineralised horizon would lie down section to the east of MCPD 3.

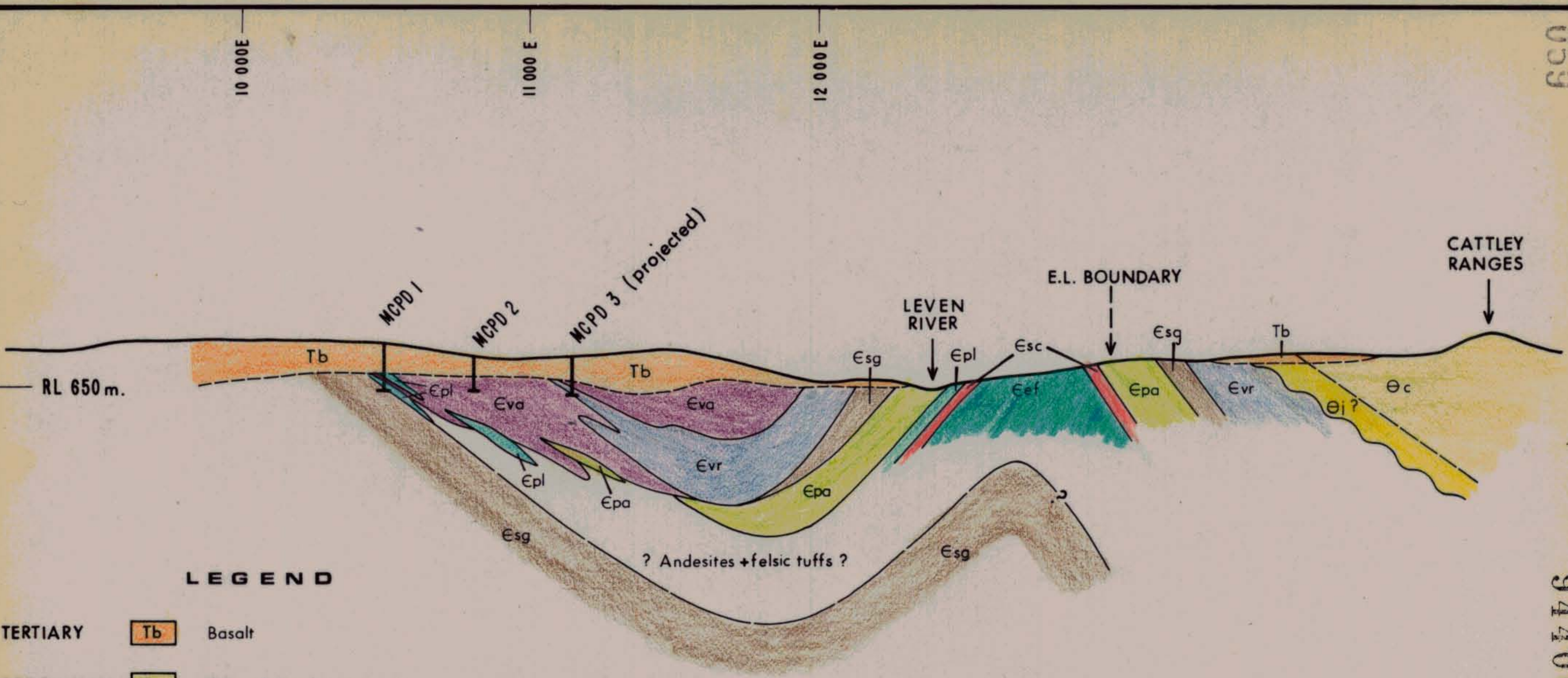
Whatever one's preference, both of the above models are in conflict with the mega stratigraphy of Komyshan (1986). His plan shows the major Henty Fault zone crossing Murray's Road at about AMG 394600E with a northerly trend. This appears to place all of EL 14/86 east of the Henty Fault zone. According to Komyshan "greywackes, quartz phyric lavas, agglomerates, tuffs and volcanoclastic conglomerates of the Tyndall Group occur to the east of the Henty Fault Zone".

Although I have long been confused by the definitions of "major sequences" of the Mt Read Volcanics, I have not come across any reference to andesites in the Tyndall Group.

It would seem that the association of micaceous greywackes, felsic pyroclastics and lavas with andesites in the south eastern part of EL 14/85 bears considerable similarity to the sequence described in the Mt Charter-Hellyer area and ascribed to the lower part of the Dundas Group.

However, much of the foregoing discussion is amusing geological "arm waving" which misses the exploration point. It is worth keeping in mind that the volcano-sedimentary stratigraphy and structure of the largely basalt covered EL 14/85 area is to date quite poorly known and that the cross sections presented here are simplistic and highly speculative. Even if the analogy to Que-Hellyer stratigraphy were proven, it would require a great deal of good luck and structural intuition to discover the sought after ore deposit by blind drilling alone. Furthermore, the Que-Hellyer host horizon is not the only, nor necessarily the most prospective, stratigraphic interval containing significant mineralisation in the northern Mt Read Volcanics. (Corbett, 1986).

Exploration in the EL 14/85 area should now be focussed upon selection and application of the geophysical technique most capable of defining drilling targets for volcanogenic massive sulphide mineralisation beneath the tertiary basalt cover.



LEGEND

TERTIARY	Tb	Basalt
ORDOVICIAN	Θc	"Owen" Conglomerate etc.
	Θi	"Jukes" Conglomerate (may not be present)
CAMBRIAN	Єva	Andesite
	Єvr	Rhyolite - Rhyodacite extrusives
	Єpa	Felsic pyroclastics fine grained
	Єpl	Felsic lapilli tuffs
	Єef	Fine grained siliceous vitric tuffs
	Єsc	Chert / Tuffaceous chert
	Єsg	Micaceous greywacke / siltstone

5 cm

PANCONTINENTAL MINING LIMITED
EXPLORATION DIVISION

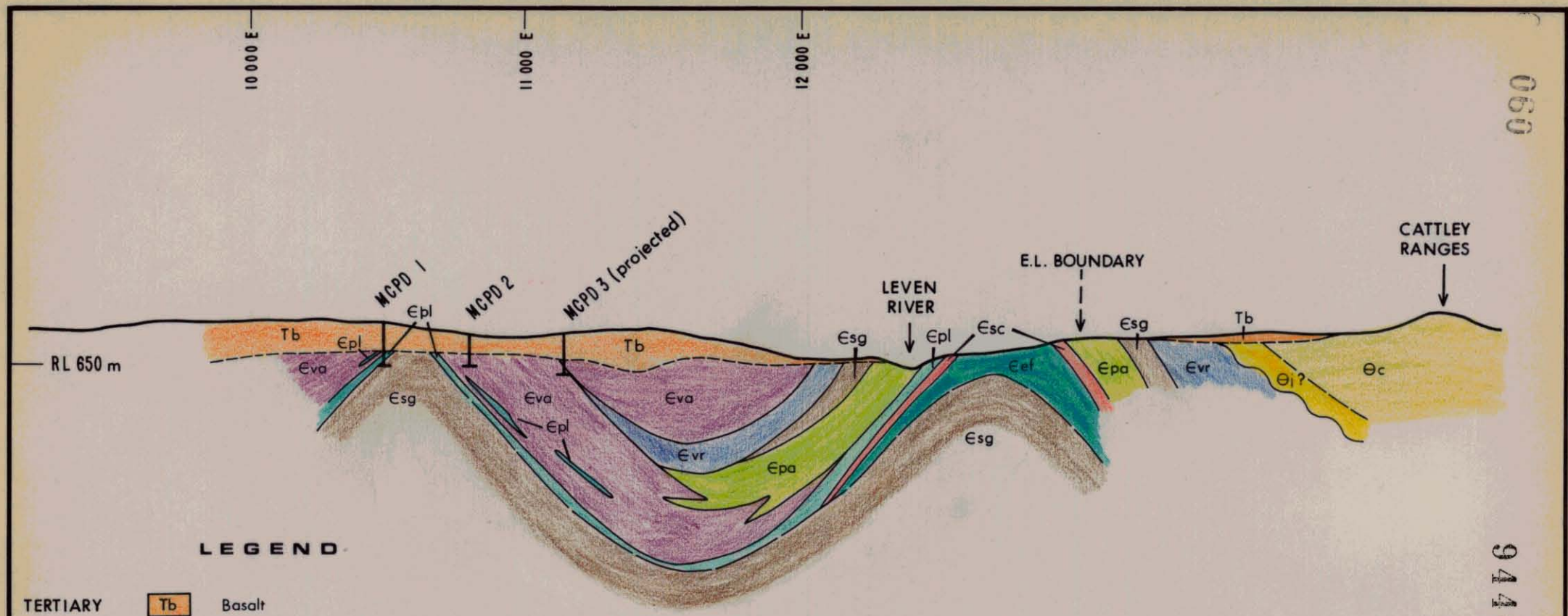
EL 14/85 MT. CATTLEY
TASMANIA
SPECULATIVE CROSS SECTION 1
12 000 N

SCALE 1 : 20 000
0 500 1000 METRES

Compiled	W.H	Date	DEC. 1986	Dwg No	
Report No		Map Ref	SK 55-3	FIGURE 4	

34.

9440060



LEGEND

TERTIARY	Tb	Basalt
ORDOVICIAN	Θc	"Owen" Conglomerate etc.
	Θi	"Jukes" Conglomerate (may not be present)
CAMBRIAN	Eva	Andesite
	Evr	Rhyolite - Rhyodacite extrusives
	Epa	Felsic pyroclastics fine grained
	Epl	Felsic lapilli tuffs
	Eef	Fine grained siliceous vitric tuffs
	Esc	Chert / Tuffaceous chert
	Esg	Micaceous greywacke / siltstone

PANCONTINENTAL MINING LIMITED
EXPLORATION DIVISION

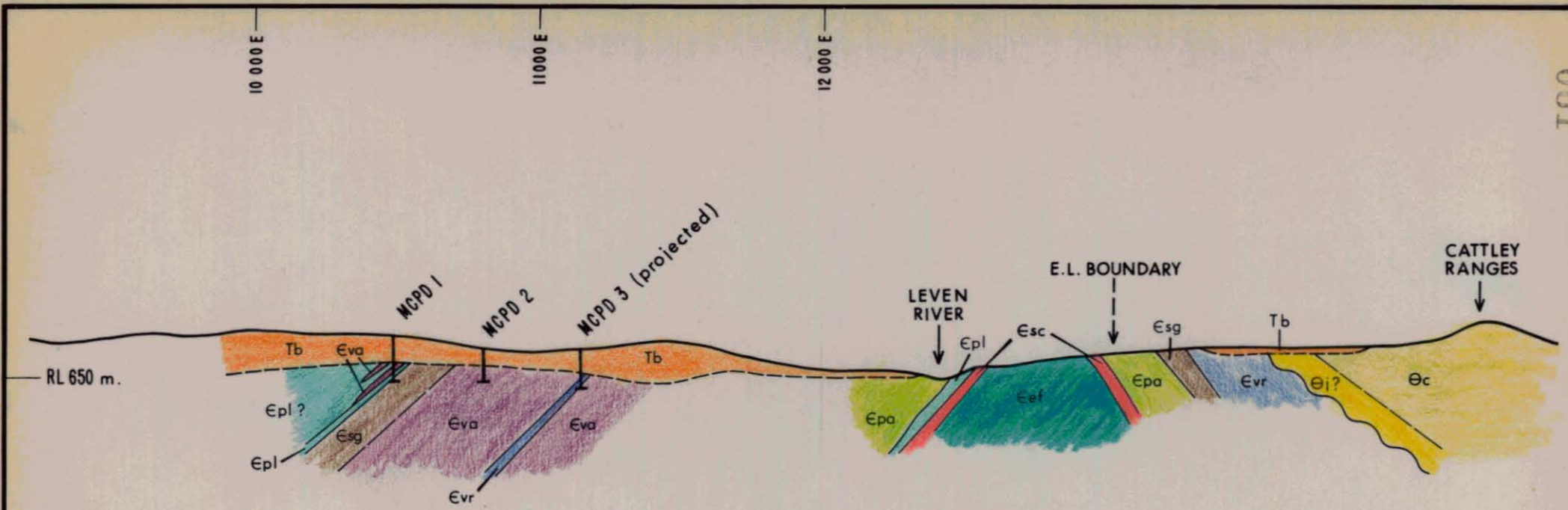
EL 14/85 MT. CATTLEY TASMANIA

SPECULATIVE CROSS SECTION 2 12 000 N

SCALE 1: 20 000

0 500 1000 METRES

Compiled W. H	Date DEC. 1986	Dwg Nº
Report Nº	Map Ref SK 55-3	FIGURE 5



LEGEND

TERTIARY	Tb	Basalt
ORDOVICIAN	Θc	"Owen" Conglomerate etc.
	Θi	"Jukes" Conglomerate (may not be present)
CAMBRIAN	Eva	Andesite
	Evr	Rhyolite-Rhyodacite extrusives
	Epa	Felsic pyroclastics fine grained
	Epl	Felsic lapilli tuffs
	Eef	Fine grained siliceous vitric tuffs
	Esc	Chert / Tuffaceous chert
	Esg	Micaceous greywacke / siltstone

5 cm

PANCONTINENTAL MINING LIMITED
EXPLORATION DIVISION

EL 14/85 MT. CATTLEY TASMANIA
SPECULATIVE CROSS SECTION 3 12 000 N

SCALE 1 : 20 000
0 500 1000 METRES

Compiled W.H	Date DEC. 1986	Dwg N°
Report N°	Map Ref SK 55-3	FIGURE 6

6. REFERENCES

BARRON, B. J. July 1986 — Petrological Report No. P6/82/353a (for: Pancontinental Mining Limited)

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CORBETT, K D November 1986 — "Geological Setting of Mineralisation the Mt Read Volcanics"

in: Large, R.R. (ed.) The Mt Read Volcanics and Associated Ore Deposits (Symposium Abstracts Volume) Geol. Soc. Australia, Tasmanian Division.

