924001

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87/16

PANCONTINENTAL MINING LIMITED

E.L. 42/85, LAKE MACKINTOSH, TASMANIA

QUARTERLY REPORT FOR PERIOD
TO 20TH JANUARY, 1987

By K.O. Airas

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924003

1. Introduction

This report describes work carried out on the Lake Mackintosh EL 42/85 during the period 21/10/1986 - 20/1/1987 by the Pancon-Outokumpu joint venture.

The main objective of the Lake Mackintosh project has been to explore for VMS - base metal deposits of the Que River - Hellyer type within the sequences of the Mt Read/Central Belt Volcanics. Felsic and intermediate volcanic stratigraphy in the Lake Mackintosh area are interpreted to correlate with the mineralised volcanics directly to the north in the Que River - Hellyer area.

Remobilised base metal sulphide deposits of the "Farrell" type may be present in the "Farrell Slates" in the eastern part of EL. The Henty Fault Zone, which extends through the Licence area is considered as gold prospective. These two latter types of mineralisation formed additional objectives of the exploration program designed for the EL.

It was recognised that as the area had been previously explored any VMS deposit present was likely to be deep seated.

The exploration carried out to meet the objectives has included:

1. Geochemical stream sediment survey.

2. Establishment of a grid with 200m line spacing.

3. Geophysical UTEM survey on the grid (Appendix 1).

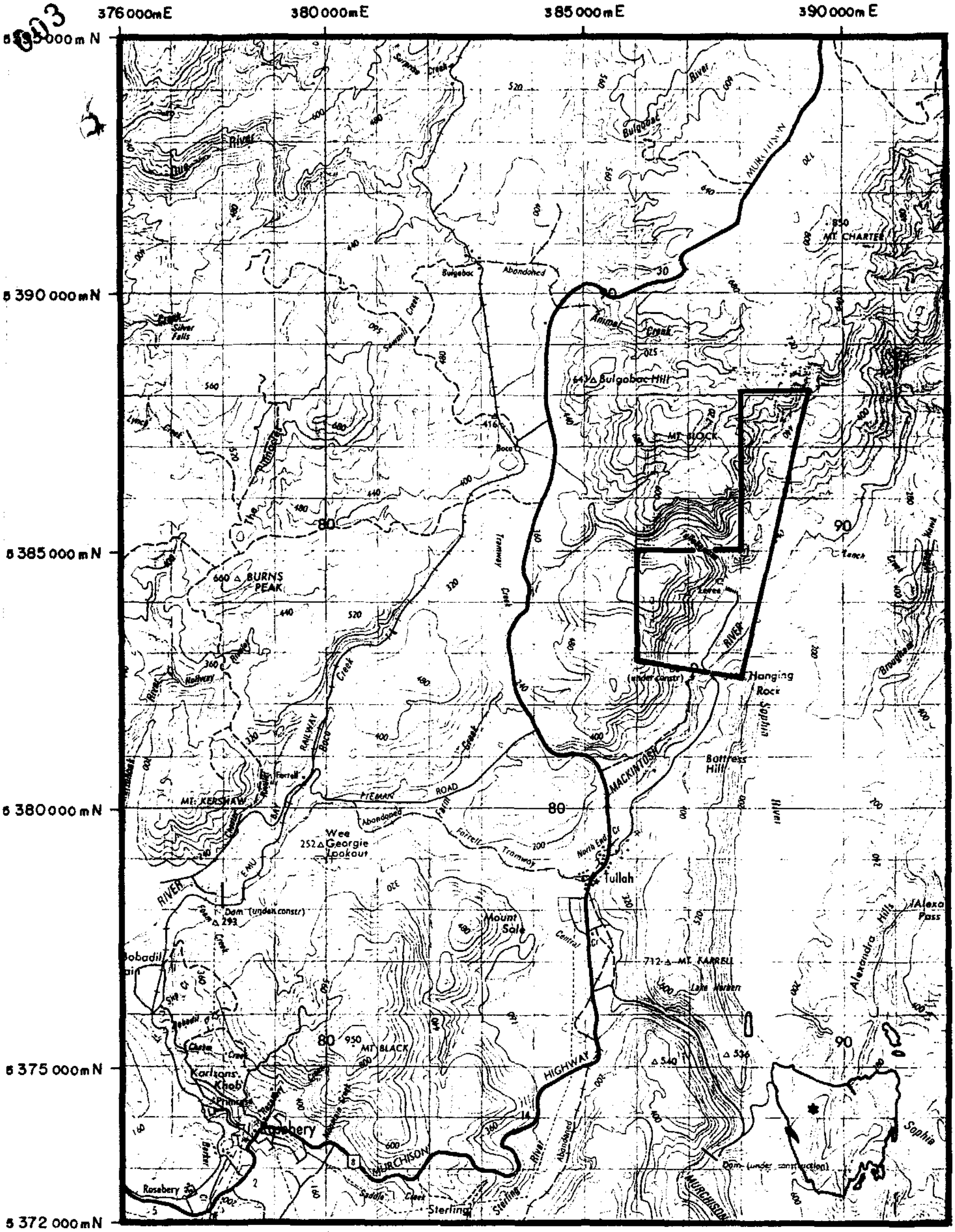
4. Geological mapping of accessible streams, roads and geophysical grid (Appendix 2).

The UTEM survey and geological mapping were completed during this quarterly period. The geochemical survey has been reported in the preceeding quarterly report, but results are repeated in Appendix 2.

2. Location and Access (Fig 1)

The Exploration Licence is located approximately 15 km north-east of Rosebery on the western shore of Lake Mackintosh. Access is via the H.E.C. road from Tullah to the Mackintosh Dam at the southern boundary of the EL.

The licence area covers rugged terrain on the eastern slopes of Mt Block.



LOCATION PLAN

924004

LAKE MACKINTOSH PROSPECT - TASMANIA

SCALE 1:100 000

2 1 0 2 4 6

KILOMETRES

5 cm

FIGURE 1

3. **Title**

Exploration Licence 42/85 was granted to Pancontinental Mining Limited on 21 April 1986 for a period of one year.

The exploration is being conducted under a joint venture between Pancontinental Mining Limited and Outokumpu Oy of Finland, with Pancontinental as an operator.

4. **Previous Exploration**

The Lake Mackintosh EL 42/85 covers a part of Area 3 of the previous EL5/63 held by Comstaff Pty Ltd during the period 1972-1985. Comstaff undertook reconnaissance stream sediment geochemistry including heavy mineral concentrates, and reconnaissance mapping during 1970-71.

The most anomalous (Cu.Zn) areas within Mullabardine and Tullabardine Creeks were followed-up by grid soil sampling and geological mapping. Workings for copper located in the Mullabardine Creek anomaly were considered to have no exploration potential. In the Tullabardine Creek area a significant stream sediment anomaly, with 8,000 ppm Zn, 150 ppm Cu, and 13 ppm Ag, was followed-up by close spaced stream sediment sampling, by grid based soil sampling, and by Banka sampling. However, all of these failed to find an explanation for the original anomaly, which was located in a swamp area. Four other stream sediment anomalous zones in the present Lake Mackintosh EL area were not further investigated by Comstaff.

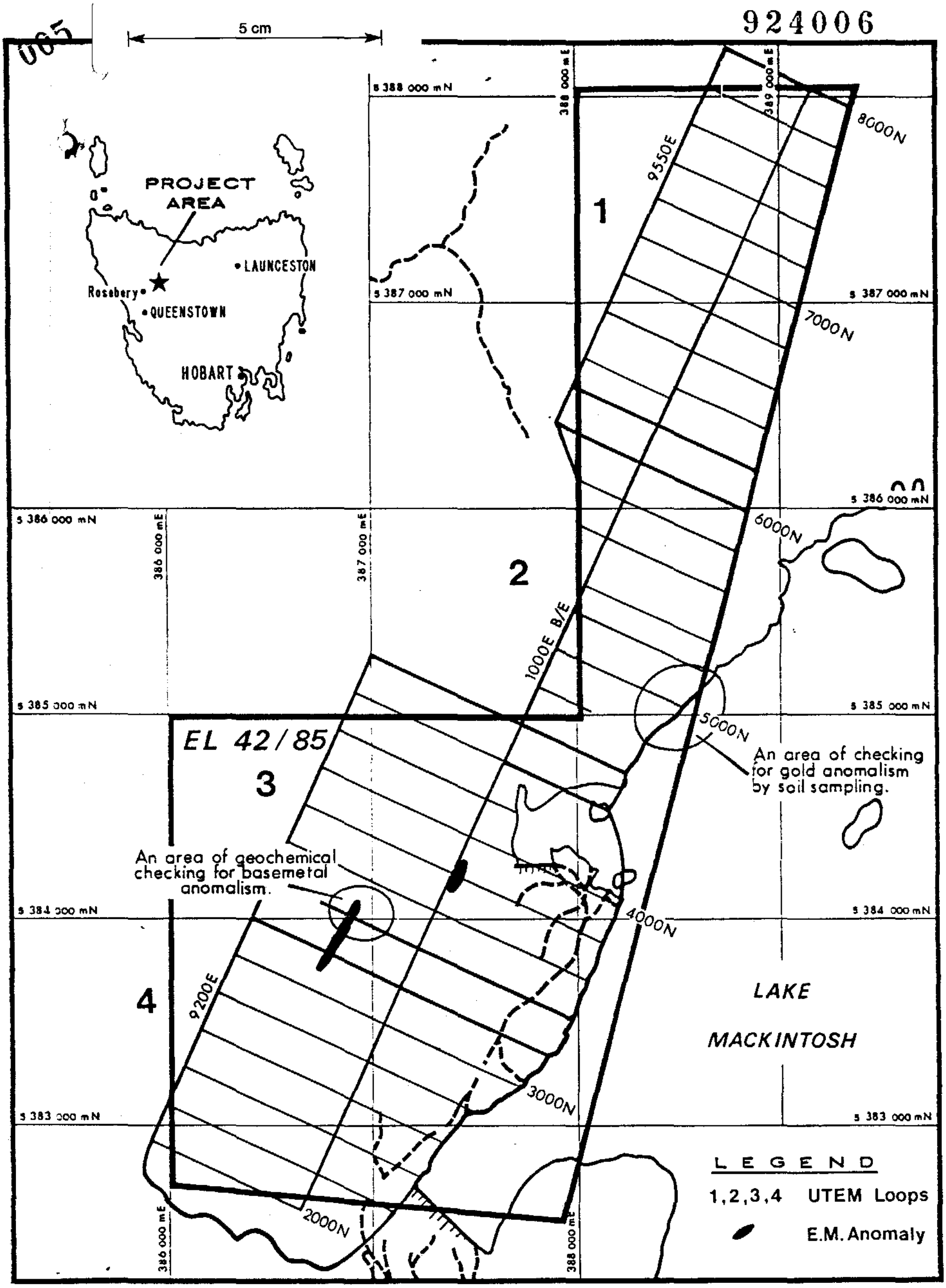
In 1975-76 the area was flown with Input EM but no anomalies were reported.

In 1977-78 a 20 line kilometre grid in the north eastern part of the EL 42/85 was reconnaissance surveyed. No interesting or anomalous results were recognised to encourage further exploration in this area.

A review of previous exploration data in 1978 failed to promote any further investigation in the Lake Mackintosh area. Geological interpretation was tentative due to the complex volcanic stratigraphic sequence and lack of continuous by mappable units. Rocks were randomly jointed and no structural features were recognised. Shales and sandstones were identified. Weak levels of zinc mineralisation were located in the Mt Block shales.

Since this review no significant exploration has been conducted in the area of EL 42/85.

924006



EL 42/85 - LAKE MACKINTOSH TASMANIA

GEOPHYSICAL GRID

SCALE 1: 25 000

0 500 1000 1500 2000

FIGURE 2

5. Work Completed

5.1 Gridding

A grid for UTEM survey was established, with a 6km baseline and cross-lines every 200m. Loop lines were cut around the perimeter of the grid to assist loop-laying for the UTEM survey. The grid covers nearly the entire licence area (Fig 2).

5.2 UTEM Survey

A UTEM survey was completed by Lamontagne Geophysics Ltd covering nearly the entire grid area. An inloop survey, using 4 large loops was conducted to maximise depth penetration. Thirty lines varying in length from 150m to 1500m and totalling 28.3 km were surveyed.

Two very weak, shallow conductors were located. They probably represent a local change in geology or a thickening of the surficial scree and humus layer.

See Appendix 1: Lake Mackintosh Utem survey. A memorandum 19.1.1987 by D.R. Wilson.

5.3 Geology

Geological mapping of accessible streams, roads and geophysical grid lines has been completed and a largely interpretative geological map of the EL area has been compiled.

The western and central areas of the licence area have been confirmed as a part of the Central Sequence of the Mt Read Volcanics, comprising a complex group of felsic volcanics including extrusives, subvolcanic intrusives, pumiceous tuffs and a variety of pyrocpiclastic deposits. Rocks in the eastern area are dominantly sediments correlated with the Dundas Group and overlying the Mt Read Volcanics.

See Appendix 2: Notes on geology of EL 42/86, Lake Mackintosh, Tasmania by W. Herrmann.

5.4 Stream Sediment Geochemistry

A stream geochemical survey was completed during the preceding quarterly period. During this period a suite of duplicate samples was collected from the localities where weakly anomalous gold values had been previously recorded.

Results of this sampling are included in Appendix 2.

6. Conclusions, Recommendations and the Future Program

The UTEM survey was selected as the principal search technique in the Lake Mackintosh program. The chosen inloop survey, using 4 large loops, should have detected an economic sized massive sulphide body to depths of at least 300m. However, no conductors indicative of significant massive sulphide mineralisation were located in the UTEM survey. Only two very weak EM responses were located and they are interpreted to represent a surficial conductor which may either be caused by a rear surface change in bedrock geology, or a local thickening of the scree and humus layer.

In addition, geological mapping has not located any significant exposures of mineralised or hydrothermally altered rocks. Although much of the volcanic sequence would appear to have been deposited subaerially there is little evidence of depositional environments which may have favoured accumulation of massive sulphide mineralisation.

The stream sediment geochemical survey has not indicated any major base metal anomalies. Only subtle weakly Zn anomalous samples from the head of a stream around 3400 N/3550E were located and are co-incident with two weak UTEM anomalies. This area is underlain by laminated, ultra fine grained tufaceous cherty siltstone and quartz-feldspar porphyry (Fig 2). This combined anomaly requires follow-up sampling.

Re-sampling of the gold anomalous stream sediment sample sites has confirmed two locations on the shoreline of Lake Mackintosh, which show weakly anomalous gold values (-80 mesh fraction). Infill soil sampling on the surrounding ridges is required.

The exploration phase, which has been conducted on the Lake Mackintosh EL and completed during this quarterly period, has not located any major anomalies indicating massive volcanic sulphide deposits. The weakly anomalous gold values on the shoreline of Lake Mackintosh are located close to the Henty Fault Zone and are worthy of follow-up sampling. The combined weak UTEM and stream sediment Zn anomaly will be checked as well.

7. **Expenditure**

STATEMENT OF EXPENDITURE

OCTOBER 21, 1986 TO JANUARY 20, 1987

MANNING	4,397
MATERIALS AND SUPPLIES	16
DRILLING	-
ASSAYING	1,818
GEOPHYSICS	-
CONSULTANTS AND CONTRACTORS-OTHER	48,098
TRAVEL AND FREIGHT	1,870
ADMINISTRATION AND TENEMENT EXPENSES	487
OVERHEADS	11,212
TOTAL	67,898
ANNUAL TENEMENT TO (31/01/1987)	$116,993

APPENDIX 1

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PANCONTINENTAL MINING LIMITED

MEMORANDUM

To:	KOA, RMDM	File: 5303.7
From:	DRW	Date: 19.1.1987

Subject: LAKE MACKINTOSH UTEM SURVEY

1. **Introduction**

Lamontagne Geophysics Ltd have completed a UTEM survey over Pancontinental's Lake Mackintosh E.L. in NW Tasmania (Figure 1.). The survey commenced on 22nd October and finished on 23rd December 1986.

The target was a volcanogenic type gold rich basemetal massive sulphide orebody of at least 2 Mt. This target was expected to be weak to moderately conductive within very resistive Mt Reid Volcanics. Previous exploration and very weakly anomalous geochemistry suggested that such a target was likely to be in excess of 100m below the surface. These factors plus the rugged topography, thick vegetation and constant rain led to the selection of UTEM as the most effective survey technique.

2. Survey Details

Geological mapping indicated that dips were very shallow thus an inloop survey, using 4 large loops (Figure 2.), was chosen to maximise any conductive response at depth. Thirty lines varying in length from 150m to 1500m and totalling 28.3km were surveyed.

The shape of loop 4 was changed part way through the survey because floodwaters kept washing the loop away.

Constant rain throughout the survey caused many delays and several repeat lines.

All data was reduced and plotted in the field. The data for each plot was normalised via both "continuous" and "point" methods. Continuous normalisation preserves the amplitude of responses but distorts the shape. Point normalisation pressures the shape but distorts the amplitude. These presentations have different advantages and disadvantages for interpretation.

The continuous normalised plots are in Appendix I.

011

3. Discussion of Results

Although there were problems with wet weather, flooding, topography and the equipment the survey data is generally of good quality. The gridding was very well done and this helps account for the smooth profiles.

All profiles show very rapid decay of the secondary electromagnetic field. The field has decayed from >100% of the primary field at channel 10 to <10% by channel 7. This rapid decay shows that the geology is very resistive and any conductors should be clearly detected.

There are no conductive features with moderate to long decays that might represent conductive volcanogenic massive sulphides. There are two very weak narrow conductors that have essentially decayed by channel 7. These may represent a change in geological rock type or a deeper section within the scree and humus cover. These conductors are located at (3200N/3400N, 9600E/9650E) and (3800N, 10025E) (Figure 2.). The shape of these responses are not sufficiently defined to obtain a possible dip. The narrowness of the peaks suggests a depth of <50m.

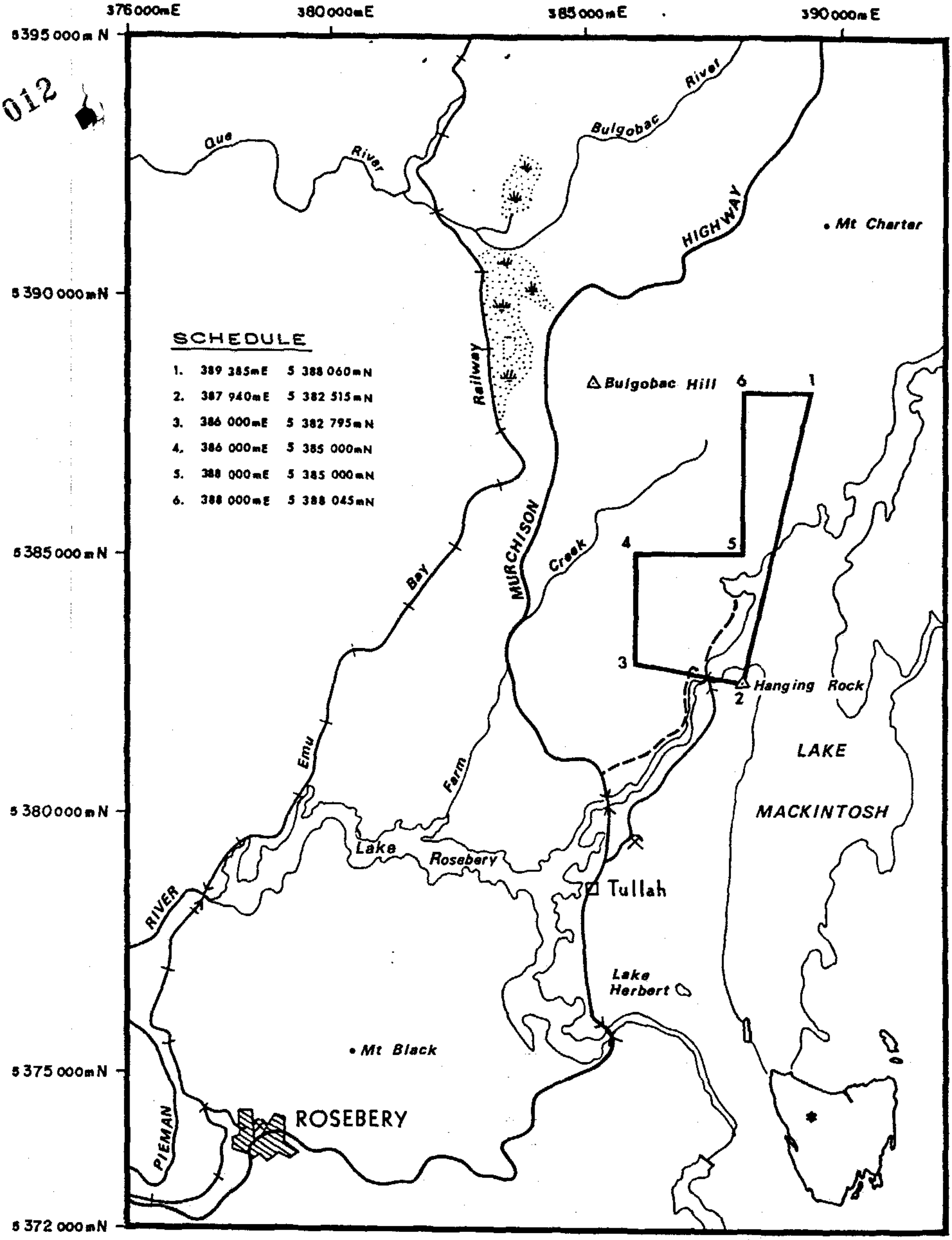
4. Conclusions and Recommendations

The UTEM survey over our Lake Mackintosh EL has not located any conductors that might represent massive sulphides.

Two very weak shallow conductors probably represent a local change in geology or a thickening of the scree and humus layer.

This survey should have detected any economic sized massive sulphide body at depths of at least 300m.

I recommend that no further geophysical exploration for massive sulphides be carried out on this grid.