HERRMANN, W. January 1986 — "Notes on the Geology of the Mt Cattley Area, EL 14/85, Tasmania". (Report to Pancontinental Mining Ltd.)

KOMYSHAN, P. November 1986 — "Geology of Hellyer-Mt Charter Area"

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APPENDIX 1

DRILL HOLE RECORD — SUMMARY SHEET

PANCONTINENTAL MINING LIMITED - (Exploration & Production Division)

HOLE No. MCPD 1

PROJECT Mt. CATTLEY — PROPERTY E.L. 14/85 (TASMANIA) — PC — DATE

DATE COMMENCED 16/9/86 — DATE COMPLETED 19/9/86 — DRILL Mobile Drill (Reverse/Core) (Top Drive) — DRILLER STACPOOLE ENTERPRISES. (LAUNCESTON)

LOCATION — GEOLOGICAL LOG BY W. HECCHANN — No. OF LOG SHEETS 2

COLLAR CO-ORDS. — mN 12000 N — mE 10435 E — SAMPLED BY — ASSAYED BY

COLLAR R.L. — PETROLOGY BY

TOTAL DEPTH 144.4 m — AZIMUTH — DIP AT COLLAR Vertical — CORE SIZES NQ. (96 - 144.4 m) Percussion: 6½" Down Hole Hammer to 20 m. 4½" " " " to 96 m.

OBJECTIVE OF HOLE

a) to test accuracy of SIROTEM estimate of basalt cover thickness

b) to obtain lithological/structural ? information of sub-basalt basement rocks.

REMARKS

THICKNESS OF BASALT :

SIROTEM estimate : 64 ± 10 m.

Actual Drilled : 87 m.

SUMMARY OF RESULTS

FROM	TO	LENGTH (m)	GEOLOGY
0	29	29	Clay, Rubble, weathered basalt fragments.
29	87	59	Basalt. (Tertiary)
~~87~~	~~96~~	~~9~~	~~weathered felsic tuff ?~~
96	102.2	6.2	weathered pinkish brown clay ash residual intermediate volcanic ?
102.2	103.7	1.5	weathered felsic tuff ?
103.7	114.4	10.7	weathered pinkish brown clay ash residual intermediate volcanic ?
114.4	129.2	14.8	Ferric tuff.
129.2	135	5.8	Interbedded siltstone and micaceous greywacke
135	144.4 E.O.H.	9.4	Massive micaceous greywacke.

LOST ITEM

HOLE SURVEY

METHOD	DEPTH	AZIMUTH	DIP
NONE			

MINERALISATION

9440625

6514

944066

Pancontinental Mining Limited — DRILL HOLE RECORD

Project: MT. CATTLEY Logged by: [signature] Date: 19/10/86 HOLE No: MCPD 1 Sheet 1 of 2

Weathering	Casing	Core Size	Recovery	DEPTH (m)	ROCK TYPE	GEOLOGICAL DESCRIPTION	GRAPHIC LOG	STRUCTURE (Bedding, Fracturing, Cleavage, Brecciation, Faulting, Veining)	MINERALISATION (% Sulphides, ?)	ALTERATION (CALCITE)	SAMPLE NUMBER	INTERVAL	ASSAYS	Petrology
WEATHERED	6"	6½" Down Hole Hammer		0–20	Clay and Rubble	Red brown clay, weathered vesicular basalt, occasional fresh basalt chips represent floaters.	Tb (OX)		?: Small (<1mm) grains of clear, hard, high R.I. mineral. Not heavy. (harder than glass)	(white as vesicle fillings)	NOT SAMPLED			
				20–28	Weathered basalt.	Weathered basalt + clay, some fresh chips of floaters.	(OX) Tb					20-25		
				28–34	Basalt	Mixture red-brown (oxidised) and dark grey (fresh) olivine phyric basalt.	Tb					25-28, 28-31, 31-34		
FRESH				34–50	Basalt	Dark grey to black olivine basalt. Generally fine grained network fabric, locally with glassy looking matrix and small black fragments of black glass. Some intervals partly vesicular.	Tb			2%, 1%, tr., tr.		34-37, 37-40, 40-43, 43-46, 46-49		
		4¾" Down Hole Hammer		50–61						tr., tr., tr.		49-52, 52-55, 55-58, 58-61		
FRESH				61–76	Basalt	Dk. grey to dk. purplish grey very fine grained semi glassy basalt. Olivine not visible. Locally vesicular	Tb		tr.	1%		61-64, 64-67, 67-70, 70-73, 73-76		
				76–79	Basalt	Dk. grey f.g. ol. basalt crowded c̄ glassy frags.	Tb					76-79		
				79–82	Basalt	Dk. purplish grey vesicular glassy basalt	Tb					79-82.2		
				82–89	Basalt	Dk. grey fine grained olivine basalt.	Tb					82.2-85.4		
	CHIP			89–96	?	Pale green-grey-whitish clayey weathered rock with fine granular fabric, possibly felsic pyroclastic, not quartz bearing.						85.4-88.75, 88.75-91.9, 91.9-96.0		
	CORE			96–102.2	?	Soft pinkish brown puggy clay. Possibly originally a felsic/vesicular [illegible]			Rare siliceous (chalcedonic) granules of [illegible] vesicle fillings?					
WEATHERED				102.2–102.7	Felsic Tuff?	Wd. felsic lapilli tuff or epiclastic congl.		No structure; Obviously very immature sediment.						
	HQ	NQ		102.7–111.6	?	Soft pink brown puggy clay. Relict fine (<0.5 mm) felsic? network fabric and small green-grey round clay vesicle fill ings? Could be wd. intermediate lava?		45° to c.a. (alignment of vesicles?)	tr. chalcedonic vesicle fillings. (9?m)					
				111.6–	Felsic Tuff	Wd. tan to grey brown granular (1-4 mm) feldspar xtals + fragments, some quartz and sparsely distributed small (5-20 mm) glassy? feldspar phyric [illegible]								

0??

944067

Pancontinental Mining Limited **DRILL HOLE RECORD**

Project: Mt. Carney Logged by: [illegible] Date: 19/6/86 HOLE No: MCPD 1 Sheet 2 of 2

Weathering	Casing	Core Size	Recovery	DEPTH	ROCK TYPE	GEOLOGICAL DESCRIPTION	Bedding	Structure	% Sulphides
WEA.				129.2	Felsic Tuff.	in felsic intermediate "[illegible]" weak eutaxitic fabric in [illegible] parts [illegible] 129.8 - 129.2 m	40°	+ LAOC (eutaxitic foliation) contact [illegible] over [illegible]	0.2%
	HQ	NQ		135.0	Siltstone and Micaceous Greywacke	Interbedded to laminated dk grey to mid grey fine siltstone and medium to fine grained micaceous sandstone/greywacke.	45° 35°		0.5%
				144.4 E.O.H.	Micaceous Greywacke/ Sandstone	Medium grained (0.5 - 1.0 mm) micaceous greywacke, fine pearly flakes of mica on bedding plane. Generally massive.	40° 25°		

MCPD 1 CORE RECOVERY:

DEPTH:	INCREMENT:	CORE REC.	% REC.
96.0 - 97.8	1.8	0.5	28
97.8 - 99.4	1.6	1.15	72
99.4 - 101.8	2.4	2.1	88
- 102.4	0.6	0.6	100
- 105.4	3	2.8	93
- 108.4	3	2.4	80
- 111.4	3	2.0	67
- 114.4	3	1.3	43
- 117.4	3	1.4	47
- 120.4	3	1.5	50
- 123.4	3	2.9	97
- 126.4	3	3.0	100
- 129.4	3	2.7	90
129.4 - 130.8 / - 131.35 / - 132.4	3	2.55	85
- 134.9	2.5	2.5	100
- 136.8	1.9	1.7	89
- 138.0	1.2	1.2	100
- 138.4	0.4	0.4	100
- 141.4	3	3.0	100
- 144.4	3	3.0	100

656

94068

DRILL HOLE RECORD — SUMMARY SHEET

PANCONTINENTAL MINING LIMITED - (Exploration & Production Division)

HOLE No MCPD 2

PROJECT MT. CATTLEY PROPERTY EL 14/85 TASMANIA PC DATE 25/9/86

DATE COMMENCED 23/9/86 DATE COMPLETED 24/9/86 DRILL Mobile Drill (Pen/Cove; top drive) DRILLER STACPOOLE ENTERPRISES (LAUNCESTON)

LOCATION GEOLOGICAL LOG BY W. HERRMANN No. OF LOG SHEETS 2

COLLAR CO-ORDS. mN 12000 N mE 10500 E SAMPLED BY ASSAYED BY

COLLAR R.L. PETROLOGY BY

TOTAL DEPTH 117.5 m. AZIMUTH DIP AT COLLAR Vertical CORE SIZES 6¼" Down Hole Hammer 0–10 m. 4½" Down Hole Hammer 10–72 m. NQ. core 72–117.5 m.

OBJECTIVE OF HOLE

a) to test accuracy of SIROTEM estimate of basalt cover thickness

b) to obtain lithological/structural? information of sub-basalt basement rocks.

REMARKS

THICKNESS OF BASALT:

SIROTEM Estimate: approx 110 m.

Actual Drilled: 60 m.

SUMMARY OF RESULTS

FROM	TO	LENGTH	GEOLOGY
0	10	10	Clay, rubble, weathered basalt.
10	22	12	Olivine Basalt. (Tertiary.)
22	28	6	Weathered basalt, clay, sandy quartz-feldspar bearing gravel.
28	60	32	Olivine Basalt, locally glassy, vesicular. (Tertiary.)
60	117.5 E.O.H.	57.5	Amygdaloidal lava termed "Andesite". (Cambrian)

HOLE SURVEY

METHOD	DEPTH	AZIMUTH	DIP
NONE			

MINERALISATION

057

9944069

Pancontinental Mining Limited — DRILL HOLE RECORD

Project: MT. CATTLEY Logged by: [illegible] Date: 24/9/8[illegible] HOLE No: MCDD 2
Sheet 1 of 2

Weathering	Casing	Core Size	Recovery	DEPTH (M)	ROCK TYPE	GEOLOGICAL DESCRIPTION	GRAPHIC LOG	STRUCTURE	MINERALISATION	ALTERATION	SAMPLE NUMBER	INTERVAL	ASSAYS	Petrology
Weathered	6"	6¼" Hammer		0–10	Clay and Rubble.	Weathered basalt and brown clay. Considerable water inflow into hole.	Tb (ox)				NOT SAMPLED			
Fresh				10–22	Basalt	Medium to dark grey fine grained olivine bearing basalt, locally with dark glassy interstitial patches. Hole dry to 19 m.	Tb					10-13, 13-16, 16-19, 19-22		
Weath.				22–25	Basalt and Gravel	Basalt, partly oxidized. Olivine weathered. Some green clay, and coarse sandy gravel including qtz + feldspar.	Tb (ox)	Hole caving, causing drilling problems, requiring Hammer. Pulled rods 3 times to clear blocked parts.				22-25		
Fresh		4½" Down Hole Hammer		25–50	Basalt.	Dk. grey to purplish grey olivine bearing basalt; locally glassy and vesicular. Oxidized basalt and some qtz. sand contamination from cave in zone 22-28 m.	Tb					25-28, 28-31, 31-34, 34-37, 37-40, 40-43, 43-46, 46-49		
Fresh				50–60			Tb					49-52, 52-55, 55-58		
Weathered	CHIPS			60–72	Weathered Intermediate volcanic ?	Very small chips of pale dove grey weathered-clayey rock. Some chips have fine granular fabric. More commonly fine near aphanitic fabric, occasionally fine tabular feldspar. Quartz is rare.	^ ^	Fracturing? [illegible]				58-61, 61-64, 64-67, 67-70, 70-72		
	CORE			72			^							
Weathered	HQ	↓		72–81.4	Weathered vesicular "Andesite"	Olive brown, very fine grained weathered volcanic rock with round to ellipsoidal small (1-6mm) vesicles and amygdales forming about 2-5% of rock volume.	^ ^	Widespread in situ/auto brecciation and veins/veinlets roughly by carbonate. Abundant (~3% of core) veins (<1mm to 10mm) and vein lets of calcite-qtz-chlorite with traces <0.05% of Pyrite ± Haematite.	Pyrite < 0.05%. Haematite trace.					
		NQ CORE		81.4–117.5	Amygdaloidal "Andesite"	Very fine grained nearly aphanitic volcanic rock of medium dark green-grey to pale green grey colour, containing approx. 2-3% (vol) rounded/ellipsoidal amygdales. Smaller (<5mm) amygdales are filled with dark green soft radiating mineral [illegible] chlorite with minor qtz-carbonate. Larger vesicles (to 40mm) filled with white calcite ± qtz and chlorite. Considerable in situ/auto brecciation, breccia matrix cement largely calcite. Abundant calcite-qtz-chlorite veins with traces (<0.05%) Pyrite, minor Haem.	^ ^							
				117.5 E.O.H.										