LOCATION PLAN 924013

LAKE MACKINTOSH PROSPECT - TASMANIA

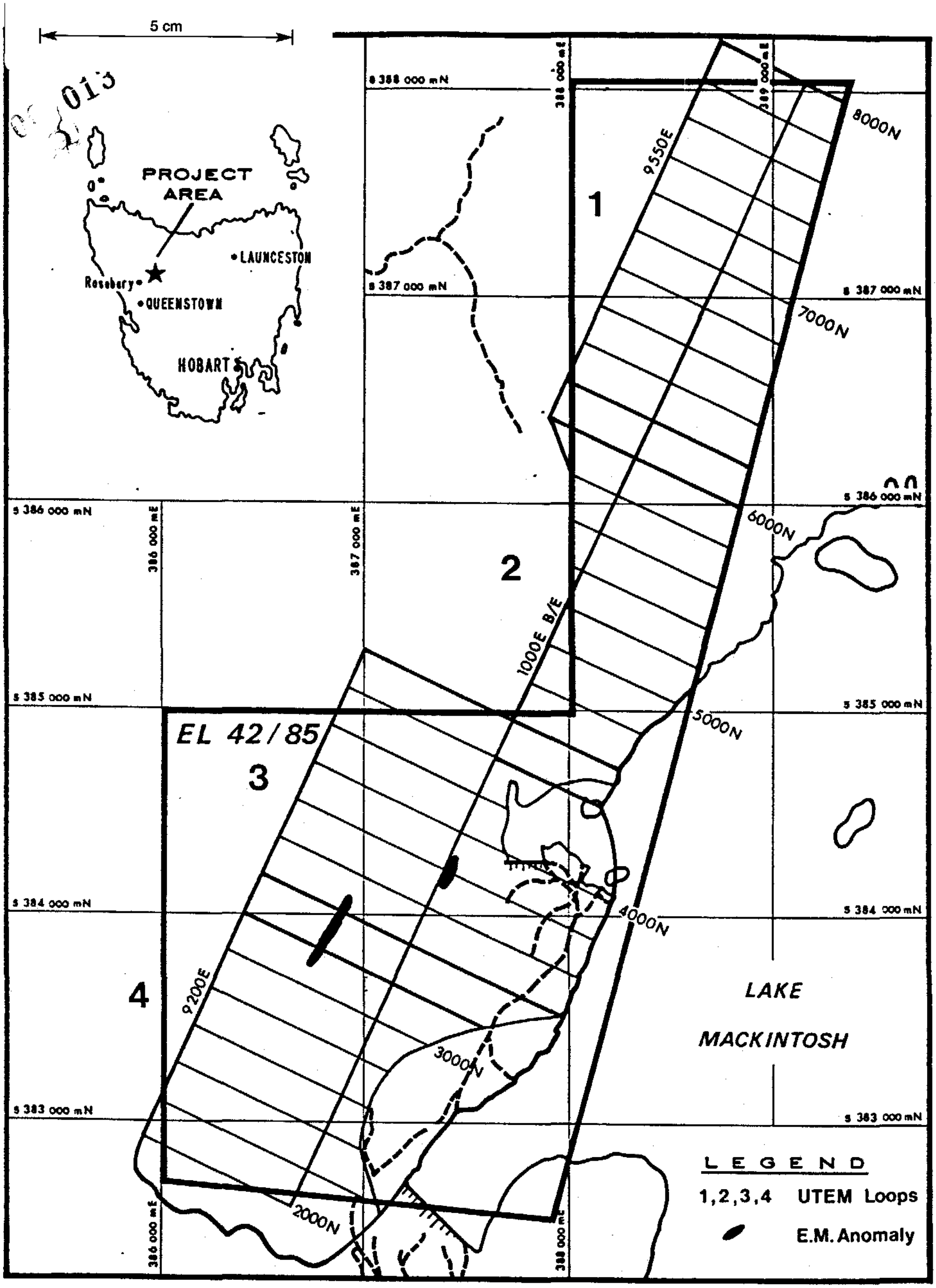
SCALE 1:100 000

5 cm

2 1 0 2 4 6

KILOMETRES

FIGURE 1



EL 42/85 - LAKE MACKINTOSH TASMANIA GEOPHYSICAL GRID

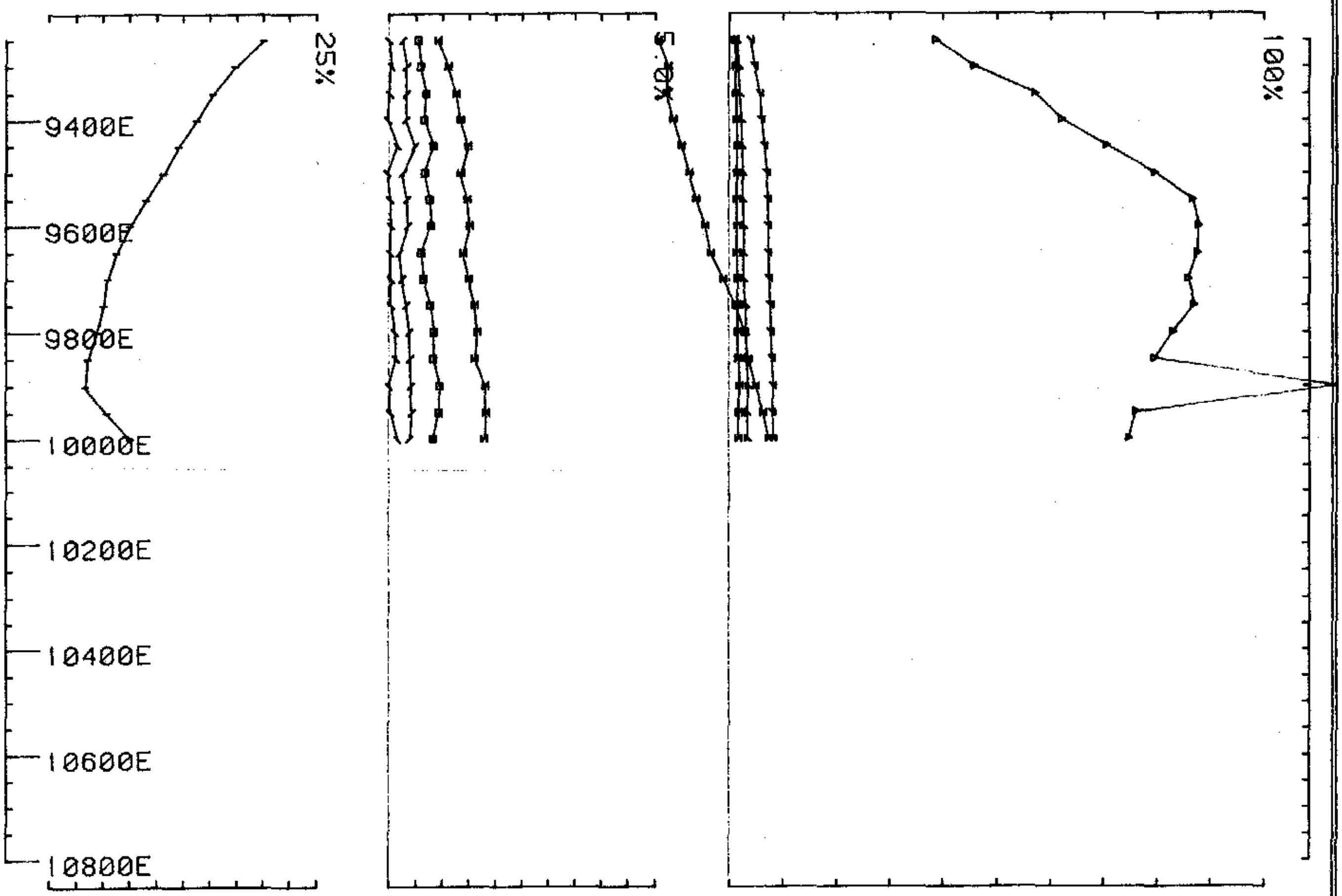
924014

SCALE 1:25 000

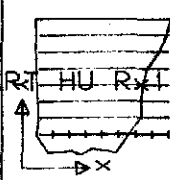
0 500 1000 1500 2000

924015

014

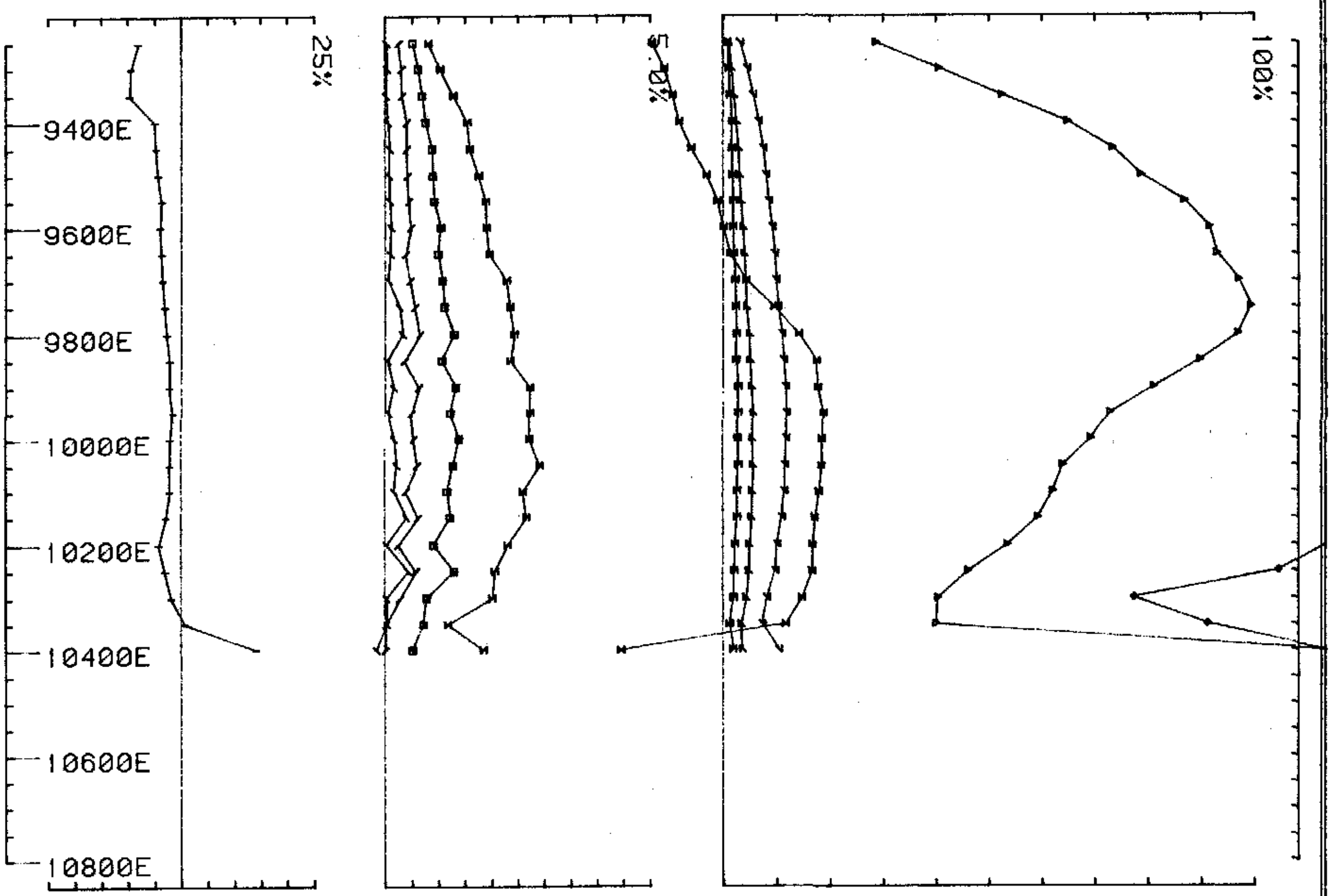


LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- Lake MackIntosh
CLIENT :- PANCONTINENTAL Mining Ltd. CREW :- ART HU RX10 C3
Line 2000N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

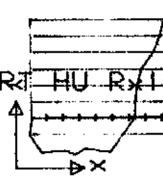


Lake MackIntosh
LOOP 0004
LINE 2000
Hz

015



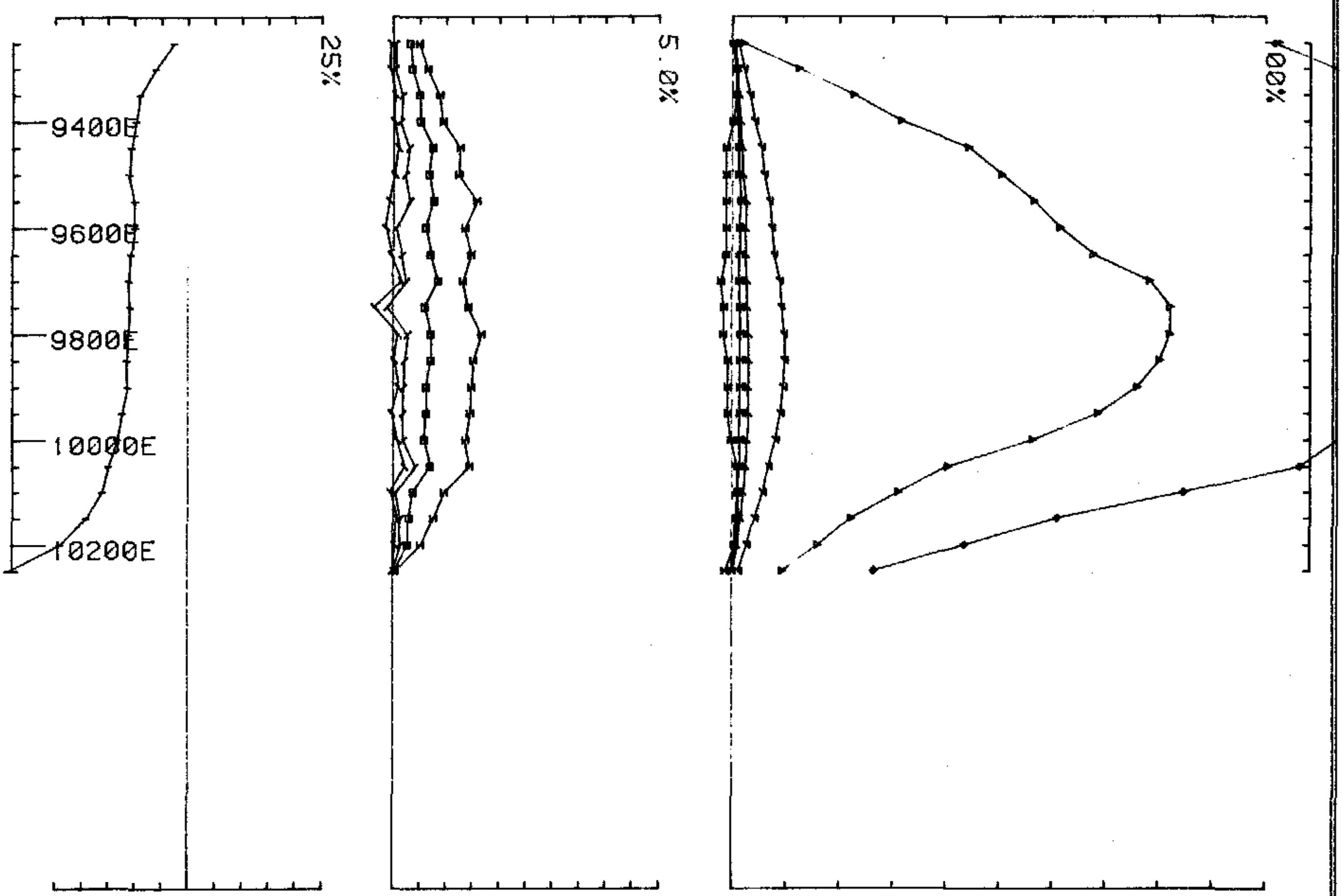
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- Lake MackIntosh
CLIENT :- PANCONTINENTAL Mining Ltd. CREW :- ART HU Rx10 C3
Line 2200N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



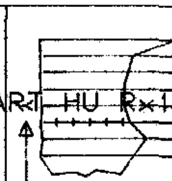
Lake MackIntosh
LOOP 0004
LINE 2200
Hz

924017

1016

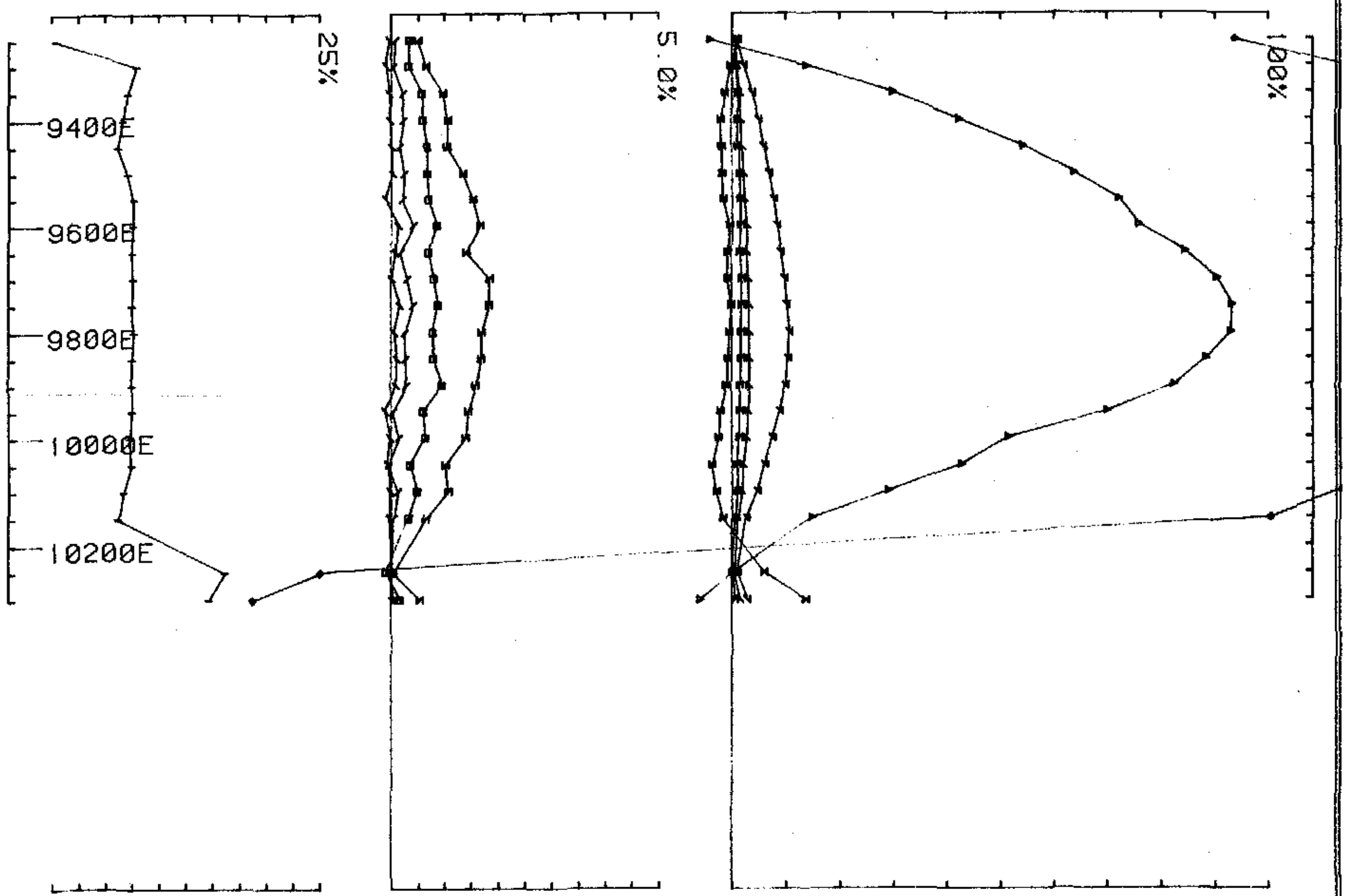


LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- Lake MackIntosh
CLIENT :- PANCONTINENTAL Mining Ltd. CREW :- ART HU Rx10 c3
Line 2400N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch I NORMALIZATION



Lake MackIntosh
LOOP 0104
LINE 2400
Hz

017



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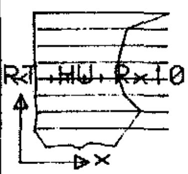
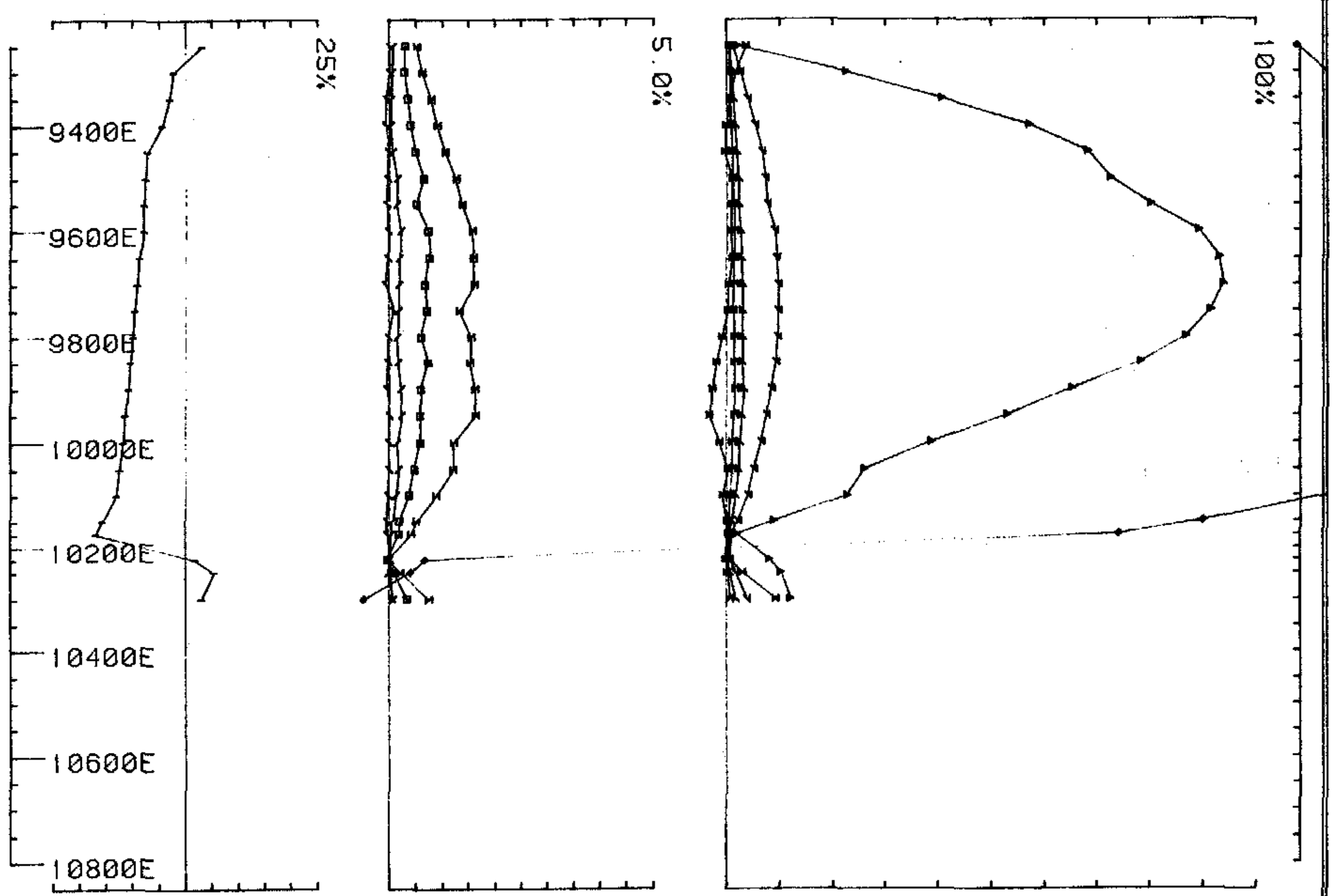
AREA :- Lake MackIntosh
CLIENT :- PANCONTINENTAL Mining Ltd. CREW :- ~~ART HU Rx10~~ c3
Line 2600N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Lake MackIntosh
LOOP 0104
LINE 2600
Hz

018

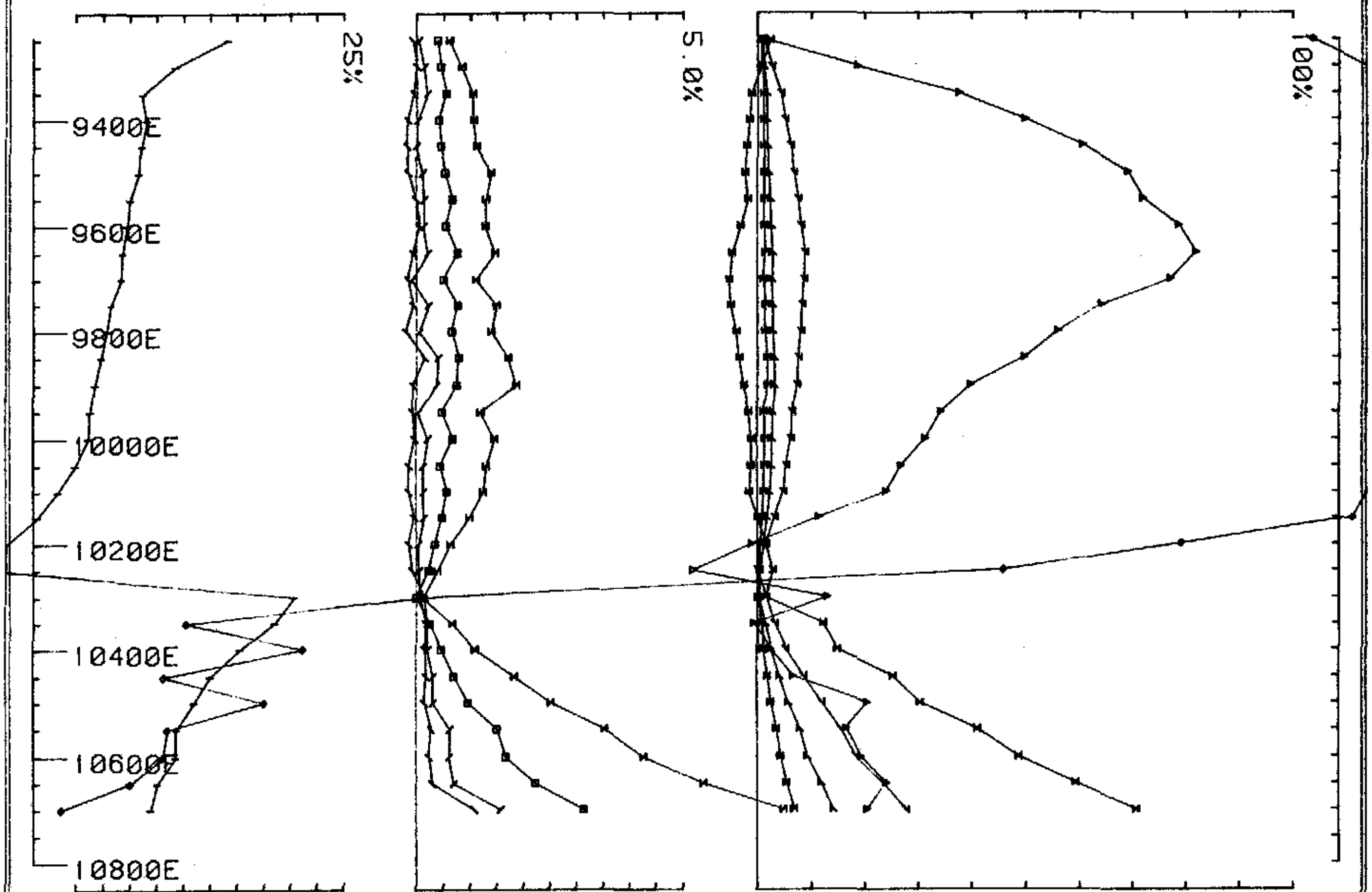


LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- Lake MackIntosh
CLIENT :- PANCONTINENTAL Mining Ltd. CREW :- ART HU Rx8 C8
Line 2800N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

Lake MackIntosh
LOOP 8104
LINE 2800
Hz

924020

019

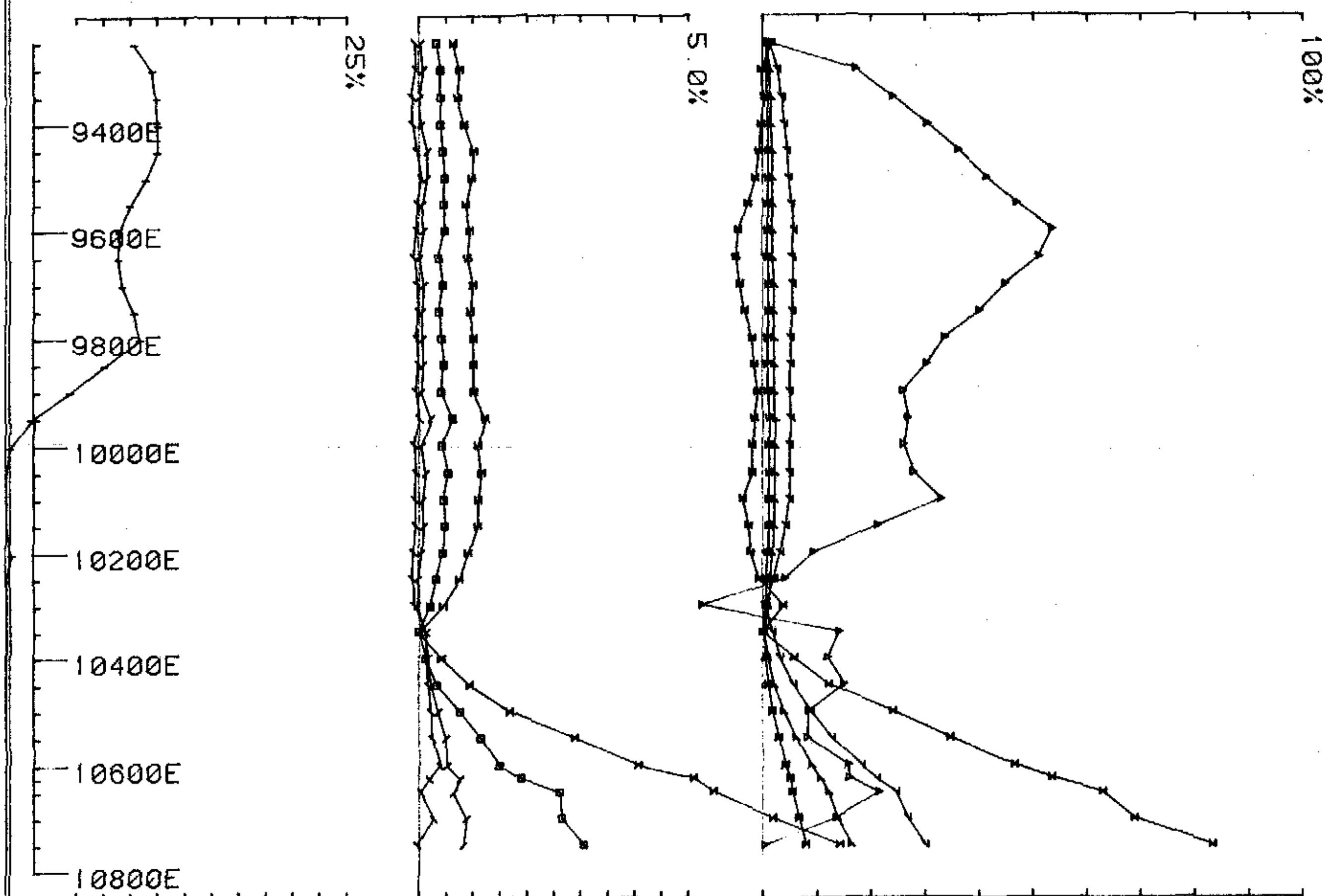


LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- Lake MackIntosh
CLIENT :- PANCONTINENTAL Mining Ltd. CREW :- ~~ART HU Rx8~~ C8
Line 3000N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

Lake MackIntosh
LOOP 0104
LINE 3000
Hz

924021

020

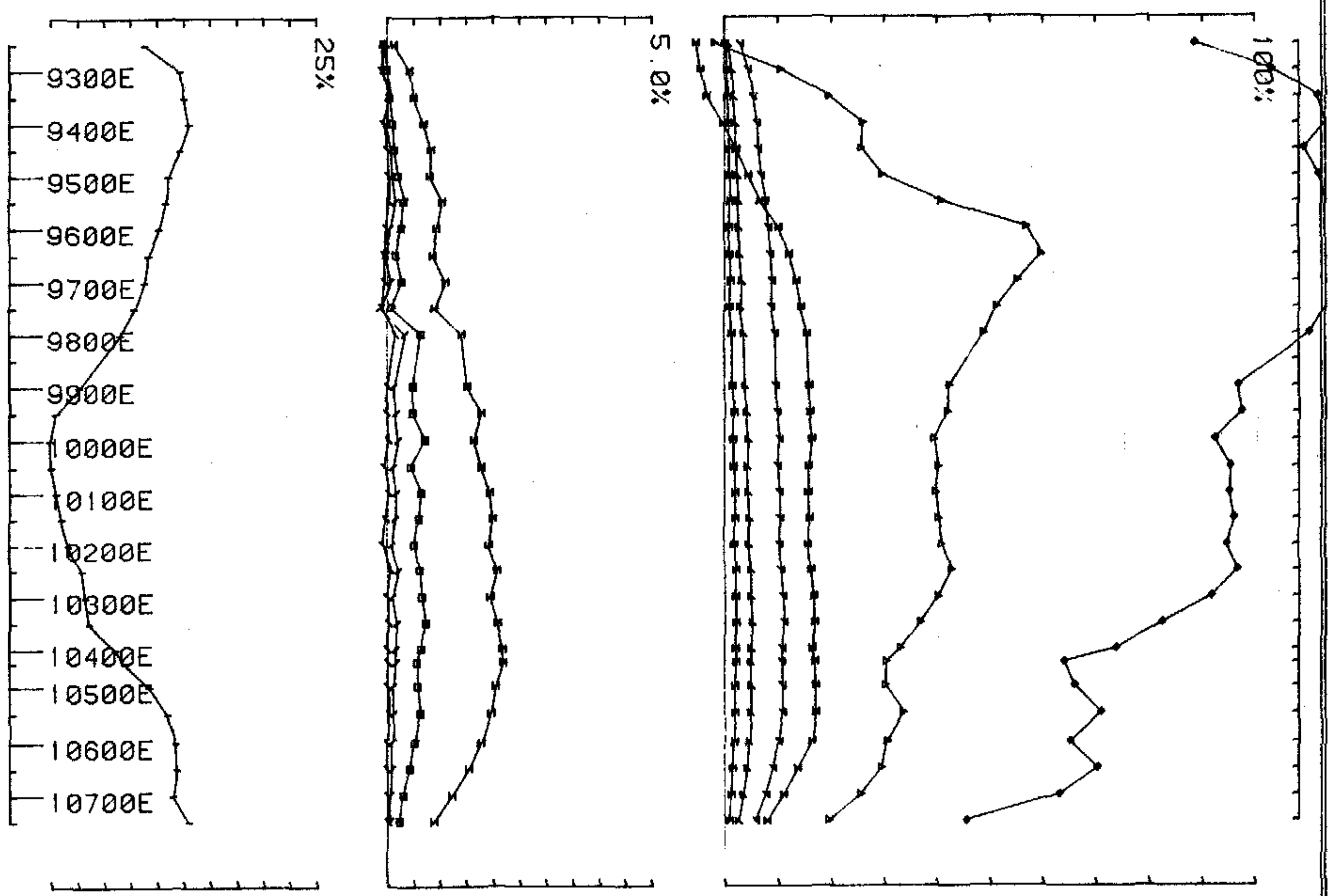


LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- Lake MackIntosh
CLIENT :- PANCONTINENTAL Mining Ltd. CREW :- ART HU Rx8 C8
Line 3200N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

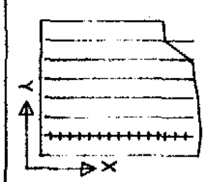
Lake MackIntosh
LOOP 0104
LINE 3200
Hz

924022

021



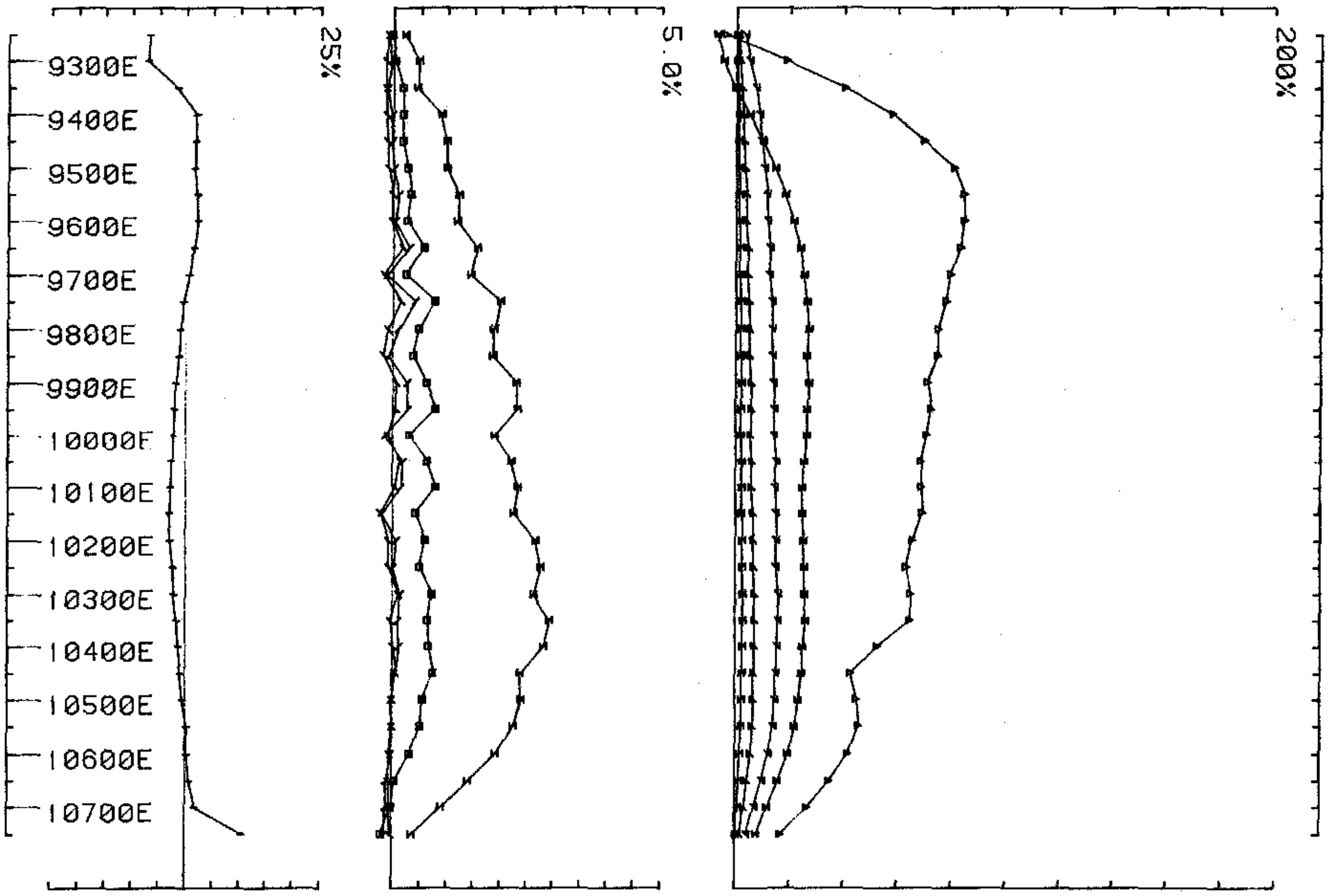
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- LAKE MACKINTOSH
CLIENT :- PAN CONTINENTAL CREW :- PMM
Line 3400N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



LAKE MACKINTOSH
LOOP 0003
LINE 3400
Hz

924023

022



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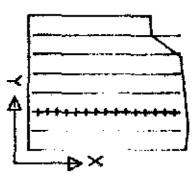
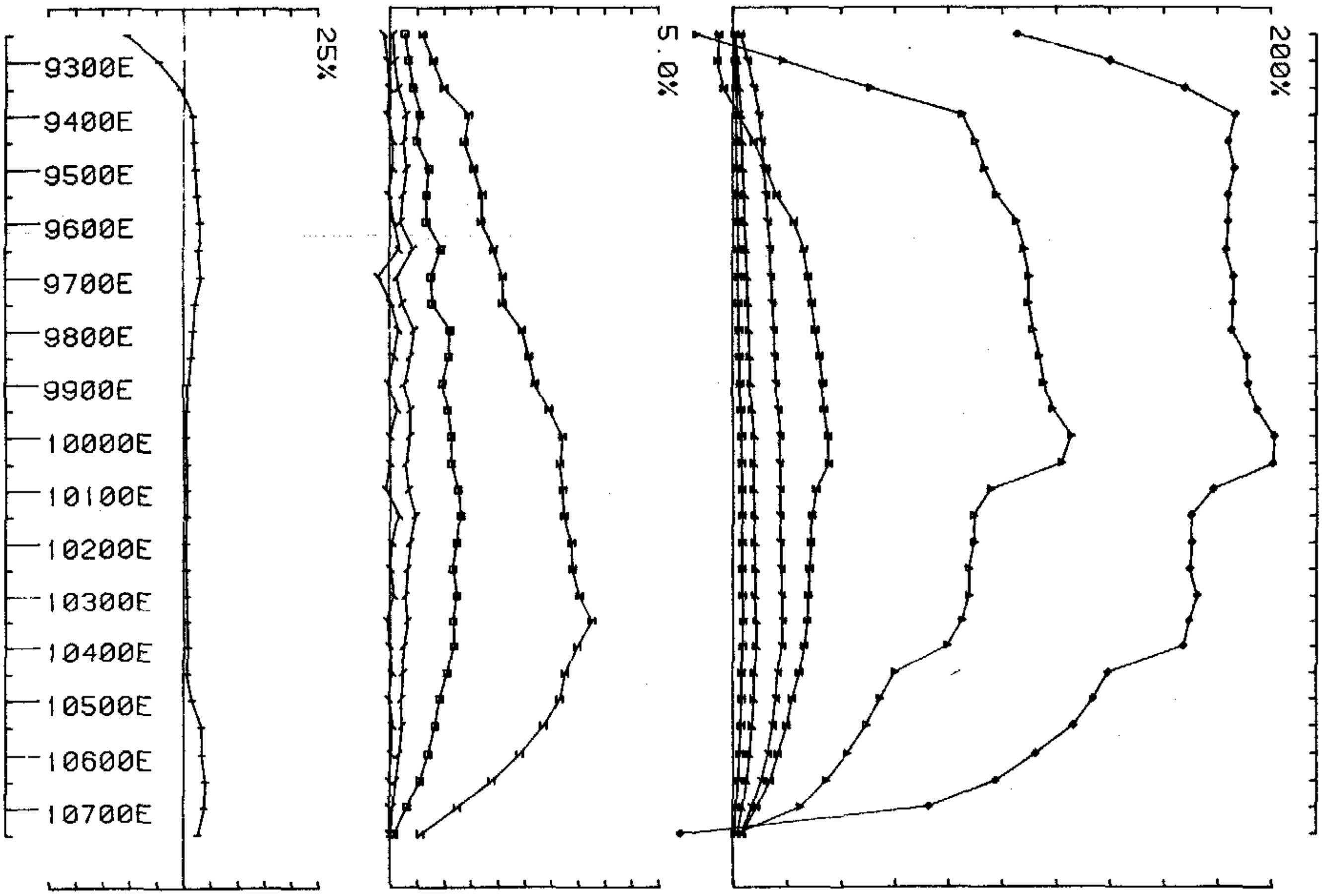
AREA :- LAKE MACKINTOSH
CLIENT :- PAN CONTINENTAL CREW :- PMM
Line 3600N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



LAKE MACKINTOSH
LOOP 0003
LINE 3600
Hz

023



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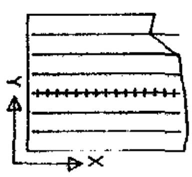
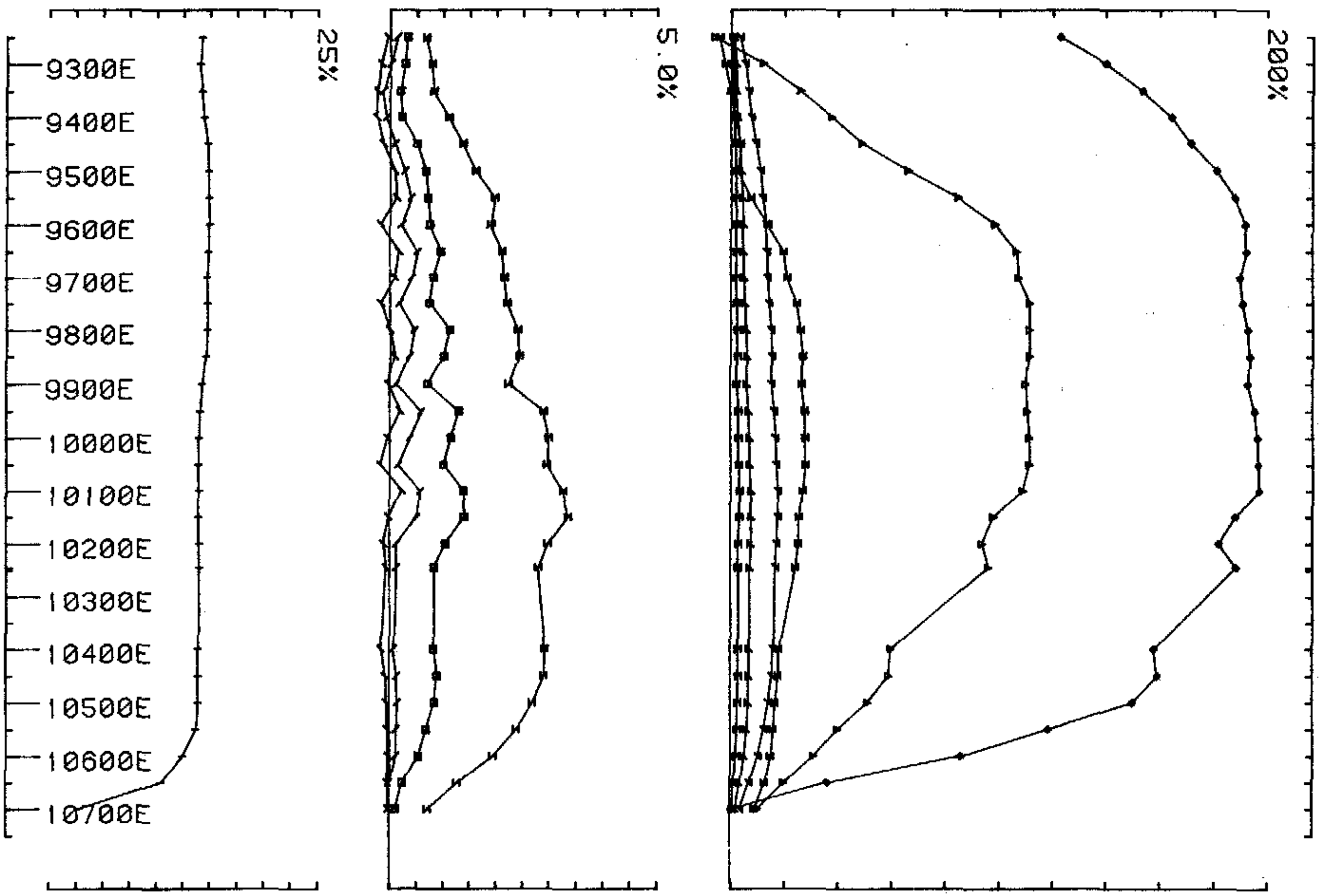
AREA :- LAKE MACKINTOSH
CLIENT :- PAN CONTINENTAL CREW :- ART PMM
Line 3800N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

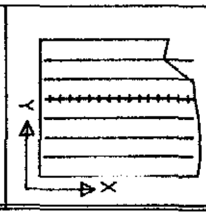


LAKE MACKINTOSH
LOOP 0003
LINE 3800
Hz

924

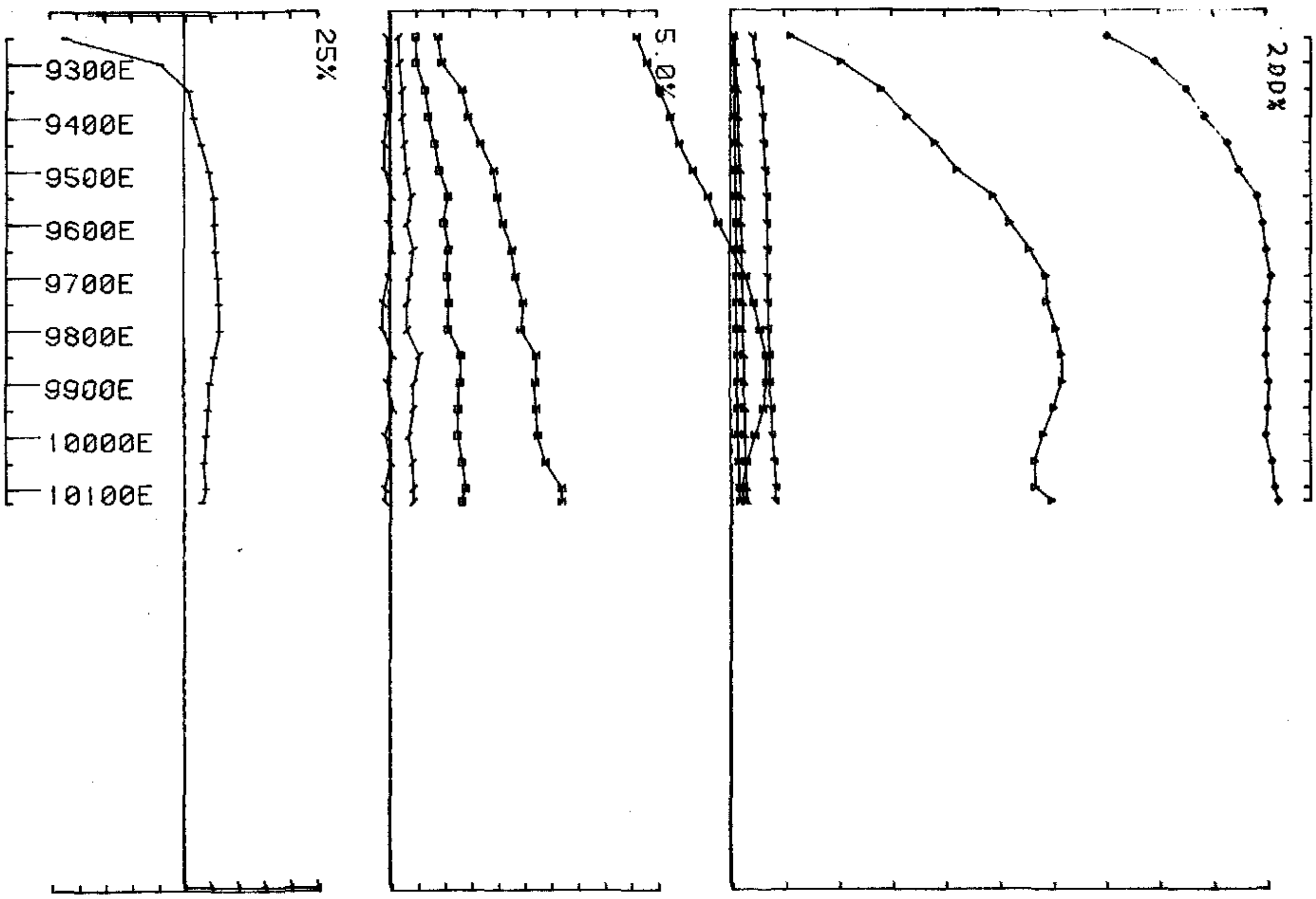


LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- LAKE MACKINTOSH
CLIENT :- PAN CONTINENTAL CREW :- ART PMM
Line 4000N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

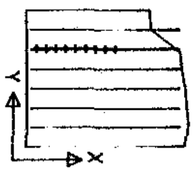


LAKE MACKINTOSH
LOOP 0003
LINE 4000
Hz

025

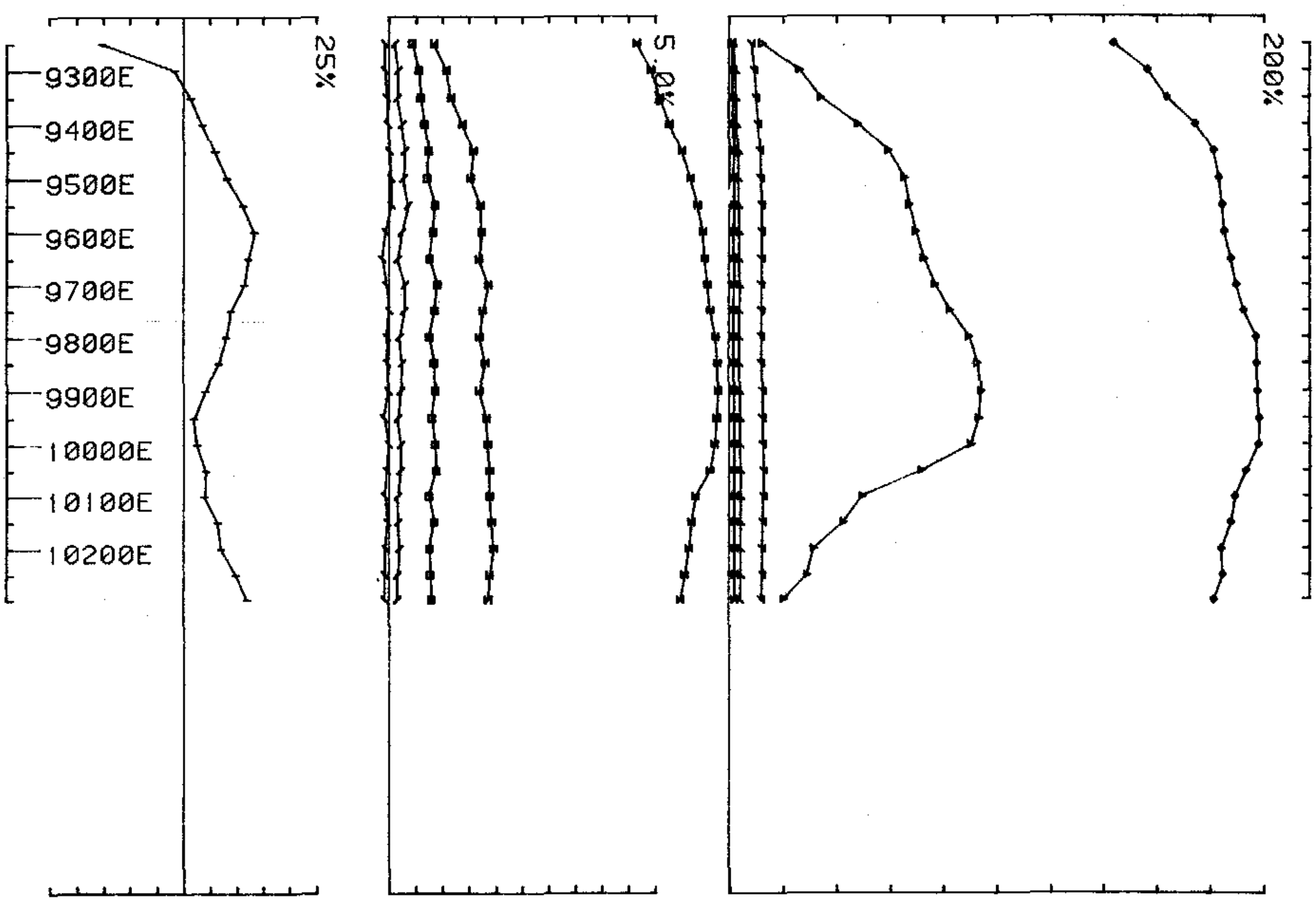


LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- LAKE MACKINTOSH
CLIENT :- PAN CONTINENTAL CREW :- PMM
Line 4200N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