658

Pancontinental Mining Limited — DRILL HOLE RECORD

Project: [illegible] Logged by: [illegible] Date: 24/5/[illegible] HOLE NO: MCPD 2
Sheet 2 of 2

94070

Weathering	Casing	Core Size	Recovery	DEPTH	ROCK TYPE	GEOLOGICAL DESCRIPTION	GRAPHIC LOG	STRUCTURE: Bedding	Fracturing	Cleavage	Brecciation	Faulting	Veining	MINERALISATION: % Sulphides	ALTERATION	SAMPLE NUMBER	INTERVAL	ASSAYS

MCPD 2 : CORE RECOVERY:

DEPTH (m)	INCREMENT	CORE REC.	% REC.
72 – 72.5	0.5	0.15	30
72.5 – 74.3	1.8	0.45	25
– 75.5	1.2	0.65	54
– 76.3	0.8	0.80	100
– 78.5	2.2	2.1	95
– 79.8	1.3	1.0	77
– 81.5	1.7	1.5	88
– 84.5	3	3.0	100
– 87.5	3	3.0	"
– 90.5	3	3.0	"
– 93.5	3	3.0	"
– 96.5	3	3.0	"
– 99.5	3	3.0	"
– 102.5	3	3.0	"
– 105.5	3	3.0	"
– 108.5	3	3.0	"
– 111.5	3	3.0	"
– 114.5	3	3.0	"
114.5 – 117.5 E.O.H.	3	3.0	"

ZONE OF OXIDATION

Drilling Conditions: Very weathered soft clayey zone and extensively fractured down to about 50m. Above 76.3m. The rock is soft clay like to work away. Intense fracturing in the zone 79.8 – 85 m.

Pancontinental Mining Limited **DRILL HOLE RECORD**

Project: MT. CATTLEY [illegible] Logged by: [illegible] Date: 1/6/86 HOLE No. MCPD[illegible] Sheet 1 of 2

9440771

Weathering	Casing	Core Size	Recovery	DEPTH	ROCK TYPE	GEOLOGICAL DESCRIPTION	GRAPHIC LOG	STRUCTURE: Bedding	Fracturing	Cleavage	Brecciation	Faulting	Veining	MINERALISATION: % Sulphides	Pyrite	Chalco.	Sphalerite	ALTERATION	SAMPLE NUMBER	INTERVAL	ASSAYS
Weathered		6½" Drill Hammer		0 – 5 – 10 – 13.5	Clay and Rubble	Red brown clay, weathered vesicular basalt.	Tb (ox)												Not Sampled		
Weath. Fresh		4½" Down Hole Hammer			Basalt.	Clayey weathered basalt.	Tb													13.5-16	
					Basalt	Dk. grey fine granular olivine phyric basalt.	Tb													16-19	
					Basalt.	Sloppy brown clayey soup, few fine fresh basalt chips.	Tb													19-22	
Weath.																				22-25	
					Basalt.	Fine grained to glassy black dark grey to black vesicular and/or olivine bearing basalt.	Tb													25-28 28-31 31-34 34-37 37-40 40-43 43-46 46-49	
							Tb													49-52 52-55 55-58 58-61 61-64 64-67 67-70 70-73	
				85	Basalt.	Reddish grey, very vesicular "Scoriaceous" basalt.	Tb													73-76 76-79 79-82	
Weathered (?)					"Andesite"	Weathered feldspar porphyritic "Andesite". Light buff brown to khaki colour; small (1-3mm) creamy-grey plagioclase phenocrysts scattered (~10%) in light grey brown glassy? matrix with distinctive network of fine fractures. Abundant filled cavities.		Vesicles (amygdales) [illegible] 40° to [illegible]	Distinctive network microfracturing in [illegible]	([illegible])	Matrix [illegible]		Occasional small [illegible]							82-85 85-88 88-91 91-94.4	
Fresh.		NQ Core		101.7	Feldspar porphyritic "Andesite"	Fresh (unoxidised) equivalent of above.		Vesicle [illegible] 20-30 [illegible]	Distinct. matrix micro fracturing	101-104 [illegible] 107-107.5 [illegible]	Matrix micro fracture [illegible]		Qtz-calc. 5-10/m. [illegible]	< 0.05%	Trace	Trace.					
				109.4	"Rhyodacite"	Light pinkish brown - grey colour, tabular phenocrysts plagioclase (1-4mm, 10% vol) + small rounded grains quartz (1-2mm 5% vol) and minor [illegible] (biotite?) (1-4mm <5%) in a fine K-feldspar rich matrix. Small elongate [illegible] chlorite filled [illegible] (1-[illegible]		Banding [illegible] 40° to 60° [illegible]	|	|			Qtz + calcite [illegible]	< 0.05%	Trace ?	Trace [illegible]	Trace				

0770

944072

Pancontinental Mining Limited — DRILL HOLE RECORD

Project: MT. CATTLEY Logged by: [illegible] Date: [illegible] HOLE Nº: MCPD 3 Sheet 2 of 2

Weathering	Casing	Core Size	Recovery	DEPTH	ROCK TYPE	GEOLOGICAL DESCRIPTION	GRAPHIC LOG	STRUCTURE: Bedding	Fracturing	Cleavage	Brecciation	Faulting	Veining	MINERALISATION: % Sulphides	[illegible]	ALTERATION	SAMPLE NUMBER	INTERVAL	ASSAYS	Petrology
				119.5 E.O.H.	"Andesite"	[illegible], [illegible] 101.7–109.4 m. but with [illegible] [illegible] in [illegible] [illegible] fabric.		[illegible]			[illegible]		[illegible]	[illegible]	[illegible]					

MCPD 3. CORE RECOVERY:

DEPTH.	RUN	CORE	% REC.	
94.4–96.5	2.1	2.1	100	ZONE OF OXIDATION
–99.1	2.6	2.6	100	
99.1–100.3	1.2	1.1	92	
–101.6	1.3	1.3	100	
–102.5	0.9	0.9	100	
–105.5	3.0	3.0	100	
–108.5	3.0	3.0	100	
–111.5	3.0	3.0	100	

074

9440/3

DRILL HOLE RECORD — SUMMARY SHEET

PANCONTINENTAL MINING LIMITED - (Exploration & Production Division)

HOLE NO MCH 3

PROJECT Mt. Cattley — PROPERTY EL 14/85 TASMANIA — PC — DATE 2/12/36

DATE COMMENCED 25/3/36 — DATE COMPLETED 3/6/36 (1/10/36) — DRILL Mobile Drill Top Drive Pow. (coal) — DRILLER STACPOOLE ENTERPRISES (LAUNCESTON)

LOCATION Ex Beaconsfield Rd. 630 m. south of line 12000 N. — GEOLOGICAL LOG BY W. HERRMANN — No. OF LOG SHEETS 2

COLLAR CO-ORDS. — mN — mE — SAMPLED BY — ASSAYED BY

COLLAR R.L. — PETROLOGY BY

TOTAL DEPTH 129.5 m AZIMUTH — DIP AT COLLAR Vertical — CORE SIZES 6¼" Downhole Hammer 0-13.5 m ; 4½" Downhole Hammer 13.5 - 94.4 m ; 94.4 m - 129.5 m : NQ Core.

OBJECTIVE OF HOLE

a) to test accuracy of SIROTEM estimate of basalt cover thickness.

b) to obtain lithological/structural? information of sub basalt basement rocks.

REMARKS

THICKNESS OF BASALT :

SIROTEM estimate : 64 ± 15 m.

Actual Drilled : approx 83 m.

SUMMARY OF RESULTS

FROM	TO	LENGTH	GEOLOGY	
0	16	16	Clay, rubble, weathered vesicular basalt.	TERTIARY.
16	83	67	Olivine Basalt, vesicular glassy basalt.	TERTIARY.
83	101.7	18.7	Weathered feldspar porphyritic "Andesite"	CAINOZOIC
101.7	109.4	7.7	Fresh feldspar porphyritic "Andesite"	CAINOZOIC
109.4	125.1	15.7	Feldspar - quartz (Biotite?) porphyritic / flow banded "Rhyodacite"	CAINOZOIC
125.1	129.5	± 4	Feldspar porphyritic "Andesite".	CAINOZOIC
	E.O.H.			

HOLE SURVEY

METHOD	DEPTH	AZIMUTH	DIP
None.			

MINERALISATION

[redacted]

6/12

APPENDIX 2

B.J. BARRON, B.Sc., Ph.D., (Sydney)
PETROLOGIST

944075

7 Fairview Ave.,
St. Ives,
SYDNEY NSW 2075
Tel. (02) 449 5839

Our ref: P6/82/402a

Your ref: Phone call and lette rof 6th November 1986.

PETROGRAPHIC EXAMINATION OF FIVE

ROCK SAMPLES.

Report No: P6/82/402a 26th November, 1986.

For: Pancontinental Mining Ltd.

Dr. B.J. Barron,
Consulting Petrologist.

Sample No. 19816

Rock Type. Partly weathered and degraded poorly sorted lithic (crystal) tuff comprising argillically altered fragments from a strongly porphyritic acidic source.

Hand Specimen A friable mid green-grey fine grained sample containing numerous white to pale grey subhedral (?feldspar) phenocryst sites and poorly defined lithic fragment outlines. No K-feldspar was detected by staining and the rock is not magnetic.

Thin Section. Fragmental texture is preserved in this sample and is defined by abundant poorly sorted volcanic lithic and crystal debris ranging in size up to about 3 mm across. Lithic clasts predominate, all showing intense argillic alteration, partial degradation due to near surface weathering, and deformation of lithic fragments most likely accompanying the intense alteration. Shapes of lithic fragments are poorly defined due to the ubiquitous alteration, but most are highly irregular while angular and deformed shapes are common, with certain fragments now molded around more competent grains. Recognisable lithic fragments account for about 60% of the total thin section area, with a further 20% of crystal debris and about 20% of a meagre rock matrix.

A variety of lithic fragments may be recognised by poorly preserved relict textural features including pumiceous types with flattened and deformed vesicle sites now marked by almost opaque oxide staining, while the once-glassy groundmass fraction is now converted to pale green partly oxidised chlorite ± dusty fibrous birefringent clay (?montmorillonite). Elsewhere are coarsely porphyritic volcanic fragments containing phenocrysts and glomeroporphyritic aggregates of stout subhedral plagioclase crystals. Sparse relict islands of the albitised plagioclase are preserved within a mat of dense wispy very fine grained "sericite" (or illite, pyrophyllite etc.). Also present in certain of the fragments are unbroken deeply embayed and magmatically corroded quartz phenocrysts (up to 0.8 mm across), while much smaller quartz phenocrysts (up to 0.3 mm across) commonly show subhedral outlines. Accessory relict sites of microphenocrysts include degraded mafic crystals, including biotite now pseudomorphed by strands of "sericite" interlayered with

faintly pleochroic brown biotite and abundant sphene granules, as well as ?amphibole now replaced by fibrous chlorite. Opaque oxide microphenocrysts are pseudomorphed by white leucoxene intergrown with dusty opaque oxides and traces of sulphides. Crystal debris includes broken angular quartz, degraded plagioclase and similar altered mafic crystals to those described above. Zircon is a rare accessory phase. The meagre rock matrix consists of poorly defined almost cryptocrystalline low birefringent brown clouded clay (mostly ?kaolinite), wispy strands of birefringent pale brown montmorillonite, illite (or sericite), as well as pale olive green chlorite.

The sample may be only tentatively identified in terms of its relict primary textures and mineralogy, however the dominant lithic fragments and presence of relict phenocrystic quartz, albitised plagioclase and barely recognisable deformed biotite flakes suggests a rather acidic volcanic source for this poorly sorted lithic (crystal) tuff.

Sample No. 19818

Rock Type. Sparsely amygdaloidal fine grained volcanic rock of intermediate primary composition, that is cut by weakly mineralised veining and strong alteration to assemblages amongst the phases chlorite-carbonate-sericite and clay.

Hand Specimen A massive fine grained mid green-grey sample enclosing sparse conspicuous well rounded pale grey to dark grey patchy and zoned amygdales. The sample is cut by a branching network of narrow partly mineralised pale grey veins. Both the veins and amygdales give strong reaction to cold dilute HCl indicating the presence of calcite. K-feldspar staining proved negative and the rock is not magnetic.

Thin Section. Primary mineralogy is completely replaced by an argillic secondary assemblage in this sample, but since alteration is mostly selective relict textural features are clearly preserved.

The relict texture of the sample is dominated by a decussate mat of elongate prismatic feldspar microlite sites that are mostly less than 0.35 m long and 0.05 mm wide. These are now selectively replaced by extremely fine grained dense aggregates of "sericite" (or illite, pyrophyllite, paragonite etc.). Sparse mafic microphenocryst sites also retain narrow subhedral prismatic shapes but are pseudomorphed by very dominant pale grey chlorite crammed with minute sphene granules and traces of secondary carbonate. Shapes of the mafic crystal sites suggest the presence of previous amphibole or even pyroxene. The ubiquitous microlites are set in a rather meagre groundmass fraction now replaced by small patches of microgranular secondary quartz, in turn set in pale green chlorite. The latter most likely pseudomorphs an interstitial glassy groundmass fraction. Minute accessory wispy crystallites that now comprise aggregates of red-brown dusty limonitic oxides could represent sites of unoriented opaque oxide granules. The conspicuous large rounded patches of the hand specimen are amygdales which reach about 8 mm across and are filled with assemblages amongst the phases chlorite, carbonate and quartz. Several of these contain central zones of chlorite with narrow rims of microgranular secondary quartz ± carbonate, while elsewhere are vesicle sites filled with patchy polygonised quartz that may have been opaline silica or chalcedony, intergrown with carbonate (calcite) and chlorite. The narrow branching veins are filled mostly with carbonate, (calcite), clouded centrally by a zone of red-brown limonitic oxide dust and clusters of fine grained pyritic sulphide crystals. Certain of the carbonate veins have patches of opaque sulphides partly associated with chlorite and anhedral patches of sphalerite adjacent to the vein but located in the host rock.

The sample cannot be identified accurately in terms of its primary mineralogy due to intense alteration. Nevertheless it may be described as a sparsely amygdaloidal fine grained volcanic rock of intermediate primary composition that has undergone veining and strong alteration to low grade assemblages amongst the phases chlorite-carbonate-sericite and clay. Traces of sulphide mineralisation is associated with veining.

Sample No. 19820

Rock Type. Porphyritic and once-vesicular trachyte or trachyandesite that has undergone substantial selective alteration to a low grade chlorite-albite-quartz-(carbonate-sericite) secondary assemblage.

Hand Specimen A mid grey fine grained ?microporphyritic sample containing elongate to irregular and deformed amygdales up to 3 cm long and 5 mm wide. K-feldspar staining gave weak patchy positive results, and the rock is not magnetic.

Thin Section. This is a very fine grained sparsely porphyritic and once glassy volcanic rock, retaining conspicuous elongate rounded amygdales and a distinct pattern of perlitic cracking. Phenocrysts account for about 10% of the total thin section area and small to large amygdales comprise a further 10%. The phenocrysts include subhedral prisms and aggregates of albitised plagioclase (mainly less than 1 mm long) lightly dusted with wispy sericite and minor carbonate, while sparse mafic phenocryst sites and clusters reach 4 mm long. The latter are replaced by dense chlorite, granular secondary quartz and dusty sphene granules. Associated opaque oxide microphenocrysts are degraded to leucoxene and translucent limonitic oxides. Several stout prismatic mafic crystal sites that almost certainly once comprised an amphibole enclose clusters of partly albitised and sericitised plagioclase laths, as well as accessory opaque oxide and apatite crystals. The amygdales have elongate narrow wavy shapes generally drawn out subparallel to the direction of previous flow, and these are filled with zoned secondary assemblages amongst the phases chlorite, quartz, wispy "sericite" (or montmorillonite), and carbonate. Several of these contain fibrous radiating pale green chlorite centrally with patchy quartz and "sericite" peripherally, while in others granular to prismatic secondary quartz is present centrally, intergrown with patchy carbonate and narrow zones of pale green chlorite peripherally. All the amygdales have narrow rims of fine grained groundmass material and outer margins stained by red-brown to almost opaque limonitic oxide dust.

The voluminous groundmass fraction of this rock contains very abundant wispy albite microlites well aligned subparallel to the magmatic flow direction and defining a trachytic texture. A conspicuous pattern of narrow curving perlitic cracks throughout this felsic fraction suggests quite rapid cooling of the predominantly glassy rock. The cracks are now marked by concentrations of chlorite and sphene granules. Trace proportions of fine grained sulphides are mostly located in narrow veinlets and patches containing secondary carbonate.

The sample may be described as a porphyritic and once-vesicular trachyte or trachyandesite, that has undergone substantial selective alteration to a low grade chlorite-albite-quartz-(carbonate-sericite) secondary assemblage.

Sample No. 19821

Rock Type. Partly altered and veined porphyritic and vesicular volcanic rock most likely of rhyodacitic primary composition.

Hand Specimen A mid-brown fine grained rather massive sample containing numerous medium grained dark green ?mafic crystal sites, as well as sparse pale grey felsic sites. The rock is cut by several narrow pale grey veins that react strongly with cold dilute HCl indicating dominant calcite, while the fine grained groundmass fraction of the rock gives positive K-feldspar staining results. The sample is not magnetic.

Thin Section. Sparsely porphyritic and vesicular texture is well developed in this once partly glassy volcanic rock. Phenocrysts and glomeroporphyritic aggregates occupy about 10% of the total thin section area and these include dominant albitised plagioclase, fewer degraded mafic phenocryst sites, and sparse accessory opaque oxide microphenocryst sites. The phenocrysts and aggregates rarely exceed 1 mm across. Also present are sparse amygdales with well rounded to irregular shapes that are mostly less than 3 mm long and 1 mm wide, but with rare elongate amygdales reaching more than 5 mm long that are filled with

carbonate ± quartz centally and "sericite" ± chlorite peripherally. The albitised plagioclase phenocrysts have characteristic prismatic shapes, and enclose various proportions of wispy sericite and chlorite and traces of carbonate. No mafic phenocrysts are preserved as such, and these sites are pseudomorphed by dense pale green chlorite and patchy sphene dust, while degraded opaque oxide crystal sites almost certainly had titaniferous primary compositions since they are pseudomorphed by dense secondary sphene ± white leucoxene. Shapes of the altered mafic crystal sites are not particularly diagnostic, except that they appear to be prismatic rather than flaky suggesting previous amphibole ± pyroxene instead of biotite. Microphenocrysts of partly polygonised and clouded quartz are accessory. The fine grained to once glassy groundmass now is devitrified into rather coarse equigranular interlocking felsic domains (mostly K-feldspar - see staining of offcut) which are crammed with wispy prismatic albite microlites that are partly trachytic (aligned subparallel to a former direction of magmatic flow) and partly unoriented and decussate. The abundant groundmass fraction also contains abundant dusty limonitic oxide inclusions.

The narrow branching veins that cut across this sample contain patchy granular carbonate and quartz in approximately equal major proportions as well as minor chlorite. The rock lacks sulphide mineralisation.

The presence of sparse quartz phenocrysts and a quartz-K-feldspar-rich, once-glassy groundmass fraction suggests rhyolitic affinity for this rock, however it also contains numerous sodic plagioclase and altered mafic phencoryst sites and abundant wispy sodic plagioclase microlites. It may be only tentatively identified as a porphyritic and amygdaloidal rhyodacite, since it has undergone substantial but selective albite-carbonate-chlorite-("sericite") alteration.

Sample No. 19822

Rock Type. Devitrified and altered lithic fragmental (or auto-brecciated) rock, containing sparsely porphyritic once-glassy volcanic material of intermediate primary composition.

Hand Specimen Dark grey angular ?autobrecciated lithic fragments or relict "islands" of host rock are set in a meagre matrix of mid grey fine grained material. The "fragments" enclose scattered dark green-grey medium grained crystal sites as well as sparse pink oxidised felsic crystal sites. K-feldspar staining proved negative and the rock is not magnetic.

Thin Section. Perlitic structures throughout this rock which are accentuated by selective alteration, indicate a parent type consisting mostly of volcanic glass, and the coarse fragmental or autobrecciated texture of the hand specimen is not particularly obvious in the thin section. The sample retains recognisable sparse albitised plagioclase phenocryst sites and aggregates, most of which do not exceed 1 mm across. these retain relict patches or "islands" of albitised plagioclase that is heavily clouded with dusty "sericite" (or pyrophyllite, paragonite etc.), and fewer mafic phenocryst sites retaining prismatic outlines of previous ?amphibole, that are now replaced by dense fine grained chlorite and patches of secondary quartz. As in the previous samples the accessory oxide microphenocrysts are degraded to translucent secondary oxides and white leucoxene.

The enhanced perlitic structures in the sample are marked by central zones of yellow to red-brown clouded clay ± barely recognisable relict felsic microlitic material, enclosed within narrow margins of fine grained green chlorite. Certain areas of the sample appear to be fragmental, with similar partly altered once-glassy domains enclosed within areas of microcrystalline cherty ?quartz clouded with trails of wispy sericite and dusty sphene granules. Elsewhere is a "fragment" or patch that is texturally different to the enclosing host lithology comprising about 35% of unoriented heavily sericitised and albitised plagioclase microphenocrysts and aggregates, as well as fewer mafic crystal sites now converted to dense chlorite, all set in a once glassy groundmass dominated by a mosaic of secondary microgranular cherty quartz intergrown with wispy montmorillonite ± chlorite. Anastomosing and branching very narrow veinlets that cut across the sample are filled with fibrous pale brown stained birefringent clay (?montmorillonite).

Although this sample has undergone substantial devitrification and selective albite-quartz-chlorite-clay alteration, it is not at all mineralised. Rather poorly preserved relict textures suggest a partly lithic fragmental (or autobrecciated) parent type, containing sparsely porphyritic once-glassy volcanic material of intermediate primary composition.

B.J. BARRON, B.Sc., Ph.D., (Sydney)
PETROLOGIST

7 Fairview Ave.,
St. Ives,
SYDNEY NSW 2075
Tel. (02) 449 5839

Our ref: P6/82/353a

Your ref: Letter dated 17th June, 1986; Purchase Order No. 51523.

PETROLOGICAL EXAMINATION OF TWENTY ROCK SAMPLES FROM THE MT. CATTLEY PROSPECT, TASMANIA.

Report No: P6/82/353a 3rd July, 1986.

For: Pancontinental Mining Limited.

Dr. B.J. Barron,
Consulting Petrologist.

A. BLACKMARSH ROAD WINDOW

Sample No. 18701

Rock Type. Altered and partly oxidised (weathered) vitric tuff containing abundant crystal and lithic fragments from an acidic volcanic source.

Hand Specimen A mottled pale grey and pale red-brown, partly oxidised and stained fine grained sample containing abundant medium grained white ?crystal sites and fewer dark grey sites. The rock also contains sparse coarse dark grey ?lithic fragments. Staining for K-feldspar gave positive results mostly for the fine grained matrix fraction.

Thin Section. Unsorted fragmental texture is well preserved in this pyroclastic rock, in spite of substantial argillic alteration and partial oxidation due to near surface weathering. The sample contains about 20% of broken angular crystal debris, most of which is in the size range 0.1 mm up to 0.5 mm across (fine to medium sand size). Subordinate lithic fragments which account for less than 25% of the angular and broken debris also generally do not exceed 5 mm across. The crystal debris includes very dominant angular and broken quartz chips and common prismatic phenocrysts and cleavage fragments of K-feldspar partly degraded to low birefringent yellow-brown oxide-stained clay. Ragged and deformed sites of wispy biotite flakes now are partly converted to interlayer sericite and opaque oxide dust. The recognisable lithic fragments include once-glassy coarsely devitrified volcanic types now converted to granular secondary K-feldspar intergrown with a network of wispy pale green ?montmorillonite. Other fragments are converted to dense monomineralic chlorite, and elsewhere are fragments with poorly preserved relict textures of a flow banded parent type. Still other fragments contain unoriented wispy feldspar microlites set in a devitrified matrix of granular intergrown felsic domains.

In the voluminous rock matrix are preserved clear relict textures of cuspate and angular glass shards together with much finer grained broken crystal and lithic debris similar to that described above. The glass shards are selectively replaced by microgranular to cherty felsic material (mostly ?K-feldspar), which is clear

of dusty inclusions, and these are set in a "cherty" matrix strongly clouded by limonitic oxide dust.

The sample retains clear relict textures of glass shards confirming its pyroclastic origin. It may be classed as an altered and partly oxidised (weathered) vitric tuff containing abundant crystal and lithic fragments from a porphyritic acid volcanic source.

Sample No. 18702

Rock Type. Altered and partly oxidised (weathered) vitric tuff, with sparse angular and broken crystal debris, and rare accessory ?carbonaceous sedimentary lithic fragments and tourmaline.

Hand Specimen A mid green-grey fine grained rather massive sample that is cut by several joints coated with black oxides. K-feldspar staining gave very strong positive results.