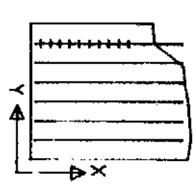


LAKE MACKINTOSH
LOOP 0003
LINE 4200
Hz

026



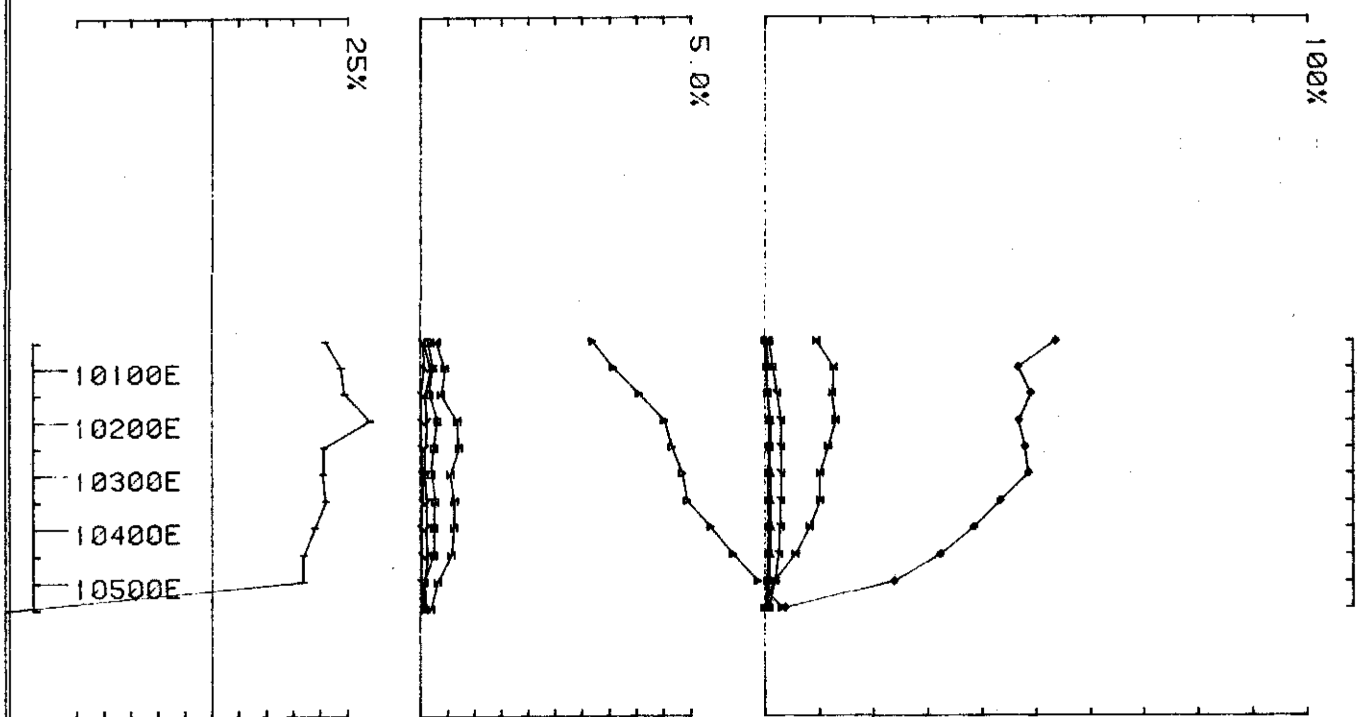
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- LAKE MACKINTOSH
CLIENT :- PAN CONTINENTAL CREW :- PMM
Line 4400N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



LAKE MACKINTOSH
LOOP 0003
LINE 4400
Hz

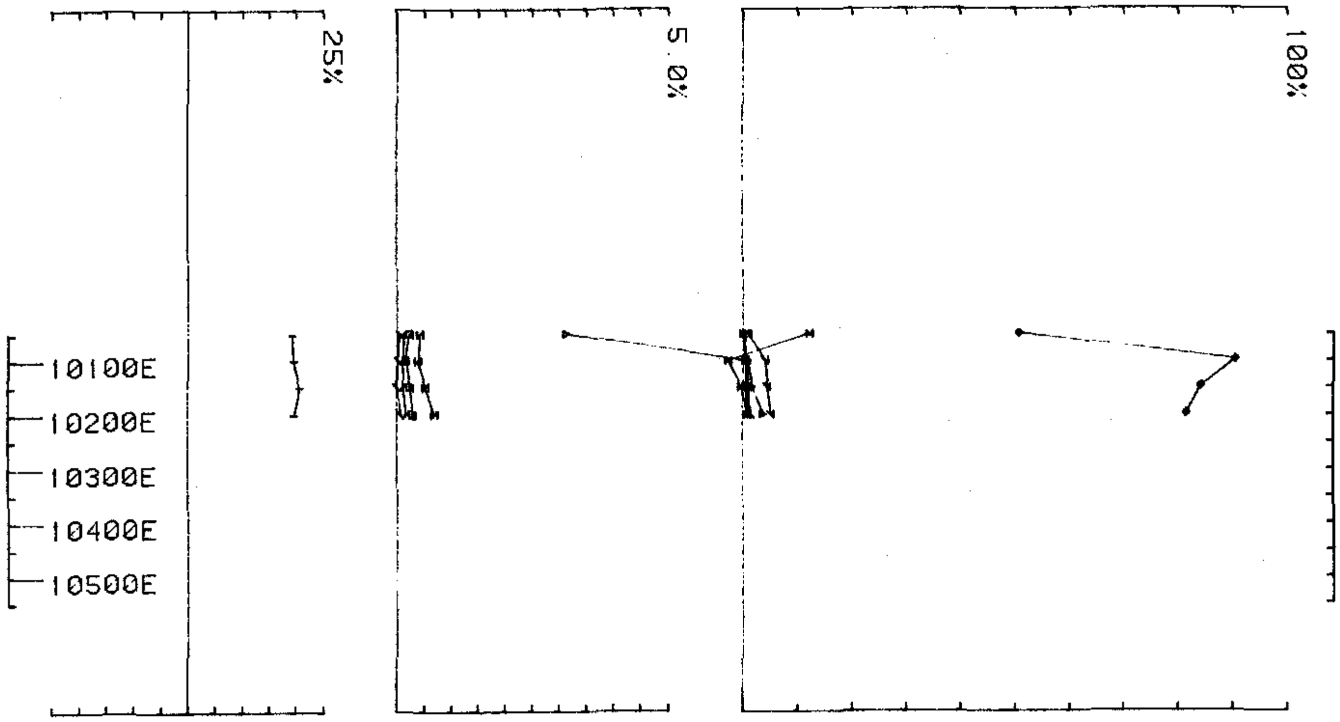
924028

027



LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- LAKE MACKINTOSH
CLIENT :- PAN CONTINENTAL CREW :- BM Rx10
Line 4600N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

028



LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- LAKE MACKINTOSH
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Line 4800N Hz COMPONENT BASE FREQ :- 26.230HERTZ
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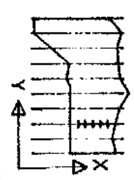
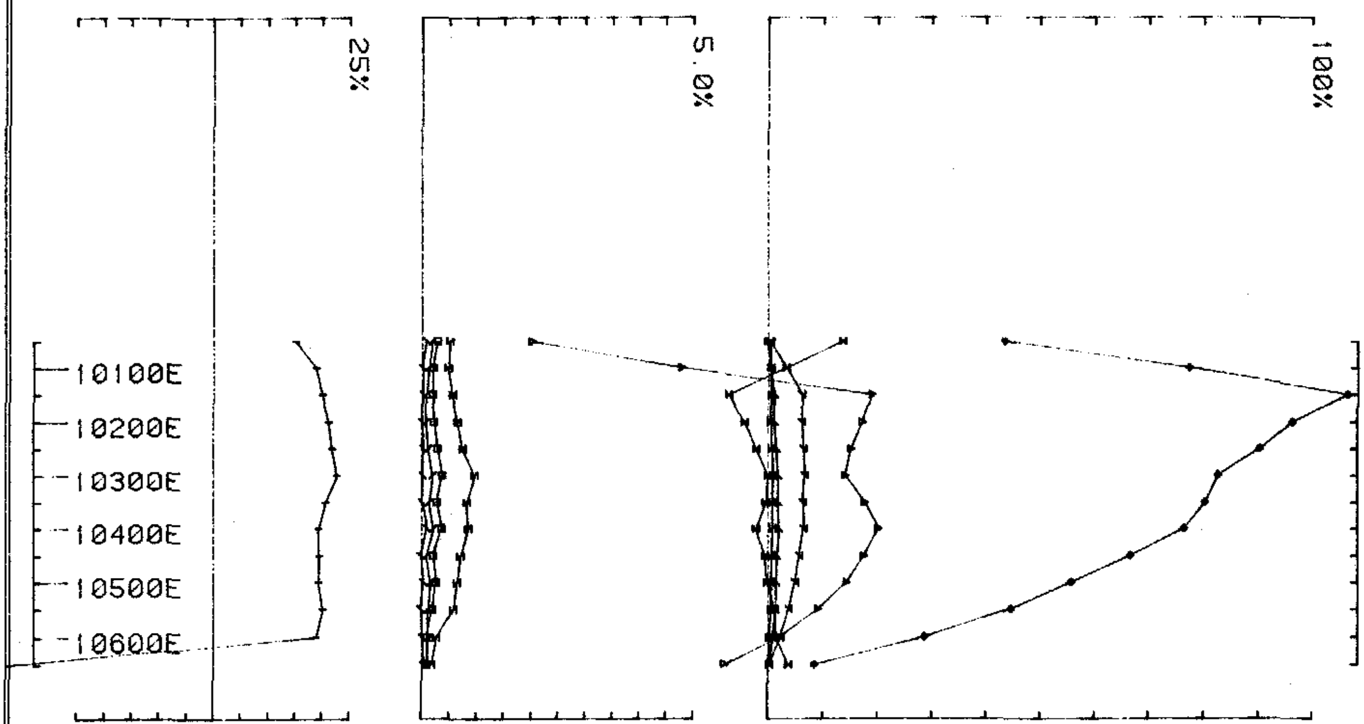


LAKE MACKINTOSH
LOOP 0002
LINE 4800
Hz

029



LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- LAKE MACKINTOSH
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Line 5000N Hz COMPONENT BASE FREQ :- 26.230HERTZ
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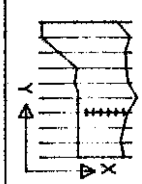
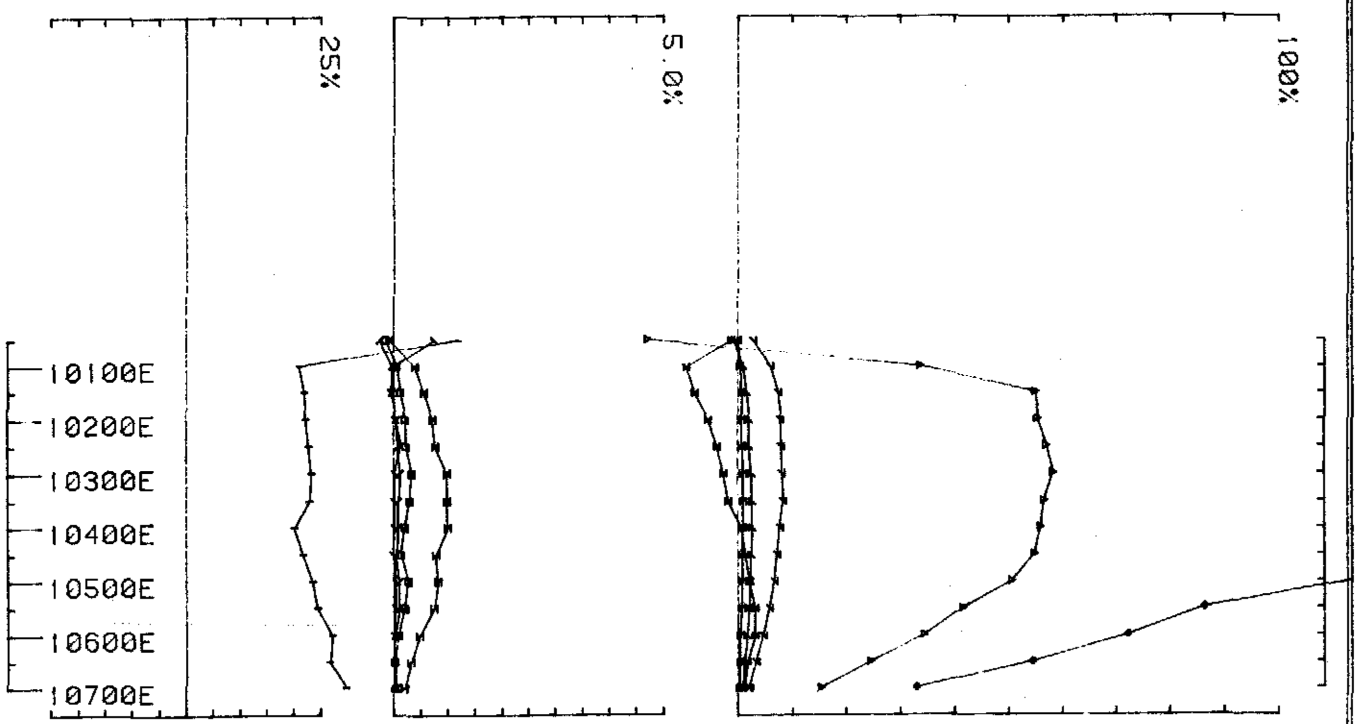
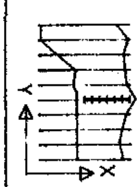


LAKE MACKINTOSH
LOOP 0002
LINE 5000
Hz

030



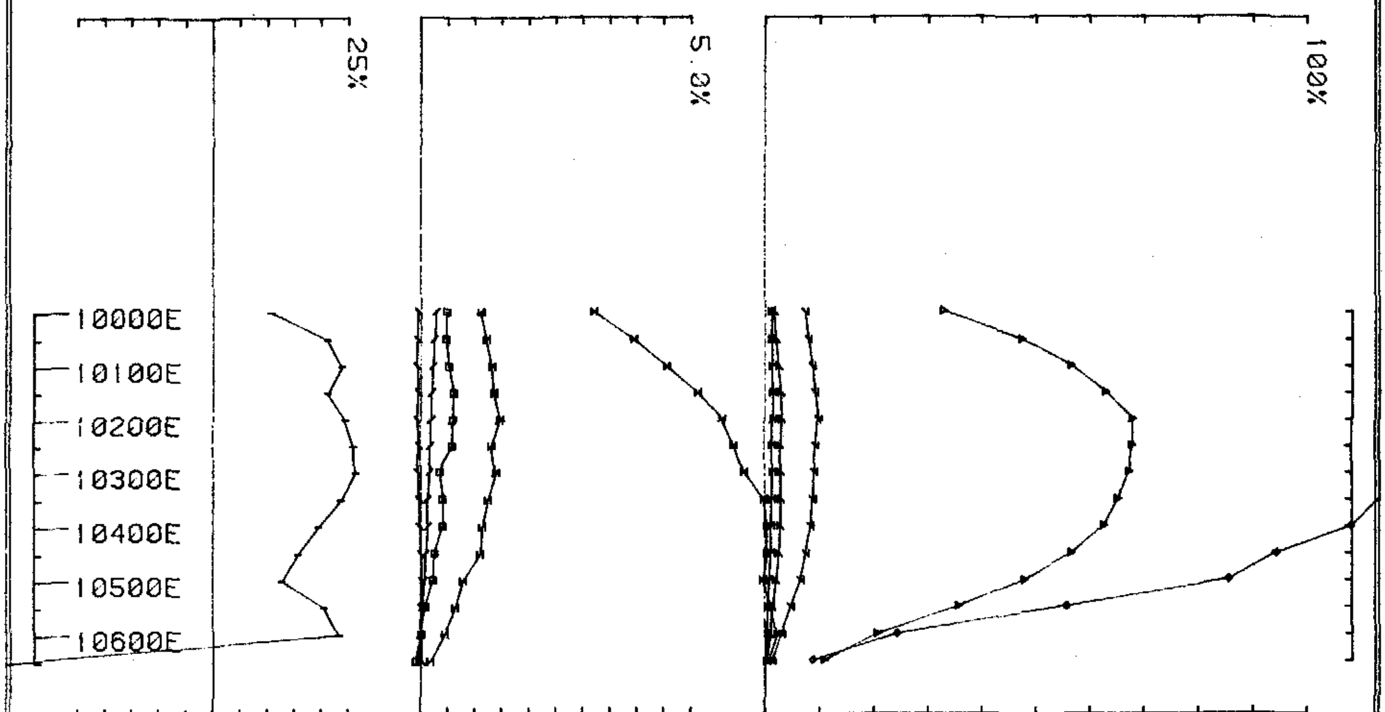
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- LAKE MACKINTOSH
CLIENT :- PAN CONTINENTAL CREW :- BM Rx10
Line 5200N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



LAKE MACKINTOSH
LOOP 0002
LINE 5200
Hz

924032

031



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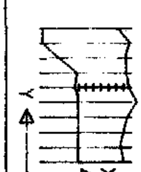
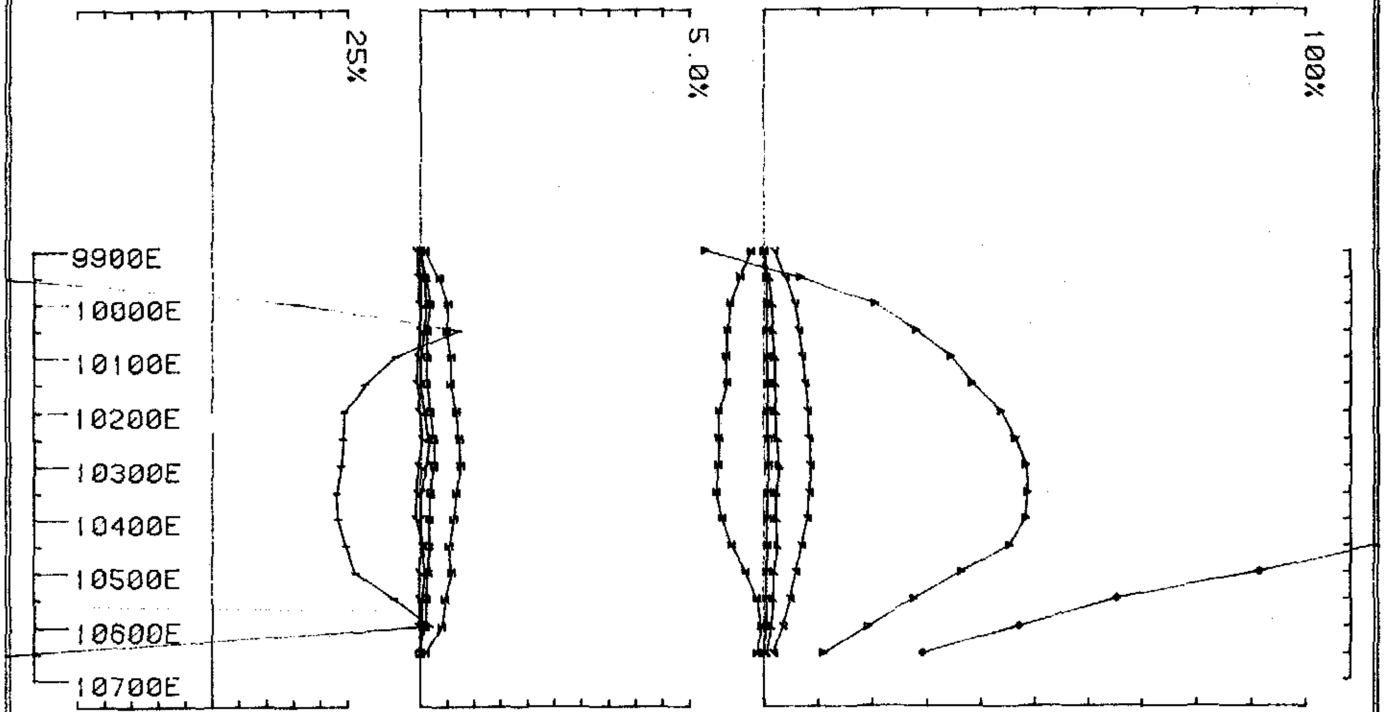
AREA :- LAKE MACKINTOSH
CLIENT :- PAN CONTINENTAL CREW :- BM Rx10
Line 5400N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



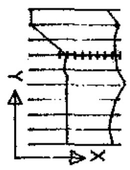
LAKE MACKINTOSH
LOOP 0002
LINE 5400
Hz

924033

032

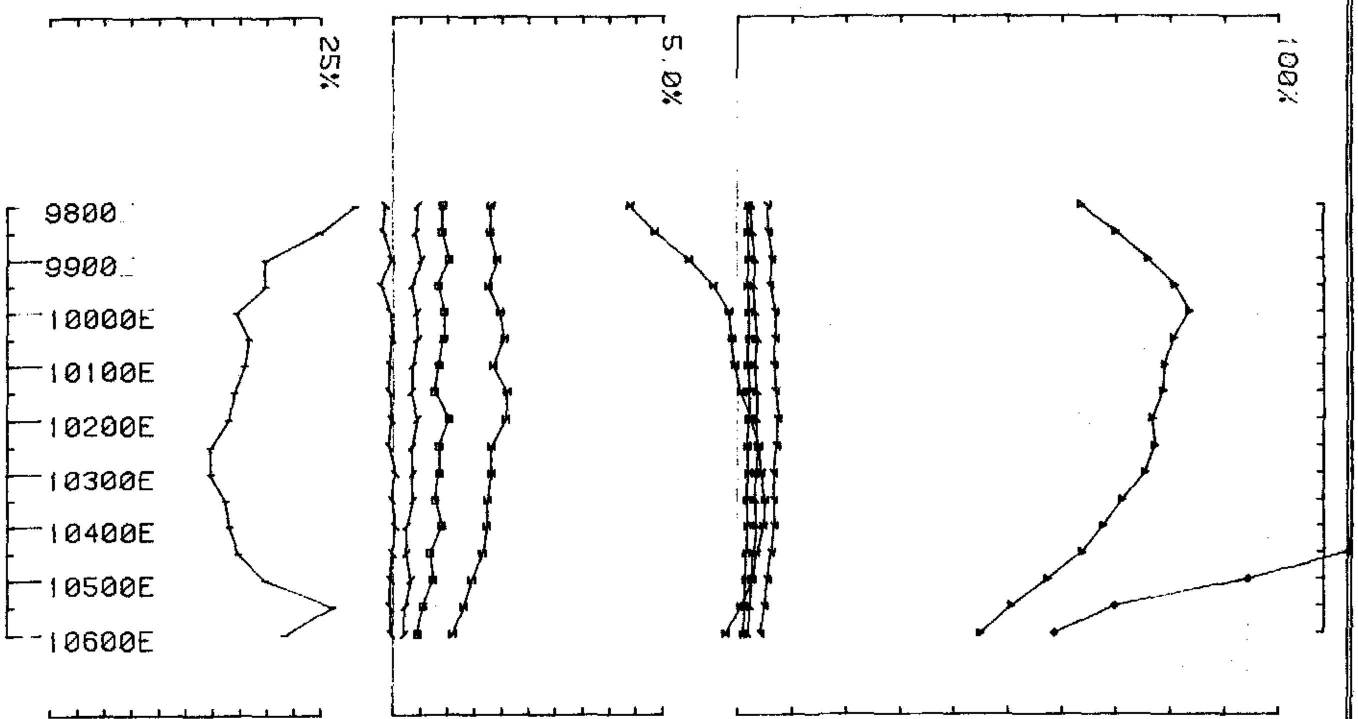


LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- LAKE MACKINTOSH
CLIENT :- PAN CONTINENTAL CREW :- BM Rx10
Line 5600N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