Thin Section. This is a much finer grained sample than the previous sample 18701, but yet it retains clear relict textures of abundant cuspate glass shards and angular crystal debris indicating pyroclastic origin. Sparse angular quartz chips and almost equally abundant deformed and degraded mica flakes together account for about 10% of the total thin section area and are more or less evenly distributed throughout an extremely fine grained, partly altered matrix fraction. The mica flakes almost certainly once were biotite, but now are converted to "sericite" and dusty opaque oxides. Rare cleavage fragments of K-feldspar are barely recognisable, while accessory lithic fragments now are converted to patchy microgranular K-feldspar intergrown with wispy pale green ?montmorillonite. The ubiquitous fine grained cuspate glass shards are now converted to a microcrystalline felsic mosaic (mostly K-feldspar), enclosed within a matrix now converted to wipsy low birefringent argillic material and oxidised ?chlorite. Rare small grains of tourmaline and carbonaceous ?mudstone are accessory.

The sample has undergone partial oxidation

and weathering to patchy argillic material stained by yellow-brown limonitic oxide dust, and partly dendritic branching narrow fractures and joints that are coated with almost opaque to red-brown oxides.

An abundant tuffaceous component in this fine grained sample is defined by outlines of abundant glass shards, and presence of angular and broken crystal debris including quartz and minor K-feldspar. The presence of accessory tourmaline grains and sparse, very small clasts of carbonaceous mudstone, however, suggests that a small proportion of sedimentary material most likely comes from a nearby terrestrial source. The rock may be described as an altered and partly oxidised (weathered) vitric tuff with minor angular and broken crystal debris, and rare accessory sedimentary material.

Sample No. 18703

Rock Type. Altered and partly oxidised (weathered) vitric tuff, with abundant broken phenocrystic feldspar, quartz and lithic debris from an acidic volcanic source.

Hand Specimen A mottled medium to rather coarse grained fragmental sample containing abundant white ?feldspar crystal sites and fewer sparse elongate dark green-grey sites. No K-feldspar was detected by staining.

Thin Section. Intense but mainly selective fine grained argillic alteration has affected this sample but in spite of this, clear unsorted fragmental tuffaceous relict textures are preserved. Angular crystal and lithic clasts are represented in approximately equal major proportions, and together these account for about 30% of the total thin section area. The crystal debris includes abundant cleavage fragments of albitised and "sericitised" phenocrystic plagioclase, (from about 0.5 mm up to 2 mm across), while subordinate sparse angular quartz chips rarely exceed 0.6 mm across. A variety of lithic fragments is represented, including intensely argillically altered once-glassy flow banded volcanic types, strongly plagioclase-porphyritic once-glassy types (now largely converted

to wispy pale yellow stained birefringent clay), and deformed once glassy fragments with barely recognisbale rounded vesicle sites. The fragments now are converted to dense wispy pale yellow-green "sericite" and chlorite intergrown in a dense, extremely fine grained cherty "felsic" mosaic. Zircon grains are accessory.

Most of the extremely fine grained matrix fraction comprises intergrown wispy argillic material (birefringent ?montmorillonite as well as low birefringent clay-?kaolinite), together with wispy "sericite" (or pyrophyllite etc.), cherty quartz ± albite and degraded chlorite. Well preserved cuspate angular glass shards now consist of a microgranular aggregate of secondary albite ± quartz that is clear of the ubiquitous argillic clouding of the enclosing matrix fraction.

This sample retains relict textures of abundant glass shards and sparse angular unsorted quartz and feldspar crystal and lithic debris. It has undergone intense but selective albite-quartz-clay alteration and partial oxidation due to weathering, but may be identified as a vitric tuff, with abundant broken and angular phenocrystic feldspar, quartz and lithic debris from an acidic volcanic source.

Sample No. 18704

Rock Type. Well sorted fine grained quartz- and feldspar-rich arenite.

Hand Specimen A massive fine grained mid-grey sample for which K-feldspar staining gave positive results for more or less evenly distributed grains throughout the sample.

Thin Section. Well sorted clastic sedimentary texture is clearly evident in this sample which has an average grain size of about 0.15 mm (fine sand sized grains) and a grain size range of 0.1 mm up to 0.25 mm (all within the fine sand size range). The angular detrital grains account for approximately 70% of the total thin section area, and these include the following in decreasing order of abundance; quartz 30%;

K-feldspar 15%; degraded mica flakes 10%; albite 5%, cherty lithic clasts 5%; carbonate 5%; and sparse accessory detrital grains of tourmaline, rutile, apatite, sphene, and opaque oxides. The quartz grains exhibit strong angular and broken shapes, as do the feldspar cleavage fragments. Mica flakes are generally bent and deformed, and most of these are now pseudomorphed by sericite ± opaque oxide dust. Subordinate flakes now are replaced by dense pale green chlorite. The lithic clasts comprise very fine grained types that are monomineralic cherty quartz, or else contain cherty quartz throughout which is developed abundant carbonaceous dust. Accessory tourmaline includes pale olive green grains as well as variegated and zoned grains with blue centrally and pale olive green peripherally. Sparse scattered carbonate grains appear to be partly detrital and partly are finely polygonised, and most have narrow margins of dense red-brown limonitic oxides indicating a fairly iron-rich composition for this phase.

The meagre rock matrix fraction comprises wispy sericite, chlorite, quartz, patchy limonitic oxides and low birefringent clay (kaolinite).

Well sorted clastic sedimentary texture is characteristic of this fine grained quartz-rich arenite which has undergone moderate patchy alteration and oxidation due to near surface weathering.

Sample No. 18705

Rock Type. Well sorted fine grained quartz-rich weakly carbonaceous arenite.

Hand Specimen A compact massive fine grained mid-grey coloured sample for which K-feldspar staining gave weak positive results for more or less evenly scattered small angular grains.

Thin Section. This is a very well sorted fine grained clastic sedimentary rock similar to the previous sample 18704. It contains in the order of 70% recognisable angular detrital grains that range in size

from 0.03 mm to 0.25 mm (very fine to fine grained sand). The average grain size for the sample is about 0.13 mm (fine grained sand size). An approximate modal composition for the sample is as follows; quartz 30%; deformed and degraded mica flakes 20%; plagioclase 10%; clouded K-feldspar 10%; accessory grains including lithic clasts, tourmaline, apatite, rutile, sphene and zircon. The quartz grains and feldspar cleavage fragments have strongly angular shapes, while mica flakes are bent, deformed and degraded. The latter now mostly comprise sericite clouded by opaque ?oxide dust, while elsewhere are flakes that are now converted entirely to chlorite. Sparse flakes retain brown pleochroism of a biotite parent. The accessory lithic clasts include very fine grained carbonaceous mudstone, carbonaceous siltstone and extremely fine grained cherty quartz-rich types.

Once again there is a minimum proportion of rock matrix present, and this consists of a secondary assemblage amongst the phases chlorite, quartz, patchy carbonate, sericite and variable concentrations of carbonaceous dust. The sparse small patches of carbonate form discrete clusters evenly distributed throughout the sample. The accessory phases include tourmaline grains of various colours including weakly pleochroic olive green, and blue-green types. Zircons are elongate prismatic shaped crystals.

This sample may be simply identified as a well sorted fine grained quartz-rich, weakly carbonaceous arenite.

Sample No. 18706

Rock Type. Partly argillically altered and carbonated vitric tuff, with abundant small angular quartz chips.

Hand Specimen A mid-grey very fine grained compact massive sample containing scattered medium grained pale grey ?crystal sites. K-feldspar staining gave strong positive results.

Thin Section. This is an extremely fine grained sample that consists largely of a microcrystalline felsic mosaic throughout which are scattered small angular quartz chips and wispy deformed mica flakes. The quartz chips and mica flakes rarely exceed 0.1 mm across. Barely recognisable are polygonised and devitrified fine grained flow banded acidic volcanic clasts, that are now converted to a microcrystalline quartz-K-feldspar intergrowth with narrow bands of extremely fine grained wispy clay defining the lamination. Vague outlines of previous ?feldspar cleavage fragments also are pseudomorphed by a microgranular quartz-K-feldspar intergrowth ± patches of clay clouded with dusty inclusions. By far the majority of the sample, however, contains ubiquitous vague outlines of cuspate glass shards now devitrified to a cherty quartz - K-feldspar intergrowth (see staining of offcut), and these are enclosed within a matrix that is relatively rich in pale brown clouded and dusty birefringent argillic material (?montmorillonite). Also present throughout the matrix of this sample are numerous irregular vein-like patches of carbonate. Accessory opaque oxide grains now are largely converted to sphene ± blue anatase.

Several narrow veins that cut across this rock contain granular quartz, carbonate and small anhedral patches of a red-brown isotropic phase that is most likely iron-rich?sphalerite. This phase also is present in trace proportions throughout the voluminous shard-rich matrix.

The sample gives a strong positive K-feldspar stain, and also contains ubiquitous poorly preserved outlines of glass shards. It may be described as a partly argillically altered and carbonated vitric tuff with abundant small angular quartz chips.

Sample No. 18707

Rock Type. Altered vitric tuff with sparse crystal chips from an acid volcanic source and minor mixed sedimentary material.

Hand Specimen A fine grained massive mid grey sample with a narrow red-brown oxidised and weathered selvedge. K-feldspar staining gave positive results for the majority of the fine grained sample. Very slow reaction with cold dilute HCl indicates the presence of minor calcite.

Thin Section. Sparse angular and broken crystal debris which accounts for about 5% of this sample, includes dominant chips of quartz, common clouded K-feldspar chips, subordinate cleavage fragments of weakly sericitised and albitised plagioclase and deformed mica flakes that are now converted to sericite. The crystal debris ranges up to a maximum size of 0.35 mm, but most is less than 0.15 mm across. Accessory crystal debris includes small opaque oxide crystal sites that are now converted largely to microgranular sphene, and minute zircon crystals, while accessory lithic clasts comprise extremely fine grained, strongly carbonaceous mudstone. Very rare chips of pleochroic variegated blue and brown tourmaline also are accessory.

The voluminous, very fine grained rock matrix in which the crystal debris is 'suspended', comprises an almost cryptocrystalline felsic aggregate with abundant K-feldspar (see staining of offcut), throughout which are developed large irregular shaped patches of fine grained secondary carbonate. Also present are wispy fibrous argillic aggregates of ?montmorillonite ± sericite. Very vague outlines in this fraction suggest the presence of previous cuspate and angular glass shards.

The extremely fine grained partly carbonated and partly argillically altered nature of this rock precludes its accurate identification. The presence of rare carbonaceous lithic clasts and accessory tourmaline chips, however, suggests a clastic sedimentary contribution, but the distinct positive stain for K-feldspar and vague outlines of volcanic glass shards suggests that the majority of the sample is tuffaceous. It may be tentatively identified as an altered vitric tuff with sparse crystal chips from an acidic volcnaic source and minor mixed sedimentary material.

Sample No. 18708

Rock Type. Partly altered crystal ?vitric tuff with abundant material from an acidic volcanic source, and a minor clastic sedimentary contribution.

Hand Specimen A massive medium grained sample containing very abundant white ?crystal sites, and fewer dark grey crystal sites, set in a very fine grained green-grey matrix. Patchy yellow-brown limonitic oxide staining is due to surficial weathering effects. K-feldspar staining gave strong positive results.

Thin Section. Angular crystal fragments are a dominant textural feature of this sample in which they account for approximately 40% of the total thin section area. These crystal sites mostly are within the size range 0.2 mm to 0.4 mm (medium sand sized particles), but sparse altered sites up to 0.7 mm also are present. Quartz and altered feldspar crystal sites are present in approximately equal major proportions, and quartz grains mostly are angular with several magmatically rounded and embayed grains. On the other hand the altered feldspar crystal debris includes subhedral prismatic-shaped sites, but most are angular or irregular. Also present are abundant sites of deformed and altered biotite flakes which are aligned subparallel to a weak layering. Accessory debris includes quite large euhedral zircon crystals, opaque oxide grains now converted to sphene dust, rare grains of apatite and tourmaline. Rare, very well rounded sites filled with cherty quartz equally may be filled-in vesicles or polygonised organic material (?radiolaria).

Feldspar crystal sites are selectively converted to dense "sericite" (or pyrophyllite, paragonite etc.), while only a little biotite remains in sites that are largely converted to green birefringent interlayer chlorite-"sericite". As in previous samples there are poorly preserved outlines of possible glass shards in a matrix dominated by an exceptionally fine grained, almost cryptocrystalline K-feldspar rich mosaic enclosing very small patches of "sericite" and "chlorite". Partial staining by limonitic oxides due to weathering has selectively affected altered feldspar and biotite crystal sites.

This sample may be rather tentatively identified as an altered crystal/vitric tuff, especialy since it contains a fine grained K-feldspar-rich matrix with vague relict textural evidence of glass shards. The presence of accessory ?detrital tourmaline, and organic remains, however, most likely indicates the presence of a minor mixed sedimentary component.