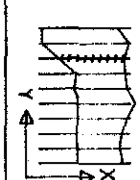


LAKE MACKINTOSH
LOOP 0002
LINE 5600
Hz

033



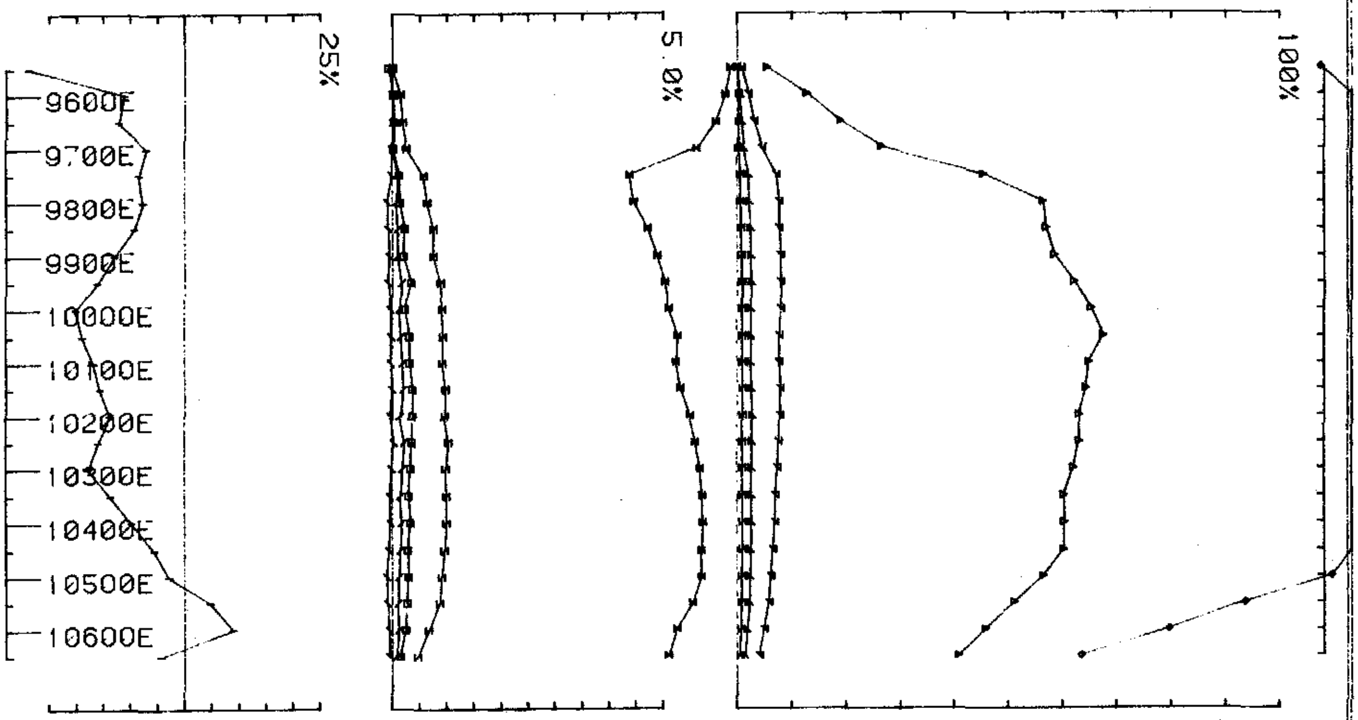
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- LAKE MACKINTOSH
CLIENT :- PAN CONTINENTAL CREW :- BM Rx10
Line 5800N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



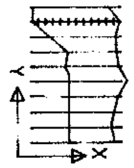
LAKE MACKINTOSH
LOOP 0002
LINE 5800
Hz

924035

034



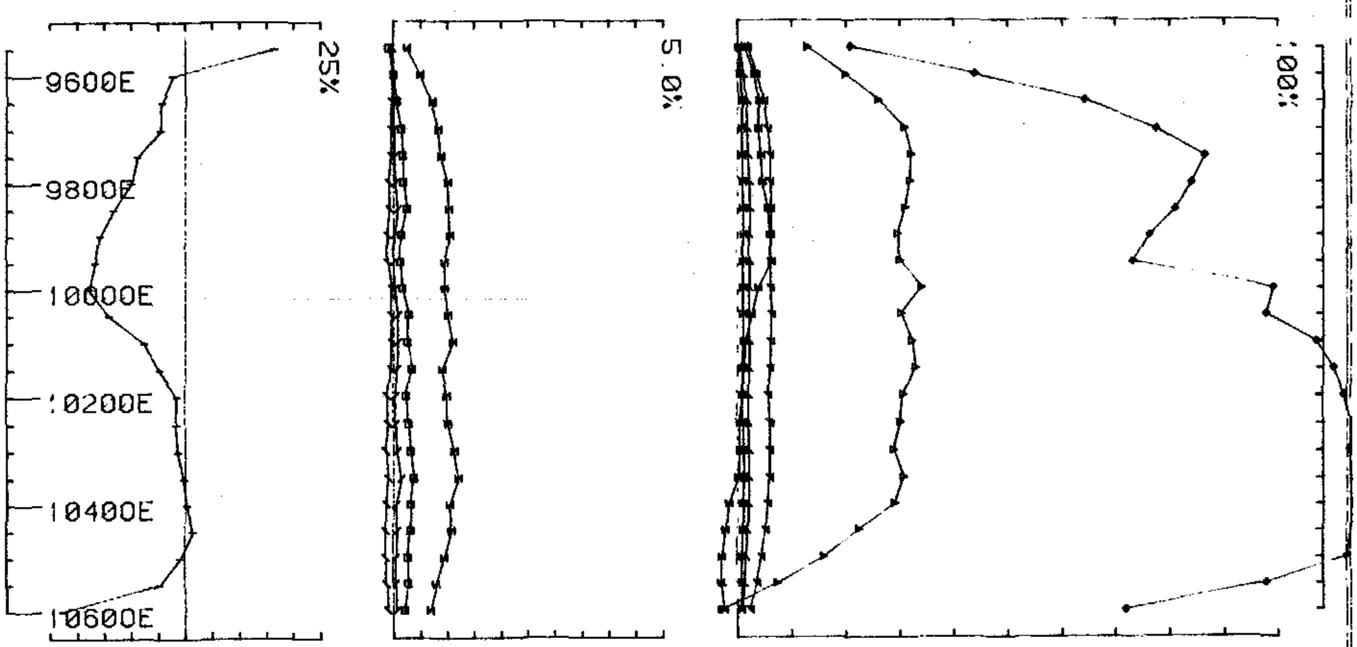
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- LAKE MACKINTOSH
CLIENT :- PAN CONTINENTAL CREW :- RH Rx8
Line 6000N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



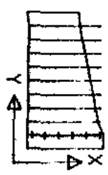
LAKE MACKINTOSH
LOOP 0002
LINE 6000
Hz

924036

035



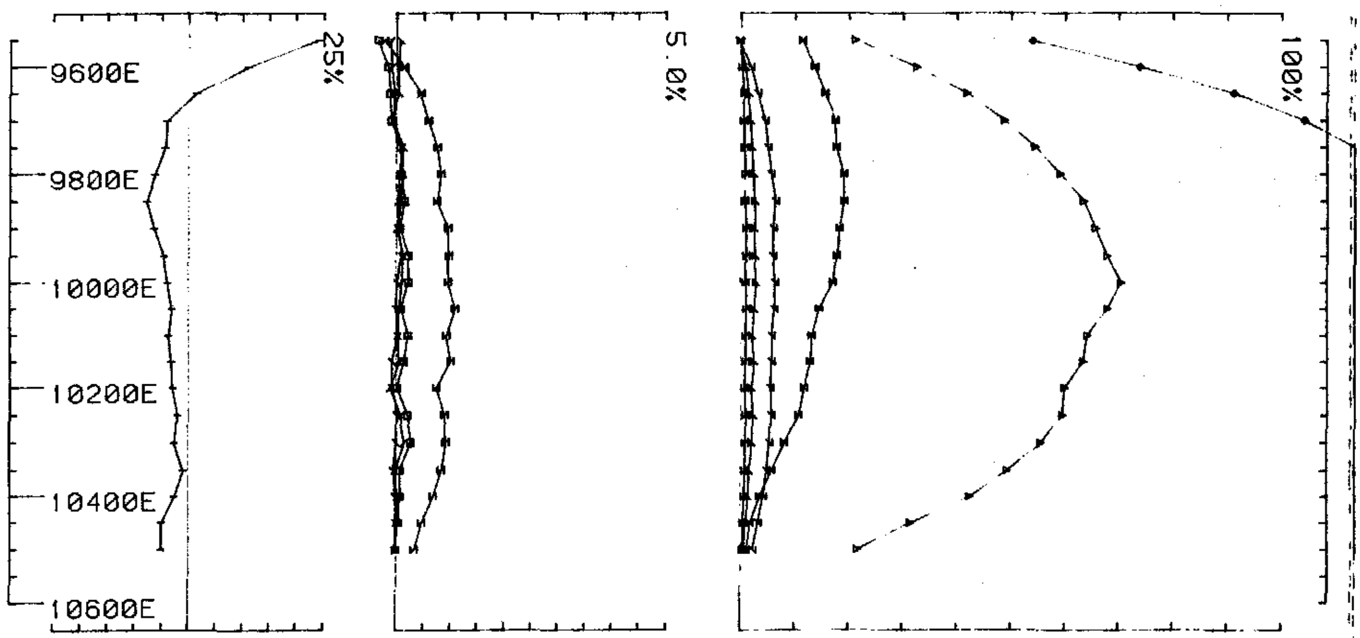
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- Lake Mackintosh
CLIENT :- Pancon Min. Ltd. CREW :- BM ART Rx10
Line 6200N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Lake Mackintosh
LOOP 0001
LINE 6200
Hz

924037

036

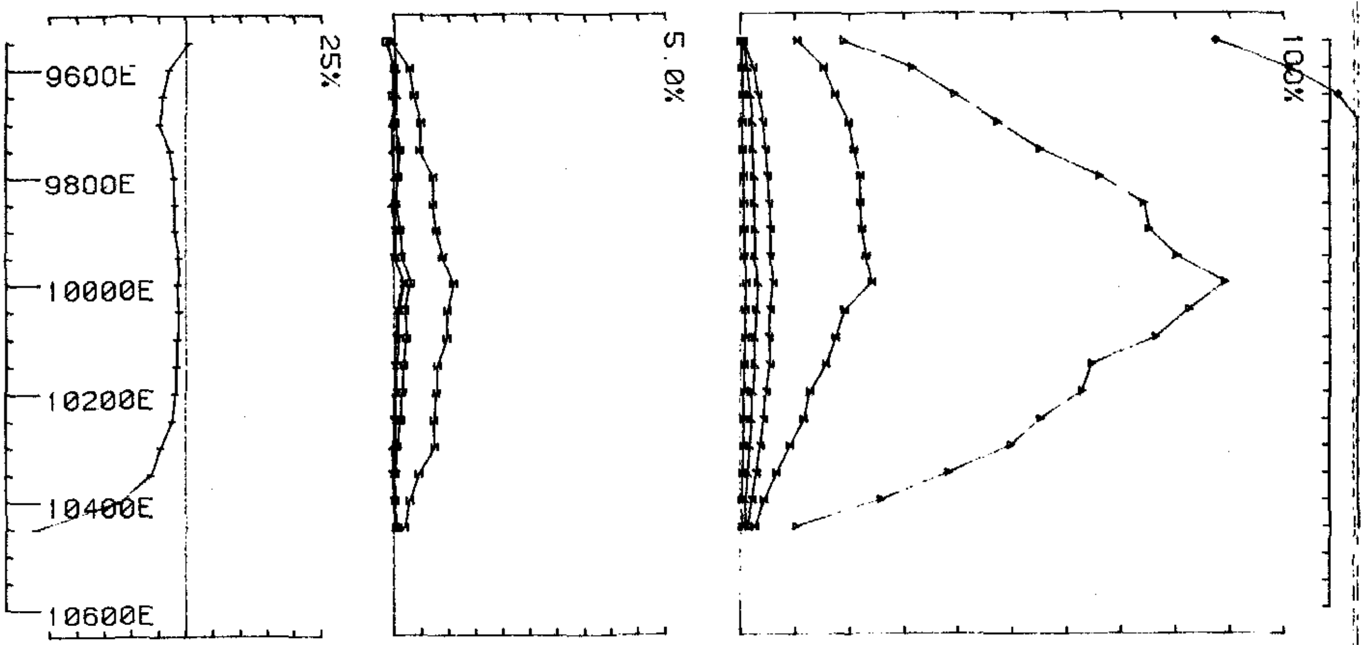


LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- Lake Mackintosh
CLIENT :- Pancon Min. Ltd. CREW :- BM ART Rx10
Line 6400N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

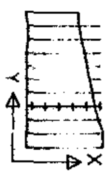
Lake Mackintosh
LOOP 0001
LINE 6400
Hz

924038

037



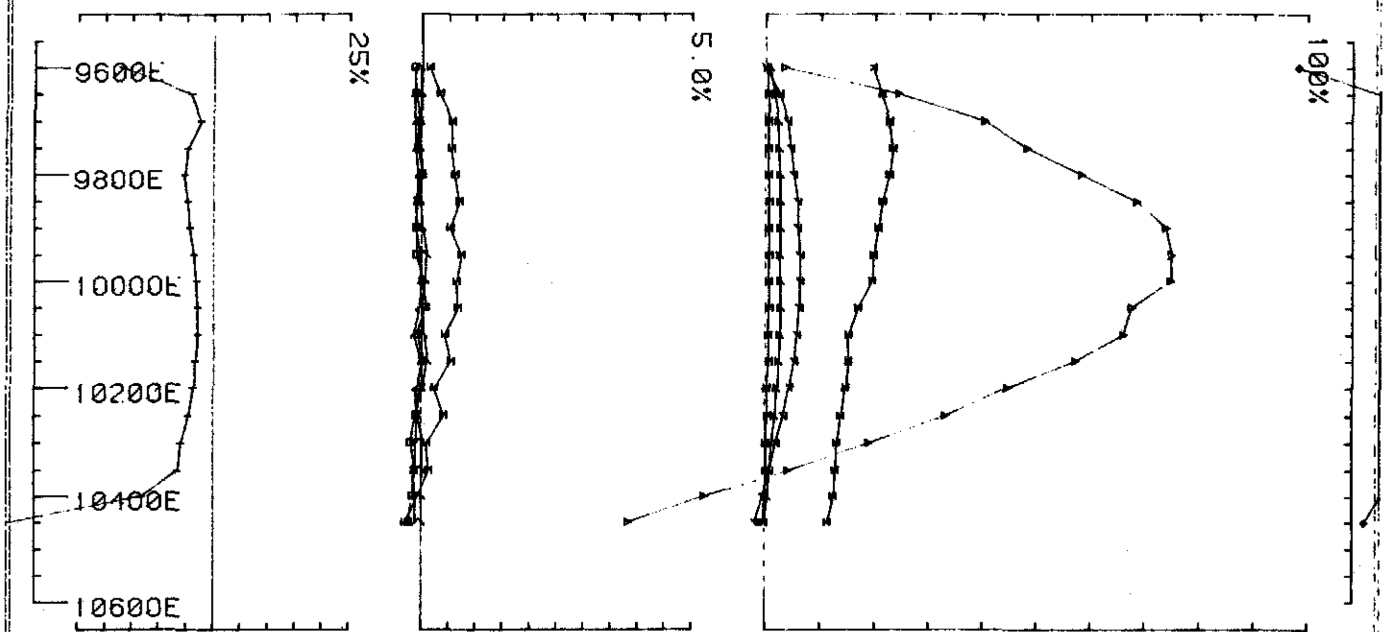
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- Lake Mackintosh
CLIENT :- Pancon Min. Ltd. CREW :- BM ART Rx10
Line 6600N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Lake Mackintosh
LOOP 0001
LINE 6600
Hz

924039

038

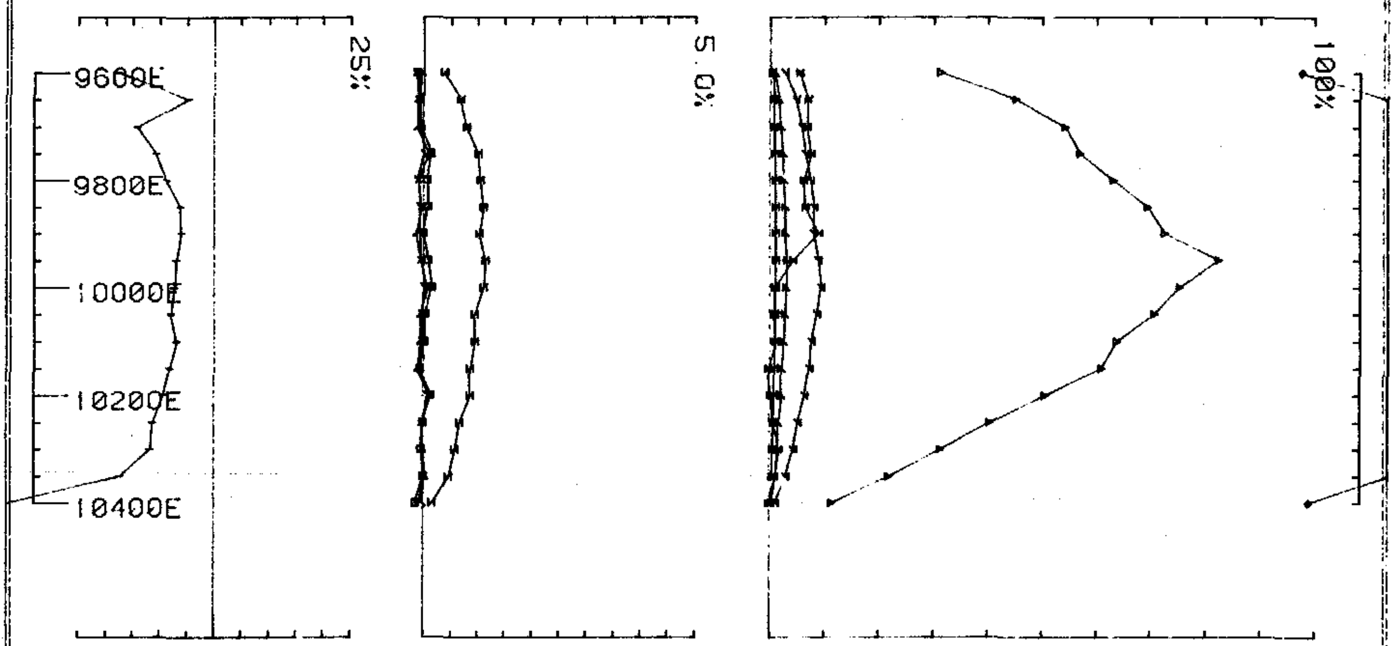


LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- Lake Mackintosh
CLIENT :- Pancon Min. Ltd. CREW :- BM ART Rx10
Line 6800N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

Lake Mackintosh
LOOP 0001
LINE 6800
Hz

924040

039

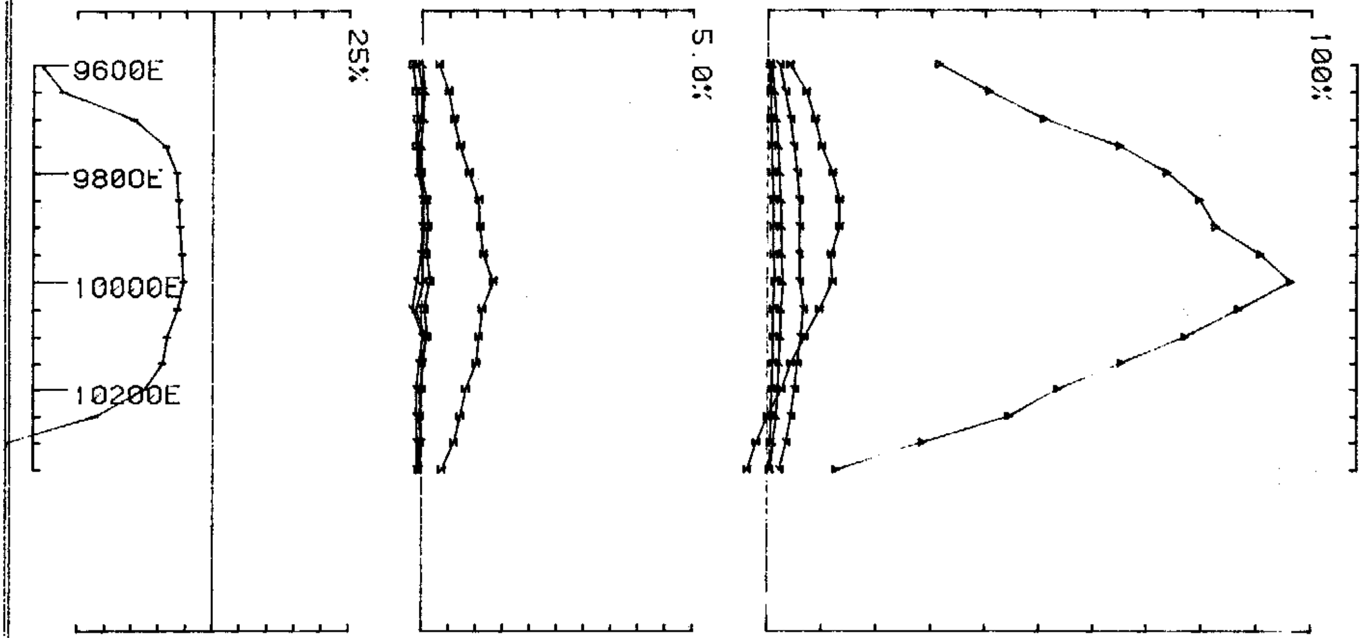


LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- Lake Mackintosh
CLIENT :- Pancon Min. Ltd. CREW :- RH ART Rx8
Line 7000N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION

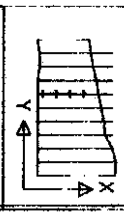
Lake Mackintosh
LOOP 0001
LINE 7000
Hz

J24041

040



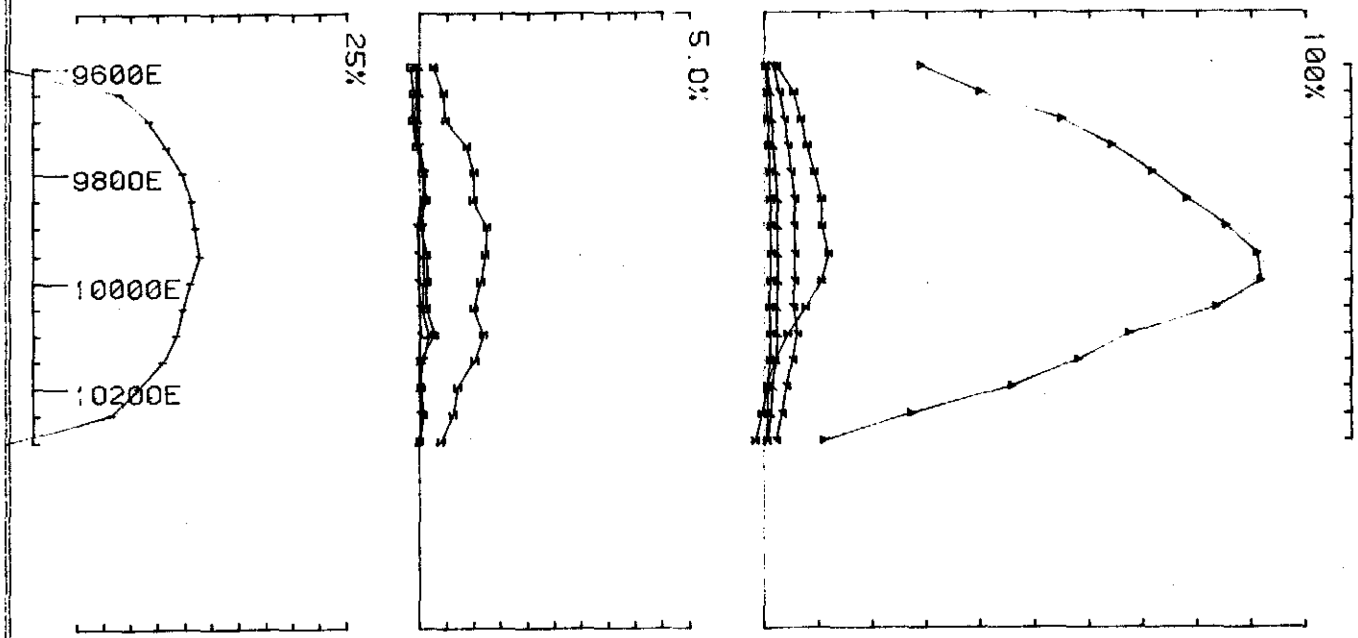
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- Lake Mackintosh
CLIENT :- Pancon Min. Ltd. CREW :- RH ART Rx8
Line 7200N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



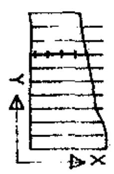
Lake Mackintosh
LOOP 0001
LINE 7200
Hz

924042

041



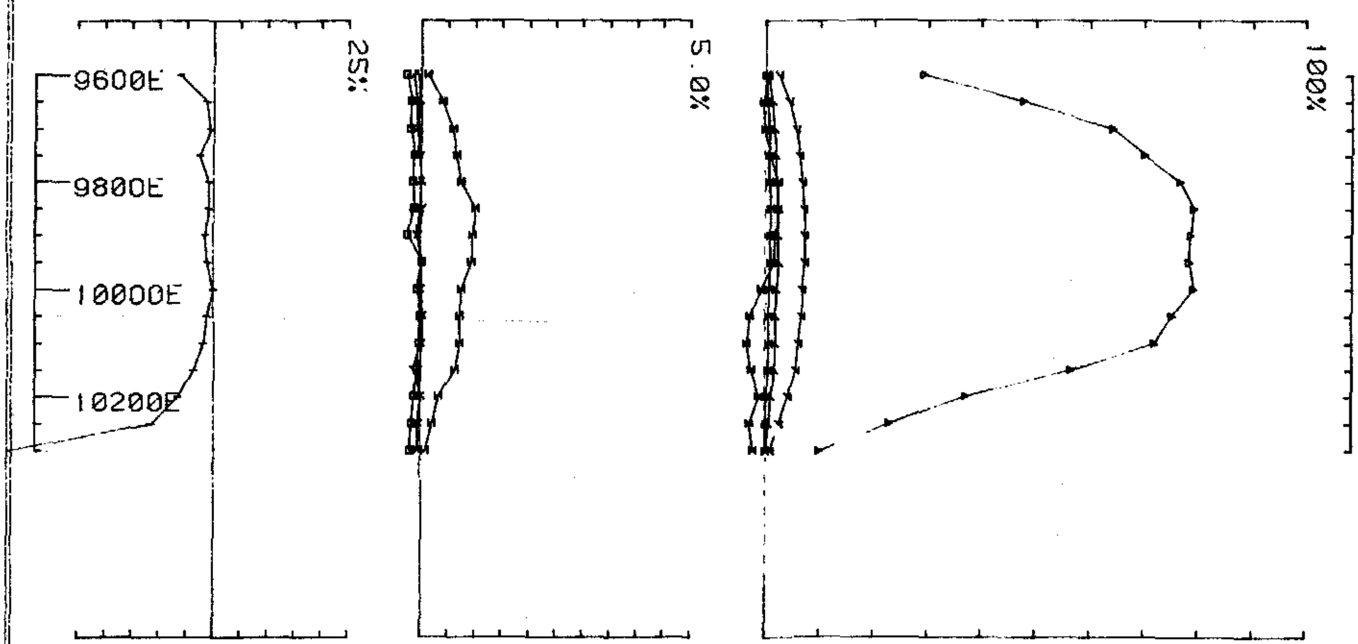
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- Lake Mackintosh
CLIENT :- Pancon Min. Ltd. CREW :- RH ART Rx8
Line 7400N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



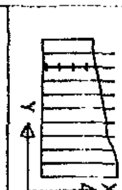
Lake Mackintosh
LOOP 0001
LINE 7400
Hz

924043

042



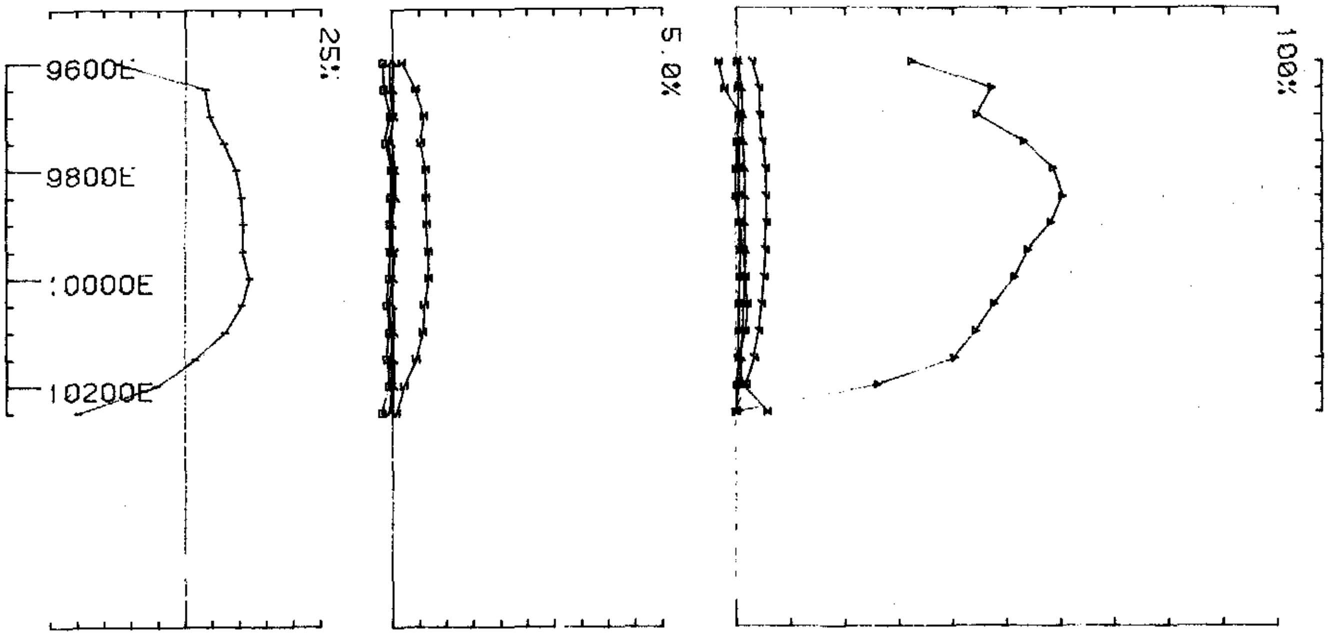
LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- Lake Mackintosh
CLIENT :- Pancon Min. Ltd. CREW :- RH ART Rx8
Line 7600N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



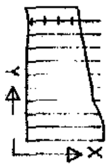
Lake Mackintosh
LOOP 0001
LINE 7600
Hz

924044

043



LAMONTAGNE GEOPHYSICS UTEM SURVEY JOB 8654
AREA :- Lake Mackintosh
CLIENT :- Pancon Min. Ltd. CREW :- RH ART Rx8
Line 7800N Hz COMPONENT BASE FREQ :- 26.230HERTZ
SECONDARY FIELD CONTINUOUS Ch 1 NORMALIZATION



Lake Mackintosh
LOOP 0001
LINE 7800
Hz

APPENDIX 2

045

924046

87/7

NOTES ON GEOLOGY OF EL 42/85

LAKE MACKINTOSH, TASMANIA

for

PANCONTINENTAL MINING LIMITED

9 - 13 Young Street, Sydney 2000

by

W. HERRMANN
RSD 1066 Devonport, Tasmania 7310

5 December, 1986

Distribution

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

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1.	Lake Mackintosh EL 42/85 Geological Plan	1:5000	37/C/2
2.	Lake Mackintosh EL 42/85 Stream Sediment Sample Location	1:5000	37/F/1

924049

1. 048 INTRODUCTION

Exploration Licence 42/85 of about 7.5 sq. km., is situated at the western shore of Lake Mackintosh, near Tullah in western Tasmania.

Stream sediment sampling and geological mapping of the area was carried out under a contract basis by the writer, at the request of the licence holder: **PANCONTINENTAL MINING LTD**, intermittently during the period August to November 1986.

This report includes a Geological Plan and Stream Sediment Sample Location/Result Plan at 1:5000 scale.

2. SUMMARY AND CONCLUSIONS

Geological mapping of accessible streams, roads and geophysical grid lines has allowed compilation of a largely interpretative geological map of EL 42/85.

The western two thirds of the licence is occupied by a complex group of felsic volcanics including extrusives, subvolcanic intrusives, pumiceous tuffs and a variety of pyro-epiclastic deposits ranging from coarse breccias to ultra fine tuffs. These are identified as part of The Central Volcanic Sequence of the (Cambrian) Mt Read Volcanics. They have general northerly strike trend and dip moderately to the east.

Rocks in the eastern one third of the licence are dominantly sediments of mixed psammo-pelitic metasedimentary and felsic volcanic provenance. These are correlated with the (Mid-Late Cambrian) Dundas Group.

They also have northerly strike trends and moderate easterly dip and there is lithological evidence for a grossly conformable, transitional, overlying relationship to the (underlying) volcanic sequence in the northern part of the licence. In the southern part of the licence the sedimentary group is affected by intense deformation and cleavage development in the NNE trending structure recognised by others as part of the major Henty Fault Zone representing a (Devonian?) west dipping thrust fault.

Mapping has not located any important exposures of hydrothermally altered or mineralized rocks. Though much of the volcanic sequence would appear to be of subaerial deposition there is slender evidence (in an isolated occurrence of pyritic black slate within the volcanics) for the existence of depositional environments which may have favoured accumulation of massive sulphide mineralization.

Stream sediment geochemical survey of the area has not indicated any base metal anomalies worthy of immediate follow-up.

Some widely scattered anomalous gold results (up to 0.18 gm/t Au - 80 fraction sediments) have been re-sampled in order to test the accuracy of the analyses.

3. METHODS

3.1. Access

EL 42/85 covers an area of mainly steep and thickly forested terrain. Much of the low lying swampy ground along the watercourse south of Tullabardine Dam is covered by low but dense tea-tree/cutting grass/bauera vegetation. Parts of the east facing slopes, mainly in the area south-west of Tullabardine Dam, have been affected by fire and are now covered by tall bracken fern. Elsewhere, typical Tasmanian temperate rainforest prevails with extensive patches of "horizontal".

Good access to the southern part of the licence is provided by sealed road from Tullah to the Tullabardine Dam. This road is closed at the Mackintosh Dam during times when the lake is spilling (as it was during most of October when the bulk of this mapping was undertaken). Foot access within this area is facilitated by the recently completed (PANCON) UTEM geophysical grid and various HEC foot tracks.

Access to the northern part is practically restricted to the 4 wheel drive vehicle track which skirts the southern flank of Mt Block. (Access to this track is via the HEC powerline, turn off Murchinson Hwy. at locked gate about 0.7km south of Boco Siding turnoff. Key to gate is available from Mr Neville Tubb, HEC Transmission Lines Depot near the football ground at Tullah).

From the Mt Block track foot access into the licence area is provided by two routes:

1) a short foot track from the end of the southern fork leading down to the western end of grid line 6000N.

2) a roughly cut track originating on the northern fork of the Mt Block track (about 200m north of junction) and leading more or less down the creek bed approximately as far as the 10000E base line in the vicinity of line 6400N.

Parts of the eastern boundary of the licence may be conveniently accessed by boat. A launching ramp is located a few hundred metres east of Tullabardine Dam.

3.2. Geochemical Sampling

The stream sediment sampling/geological reconnaissance program was commenced in early June 1986 but was postponed due to weather related problems, until late August.

Approximately twelve days were required for the collection of about 150 samples. The writer was assisted in this task for varying periods by Kari Airas (Pancontinental), Phil Anderson and Mark Barnett (temporary field assistants).

Since the sampling was carried out prior to establishment of the UTEM geophysical grid tracks, access was limited to the routes outlined above.

051

Samples of fine active stream sediment were collected above stream confluences and at nominal 200m intervals along streams. Panned concentrates (approximately 2.5l of -7mm screened sediment panned down to about 100-200 gm concentrate) and 5kg bulk sediment samples were collected at pre-defined (Pancontinental) locations.

Distances along streams were measured with a "Topolite" chain. Due to the generally heavy going in "horizontal" overgrown streams and short winter days some of the more remote stream systems were incompletely sampled.

Some navigational difficulties were experienced due to minor inaccuracies in the base map and the phenomenon of some streams becoming subterranean in areas of (presumably) thick talus.

Samples were submitted to AMDEL for analysis as follows:

Fine Sediments:

Dried, screened -80 mesh, analysis of -80 fraction:

Cu, Pb, Zn, Mn: Method A1/1)
AAS) Perchloric Acid Digestion
Ag, As : Method A1/2)

Au : Method A7/2 Fusion/solvent extraction /AAS

*Panned Concentrates: *ANALABS

Cu, Pb, Zn, Ag: Method 199
Au : Method 329/334

5kg Bulk Samples:

Au : Method A3 (cyanidation)

3.3. Geological Mapping

Geological reconnaissance mapping of stream bed outcrops was carried out concurrently with stream geochemical sampling. A glance at the geological plan will show that such exposures are relatively few.

Subsequently, during mid October-November geological mapping was completed over foot tracks cut for the UTEM geophysical grid.

Possibly mineralized exposures were sampled (Sample Numbers 19829-19836, total 8) and will be submitted to ANALABS, Burnie for analysis as follows:

Preparation : Crush, pulverise
Analysis : Cu, Pb, Zn, Fe, Mn, As, Ag Method 101 (Perchloric Acid digest/AAS)
Au : Method 309 30g. fusion/AAS

*(Analytical results not yet available at time of writing). See Appendix II.

In addition, approximately 120 rock specimens were collected for comparative and explanatory purposes. These are numbered M1 - M93 (excluding M13, M14, M29) and M101 - M126 (excluding M103, M106). Locations are shown on the geological plan (1:5000 scale).

Small offcut slabs of these rocks will be sent to (and presumably retained by) Pancontinental's Sydney Office. (Except offcuts of M1 - M10 which were forwarded there with accompanying notes on 10/4/86).

Of these rock specimens, ten individuals representing the principal (mainly volcanic) lithotypes encountered during mapping, have been selected for major/minor element analysis and micropetrographic description.

Analysis will be by AMDEL according to Amdel Reference GA3/698/0 for the following list of oxides and elements:

SiO_2, TiO_2, Al_2O_3, Fe_2O_3, MnO, MgO, CaO, Na_2O, K_2O, P_2O_5, Ingition loss, S, Ag, As, Ba, Bi, Co, Cr, Cu, Mo, Nb, Ni, Pb, Rb, Sb, Se, Sr, V, W, Y, Zn, Zr.

An additional five specimens have been selected for micropetrographic description in the hope of elucidating obscure relationships between some pyro-epiclastic rocks and detrital sediments.

The following Table 1 lists the specimen numbers thus selected and their approximate locations according to UTEM grid co-ordinates.

The cryptic letter codes (eg: Epf) refer to the lithotype abbreviations used in the Geological Legend of the 1:5000 Geological Plan.

TABLE 1

Specimen No	Type	Location	Analysis	Micropetrography
M63	Jdl	3800N/9750E	/	/
M119	Ees	7200N/9700E	/	/
M67	Eef	4000N/9750E	/	/
M69	Epa	4200N/9800E	/	/
M55	Epp	3650N/9600E	/	/
M121	Epf	6560N/9225E	/	/
M78	Epb	5000N/10300E	/	/
M113	Evr	6800N/9650E	/	/
M72	Evd (non vesicular)	Tullabardine Dam	/	/
M40	Eir	2800N/9325E	/	/
M124	Esg	7600N/9775E		/
M62	Esl	50m Nth of Mackintosh Power Station		/
M123	Epa	7600N/9775E		/
M125	Epp	Creek, about 7100N/9250E		/
M68	Evd (vesicular)	4000N/9850E		/

4. GEOLOGY

The geology of the EL 42/85 area can be broadly divided into two main rock associations:

i) The western two thirds of the area is occupied by a complex group of felsic volcanic rocks incorporating subvolcanic intrusives, extrusives, pumiceous ignimbritic tuffs and a variety of pyro-epi-clastic deposits ranging from coarse volcanic breccias to ultra fine ash tuffs.

ii) Rocks of the eastern one third of the licence are dominantly sediments of mixed (metasedimentary? and felsic volcanic) provenance ranging in character from fine slaty shales and siltstones to medium to coarse grained greywackes and lithiwackes.

In the far south eastern corner of the licence siliceous conglomerates crop out at the northern termination of a prominent strike ridge running through Mt Farrell.

Plate 1 shows the distribution of rock types. It will be noted that degree of outcrop is generally not great, that mapping was largely confined to lines of access (cut tracks, roads, creeks) and in consequence the boundaries shown are almost entirely interpreted.

In the following subsections I will attempt to describe the major lithotypes encountered and follow with discussions of the structure and stratigraphic correlations.

4.1. Descriptions of Lithotypes

4.1.1. Volcanics:

Evd: Dacitic extrusive/intrusive

This is a compositionally fairly uniform rock consisting of pale creamy to pink often zoned and weakly glomeroporphyritic phenocrysts of plagioclase (1-2mm, 5%), with small prismatic grains or aggregates of ferromagnesian mineral (probably pyroxene) (upto 1mm, 3%) evenly distributed in a usually dark pinkish grey matrix apparently consisting of fine feldspars with very fine interstitial dusting of ferromagnesians. Fine granules of magnetite are usually present as an accessory phase and the rock is often weakly magnetic.

Small elongate calcite + chlorite or quartz filled amygdales are very often present, accounting for upto about 5% of the rock volume, and displaying a linear preferred orientation. These rocks are generally otherwise quite massive and structureless.

They occupy large areas around Tullabardine Dam and west of the Mackintosh Dam and in both areas appear to be in sharp, possibly faulted contact with cleaved sediments to the east. On the basis of abundant amygdales I would interpret these rocks mainly as extrusive (lavas). However, the digitate apparently cross cutting boundary near line 3800N and the occurrence in the far north-east corner of the licence in an area dominated by sediments, suggests they may be partly intrusive. Certainly, some of the non vesicular (M72) or more crystalline (M102) varieties could be shallow subvolcanic intrusive "feeders".

The feldspars are generally quite fresh and show no signs of hydrothermal alteration. The one exception to the generalisation occurs at 5000N/10250E where irregular pale grey weakly silicified patches of unknown extent contain 1-2% pyrite as disseminations and fine stringer veinlets. (Sampled for analysis: 19833).

(ppm: Cu 10, Pb 20, Zn 35, Ag <0.5, Mn 430, As 5, Au <0.008/% Fe 2.5).

Eir: Quartz + Feldspar + Biotite Porphyry.

This is another compositionally and texturally uniform rock type apparently occupying large areas in the central and north western parts of the southern segment of the licence. Specimens M10, M40, M41 are typical examples. It consists of euhedral phenocrysts of clear quartz (1-4mm, ~5%) with tabular prismatic phenocrysts of zoned plagioclase (1-5mm, ~5%) and prismatic flakes of dark biotite (1-3mm, 2%) evenly distributed and usually randomly orientated in a very fine grained pale pink to buff coloured granular quartzo-feldspathic matrix. The matrix probably contains considerabl K-feldspar.

The compositional uniformity and texture and presence of wall rock xenoliths (at creek confluence near 3400N/9650E) support an intrusive mode of origin. Distribution of outcrops suggests a largely cross cutting, partly sill like intrusive form.

No indications of mineralization or hydrothermal alteration were observed in rocks of this type.

Evr: "Rhyodacitic-Rhyolitic" porphyritic extrusives.

Rocks in this category are glassy extrusives. (lavas)

They are typically composed of small, zoned, tabular pink-grey phenocrysts of plagioclase (1-2mm, <3%) subordinate, equant phenocrysts of clear quartz, (1mm, <2%) and thin prismatic grains of dark green ferromagnesian (biotite?) (1mm, <2%) sparsely distributed in a pale grey to pinkish grey very fine grained siliceous, probably glassy, matrix.

The prismatic minerals may show a weak planar preferred orientation and occasionally a weak flow banding is present in the matrix. Specimens M87, M107, M108 and M 113 are representative examples.

These rocks form large cliff exposures in the north west part of EL 42/85 and commonly display a coarse fragmental character, thought to be due to autobrecciation. (Specimen M114). Sparse interfragment spaces are filled with feldspar phyric dark greenish grey somewhat chloritic lithic tuff or "millrock".

I interpret these rocks as representing high viscosity extrusive lavas. They are closely associated with lapilli tuffs of similar composition (Epf) and also have compositional affinities with the coarse volcanic breccias (Epb) occupying part of the ridge NNE of Tullabardine Dam. These latter (two) may represent the explosive volcanism phase of a degassing volatile magma chamber with the Evr representing terminal extrusion of the low volatile, viscous magma remnant. Based on megascopic appearance I would expect a fairly close chemical relationship also with the quartz + feldspar + biotite porphyry (Eir) which may also be co-magmatic.

Epb and Epf: "Rhyodacitic-Rhyolitic" Volcanic Breccias and Lapilli Tuffs.

These are compositionally and spatially closely related rocks occurring in the north-eastern "arm" of the licence and distinguished only on the basis of clast size.

Specimens M15, M16, M73, M77, M79, M101, M121 are representative of the lapilli tuff: Epf. Clasts are rather variable but consist mainly of volcanic lithics including pale pink feldspar + quartz porphyritic extrusives dark chloritic feldspar phyric altered pumice and fine siliceous-vitric tuffs usually closely crowded in a variable murky felsic-siliceous glassy looking matrix. M73 is an unusual type composed mainly of silicified deformed pumice clasts with a sparse interstitial matrix of black "chert".

The coarser volcanic breccias contain similarly variable volcanic clast types but probably are generally dominated by feldspar + quartz phyric "Rhyodacitic-Rhyolitic" extrusives (Evr). Specimens M25, M78, M82 are examples, though it should be pointed out that due to large fragment sizes (upto 500mm) it is difficult to obtain good "hand specimens". M82 appears to contain fragments of feldspar + ferromagnesian phyric dacite (Evd) in a more felsic matrix.

These rock types usually do not show any stratification at outcrop scale although on line 5000N there appears to be a gradual fining and decreasing clast content eastwards (up sequence?).

They probably represented a wide spectrum of pyroclastic fall and flow deposits possibly transitional to autobrecciated coherent lavas at one end and to epiclastic mass debris flows at the other.

Epp: Pumiceous feldspar phyric tuffs.

These are characteristically mottled grey rocks containing small flattened - wispy, dark "chloritic" sometimes feldspar phyric fragments, thought to represent collapsed pumice or juvenile lava clasts, and fragments and crystals of white plagioclase enclosed by a pale grey murky siliceous tuffaceous/glassy matrix. The rocks are commonly quite massive in outcrop without internal fabric (eg: M12, M55, M81, M85) but in some cases a wavy "eutaxitic" foliation (M71) or crude laminar flowbanding (M125) may be developed.

These rocks occupy large areas of great compositional uniformity on the northern part of the ridge west of Tullabardine Dam, and the prominent ridge between about 5200N and 6400N. I suspect they are also important in the intervening (unmapped) steep cliffs west of 5000N.

They are generally distinguishable from the previously described breccias and lapilli tuffs by the near absence of rigid lithic clasts. I suspect micropetrographic examination will show evidence of glassy welding. I regard these as pyroclastic pumice/ash fall and flow deposits erupted from emergent (ie: subaerial) volcanic vents.

These pumiceous tuffs generally do not appear to contain much K-feldspar or quartz suggesting some chemical variation from the Evr-Eir Rhyodacitic-Rhyolitic group and possibly a separate magmatic source.

Epa: Fine to medium grained feldspar phyric Tuffs.

This group essentially comprises the finer grained crystal-vitric ash tuff end of the pyroclastic fall spectrum. They are compositionally and spatially closely related to the pumiceous tuffs Epp.

Specimens M64, M70, M76, M86 and M126 are examples. They are almost too fine to describe adequately by hand lens inspection but appear to consist of fine crystals and fragments of whitish feldspar and fine wispy sub millimetre sized fragments of non-descript volcanic detritus and pumice? in a fine tuffaceous ground mass of glassy shards and ash.

Specimen M126 (which is interbedded with Epp type M125) contains sparse flattened "fiamme" and feldspar crystals in a very fine vaguely bedded ash matrix.

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As noted in the legend these rocks are occasionally well bedded. I regard them mainly as pyroclastic ash fall deposits.

More problematical are rocks of broadly similar composition and fabric such as (M123), which in the north eastern part of the licence are intimately interbedded with shaly siltstones and micaceous greywackes which can only be regarded as turbiditic (water deposited) sediments. The subdivision Epa (incorporating all finer grained felsic feldspar phyric tuffs) may therefore overlap partly with the volcanic-epiclastic environment of deposition.

4.1.2. **Undifferentiated Pyro-Epi-Clastics**

The two groups of rocks in this category have caused me considerably head scratching.

Eef: Ultra fine grained Tuffaceous cherty Siltstones.

These are typically a pale dove grey colour mesoscopically resembling massive chert. They are commonly internally massive without stratification, obviously of very siliceous composition. Under the hand lens I barely discern a very fine granular or meshwork texture which the imagination interprets as fine ashy volcanic detritus. A classic example is specimen M67. Some specimens (M45, M49) appear to be dusted with tiny white grains which might represent feldspar microlites or spherulites. In some cases as in M89 (which is also crudely layered) these pale specks are upto one millimetre size and resemble small clots.

Rocks of this type are mainly associated with pyroclastics (Epp and Epa) in the area west and north of Tullabardine Dam but also occur amongst sediments in the far north east of the licence. As noted, they are commonly quite massive; the outcrop near 4000N/9800E must represent at least several tens of metres of stratigraphic thickness yet no bedding or grain size variation could be discerned in it. However, in places, rocks of this general description may be quite finely laminated as in several small outcrops on 3400N. Specimen M50 a floater from about 3200N/9900E displays the pale grey cherty appearance with whitish "microlites"(?) and also fine bedding laminations (which are slightly displaced by tiny faults which subparallel a weak fracture clearage) (This specimen somewhat resembles M126 which contains glassy fiamme which implies a pyroclastic origin).

Closely associated with these fine cherty rocks (but only once observed in outcrop) are finely fragmental rocks (M42, M44, M51) dominantly composed of clasts of fine cherty rock but also containing other volcanic lithics including glassy flow banded Rhyolite and quartz + feldspar + biotite prophyry (Eir) and quartz and feldspar crystal fragments. Some of the clasts are fairly well rounded; the matrix is variable from granular-sandy to ashy-tuffaceous. These could well be epiclastic sediment breccias and volcanolithic conglomerates.

The origin of these fine cherty rocks is obscure. They appear to be associated with both pyroclastic fall/flow rocks and turbiditic sediments. The occasional presence of fine bedding laminations suggests a sedimentary mode of deposition, either pyroclastic or epiclastic. The uniform fine grain size and generally massive character implies uninterrupted deposition at a site fairly distal from the erosional or volcanic source. On the other hand, possible epiclastic breccias indicate at least intermittent periods of instability and deposition of mass flow debris.

Ees: Tuffaceous/sericitic/siliceous Siltstones.

This group essentially represents a continuum from the above very fine "cherty" rocks to more granular silty rocks of similar fairly siliceous composition, probably largely derived from felsic volcanic sources.

Typical specimens are M26, M37, M57, M59, M83, M88, M104, M105, M109, M107, M119. They are generally of medium grey colour, have a "tuffaceous" appearance and range in grain size from fine sand to silt. They may be massive or thickly laminated.

They occur prominently amongst deformed slate and greywacke in the Mackintosh spillway area and also in a roughly 500m wide strip adjacent to the main volcanic sequence and appear to represent a transition between the volcanic/pyroclastic and detrital sedimentary environments.

I interpret these as epiclastic sediments, probably largely of subaqueously deposited air fall ash. Some true pyroclastic (subaerial) tuffs may also be included.

4.1.3. Sediments

Esl: Feldspathic - Tuffaceous Lithiwacke

I use this term to identify coarse grained sediments with a significant content of clearly volcanically derived detritus. Crystals and fragments of feldspar and to a lesser extent, quartz, are prominent along with small lithic fragments of non-descript felsic volcanic and dark wispy fiamme? in a generally felsic tuffaceous looking silty or sandy matrix.

They occur interbedded with tuffaceous siltstones and dark slates in the Mackintosh Dam/Spillway area and also in a few hundred metre wide strip east of the main volcanic group in the north east part of the licence area.

There are four not particularly good, specimens M28, M39, M62 and M116, in the collection. M62 contains abundant small wispy fiamme, feldspar and small pinkish rhyolitic fragments and could pass for a felsic tuff.

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Esg: Micaceous/Tuffaceous Greywacke- Siltstone.