Sample No. 18709

Rock Type. Weakly banded carbonaceous "chert" with sparse microfossils, that is partly derived from a reworked K-feldspar-rich acidic volcanic or tuffaceous source.

Hand Specimen An extremely fine grained dark grey, compact, "cherty" massive sample, that is cut by several narrow joints coated with limonitic oxides. K-feldspar staining gave strong positive results.

Thin Section. In contrast to the previous sample 18708 there is no crystal debris represented in this extremely fine grained sample. A weak sedimentary layering is evident however, due to progressive decrease in size and proportion of carbonaceous particles that are "suspended" in an otherwise featureless, almost cryptocrystalline "cherty" or felsic mass, intergrown with sparse wispy unoriented flakes of "sericite" (or illite etc.). Also present in this rock are sparse small (about 0.1 mm across), very well rounded sites that are filled with microgranular polygonised quartz which is clear of the ubiquitous dusty carbonaceous clouding of the enclosing host rock. These sites almost certainly represent microfossils (possibly radiolaria).

In contrast with the large proportion of opaque carbonaceous dust and relict textures of microfossils, the voluminous cherty or "felsic" rock matrix, which accepts a distinct K-feldspar stain, almost certainly consists of reworked, once-glassy tuffaceous particles from an acidic volcanic source.

Although this sample is extremely fine grained, it may be identified as a weakly banded carbonaceous "chert" with sparse microfossils, that is partly derived from a reworked K-feldspar-rich acidic volcanic or tuffaceous source.

B. UPPER RIVER ROAD WINDOW

Sample No. 18722

Rock Type. Partly altered and polygonised vitric tuff with sparse small crystal chips from an acidic volcanic source.

Hand Specimen An almost white, extremely fine grained compact massive sample for which K-feldspar staining gave positive results except for several narrow branching veinlets. Yellow-brown limonitic oxides stain exposed and discontinuous joint surfaces.

Thin Section. Distinct relict outlines of wispy branching and cuspate glass shards are preserved throughout this sample. These are not flattened or welded, and now are pseudomorphed by polygonised felsic aggregates that are mostly K-feldspar (see staining of offcut) ± albite. The relict shards are enclosed within a dense fine grained to almost cryptocrystalline cherty mat that is clouded by abundant dusty argillic and opaque inclusions. Sparse broken crystal debris (up to 0.8 mm across), suspended in this voluminous shard-rich matrix, includes angular cleavage fragments of clouded K-feldspar, albitised plagioclase, and relatively fewer of quartz. Also present are dense patches and trails of dusty inclusions marking previous sites of deformed biotite flakes while clusters of sphene granules replace previous titaniferous opaque oxides.

Trace proportions of small euhedral shaped crystal sites that are now filled with almost opaque to red-brown translucent limonitic oxides once most likely contained sulphides, but

narrow discontinuous fractures also coated with similar oxides almost certainly once contained iron-bearing carbonate since subhedral rhombic crystal shapes are well preserved.

The ubiquitous well preserved relict textures of glass shards in this sample clearly indicate its vitric tuffaceous origin. It contains sparse angular and broken K-feldspar, albite and quartz crystal debris derived from an acidic volcanic source. The rock has undergone polygonisation of the extremely fine grained felsic shard material, and partial argillic clouding of the remaining cherty matrix fraction.

Sample No. 18723

Rock Type. Partly altered and finely polygonised (or devitrified) vitric tuff containing sparse angular feldspar and quartz crystal debris.

Hand Specimen A massive very fine grained "cherty" pale brown sample for which K-feldspar staining gave weak positive results. Microscopic crystal sites give strong positive K-feldspar staining results.

Thin Section. Unsorted fine grained crystal debris accounts for only about 3% to 5% of the present thin section area, and most is less than 0.3 mm across. Most of this fraction includes albitised plagioclase cleavage fragments and almost equally abundant quartz chips, with subordinate angular chips of K-feldspar. Accessory barely recognisable ragged crystal sites that once contained deformed biotite flakes now contain aggregates of a very fine grained pale green birefringent layer silicate phase intergrown with dusty opaque ?oxides. Other recognisable relict textures inlcude minute vesicle sites that are rimmed with green birefringent argillic products enclosing microgranular aggregates of secondary quartz.

The broken angular crystal debris is "suspended" in a very abundant matrix in which are well preserved outlines of ubiquitous

wispy cuspate volcanic glass shards. As in the previous sample the shards are not particularly flattened or "welded", and are selectively replaced by a finely polygonised felsic mosaic including abundant K-feldspar (see staining of offcut). The shards are outlined by exceptionally fine grained pale green birefringent argillic material, and a similar product fills small rounded vesicle sites. Rare irregular shaped lithic fragments that lack relict textures are pseudomorphed by an intergrowth of quartz, K-feldspar and pale green birefringent clay (?montmorillonite).

Very narrow branching veinlets contain micro-granular quartz, while later patches and veinlets contain anhedral aggregates of carbonate. Rare small disseminated euhedra of pyrite have narrow margins of red-brown limonitic oxides.

The sample may be accurately identified as a partly altered vitric tuff, since relict textures of abundant glass shards are well preserved. In addition the sample contains sparse broken feldspar and quartz crystal debris from an acidic volcanic source.

Sample No. 18724

Rock Type. Partly weathered and oxidised, partly argillically altered unsorted lithic tuff, containing material from a trachytic to rhyolitic volcanic source.

Hand Specimen A distinctly fragmental sample containing scattered fine grained elongate but irregular shaped pink lithic fragments (up to 1.5 cm long) and fewer dark green deformed fragments, set in a fine grained mid-grey coloured matrix. K-feldspar staining gave positive results for the pink fragments and smaller ?crystal debris.

Thin Section. A variety of unsorted lithic/crystal debris is represented in this tuffaceous sample. Lithic fragments account for about 25% of the total thin section area, while broken angular crystal clasts occupy a further 15%. The remainder of the sample is a very fine grained partly altered felsic matrix. Individual lithic fragments exhibit

angular and irregular to deformed shapes and include the following types; microporphyritic trachyte, with prismatic albite microphenocrysts set in a matrix of magmatic flow oriented albite microlites ± K-feldspar; once glassy microporphyritic types with sparse skeletal to subhedral plagioclase microphenocrysts and sparse feldspar microlites set in an almost cryptocrystalline heavily clouded K-feldspar-rich groundmass; once glassy volcanic types similar to the latter, but with abundant small rounded vesicle sites now filled with wispy green birefringent layer silicates (?montmorillonite ± green "biotite"); "cherty" felsic tuffaceous types with sparse angular plagioclase crystal debris; and once-glassy devitrified fragments that now comprise a K-feldspar-rich mosaic clouded by red-brown hematite dust (most likely the pink lithic fragments of the hand specimen); while other deformed fragments now consist largely of wispy pale green birefringent clay. The crystal fragments include coarse albitised and partly sericitised plagioclase phenocryst debris as well as glomeroporphyritic aggregates of this phase (up to 2 mm across), subordinate angular and broken quartz chips (mostly less than 0.8 mm across), as well as deformed and completely altered sites of previous mafic phenocryst debris. Such sites now are filled with wispy birefringent green oxidised chlorite, pale green birefringent clay (?montmorillonite) ± felsic microgranular aggregates. The voluminous rock matrix retains vague outlines of relict glass shards but consists largely of a cherty felsic mosaic intergrown with patches of chlorite, clay (including "sericite" and yellow-green ?montmorillonite), as well as accessory patches of sphene, and oxidised ?carbonate. Elsewhere are small patches of red-brown oxides that appear to pseudomorph previous accessory sulphide grains.

The sample may be described as a partly weathered and oxidised unsorted lithic tuff containing a variety of crystal debris and related lithic fragments from a trachytic to rhyolitic acidic volcanic source. Alteration is mostly selective rather than pervasive, and comprises an argillic-quartz-chlorite assemblage.

Sample No. 18725

Rock Type. Silicified and partly argillically altered, strongly porphyritic and vesicular quartz trachyte.

Hand Specimen A pale red-brown fine grained sample containing numerous evenly distributed medium grained pale grey ?feldspar crystal sites as well as fewer dark green-grey mafic crystal sites. K-feldspar staining gave strong positive results.

Thin Section. In contrast to the previous tuffaceous samples, the present rock is a distinctly porphyritic and once-vesicular volcanic igneous type. Conspicuous subrounded to irregular and branching vesicle sites now are filled with aggregates of granular secondary quartz with a grain size mostly about 0.3 mm to 0.6 mm across. The vesicle sites account for about 15% of the total thin section area, and mostly these are 0.5 mm to 1.5 mm across. A further 15% of the sample comprises euhedral to subhedral phenocrysts and glomeroporphyritic aggregates of albitised and weakly sericitised plagioclase and fewer of K-feldspar, sparse mafic phencoryst sites are completely pseudomorphed by an extremely fine grained yellow-green birefringent layer silicate (possibly oxidised chlorite, or interlayer chlorite/biotite). The shapes of several mafic crystal sites suggest the presence of previous biotite and most likely an amphibole. The vesicles and phenocrysts are set in an abundant groundmass fraction, the texture of which is dominanted by a dense mat of clouded albite microlites (mostly less than 0.1 mm long), enclosed within a polygonised mosaic of intergrown quartz, and K-feldspar (average grain size of about 0.3 mm). The K-feldspar domains are clouded by dense red-brown hematite dust responsible for the pale red-brown colour of the hand specimen. Apatite, zircon and sphene are common primary accessory phases.

Patchy selective alteration in the groundmass fraction is to small patches of chlorite and birefringent green interlayer chlorite/biotite (or oxidised chlorite). Patches of wispy argillic alteration within albitised plagioclase phenocrysts also comprises a pale green birefringent layer silicate - possibly montmorillonite, wispy colourless "sericite", and minor low birefringent ?kaolinite.

Distinct relict vesicular textures and the presence of numerous felsic and mafic phenocrysts and aggregates, as well as the decussate microlitic groundmass texture of this rock attest to its igneous origin. It may be tentatively identified as a silicified, partly argillically altered, strongly porphyritic and vesicular quartz trachyte.

Sample No. 18726

Rock Type. Partly altered and devitrified ash flow (vitric) tuff, containing poorly defined pumiceous, flow banded and unwelded vitric tuffaceous lithic fragments and crystal debris from an acidic volcanic source.

Hand Specimen A fine grained pale brown sample containing numerous medium grained pink feldspar phenocrysts in poorly defined bands or layers, as well as vague outlines of possible lithic fragments. K-feldspar staining gave strong positive results.

Thin Section. The present tuffaceous sample is somewhat banded or laminated, and elongate crystal and lithic fragments generally are oriented subparallel to this direction. It contains in the order of 15% of crystal debris and a further 15% to 20% of lithic fragments. The crystal material has an average grain size of about 1 mm, and includes cleavage fragments and phenocrysts of weakly zoned plagioclase that is lightly dusted with sericite while elsewhere are sparse crystals of K-feldspar (microcline). Also present is accessory phenocrystic quartz debris, several crystals of which exhibit bipyramidal shapes of a previous high temperature form. Other quartz grains are angular broken and partly polygonised. The lithic debris in this sample is poorly defined. It includes blocks of flow banded, once glassy ?flow banded and ?vesiclar rhyolitic material, up to about 5 mm across, that is now partly represented by a polygonised felsic mosaic interlayered with very fine grained wispy pale brown to green argillic material. Also present, are lithic fragments or lenses more than 1 cm across, that retain well preserved relict textures

of cuspate glass shards, wispy feldspar microlites, and coarse phenocrystic plagioclase. The latter occurs in aggregates (up to 1.5 mm across), certain crystals of which appear to be broken or shattered in situ.

The rock matrix in which the lithic and crystal debris is set is extremely fine grained and encloses outlines of rather poorly defined glass shards, as well as very fine grained crystal and lithic debris. Most is represented by a very fine grained cherty mosaic with abundant polygonised K-feldspar (see staining), and trails of pale brown stained wispy birefringent clay ± oxidised ?chlorite ± ?montmorillonite. Several clusters of very small secondary barite grains are located in partly altered plagioclase phenocrystic debris.

Partial welding and flattening of glass shards and pumice fragments has produced an apparent discontinuous lamination in this sample. The suparallel elongage fragments and crystal clasts have produced a partly eutaxitic texture. The rock may be described as partly altered and devitrified ash-flow (vitric) tuff.

C. ~~BARRIE~~ Basin ROAD WINDOW

Sample No. 18748

Rock Type. Intensely argillically altered quartz- and feldspar-porphyritic acidic volcanic rock, most likely of rhyolitic primary composition.

Hand Specimen A somewhat massive very fine grained pale pink-brown sample, containing sparse small voids partly lined with red-brown limonitic oxides. No K-feldspar was detected by staining.

Thin Section. This is a sparsely porphyritic acidic igneous rock in which phenocrysts comprise approximately 5% to 7% of the total thin section area. Quartz predominates slightly over altered feldspar phenocryst sites, and individual quartz phenocrysts reach 1.3 mm across and have euhedral to subhedral and slightly embayed shapes. Quartz microphenocrysts (only about 0.3 mm across), commonly exhibit dipyramidal

shapes and have narrow but irregular rims of epitaxial groundmass quartz added in optical continuity with the host crystal. No feldspar remains as such in the sample, but recognisable prismatic shaped crystal sites and glomeroporphyritic aggregates reach 5 mm across. Rare very small crystals of sphene and zircon are accessory. By far the majority of the sample however, includes a devitrified and polygonised aggregate of quartz and intergrown argillically altered feldspar crystal sites with accessory small patches of sphene dust. Polygonised quartz patches which are clear of inclusions and have irregular shapes (mainly about 0.2 mm across) may represent ubiquitous small relict ?vesicle sites. Also present are sparse small spherulites consisting of radiating quartz-rich aggregates slightly clouded by sericite "dust".

Argillic alteration of the rock is intense and mainly selective. The feldspar phenocryst sites, as well as feldspar sites throughout the rather coarsely devitrified or polygonised groundmass fraction now are converted to very dense monomineralic fine grained "sericite" (or pyrophyllite, paragonite, illite etc.). Sparse small voids have irregular shapes and are partly coated with yellow-brown limonitic oxides and narrow wavy fractures contain wispy sericite stained by limonitic oxides.

Intense argillic alteration of this sample has produced a simple quartz-"sericite" (or pyrophyllite etc.) secondary assemblage, and no feldspar remains as such. Well preserved relict textures, however, suggest a sparsely quartz- and feldspar-porphyritic volcanic parent of acidic (most likely rhyolitic) primary composition.

Sample No. 18749

Rock Type. Intensely argillically altered and partly silicified lithic ?tuff containing material from a quartz-porphyritic acidic volcanic source.

Hand Specimen A mottled fine grained pale red-brown to mid-red-brown sample containing vague outlines of unsorted irregular shaped lithic fragments up to 1 cm across. The rock is heavily stained by red- and

yellow-brown limonitic oxides on exposed surfaces. K-feldspar staining proved negative.

Thin Section. Intense silicification with very fine grained cherty to microcrystalline recrystallisation and associated intense patchy argillic alteration has affected this rock, and euhedral to subhedral, as well as shattered and broken quartz phenocrysts are the sole remaining clear relict igneous textural features. Vague outlines of rare prismatic shaped crystals most likely mark the sites of previous feldspar microphenocrysts. Outlines of possible lithic fragments are not at all well defined.

Alteration of the rock is intense and a simple quartz-"sericite" (or pyrophyllite, paragonite etc.) assemblage is now represented. These phases are present in approximately equal major proportions, with anhedral clusters of microgranular quartz intergrown with dense irregular shaped patches of "sericite". Many of the quartz patches retain impinging small spherulitic domains of radiating quartz that suggest devitrification of a once-glassy volcanic host lithology. Elsewhere are finely polygonised domains that suggest minor recrystallisation.

Partial oxidation due to near surface weathering has produced a network of branching fractures that are heavily coated with red- and yellow-brown limonitic oxides. Accessory dense irregular shaped patches of almost opaque to red-brown limonitic oxides equally could represent sites of previous iron-rich ?carbonate or ?sulphides.

The exact primary composition and finer textural features of this rock are obscured by its intense argillic alteration, silicification and partial oxidation. The presence of vague lithic fragment outlines, as well as recognisable quartz phenocrysts (unbroken euhedral crystals and crystals that appear to be shattered in situ), suggests an acidic tuffaceous or even an autobrecciated flow origin for the sample.

D. MURRAY'S SOUTH ROAD

Sample No. 18742

Rock Type. Sparsely porphyritic flow banded rhyolite containing rare xenoliths of weakly carbonaceous sericite-rich quartz siltstone.

Hand Specimen A mid purple-brown fine grained ?flow banded sample containing scattered medium grained pale grey (quartz) and pink (feldspar) phenocrysts. Staining for K-feldspar gave very strong positive results.

Thin Section. This is a sparsely porphyritic volcanic flow rock containing approximately 15% of phenocrysts that are mostly within the size range 0.4 mm to 1 mm. The phenocrysts include approximately equal major proportions of quartz and feldspars, as well as rare altered mafic and opaque oxide microphenocryst sites. The quartz phenocrysts comprise euhedral bypyramidal crystals, and similar crystals with short prism faces, as well as magmatically, very well rounded crystals with distinct embayments. On the other hand the plagioclase crystals are subhedral prismatic shapes and include individual crystals as well as glomeroporphyritic aggregates. These are albitised and lightly sericitised. Incidental xenolithic inclusions of host rock include very fine grained weakly carbonaceous sericite-rich siltstone.

The groundmass of this sample clearly was once-glassy, but now consists of a polygonised or devitrified felsic mosaic rich in quartz and K-feldspar (see staining). Narrow wavy flow bands are defined by abrupt changes in proportions of these phases. Minute microlites are present in the bands relatively rich in clouded K-feldspar, but these are lacking in the quartz-rich bands.

The rock is cut by narrow branching veinlets that are filled with almost monomineralic microgranular quartz, while several wavy narrow fractures are filled with dense fine grained wispy sericite.

Porphyritic and flow banded textures are clearly defined in this sample, which may be described as a sparsely porphyritic flow banded rhyolite, containing rare xenoliths of weakly carbonaceous sericite-rich quartz siltstone.

Sample No. 18743

Rock Type. Partly oxidised (weathered) devitrified and partly altered unsorted lithic tuff, comprising debris from an acidic volcanic source.

Hand Specimen A mottled and possibly fragmental fine grained mid grey to dark grey sample with pale red-brown patches. The sample contains numerous small irregular shaped voids, and red-brown limonitic oxides have stained exposed (weathered) surfaces. K-feldspar staining outlines scattered irregular shaped lithic fragments.

Thin Section. Unsorted lithic fragmentsl textures are characteristic of this tuffaceous sample, and occupy about 30% of the total thin section area. These have angular to highly irregular shapes, and exhibit a variety of related textural types such as flow banded weakly vesicular and porphyritic. All are very fine grained and most likely once-glassy, but now are represented by a devitrified felsic mosaic rich in K-feldspar (see staining of offcut). Porphyritic types contain stout euhedral prismatic crystals and glomeroporphyritic aggregates of weakly sericitised plagioclase and fewer crystals of subhedral dipyramidal quartz. Also present are sparse angular and broken crystal fragments including plagioclase,quartz and subordinate K-feldspar. All this debris is set in a voluminous very fine grained cherty or felsic matrix comprising dominant secondary albite, and quartz,with patches of fine grained green oxidised chlorite. Vague outlines show the presence of much smaller lithic debris similar to that described above, as well as possible glass shards.

Euhedral rhomb shaped voids coated with limonitic oxides once may have contained ?arsenopyrite, while elsewhere the voids are highly irregular shaped but also coated with dark brown to red-brown limonitic oxides. Discontinuous narrow branching fractures also are

coated with dark brown limonitic oxides.

This sample may be simply described as an unsorted lithic tuff containing a variety of angular fragments from a rhyolitic volcanic source. The rock is devitrified, partly altered and later oxidised and weathered. It contains evidence of previous minor sulphide mineralisation.

Sample No. 18744

Rock Type. Substantially altered and partly oxidised (weathered) unsorted lithic/crystal tuff, containing a variety of fragments from a quartz-porphyritic ?rhyolitic, trachytic and vitric tuffaceous source.

Hand Specimen A partly oxidised pale yellow-brown stained fine to medium grained sample, enclosing irregular shaped dark green-grey patches up to 1.5 cm across. The rock contains numerous small (weathered-out) voids. K-feldspar staining proved negative.

Thin Section. Fragmental (pyroclastic) relict textures are well preserved in this sample in spite of its intense alteration. Highly irregular shaped deformed and altered lithic fragments are characteristic together with subordinate, but nevertheless common, unsorted angular and broken phenocryst debris. The poorly defined lithic fragments range in size up to more than 1 cm across, and this material accounts for about 60% of the total thin section area. Crystal fragments comprise about 20% of the sample and range in size up to more than 1.6 mm. A variety of lithic types is represented, including once glassy quartz and plagioclase porphyritic material, as well as once-vesicular fragments in which the abundant groundmass is converted to dense fine grained chlorite, oxidised chlorite and/or pale brown fine grained birefringent ?montmorillonite. Other fragments retain albitised microlitic trachytic textures, while still others have ragged shapes marked by red-brown hematite dust defining narrow ?magmatic flow bands. Still other fine grained fragments

retain vague outlines of previous cuspate volcanic glass shards. On the other hand, crystal debris includes almost equally abundant quartz and plagioclase. Where enclosed within rims of host groundmass material these crystals retain subhedral to slightly magmatically rounded shapes, but more commonly the crystals are angular and broken or else shattered in situ. A very poorly defined rock matrix is very fine grained and in certain domains it retains vague outlines of small pumiceous fragments and glass shards. This fraction now consists of a cherty felsic mosaic intergrown with ubiquitous fine grained chlorite flakes and clouded by limonitic oxide dust.

This sample may be described as a substantially altered and partly oxidised unsorted lithic/crystal tuff containing a variety of fragments from a quartz-porphyritic ?rhyolitic, trachytic, and vitric tuffaceous source.

Sample No. 18745

Rock Type. Distinctly banded coarse to very coarse grained quartz-rich lithic arenite/quartz-biotite-rich siltstone that has undergone partial oxidation and effects of near-surface weathering.

Hand Specimen A conspicuously banded sample comprising a coarse grained partly oxidised pale yellow-brown-stained layer with a sharp boundary against a fine grained pale grey (?weakly carbonaceous) band interlayered with pale brown stained, equally fine grained bands. No K-feldspar was detected by staining.

Thin Section. The conspicuous banding in this sample is marked by a sharp boundary between adjacent coarse grained and fine grained lithic types with clastic sedimentary textures. The coarser band is a rather poorly sorted lithology with an average grain size of about 0.6 mm (coarse sand sized grains) but with abundant lithic and crystal debris reaching 2 mm (very coarse sand). Recognisable clastic grains account for approximately 55% of the total thin section area, and these

have angular to subrounded shapes. They include a variety of crystal and lithic debris amongst the following; quartz, partly degraded and deformed biotite flakes, intensely "sericitised" sites that once may have contained feldspar cleavage fragments, and possible mafic crystal sites now converted to dense oxidised chlorite. There are also numerous voids. The lithic clasts include strongly foliated and kinked carbonaceus quartz-rich, very fine grained arenite with various proportions of carbonaceous dust, very fine grained weakly foliated silty mudstone, very fine grained (almost cryptocrystalline) chert, distinctly foliated chloritic and carbonaceous quartzite, and accessory grains including partly altered red-brown spinel, titaniferous oxide sites now converted to clouded leucoxene ± sphene, and small grains of zircon. All this material is set in a meagre matrix of dense fine grained wispy "sericite", low birefringent clay (most likely kaolinite), oxidised chlorite and limonitic oxide dust.

The adjacent fine grained band has a sharp but somewhat irregular boundary with the coarser band and may underlie it. In contrast, it is a well sorted type containing about 10% of more or less evenly distributed silt sized angular quartz chips (less than 0.06 mm across), and abundant bent and degraded and yellow-brown oxide stained detrital mica flakes, set in a matrix of exceptionally fine argillic products and carbonaceous dust.

The rock may be identified as a distinctly banded, coarse to very coarse grained quartz-rich lithic arenite/quartz-biotite-rich siltstone, that has undergone partial oxidation and effects of near-surface weathering.