Rocks of this category are the dominant component of the the eastern sedimentary group at Lake Mackintosh. They range from pale to dark grey in colour, from medium sand down to silty grainsize and may be massive to thinly bedded and turbiditic in association with dark slaty shales. Compositionally they appear to consist largely of feldspar, felsic volcanic detritus and quartz? Distinctive small pearly flakes of detrital mica are often present parallel to the bedding plane and suggest a provenance, in part, of Pre-Cambrian metasedimentary terrain (c.f. McNeill, 1986).

The -more thinly bedded types sometimes contain graded beds and would be a source of facing evidence if patiently examined.

Ess: Grey to Black Slate.

These rocks need little further description. They are mainly associated with the other sedimentary groups Esl and Esg (above) but in general form a fairly minor (say 10%) portion of the sequence locally.

A thin lens (0.3m x 4m approximately) of black slightly pyritic slate occurs in association with slump disrupted fine cherty siltstone and pyro-epiclastic breccia (?) within the volcanic group at 4800N/10165E.

Oc: Siliceous Conglomerate

In EL 42/85 this rock type is confined to the far south eastern corner forming the steep ridge at Hanging Rock.

This area has not been mapped in detail. At the eastern end of Mackintosh Dam the exposure consists of coarse cobbly-pebbly siliceous conglomerate with slightly flattened clasts of metaquartzite in a siliceous sandy-gravelly matrix. Minor pyrite, erratically distributed up to 2-3%, occurs as disseminations in the matrix and encrustation on quartzite pebbles.

4.1.4. Post-Tectonic Rocks

Jdl: Dolerite

A dark greenish grey medium grained mafic rock apparently consisting of a meshwork of prismatic plagioclase and granular ferromagnesians, probably pyroxene and amphibole, with traces of accessory pyrite. Both magnetic and non magnetic types were observed. (M3, M63).

These occur as isolated outcrops and floaters on the ridge west of Tullabardine Dam. I suspect they represent small dykes or plug intrusives.

Qg: Superficial Gravels.

Generally unsorted, unlithified bouldery gravels and clays occupying much of the (old) valley of the Tullabardine Creek below the diversion dam. They contain a wide range of clast types: quartzitic metasediments, felsic volcanics and Owen type conglomerate. They are considered to represent fluvioglacial deposits.

4.2. STRUCTURE

The majority of the volcanic rocks are quite massive and give no indications of dip whilst the limited outcrop and difficult terrain make it impossible to trace lithological contacts.

Measurements of linear preferred orientations of vesicles/amygdales in lithotype Evd indicated shallow plunges around 35^0 to all points of the compass in the areas around Tullabardine Dam whereas in the far south west corner of the licence plunges of about 80^0 to the south were observed.

The fine cherty tuffaceous siltstones within the volcanic group occasionally display fine bedding laminations, strikes recorded are more or less northerly with easterly dips ranging from 20^0 to 70^0.

Some of the finer felsic tuffs also occasionally display fine regular bedding and in these also strikes are generally northerly (+ 30^0) with moderate easterly dips averaging about 40^0. The only confident westerly dip observed is at 6000N/9885E where medium grained felsic ash tuffs strike 040^0 and dip at 50^0 to the NW apparently dipping under a massive rhyolite unit which is autobrecciated at the base. Within 60m to the east of this contact are well exposed bedded ash tuffs with bedding trends in the range 320^0-0^0 and dips of about 60^0 to the east. These rocks also display small scale asymmetric and locally isoclinal folds indicative of pre-consolidation flow or slump. It seems possible that the dip reversal at the contact between tuffs and rhyolite could be due to "push" structures developed by a coherent viscous lava flowing over or into a poorly consolidated pyroclastic pile.

The overall impression is that the volcanics generally dip at moderate angles to the east. The general absence of a penetrative cleavage supports the notion of relatively open folding in the volcanic rocks and it is not likely that they could be overturned.

In the dominantly sedimentary rocks of the north eastern part of the licence bedding orientations are again fairly consistently northerly with moderate dips averaging 40^0 to the east. Only one confident younging direction (to the east) was recorded, on the far north east of the grid, but there appears to be generally little structural complication.

A moderately well developed slaty cleavage is commonly present in the finer sediments; it also has a general northerly trend and steep sub vertical dips (usually within about 10^0 either side of vertical).

In the south eastern part of the area this cleavage becomes the dominant feature and the sedimentary layering is partly transposed parallel to the steeply dipping cleavage planes.

The actual contact between massive volcanics and bedded sediment associations has been observed at only one locality, in the gully just west of Mackintosh Dam. Here massive vesicular and magnetic Evd to the west is in sharp contact with intensely cleave tuffaceous/ sericitic siltstone to the east. The contact appears to trend about 350^0 and would seem to be steep but I was unable to get a dip measurement. (There was a torrent of water coming down the western gully as the lake was spilling at that time).

There is only a weak, spaced fracture cleavage in the Evd unit but it does parallel cleavage in the adjacent siltstones. The contact is probably a fault.

Exposures in road cuttings near the picnic area east of Tullabardine Dam enable the same contact to be fairly closely "pinned down" but not actually observed. The outcrop on the south side of the road consists of strongly foliated chloritic "schist" possibly representing cataclastite derived from the the adjacent Evd and again implying a fault contact.

This strongly cleaved zone, trending SSW from the boat launching ramp, has been recognised as part of the major Henty Fault Zone and has been recently described by Berry, 1986 and McNeill 1986.

It seems the Henty Fault Zone was formed by ductile strain related to Devonian reverse (thrust) movement on a steeply west dipping fault contact between sediments and volcanics. Apparently ductile strain and cleavage formation was concentrated close to the (volcanic) hanging wall and waned to the east over a distance of about 1km.

McNeill's mapping (1986) shows the Henty Fault Zone extending its strike NNE along the lakes' western shore just outside the north eastern boundary of EL 42/85. He depicts another, north trending, fault at the contact between volcanics and sediments in the north eastern part of the licence and mentions the possibility of a faulted unconformity at this contact.

I have not observed this fault structure and do not feel the necessity of invoking a fault contact as the (admittedly limited) dip information suggests gross conformity between the volcanics and sediments which appear to overly them. Furthermore, the lithologies themselves with felsic volcanic epiclastics and possible true pyroclastics interbedded with turbiditic greywackes and the presence of vesicular dacitic extrusive or intrusive in the far north-east of the licence suggest a broadly transitional contact.

I envisage a partly emergent felsic volcanic terrain to the west with onlapping clastic sedimentation in a basin to the east. Sedimentation in the basin is at times dominated by clastic input from a Pre-Cambrian medasedimentary provenance and at times overwhelmed by influx of volcanic ash, debris flows and possible lava and pyroclastic flows from the felsic volcanic terrain. As volcanism gradually wanes detrital turbiditic sedimentation takes over and (as we observe a few hundred metres up sequence) greywackes and siltstones begin to dominate.

4.3. STRATIGRAPHY AND CORRELATIONS

Mapping by McNeill (1986) and discussion by Corbett (1986) confirm that the volcanic rocks of the western two thirds of EL 42/85 belong to the Central Volcanic Sequence of the Mt Read Volcanics. They form part to "the lava rich sequence between Mt Black and Mt Block" but at this stage the relationship with the apparently basal pyroclastic unit (of the Central Volcanic Sequence) which hosts stratiform mineralization at Rosebery-Hercules is not known.

The sedimentary association of the north east part of EL 42/85 is assigned to the Dundas Group which here overlies the Central Volcanic Sequence.

McNeill's map (1986) indicates the strongly deformed sediments in the Lake Mackintosh spillway to launching ramp area belong to the Farrell Slates and seems to imply that these are entirely allochthonous within the Henty Fault zone. On a compositional-lithological basis I can see no need for this distinction. The rocks of the so called Farrell Slates in the Mackintosh spillway area are compositionally similar to the Dundas Group Sediments in the north east of the licence. The significant difference lies in the degree of deformation and cleavage development.

I refer to regard the Farrell slates as part of the Dundas Group which have been zonally affected within the Henty Fault Zone by strong ductile strain. In the Lake Mackintosh area the Henty Fault Zone south of about AMG 5385000N marks the (faulted) boundary between the Central Volcanic Sequence and the Dundas Group. North of 5385000N the CVS/Dundas contact diverges away to the north and the Henty Fault Zone continues north-north west within the Dundas Group.

5. STREAM GEOCHEMICAL RESULTS

Stream geochemical results are tabulated in Appendix I and plotted on Plate 2.

5.1. -80 Mesh Results

A quick visual scan of the data has allowed the following impressions:

Elements	Range (PPM)	Comments
Cu	<2 to 31	Majority under 10 ppm
Pb	<5 to 32	Fairly even spread
Zn	2 to 165	Majority under 40. Cluster of over 100's in stream headwaters near 3400N and 3800N, associated with high (1800-6200) Mn.
Ag	<1 to 1	only a single sample with 1 g/t Ag. Correlates with high 31 ppm Cu in sample E15929.
Mn	30 to 6200	Majority in range 100-400
As	<20 to 70	
Au	<0.005 t 0.180	Only 12 samples over 0.01.

Obviously the Cu, Pb, Zn results are fairly low.

The cluster of Zn values in the range 100-165 near 3400 and 3800N have no observed geological explanation. The correlation with high Mn might suggest unusual precipitation of Fe/Mn hydrousoxides in the stream and subsequent "scavenging" of zinc by these oxides.

The coincidence of "high" Cu (31) and Ag (1) in sample no 15929 (which was insufficient for a gold determination) is interesting in view of the fact that it is located at the foot of the slope about 100m west of an occurrence of a lens (or raft?) of black pyritic slate (Rock Chip Sample 19832) associated with slump disrupted fine cherty siltstone/tuff and pyro-epiclastic breccia(?) at 4800N/10165E. The fact that there is no downstream trail may be accounted for by the broad horizontal forest covered swamp, several hundred metres wide at this latitude, which might lead to dilution and great lateral dispersion.

The most obviously anomalous results are of gold. However, there is the possibility that these are spuriously high. Accordingly most of the anomalous sites have been re-visited and sampled during the recent geological grid mapping.

The resampled sites are listed below:

Original Sample Location	Gold (ppm)	Resample Number
E 15906	0.045	E 15944
15912	0.020	15945
15900	0.020	15946 (about 15m upstream of original location)
15899	0.180	Not accessible (springs below Lake high water)
15901	0.180	15948
15877	0.025	15950 (about 50m downstream where creek intersects 7600N)
15879	0.050	15951 (about 30m upstream, where creek crosses UTEM loop line)

Duplicates of each sample will be submitted to two laboratories (AMDEL and ANALABS) for check analysis.

of -80 fraction by : Method A7/2 AMDEL
by : Method 309 ANALABS (*See Appendix III)

ALTERATION AND MINERALIZATION

No significant traces of mineralization were observed during geological mapping of EL 42/85.

Extensive hydrothermal alteration and pyritisation, a conspicuous association in most Tasmanian volcanogenic basemetal deposits, was likewise not detected. Most of the volcanic rocks are essentially "fresh".

Traces of disseminated pyrite, sometimes pyrrhotite, is a common but not unexpected, disseminated accessory mineral in most of the felsic volcanic types but rarely exceeds 0.5% by volume. Some of the sedimentary rocks, notably the dark slates also contain minor pyrite.

Disseminated pyrite in the range 1-2% volume was observed in three localities:

i) in association with patchy weak silicification (of unmapped extent) near 5000N/10250E apparently within Evd type extrusive (which normally contains accessory magnetite). This locality sampled in rock chip sample no 19833. (Appndix 2).

ii) Irregular, not extensive, patches of about 1% disseminated pyrite in (partly oxidised) rhyolitic lapilli-crystal tuff at 6200N/9550E. Sampled by rock chip sample 19836. (Appendix 2.).

iii) Patchy 1-2% fine disseminated pyrite occurs in strongly cleaved "schistose" fine quartz-sericite ex tuffaceous siltstone within a couple of metres of the western margin of the Henty Fault zone just west of the Mackintosh Dam. Sampled in rock chip sample no. 19831. (Appendix 2.).

None of these occurrences are expected to yield very anomalous base/precious metal results.

Quartz, quartz + chlorite and quartz + sideritic carbonate are developed on a minor scale as late stage tension gash fillings etc. in many rock types, perhaps most notably the highly deformed parcel of sediments within the Henty Fault zone. No indications of sulphide mineral were observed in these veins. A few localities were sampled (19815, 19830, 19834) but are not expected to yield significant results. (Appendix 2.).

Perhaps the most promising indication of mineralization in the area, to date, is the small lens of pyritic black slate at 4800N/10165E. (Rock chip sample no 19832). (Appendix 2). Although this appears to be a dismembered lens or raft within epiclastics and tuffs showing evidence of preconsolidation slumping, and could not be traced along strike, it does suggest that environments of deposition favourable for accumulation of massive sulphide deposits (quiescent, reducing sedimentation etc.) may have existed locally within the volcanic terrain.

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1:25000 Geological Map; Tullah-Mt Block.

Published: Geological Survey of Tasmania, Department of Mines.

067 **APPENDICES**

8.1. Appendix 1

Stream Geochemical Results

- Stream Sediment Samples (AMDEL)
- BLEG - Samples (AMADEL)
- Pancontinental (ANALABS)

8.2. Appendix 2

Rock Chip Geochemical Results

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3/698/0 - AC 5815/86
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LAKE MACKINTOSH
STREAM SEDIMENTS
15801 - 15839 (39)

REPORT AC 5815/86

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ANALYSIS
g/tonne

SAMPLE MARK	GOLD Au
15804	<0.01
15806	<0.01
15807	<0.005
15810	0.020
15812	0.030
15813	0.025
15816	<0.01
15822	<0.01
15823	<0.01
15824	0.010
15839? → 18539	<0.01

Method: A7/2

amdel

924072

Analysis code A1/1,2 | Report AC 5815/86 | Page G1

NATA Certificate | Order No. 51521 | Results in ppm

Sample	Cu	Pb	Zn	Ag	Mn	As
E 15801	5	6	23	<1	175	<20
E 15802	5	<5	16	<1	74	<20
E 15803	4	10	17	<1	145	<20
E 15804	5	10	22	<1	560	<20
E 15805	4	8	20	<1	700	<20
E 15806	5	10	24	<1	1140	<20
E 15807	3	8	13	<1	84	<20
E 15808	4	8	15	<1	120	<20
E 15809	8	26	37	<1	160	<20
E 15810	4	12	19	<1	235	<20
E 15811	3	18	17	<1	475	<20
E 15812	<2	<5	13	<1	180	<20
E 15813	2	6	12	<1	560	<20
E 15814	5	20	62	<1	1060	20
E 15815	5	26	39	<1	1840	<20
E 15816	5	22	47	<1	1020	25
E 15817	5	30	76	<1	1900	<20
E 15818	6	20	56	<1	2560	<20
E 15819	4	18	22	<1	670	<20
E 15820	3	14	15	<1	660	<20
E 15821	7	14	20	<1	460	<20
E 15822	5	18	23	<1	760	20
E 15823	5	12	23	<1	640	20
E 15824	2	10	34	<1	330	20
E 15827	2	20	40	<1	375	<20
E 15828	7	20	78	<1	770	20
E 15829	6	22	94	<1	2020	25
E 15830	7	24	110	<1	2640	30
E 15831	6	12	64	<1	1380	<20
E 15832	12	30	140	<1	3240	25
E 15833	7	32	165	<1	6200	25
E 15834	10	22	70	<1	3380	20
E 15835	10	24	96	<1	1840	<20
E 15836	8	14	82	<1	890	<20
E 15837	9	22	92	<1	1840	<20
E 15838	14	18	135	<1	1800	<20
E 15839	11	12	38	<1	520	<20
Detn limit	(2)	(5)	(2)	(1)	(5)	(20)

072

924073

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LAKE MACLINTOSH
STREAM SEDIMENTS
15841 - 878 (8)

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073

924074

Analysis code A1/1,2
A2/3
NATA Certificate

Report AC 1761/87

Page G1

Results in ppm

Sample	Cu	Pb	Zn	Ag	Mn	As	Au
19823A							<0.01
19824A							<0.01
19825A							<0.01
19826A							<0.01
19827A							<0.01
19828A							<0.01
15841 Lake Mackintosh	3	10	54	<1	455	25	<0.01
15843 stream sediments	3	14	41	<1	295	<20	<0.01
15844	3	10	52	<1	660	<20	<0.01
15845 15841-878	2	<5	10	<1	345	<20	<0.01
15846	7	16	100	<1	1460	<20	<0.01
15847	2	6	18	<1	540	<20	<0.01
15848	5	10	42	<1	380	<20	<0.01
15878	3	<5	5	<1	92	<20	<0.01
Detn limit	(2)	(5)	(2)	(1)	(5)	(20)	(0.01)

074

924075

The Australian Mineral Development Laboratories
[illegible]ington Street, Frewville, South Australia 5063
[illegible]one Adelaide (08) 79 1662
Telex AA82520

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

amdel

NATA CERTIFICATE

3/698/0 - AC 1176/87
SPT 106/87

1 October 1986

Mr Kari Airas
Pancontinental Mining Ltd
2nd Floor
9-13 Young Street
SYDNEY NSW 2000

LAKE MACKINTOSH
STREAM SEDIMENTS
15849 - 15842 (79)

REPORT AC 1176/87

YOUR REFERENCE:	Purchase Order Number 51525
REPORT COMPRISING:	Cover sheet Page 1 Pages G1 - G2
DATE RECEIVED:	22 September 1986
NOTE:	Samples 15841, 15843-48, 15878, 15893 were listed but not received. Sample 15892 was received but not listed Samples 15895, 928 and 929 had insufficient sample for gold determinations.
Approved Signatory:	Martin R. Hanckel

Manager, Chemistry Services

for Dr William G. Spencer
General Manager
Applied Sciences Group

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075

Report AC 1176/87
Page 1

ANALYSIS
g/tonne

SAMPLE MARK	GOLD Au	SAMPLE MARK	GOLD Au	SAMPLE MARK	GOLD Au	SAMPLE MARK	GOLD Au
015849	<0.005	015873	<0.005	015900	0.020	015924	<0.005
51	<0.005	75	<0.005	01	0.180	26	<0.005
52	<0.005	76	<0.005	02	<0.005	27	<0.005
54	<0.005	77	0.025	03	<0.005	28	I.S.
55	<0.005	79	0.050	05	<0.005	29	I.S.
56	<0.005	80	<0.005	06	0.045	30	<0.005
57	<0.005	82	<0.005	07	<0.005	31	<0.005
58	<0.005	83	<0.005	08	<0.005	34	<0.005
59	<0.005	84	<0.005	09	<0.005	35	<0.005
60	<0.005	85	<0.005	10	<0.005	36	<0.005
61	<0.005	86	<0.005	11	<0.005	37	<0.005
62	<0.005	87	<0.005	12	0.020	38	<0.005
63	<0.005	88	<0.005	13	<0.005	39	<0.005
64	<0.005	90	0.035	14	<0.005	40	<0.005
65	<0.005	91	<0.005	17	<0.005	41	0.130
66	<0.005	92	<0.005	18	<0.005	42	<0.005
67	<0.005	95	I.S.	19	<0.005		
69	<0.005	96	<0.005	20	<0.005		
70	<0.005	97	<0.005	21	<0.005		
71	<0.005	98	<0.005	22	<0.005		
72	<0.005	99	0.180	23	<0.005		

Method: A7/2

I.S. = Insufficient sample

Analysis code A1/1,2 Report AC 1176/87 Page G1

NATA Certificate Results in ppm

Sample	Cu	Pb	Zn	Ag	Mn	As
15849	5	6	20	<1	317	50
15851	2	12	23	<1	620	30
15852	<2	10	15	<1	88	35
15854	<2	8	11	<1	130	25
15855	<2	6	11	<1	80	25
15856	<2	10	13	<1	205	<20
15857	<2	6	8	<1	92	<20
15858	2	12	13	<1	175	<20
15859	<2	12	15	<1	125	<20
15860	2	10	13	<1	115	<20
15861	<2	8	10	<1	76	<20
15862	<2	10	11	<1	88	<20
15863	<2	8	13	<1	250	<20
15864	<2	12	15	<1	275	<20
15865	<2	8	15	<1	125	20
15866	<2	8	12	<1	125	<20
15867	<2	10	19	<1	700	30
15869	<2	10	21	<1	485	<20
15870	3	12	26	<1	690	35
15871	4	6	19	<1	455	20
15872	5	8	16	<1	280	<20
15873	2	<5	10	<1	150	30
15875	3	6	11	<1	110	<20
15876	3	6	11	<1	110	<20
15877	<2	<5	2	<1	30	<20
15879	2	<5	3	<1	30	<20
15880	7	12	20	<1	355	20
15882	6	12	18	<1	465	40
15883	3	8	21	<1	510	20
15884	4	8	20	<1	320	30
15885	3	10	38	<1	1720	30
15886	2	8	15	<1	340	<20
15887	3	8	17	<1	220	<20
15888	3	10	19	<1	98	<20
15890	5	10	21	<1	135	<20
15891	4	8	17	<1	100	<20
15892	3	7	4	<1	46	20
15895	8	22	25	<1	580	30
15896	3	12	11	<1	225	25
15897	5	16	19	<1	610	30
15898	4	14	14	<1	480	35
15899	3	20	26	<1	40	<20
Detn limit	(2)	(5)	(2)	(1)	(5)	(20)

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924078

Analysis code A1/1.2 Report AC 1176/87 Page G2

NATA Certificate Results in ppm

Sample	Cu	Pb	Zn	Ag	Mn	As
15900	4	12	18	<1	520	25
15901	4	16	15	<1	500	20
15902	2	10	5	<1	52	25
15903	3	16	13	<1	205	25
15905	5	16	31	<1	190	40
15906	3	14	25	<1	140	20
15907	4	16	23	<1	210	<20
15908	2	8	8	<1	62	35
15909	2	10	8	<1	60	20
15910	4	10	23	<1	220	<20
15911	<2	8	6	<1	135	<20
15912	<2	8	7	<1	90	20
15913	2	14	41	<1	3180	30
15914	2	12	14	<1	190	25
15917	2	12	14	<1	185	45
15918	4	16	20	<1	580	35
15919	9	10	34	<1	1440	35
15920	6	10	24	<1	490	50
15921	6	14	18	<1	145	30
15922	4	12	20	<1	280	35
15923	4	10	24	<1	265	45
15924	4	10	20	<1	440	30
15926	4	10	12	<1	620	30
15927	<2	<5	6	<1	36	30
15928	6	8	23	<1	150	30
15929	31	24	54	1	570	70
15930	5	6	34	<1	120	25
15931	4	12	12	<1	105	30
15934	4	10	17	<1	140	45
15935	4	8	13	<1	290	20
15936	3	12	12	<1	225	35
15937	3	12	13	<1	335	25
15938	4	14	28	<1	440	25
15939	19	28	44	<1	590	40
15940	10	18	18	<1	140	35
15941	5	16	19	<1	580	40
15942	5	14	16	<1	475	50
Detn limit	(2)	(5)	(2)	(1)	(5)	(20)

078

924079

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

3/698/0 - AC 69/87
SPT 213/86

10 July 1986

amdel

NATA CERTIFICATE

Mr W. Herrmann
Geologist
Pancontinental Mining Limited
2nd Floor
9-13 Young Street
SYDNEY NSW 2000

LAKE MACKINTOSH
BLEG - SAMPLE (1)

REPORT AC 69/87

YOUR REFERENCE: Purchase Order Number 51522

REPORT COMPRISING: Cover Sheet

DATE RECEIVED: 7 July 1986

ANALYSIS - ng/Kg

SAMPLE MARK	GOLD Au
E15826	145 ppb
Method: A3	

Approved Signatory: Martin R. Hanckel

[signature] for

Manager, Chemistry Services

for Dr William G. Spencer
General Manager
Applied Sciences Group

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NATA CERTIFICATE

3/698/0 - AC 1285/87
SPT 108/87

3 October 1986

Mr K. Airas
Pancontinental Mining Limited
2nd Floor
9-13 Young Street
SYDNEY NSW 2000

LAKE MACKINTOSH
BLEG - SAMPLES (3)

REPORT AC 1285/87

YOUR REFERENCE: Purchase Order Number 51526

REPORT COMPRISING: Cover sheet
Page 1

DATE RECEIVED: 29 September 1986

Approved Signatory: Martin R.Hanckel

Manager, Chemistry Services

for Dr William G. Spencer
General Manager
Applied Sciences Group

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080

Report AC 1285/87
Page 1

ANALYSIS

ng/kg

SAMPLE MARK	GOLD Au
E15904	50
16	<50
32	<50

Method: A3

ANALABS
A division of MacDonald Hamilton & Co. Pty. Ltd.
Phone (09) 458 7999 52 Murray Road, Welshpool, W.A. 6106 Telex AA92560
TLX: AA 59224

081

ANALYTICAL REPORT No. 109.5.08.03965

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

LAKE MACKINTOSH
PANCONCENTRATES (14)

Pancontinental Mining Ltd.
2nd Floor, 9-13 Young St.
Sydney
N.S.W. 2000

ORDER No.	PROJECT
51532	

DATE RECEIVED	RESULTS REQUIRED
05/11/86	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
1	10/11/86	1	14

STATE OF SAMPLES		PRE-TREATMENT							ANALYSIS		
REFER BELOW	SAMPLE NUMBERS	DRY	CRUSH	SPLIT	PULVERISE	SIEVE	OTHER SEE REMARKS	NONE	REFER TO ANALYSIS SECTION	PREPARATION	METHOD
	Various	SO Prep: 006,016							Cu,Pb,Zn,Ag/102,Weigh/199		
	Various	SO							Au/329		
	Various	SO							Au/334		

REMARKS

RESULTS TO

Pancontinental Mining Ltd.
2nd Floor, 9-13 Young St.
Sydney
N.S.W. 2000

RESULTS TO

STATE OF SAMPLES	
hole core	WC
split core	SC
cutting	CU
ock	Ro
oil	SO
ulp	PU
water	WA
tissue	TI
ream sediment	SS
eavy mineral	HM

ANALYSIS — PREPARATION			
perchloric acid	A1	cold acid	CA
hydrochloric acid	A2	specific sulphide	SS
nitric acid	A3	other mixed acids	Ma
aqua regia	A4	alkaline attack	AA
nitric-perchloric	A5	volatilization	VO
HF mixture	A6	ignition	IG
HF under pressure	A7	pressed powder (XRF)	PP
fusion	A8	glass fusion (XRF)	GF

ANALYSIS — METHOD	
atomic absorbtion	AAS
x-ray fluorescence	XRF
spectrophotometry	SPEC
colorimetry	COL
chromatography	CHR
titration	TTN
other chemicals means	CHEM
miscellaneous	MISC
fluorescence	FLUOR
inductively coupled plasma	ICP

AUTHORISED OFFICER ____________

082

ANALABS

A division of MacDonald Hamilton & Co. Pty. Ltd.