APPENDIX 3

GEOCHEMICAL DATABASE SUMMARY 28-NOV-1986 Project: MT READ

	18701	18702	18703	18706	18707	18722	18723	18724	18725	18726
- Elements assayed in percent -										
SIO2	73.4	74.5	74.2	76.2	67.4	76	79.1	72.1	70	72.5
TIO2	0.42	0.25	0.35	0.22	0.36	0.24	0.2	0.38	0.3	0.32
AL2O3	11.3	11.4	12.1	7.65	12	11.4	9.85	14	14.1	13.7
FE2O3	2.9	1.98	3.72	1.8	2.64	1.39	0.97	2	2.58	1.63
MNO	0.06	0.05	0.02	0.09	0.16	0.01	0.03	0.02	0.01	0.02
MGO	0.63	0.72	1.03	0.86	1.02	0.35	0.31	0.58	0.74	0.58
CAO	0.03	0.03	0.04	1.83	2.6	0.04	0.08	0.07	0.03	0.05
NA2O	0.12	0.13	1.63	0.11	2.86	2.9	4.26	3.58	2.36	3.34
K2O	6.9	7.35	3.16	6.05	4.8	4.54	2.6	4.34	6.25	4.72
P2O5	0.01	0.04	0.04	0.05	0.09	0.06	0.04	0.12	0.09	0.02
LOI	2.52	2.2	3.18	3.52	4.56	1.44	0.94	1.91	2.34	1.77
S	0.04	0.02	0.03	0.12	0.01	0.01	0.04	0.01	0.01	0.02
- Elements assayed in PPM -										
AG	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1
AS	2	2	2	27	13	4	3	2	2	2
AU	0.01	0.72	0.02	0.66	0.01	0.01	0.4	0.01	0.14	25
BA	1340	1360	350	1360	1020	700	350	560	940	900
BI	4	6	4	4	4	8	4	6	4	4
CO	14	5	5	8	5	5	5	5	6	5
CR	76	18	8	70	88	32	94	5	5	44
CU	6	10	6	5	3	4	3	3	2	15
MO	4	4	4	4	4	4	4	4	4	4
NB	14	14	12	10	18	12	12	10	14	14
NI	12	6	6	16	12	5	5	5	5	5
PB	120	58	18	20	24	78	8	10	6	50
RB	185	205	120	150	170	115	60	140	140	125
SB	4	4	4	4	4	6	4	6	8	4
SE	2	2	2	2	2	2	2	3	2	2
SR	11	11	45	34	64	29	45	64	50	74
V	40	160	85	10	10	150	10	10	10	10
W	10	15	10	10	10	10	10	10	40	10
Y	54	56	40	34	34	44	38	40	44	50
ZN	125	62	52	425	190	18	8	18	52	27
ZR	280	240	295	125	140	195	165	245	225	245

	19816	19817	19818	19819	19820	19821	19822
- Elements assayed in percent -							
SIO2	49.50	54.50	47.50	50.60	59.40	69.20	62.90
TIO2	0.91	0.71	0.62	0.76	0.61	0.54	0.57
AL203	22.10	14.90	12.80	15.70	16.70	13.70	15.50
FE203	6.45	8.45	7.65	8.90	6.30	3.02	6.90
MNO	0.08	0.20	0.16	0.11	0.05	0.03	0.05
MGO	5.00	6.30	4.32	5.35	3.40	1.06	2.64
CAO	0.53	0.82	10.20	4.68	1.08	1.05	0.25
NA20	0.46	1.31	2.40	2.54	3.18	3.44	3.26
K20	4.86	0.44	1.71	2.46	3.40	2.98	2.56
P205	0.12	0.10	0.03	0.11	0.15	0.14	0.14
LOI	8.30	10.30	10.80	7.40	4.18	2.88	3.22
S	0.43	0.01	0.06	0.01	0.03	0.03	0.03
- Elements assayed in PPM -							
AG	1.00	0.10	0.10	0.10	0.10	0.10	0.10
AS	17.00	7.00	4.00	2.00	2.00	2.00	2.00
BA	1200.00	260.00	700.00	950.00	1020.00	1540.00	1900.00
BI	4.00	4.00	4.00	4.00	4.00	4.00	4.00
CO	34.00	32.00	18.00	19.00	13.00	6.00	16.00
CR	270.00	250.00	38.00	34.00	34.00	20.00	36.00
CU	78.00	64.00	10.00	10.00	35.00	13.00	15.00
MO	4.00	4.00	4.00	4.00	4.00	4.00	4.00
NB	14.00	6.00	6.00	6.00	12.00	10.00	12.00
NI	62.00	29.00	2.00	2.00	3.00	3.00	12.00
PB	86.00	14.00	4.00	6.00	24.00	6.00	8.00
RB	180.00	4.00	45.00	80.00	105.00	64.00	80.00
SB	6.00	4.00	6.00	6.00	4.00	4.00	6.00
SE	2.00	2.00	2.00	2.00	2.00	2.00	2.00
SR	50.00	68.00	345.00	135.00	130.00	130.00	76.00
V	100.00	100.00	40.00	55.00	10.00	30.00	10.00
W	10.00	10.00	15.00	10.00	10.00	10.00	10.00
Y	56.00	32.00	28.00	28.00	38.00	36.00	36.00
ZN	225.00	23.00	120.00	180.00	175.00	120.00	135.00
ZR	233.00	100.00	78.00	98.00	180.00	145.00	155.00
AU	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Ti/Zr	23.2	42.6	47	46.1	20.3	22.3	22.05

Interpretation based on "GRENDL" inversion of early time and standard time Sirotem data

SURVEY PARAMETERS

Medium power Sirotem

200 m loop size

Remote vector receiver in centre of loop

Ramp time typically 140 μsec

Surveyed March 19 - April 10, 1986 by M^cSkimming Geophysics

CONTOURS

Contours are interpreted basalt thickness in metres.

200 ± 50 – basalt thickness ± range in metres

RECOMMENDED DRILLHOLES

↑
1-5

944112

PANCONTINENTAL MINING LIMITED
PANCON
EXPLORATION DIVISION

MT. CATTLEY PROJECT
EL 14/85 - TASMANIA

INTERPRETED BASALT THICKNESS

SCALE 1:10000

0 200 400 600 800 1000
METRES

Compiled D. Wilson	Date June, 1986	Dwg. Nº 36/E/2
Report Nº 86/35	Map Ref. SK 55-3	PLATE 1

87-2642

9644

392 000 E
394 000 E
396 000 E
398 000 E
400 000 E
402 000 E
404 000 E
5 412 000 N
410 000 N
408 000 N
406 000 N
404 000 N
402 000 N
400 000 N
398 000 N
5 396 000 N
TALBOT'S LAGOON
Campsite
Middlesex Road
Tommy Walker Road
Medway Road
Racecourse Road
Middlesex Spur Road
Wattle Park Road
Medway River
Blackmarsh Road
Beecroft Road
Cobbers Road
Cobbers North Road
Cobbers Sth Road
Yellow Marsh Road
Upper River Road
Hodgett's Road
Basin Road
Celery Road
Cattley Road
Cattley South Road
Murray's Road
Murray's South Road
Mackintosh Road
Painter Road
Hut
Leven R.
Basalt Waterfalls
GRID FOR SIROTEM SURVEY
E.L. 14/85
AREA OF DETAILED MAPPING
MCPD 1
MCPD 2
MCPD 3
13 000 N
12 000 N
11 000 N
10 000 N
9000 N
B/L 10000 E
gate
HEC TRANSMISSION LINE
HELLYER PROSPECT
CAMP
MT CRIPPS
CUT GRID LINES (Bearing 135°)
18709 dk grey chert
18708 chloritic feldspar (qtz) xtal tuff
Pink Congl.
18702 f.g. rhy. tuff
18706 f.g. f xtal tuff c minor diss. py
18705 m.g. micaceous g.wacke
18713 - Ts pink pebbly conglomerate
18712 - lam. g.wacke/slst
18710 v.f.g. rhyolitic ash tuff
18711 - m.g. f.g. xtal (lithic) tuff
18715 - lithic micaceous greywacke
Ts : 15 m thick interbasalt sediments; incl. pebbly grits, silts, muds with lignified plant remains. (flat lying)
Columnar jointing in Tb
18750 - f.g. rhyolitic tuff?
Massive m.g. micaceous gwacke
f.g. siliceous volc?
Weathered m.g. fxt or f. pyric rhyolite?
Laminated slst.
Lam. slst/gwacke
(contact defined by mapping float)
Thick bedded gwacke
Thinly interbedded micaceous gwacke/slst.
Micaceous gwacke minor lam. slst.
Weath. felspathic gwacke
Flat lying pink pebbly conglomerate
Pink feldspar phyric rhyolite
Ryodacitic lithic xtal tuff
Laminated cherty slst
Creamy coloured f.g. aphanitic rhyolite c patchy disseminated pyrite < 0·2 % vol.
Pink feldspar - biotite porphyry. Probably intrusive
Locally flow banded pink feldspar phyric rhyolite (marginal intrusive phase?)
Weath. f.g. cherty slst?
Coarse dacitic? lithic xtuff
f.-m.g. xtal tuff (dacitic) trace dissem. pyrite
qf xt. float
Grey chert (30m thick)
Massive f.g. "cherty tuff"
Coarse lithic x tuff
Tb & Ts congl. float
1m grey chert band strike 80°
f.g. rhyolitic tuff
Lamigrey cherty slst
m.g. qf xtuff c interbedded grey cherty/tuffaceous slst.
f.g. slst/minor micac. gwacke
Qtz phyric Rhyolite?, stained reddish near basalt contact
Intensely cleaved qtz phyric rhyolite Patchy pink staining. Minor oxidised boxwork after pyrite ≈ 1-5% locally. Associated sericitic/siliceous alteration? (Rock Chip Samples 18828-40)
Close jointed qtz phyric rhyolite
Ꝋc pink pebbly congl.
Ꝋc pink hematitic
Ꝋc scree
Pink hematite stained pebbly lithic quartz xtal tuff? rounded, flattened "cherty" volcanic pebbles aligned 040°, steep dip west? (probably aligned to cleavage)
Flat lying slabs Tb in waterfall
Weathered basalt float in stream bed
Ꝋg? (sinkholes)
Ꝋc - bouldery unconsolidated gravel/colluvium Residual deposit on Tb?
Dk. grey slst float
hematite stained qpR.
Lithic qfxt
Intensely clvd. hem st qtz. phyric rhyolite
Rhyolitic agglomerate
Pebbly congl.
Cross bed sst. & congl.
Silic q.p.Rhy c minor pyrite
Lithic ignimbrite?
Cse g. volcanolithic sst.
Pink q-f phyric rhyolite (ignimbrite?) (c magnetite accessory?)
Pink q-f phyric rhyolite (note : magnetite accessory)
Pink arkosic sst.
Arkosic volcano-lithic sandstone
Ꝋj - Coarse polymictic (volc.) conglomerate, generally dominantly andesitic, q-f-phyric rhyolite clasts prominent near eastern contact
Coarse fragmental dacitic lithic tuff c small pods/clasts of grey shale at eastern end of exposure
Gritty lithic sst, minor shale
pebbly grits/gwacke/slst/shale
1m. wide shear zone
lam. grey shaly slst.
Small contorted folds near contact
Pale grn-grey feldspar phyric rhyolite with pods sheared grey shale
(contact not exposed)
Ꝋs - m.g. arkosic-lithic sandstone, minor interbedded mudstone, slst
0·5m sandy bed
Basal 10m thick red slst/sst overlain by coarse pink siliceous congl./congl. sst.
Small folds plunge steep to south
Pink q-f phyric flow
Coarse dacitic lithic tuff, locally silicified. Rare silty sedimentary clasts
Thickly interbedded micaceous gwacke/slst/shale, facing east Shales increasing to east
Weakly stratified arkosic - lithic sst.
Boulder congl.
Stratified m.g. arkose

LEGEND

TERTIARY

- Tb — Basalt
- Ts — Interbasalt grits, silts, carbonaceous muds. Sub-basaltic pink siliceous conglomerate

ORDOVICIAN

- Ꝋg — Limestone (GORDON LIMESTONE CORRELATE)
- Ꝋc — Siliceous pink conglomerate, sst, minor slst (OWEN CONGLOMERATE CORRELATE)
- Ꝋj — Coarse polymictic (volcanic) conglomerate } JUKES CONGLOMERATE CORRELATE ?
- Ꝋs — Coarse - med. grained arkosic - lithic sandstone, minor interbedded slst, mudstone } JUKES CONGLOMERATE CORRELATE ?

CAMBRIAN

- Fine grained slst and shale. Generally laminated } MT READ VOLCANICS
- Med. grained micaceous greywacke, occasionally lithic, generally massive or thickly bedded } MT READ VOLCANICS
- Chert, cherty siltstones and tuffs } MT READ VOLCANICS

CAMBRIAN (MT READ VOLCANICS)

- Very fine grained siliceous tuffs
- Fine to med. grained qtz - feldspar xtal tuff
- Med. grained feldspar xtal tuff
- Coarse lithic tuff / volcanic breccia - rhyolitic
- Coarse lithic tuff / volcanic breccia - dacitic
- Very fine grained aphanitic rhyolite
- Qtz - feldspar phyric rhyolite
- Feldspar phyric rhyolite
- Pink feldspar (biotite) porphyry, probably intrusive

Geological Symbols : BMR System (1978)

- 18705 — Rock specimen locality
- 18706 — Rock chip sample locality (for analysis)
- Boundary - EL 14/85
- Geological outcrop
- Geological boundary - position approximate
- Geological boundary - position inferred
- Unconformity
- Dyke
- Strike and dip of strata
- Trend line showing dip
- Anticline - position inferred
- Syncline - position inferred
- Strike and dip of joint
- Strike and dip of cleavage
- Strike and dip of bedding and cleavage
- Strike and dip of platy flow structure
- Stream
- 7800 N — Cut grid line (BRG 135°)

SAMPLE LOCATIONS

- Petrological examination
- Lithochemical analyses

944113

5 cm

PANCONTINENTAL MINING LIMITED
EXPLORATION DIVISION
PANCON

MT. CATTLEY PROJECT
EL 14/85 - TASMANIA
GEOLOGICAL PLAN
PETROLOGICAL EXAMINATION & LITHOCHEMICAL ANALYSIS

SCALE 1:20,000

0 400 800 1200 1600 2000

METRES

Compiled: W. Herrmann	Date: December, 1985	Dwg No 36/D/5
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