924083

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
)	109.5.08.03965	10/11/86	51532	1 OF 1

TUBE No.	SAMPLE No.	Cu	Pb	Zn	Ag	Weigh	Au	Au		
1	15 825	5	23	55	0.2	10.575	-	0.003		
2	15 840	3	11	45	<0.1	77.163	<0.01	-		
3	15 842	4	11	33	<0.1	70.935	<0.01	-		
4	15 850	5	12	39	<0.1	110.95	<0.01	-		
5	15 853	5	7	20	<0.1	18.930	-	0.008		
6	15 868	5	14	49	<0.1	77.812	<0.01	-		
7	15 874	11	11	38	0.1	27.620	-	0.005		
8	15 881	10	56	42	0.1	58.203	0.02	-		
9	15 889	7	8	19	0.1	67.308	<0.01	-		
10	15 892	41	9	50	<0.1	3.343	-	<0.001		
11	15 894	13	6	17	<0.1	10.992	-	0.024		
12	15 915	6	7	25	<0.1	53.258	<0.01	<0.001		
13	15 925	6	11	21	0.1	48.017	<0.01	<0.001		
14	15 933	4	4	12	<0.1	15.437	-	0.034		
15										
16										
17										
18										
19										
20										
21										
22										
23	DETECTION	1	1	1	0.1	0.001	0.01	0.001		
24	UNITS	PPM	PPM	PPM	PPM	GMS	PPM	PPM		
25	METHOD	102	102	102	102	199	329	334		

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

AUTHORISED OFFICER

083

8.2. Appendix 2

924084

Rock Chip Geochemical Results

- Elements assayed in percent -

	M113	M1[illegible]	M121
SIO2	75.90	70.20	74.50
TIO2	0.25	0.56	0.30
AL2O3	11.00	13.50	12.90
FE2O3	1.29	4.10	2.00
MNO	0.03	0.09	0.05
MGO	0.18	0.33	0.43
CAO	0.36	1.09	0.67
NA2O	0.54	4.36	2.40
K2O	8.50	1.32	4.72
P2O5	0.01	0.14	0.02
LOI	0.76	2.54	1.39

- Elements assayed in PPM -

	M113	M1[illegible]	M121
AG	0.10	0.10	0.10
AS	2.00	7.00	10.00
CU	3.00	9.00	4.00
MN			
PB	92.00	52.00	32.00
ZN	16.00	42.00	25.00
BA	1220.00	490.00	980.00
BI	4.00	4.00	4.00
CO	2.00	3.00	2.00
CR	6.00	22.00	22.00
MO	4.00	4.00	4.00
NB	10.00	10.00	14.00
NI	5.00	2.00	3.00
RB	210.00	48.00	160.00
SB	4.00	6.00	6.00
SE	2.00	2.00	2.00
SR	140.00	435.00	335.00
V	10.00	10.00	10.00
W	10.00	10.00	10.00
Y	38.00	36.00	40.00
ZR	200.00	200.00	255.00

085

	M40	M55	M63	M67	M69	M72	M78
- Elements assayed in percent -							
SIO2	73.50	62.00	55.50	75.30	64.90	68.40	71.70
TIO2	0.24	0.71	1.31	0.26	0.72	0.51	0.36
AL2O3	12.30	15.40	15.20	13.00	15.60	14.50	13.50
FE2O3	2.02	5.75	11.10	2.14	5.10	4.50	2.26
MNO	0.02	0.10	0.17	0.05	0.09	0.06	0.07
MGO	0.49	1.76	3.20	0.72	1.42	1.20	0.55
CAO	0.15	2.98	6.50	1.42	2.42	2.70	2.78
NA2O	2.00	3.30	3.22	2.24	3.82	3.96	2.22
K2O	6.25	3.76	1.98	4.46	4.08	3.60	3.56
P2O5	0.01	0.11	0.22	0.01	0.14	0.08	0.01
LOI	1.45	1.86	2.20	1.24	1.82	1.20	1.56
- Elements assayed in PPM -							
AG	0.10	0.10	0.10	0.10	0.10	0.10	0.10
AS	2.00	7.00	2.00	4.00	6.00	7.00	2.00
CU	5.00	6.00	13.00	6.00	1.00	6.00	2.00
MN							
PB	10.00	36.00	20.00	50.00	24.00	20.00	28.00
ZN	36.00	86.00	82.00	37.00	42.00	30.00	33.00
BA	1240.00	910.00	560.00	930.00	1100.00	790.00	730.00
BI	4.00	4.00	4.00	4.00	4.00	4.00	4.00
CO	3.00	91.00	17.00	4.00	8.00	8.00	2.00
CR	46.00	32.00	64.00	5.00	16.00	16.00	5.00
MO	4.00	4.00	4.00	4.00	4.00	4.00	4.00
NB	16.00	12.00	6.00	16.00	14.00	10.00	12.00
NI	4.00	5.00	4.00	4.00	4.00	9.00	4.00
RB	155.00	135.00	47.00	200.00	140.00	62.00	140.00
SB	4.00	4.00	4.00	6.00	4.00	8.00	4.00
SE	2.00	2.00	2.00	2.00	2.00	3.00	2.00
SR	105.00	415.00	455.00	165.00	450.00	280.00	340.00
V	10.00	10.00	10.00	10.00	10.00	10.00	10.00
W	10.00	10.00	10.00	10.00	15.00	10.00	10.00
Y	32.00	38.00	34.00	44.00	40.00	38.00	34.00
ZR	155.00	210.00	265.00	115.00	245.00	200.00	250.00

924086

ANALABS

A division of MacDonald Hamilton & Co. Pty. Ltd.

Phone (09) 458 7999 — 52 Murray Road, Welshpool, W.A. 6106 — Telex AA92560

ANALYTICAL REPORT No. 109.3.08.04057

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

Pancontinental Mining Ltd.
2nd Floor, 9-13 Young St.
Sydney
N.S.W. 2000

ORDER No.	PROJECT
51534	

DATE RECEIVED	RESULTS REQUIRED
09/12/86	ASAP

No. OF PAGES OF RESULTS	DATE REPORTED	No. OF COPIES	TOTAL No. OF SAMPLES
2	06/01/87	1	17

STATE OF SAMPLES REFER BELOW	SAMPLE NUMBERS	PRE-TREATMENT: DRY / CRUSH / SPLIT / PULVERISE / SIEVE / OTHER SEE REMARKS / NONE	ANALYSIS: REFER TO ANALYSIS SECTION	PREPARATION	METHOD
	~~[illegible]~~	~~RO Prep: 00[illegible],007,[illegible]~~	~~Cu,Pb,Zn,Ag,Mn/101,[illegible]~~		
	~~[illegible]~~	~~RO~~	~~Au/309~~		
	19829/Z6	RO Prep: 006,009,016,013,018	Cu,Pb,Zn,Ag,Fe,Mn/101,As/114		
	19829/Z6	RO	Au/309		

REMARKS

RESULTS TO

Pancontinental Mining Ltd.
2nd Floor, 9-13 Young St.
Sydney
N.S.W. 2000

RESULTS TO

STATE OF SAMPLES		ANALYSIS — PREPARATION				ANALYSIS — METHOD	
whole core	WC	perchloric acid	A1	cold acid	CA	atomic absorbtion	AAS
split core	SC	hydrochloric acid	A2	specific sulphide	SS	x-ray fluorescence	XRF
cutting	CU	nitric acid	A3	other mixed acids	Ma	spectrophotometry	SPEC
rock	Ro	aqua regia	A4	alkaline attack	AA	colorimetry	COL
soil	SO	nitric-perchloric	A5	volatilization	VO	chromatography	CHR
pulp	PU	HF mixture	A6	ignition	IG	titration	TTN
water	WA	HF under pressure	A7	pressed powder (XRF)	PP	other chemicals means	CHEM
tissue	TI	fusion	A8	glass fusion (XRF)	GF	miscellaneous	MISC
stream sediment	SS					fluorescence	FLUOR
heavy mineral	HM					inductively coupled plasma	ICP

AUTHORISED OFFICER

924087.

087

ANALABS

A division of MacDonald Hamilton & Co. Pty. Ltd.

924088

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	109.5.08.04057	06/01/87	51534	1 OF 2

TUBE No.	SAMPLE No.	Cu	Cu	Pb	Pb	Zn	Zn	Ag	Ag	Fe
10	19629	35	–	45	–	10	–	<0.5	–	1.25
11	19830	5	–	<5	–	5	–	<0.5	–	0.52
12	19831	20	–	40	–	15	–	<0.5	–	0.87
13	19832	40	–	50	–	55	–	<0.5	–	2.95
14	19833	10	–	20	–	35	–	<0.5	–	2.30
15	19834	20	–	40	–	20	–	<0.5	–	2.50
16	19835	20	–	20	–	115	–	<0.5	–	5.10
17	19836	10	–	5	–	35	–	<0.5	–	3.10
18										
19										
20										
21										
22										
23	DETECTION	5	1	5	1	5	1	0.5	0.1	0.05
24	UNITS	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	%
25	METHOD	101	102	101	102	101	102	101	102	101

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

AUTHORISED OFFICER

088

ANALABS

A division of MacDonald Hamilton & Co. Pty. Ltd.

924089

ANALYTICAL DATA

SAMPLE PREFIX	REPORT NUMBER	REPORT DATE	CLIENT ORDER No.	PAGE
	109.5.08.04057	06/01/87	51534	2 OF 2

TUBE No.	SAMPLE No.	Mn	As	Au
10	19829	35	9	0.017
11	19830	35	2	<0.008
12	19831	20	22	0.040
13	19832	160	66	<0.008
14	19833	430	5	<0.008
15	19834	2450	9	<0.008
16	19835	1500	2	<0.008
17	19836	210	13	<0.008
18				
19				
20				
21				
22				
23	DETECTION	5	1	0.008
24	UNITS	PPM	PPM	PPM
25	METHOD	101	114	309

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

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8.3. Appendix 3

Results and Notes of the Additional Stream Geochemical Sampling

090

STREAM GEOCHEMISTRY,

resampling on sites of anomalous gold.

Sites, where anomalous results of gold were obtained, were resampled. Douplicate samples were collected and the -80 mesh fraction was assayed for gold separately in laboratories at AMDEL (method A7/2) and ANALABS (method 309). Results of analysis are presented in Table 1.

TABLE 1

Original Sample No.	Repeated Sample No.	AMDEL Original Sampling	AMDEL Repeated Sampling	ANALABS Repeated Sampling
15906	15944	0.045	0.025	<0.008
15912	15945	0.020	<0.005	0.008
15900	15946	0.020	0.040	0.300
15901	15948	0.180	0.040	<0.008
15949	15949	-	0.030	<0.008
15877	15950	0.025	<0.005	<0.008
15879	15957	0.050	0.015	<0.008

It is hard to draw any significant conclusions from the three sets of results.

Sampling sites 15900/15946 and 15910/15948 are close to each other. Samples show weakly anomalous results nearly in all assays. A follow up sampling around them will, therefore, be required.

091

8.4. Appendix 4

Petrological Examination

092

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

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

Our ref: P6/82/408a

Your ref: Purchase Order No. 14203

PETROLOGICAL EXAMINATION OF FIFTEEN
ROCK SAMPLES

Report No: P6/82/408a

5th January, 1987.

For: Pancontinental Mining Limited.

Dr. B.J. Barron,
Consulting Petrologist.

093

Sample No. M63 Jdl 3800N/9750E

Rock Type. Partly altered quartz microdiorite of shallow intrusive (?dyke) emplacement.

Hand Specimen A massive medium to fine grained mid green-grey sample for which K-feldspar staining gave weak positive results. The sample is not magnetic.

Thin Section. This igneous sample has a holocrystalline subophitic texture with an average grain size of about 0.3 mm. It is sparsely microporphyritic with rare crystals reaching 1 mm across. The latter include almost colourless clinopyroxene with narrow partial rims of pale brown clinopyroxene and associated red-brown to olive green amphibole. An approximate modal composition for primary phases is as follows: calcic plagioclase 55%; hornblende 10%; clinopyroxene 8%; quartz 12%; degraded skeletal titaniferous opaque oxide microphenocrysts 8%; K-feldspar 5%; and 2% of accessory phases including apatite; sphene and fine grained opaque oxides.

The calcic plagioclase is present as a mat of unoriented elongate laths that are partly albitised and partly clouded by dusty "sericite" and carbonate ± microgranular epidote. Ragged to acicular crystals of pale brown hornblende, on the other hand, are intergrown with pale green actinolitic amphibole peripherally, with variable proportions of patchy epidote, carbonate, and chlorite. Unlike the coarser colourless clinopyroxene microphenocrysts, the lath shaped clinopyroxene crystals are pale yellow-green and partly converted to pale green wispy actinolitic amphibole. Anhedral quartz patches, and patches of quartz-K-feldspar micrographic intergrowth partly enclose plagioclase laths, hornblende and clinopyroxene crystals. The skeletal titaniferous opaque oxide microphenocrysts retain lamellar intergrowth textures, with alternate lamellae degraded to white leucoxene.

The holocrystalline but medium to fine grained texture of this intrusive ignrous sample suggests shallow intrusive (?dyke) emplacement, and its primary modal composition suggests a quartz microdiorite parent.

094

Sample No. M119 Ees 7200N/9700E

Rock Type. Partly altered fine grained weakly banded vitric/ crystal tuff.

Hand Specimen A pale grey fine grained sample in which patchy positive K-feldspar staining defines a weak layering. The sample is not magnetic.

Thin Section. Partial selective alteration in this sample enhances well preserved fine grained pyroclastic relict textures of cuspate glass shards, and broken crystal debris. Recognisable sites of broken angular crystals and cleavage fragments account for about 25% to 30% of the total thin section area and include evenly distributed debris with an average size of about 0.3 mm. Very heavily "sericitised" feldspar sites greatly predominate, with subordinate degraded elongate ragged shaped mica sites that are converted to intergrown microgranular quartz and "sericite". Still other sites are now converted to chlorite, while the ubiquitous sites of previous glass shards now contain finely polygonised secondary K-feldspar. Sparse angular quartz chips reach 0.2 mm across. An abundant exceptionally fine grained rock matrix also contains abundant clouded K-feldspar, sphene dust, chlorite patches, "sericite" (or pyrophyllite, paragonite etc.) and secondary albite. Rare once-glassy volcanic lithic fragments contain abundant unoriented minute crystallines too narrow for accurate microscopic resolution. Primary accessory crystal debris includes apatite, degraded opaque oxides and rare subhedral cubic oxidised ?sulphide crystal sites. Several narrow branching microfractures and a narrow oxidised surface zone are coated with yellow-brown limonitic oxides due to weathering. The weak banding outlined by K-feldspar staining of the hand specimen is not particularly obvious in thin section.

The well preserved relict textures of glass shards and selectively altered fine grained broken angular crystal debris clearly indicates a pyroclastic origin for this sample. It may be described as a partly altered fine grained weakly banded vitric crystal tuff.

<u>Sample No.</u> M67 Cef 4000N/9750E

<u>Rock Type.</u> Extremely fine grained K-feldspar rich finely polygonised cherty rock, most likely of shard-rich vitric tuffaceous origin.

Hand Specimen A very fine grained compact massive (cherty) sample with a narrow pale yellow-brown rind on an exposed (weathered) surface. K-feldspar staining gave strong positive results.

<u>Thin Section.</u> This is an extremely fine grained sample in which textural features are poorly preserved. Sparse recognisable very angular crystal debris rarely exceeds 0.1 mm, and this comprises albitised plagioclase, quartz, K-feldspar and rare small flattened lenses (?lithic fragments) of carbonaceous material. These crystal chips and possible lithic fragments are "suspended" in a voluminous, extremely fine grained felsic matrix (mainly K-feldspar - see staining) intergrown with wispy "sericite" (or illite etc.), ubiquitous heavily clouded patches of almost cryptocrystalline epidote (or clinozoisite) and fewer sphene granules. There are very vague outlines in the extremely fine grained rock matrix of possible cuspate glass shards, but these are largely obscured by the ubiquitous, extremely fine grained polygonisation.

Accessory very small (up to 0.15 mm) cubic shaped crystals and aggregates of pyritic sulphides account for less than 0.5% of the total thin section area. A very narrow veinlet which cuts across the rock is filled with microgranular K-feldspar, minor quartz, small aggregates of ?clinozoisite with anomalous birefringence and several patches of yellow stained and oxidised ?chlorite.

The exact composition and texture of this sample is obscured by very fine polygonisation. The presence of very abundant K-feldspar (see staining of offcut), and vague outlines of possible glass shards indicates that most material is derived from an acidic volcanic source, but the presence of rare carbonaceous lenses, and lack of clear glass shard textures suggests partial reworking. The sample may be described rather tentatively as an extremely fine grained K-feldspar rich finely polygonised cherty rock, most likely of shard-rich vitric tuffaceous origin and acidic composition.

Sample No. M69 Epa 4200N/9800E

Rock Type. Partly altered and devitrified poorly sorted medium to fine grained K-feldspar-rich crystal tuff.

Hand Specimen A medium to fine grained somewhat massive mid green-grey sample for which K-feldspar staining gave strong positive results outlining very abundant small angular to irregular shaped crystal sites. Rare traces of minute sulphide crystals are accessory.

Thin Section. Poorly sorted fragmental texture is well preserved in this sample which is partly altered and weakly foliated. Broken angular crystal debris and glomeroporphyritic aggregates predominate, accounting for about 15% to 20% of the total thin section area, while a further 10% of the sample comprises barely recognisable lithic debris. The angular crystal chips and cleavage fragments mostly lie within the size range 0.2 mm to 0.5 mm and include very abundant mottled K-feldspar, albite clouded with wispy sericite and epidote granules, as well as sparse, very angular to irregular chips of quartz. Lithic debris includes devitrified glassy volcanic fragments with subparallel microfractures. Elsewhere are lithic fragments enclosing sparse albitised plagioclase microphenocrysts set in a microgranular devitrified felsic matrix. Still other sites once comprised biotite as elongate deformed flakes, but these are now pseudomorphed by microgranular secondary K-feldspar intergrown with trails of minute sphene granules. Still other sites of degraded mafic phases now are replaced by aggregates of chlorite and epidote granules. Accessory titaniferous oxide microphenocrysts are marked by white leucoxene ± sphene granules.

The voluminous rock matrix comprises dense aggregates of secondary phases including the following; albite, quartz, K-feldspar, ubiquitous sphene granules and patchy aggregates of epidote and chlorite.

This sample has a poorly sorted to chaotic fragmental (pyroclastic) texture with no evidence of sedimentary reworking. The debris is derived from a K-feldspar rich acidic volcanic source but there is also altered mafic crystal debris, possibly suggesting a dacitic parent type. The present rock may be described as a partly altered and devitrified poorly sorted medium to fine grained K-feldspar-rich crystal tuff.

Sample No. M55 Epp 3650N/9600E

Rock Type. Crystal/lithic tuff of acidic primary composition that has undergone low grade selective alteration and weak (metamorphic) recrystallisation.

Hand Specimen A rather massive fine grained mid grey sample containing sparse medium grained pale grey ?feldspar crystal sites and fewer dark green-grey ?mafic crystal sites. K-feldspar staining gave strong positive results for abundant angular crystal debris, and weaker positive results for the voluminous matrix fraction.

Thin Section. The texture of the present sample is somewhat similar to that of the previous sample M69, however it is considerably coarser grained. It retains a chaotic unsorted texture defined by at least 40% of angular crystal and altered lithic debris. The crystal fragments vary in size up to 2 mm across, but most are less than 1 mm across. Poorly defined lithic fragments, on the other hand, reach up to 3 mm across, and account for about 30% of the debris. The angular crystal debris including cleavage fragments comprise very abundant albitised and clouded plagioclase enclosing clusters of minute epidote granules, as well as patches of wispy "sericite" (or illite etc.). Also present are subordinate angular quartz chips and clouded phenocrystic K-feldspar fragments. Sparse altered mafic crystal sites now contain aggregates of epidote or dense fine grained chlorite ± sphene granules. Lithic fragments almost certainly were once-glassy volcanic types but now are devitrified to microgranular K-feldspar, with poorly defined flow bands and perlitic cracks, marked by narrow trails of chlorite, minute sphene granules ± epidote. Elsewhere are fragments and patches now comprising dense granular secondary albite, while other once glassy volcanic material comprises chlorite enclosing numerous wispy feldspar microlites and stout albitised plagioclase phenocrysts that are dislocated or deformed and crowded with wispy "sericite" flakes.

The voluminous much finer grained rock matrix lacks clearly recognisable relict textures and consists of a polygonised felsic mosaic intergrown with very fine grained patchy epidote, sphene granules, chlorite, and traces of fine grained dusty sulphides.

The sample retains a chaotic unsorted fragmental texture and comprises debris from a porphyritic acidic volcanic source. Devitrification and polygonisation of once glassy flow banded material accounts for most of the K-feldspar and albite-rich patches in the sample. The rock may be described as a crystal/lithic tuff of acidic primary composition that has undergone low grade (metamorphic) alteration.

Sample No. M121 Epf 6560N/9525E

Rock Type. Lithic tuff comprising altered and devitrified once-glassy quartz and plagioclase porphyritic lithic and crystal fragments from an acidic volcanic source.

Hand Specimen A mottled sample with pale pink irregular shaped patches and ?crystal sites set in a mid grey fine grained matrix. K-feldspar staining gave positive results for the pale pink mottled patches, and outlines K-feldspar poor patches or fragments.

Thin Section. Outlines of angular to irregular shaped lithic fragments up to 1.5 cm across are rather poorly defined in this sample due to ubiquitous fine polygonisation, mostly due to devitrification. Nevertheless, sparse phenocrysts and glomeroporphyritic aggregates protected by margins of finely devitrified host material retain subhedral prismatic shapes. The latter include partly albitised plagioclase and quartz. Elsewhere are angular and broken plagioclase cleavage fragments, and both quartz and plagioclase crystals that have been shattered in situ. Certain of the feldspar crystals enclose intergrown patches of K-feldspar. The once-glassy to fine grained groundmass fractions of the sparsely porphyritic acidic volcanic fragments now are polygonised to form a K-feldspar-quartz-rich felsic mosaic with variable proportions of albite and numerous small wispy patches of green chlorite. Wispy birefringent clay (?montmorillonite) ± chlorite outlines narrow sub-parallel magmatic flow bands and perlitic cracks in several once-glassy volcanic fragments, while elsewhere are rare small rounded vesicular sites. Small clusters of epidote ± allanite form accessory secondary phases in several albitised plagioclase crystal sites. Small aggregates of limonitic oxides and sphene dust most likely mark sites of previous opaque oxide microphenocrystic debris.

The sample may be simply described as a lithic tuff containing altered and devitrified once-glassy sparsely quartz- and plagioclase porphyritic lithic and crystal fragments from an acidic volcanic source.

Sample No. M78 Epb 5000N/10300E

Rock Type. Partly altered, poorly sorted vitric tuff with sparse lithic fragments and crystal debris from a porphyritic once glassy acid volcanic source.

Hand Specimen A patchy fragmental sample comprising numerous medium to coarse grained pale grey ?feldspar crystal sites and aggregates as well as sparse large angular pale pink lithic fragments. K-feldspar staining gave strong positive results for the fine grained pale pink fragments.

Thin Section. Recognisable angular and broken lithic fragments account for about 30% of the total thin section area, and vary in size up to about 1.5 cm across. Also present are sparse scattered broken angular feldspar cleavage fragments most of which are albitised and clouded plagioclase. The lithic fragments include a variety of related textural types. Most of these enclose phenocrysts and glomeroporphyritic aggregates of albitised plagioclase up to 3 mm across, as well as sparse magmatically rounded and embayed quartz microphenocrysts. The latter are set throughout a fine grained devitrified K-feldspar-rich felsic mosaic with narrow curving perlitic cracks marked by aggregates of wispy chlorite ± montmorillonite. Elsewhere are strongly porphyritic types with glomeroporphyritic clusters of albitised plagioclase set in a dense groundmass of fine grained decussate secondary albite ± wispy chlorite. Aggregates of fine grained epidote are accessory. Still other lithic fragments lack clearly recognisable relict textures except for vague outlines of subparallel magmatic flow lines marked by wispy "sericite" etc., intergrown with trails of chlorite granular albite and accessory fine grained epidote. Rare porphyritic lithic fragments contain albite phenocrysts and degraded opaque oxides, set in massive chlorite.

The voluminous rock matrix which lacks recognisable finer textural features comprises extremely fine grained cherty material with sphene dust and patchy clinozoisite enclosing sparse angular albitised feldspar crystal debris. The latter is clouded with wispy sericite, and sparse aggregates of epidote while throughout the cherty felsic material are poorly preserved cuspate to angular outlines of possible glass shards. In contrast, quite large irregular shaped aggregates of clinozoisite fill veinlets and branching microfractures, as well as possible voids between lithic fragments.

Unsorted fragmental texture is well preserved in this sample and the porphyritic acidic volcanic material is of several different but related textural types. The fragments are "suspended" in a cherty felsic K-feldspar poor matrix retaining poorly preserved outlines of glass shards. The rock may be identified as a partly altered, poorly sorted vitric tuff with sparse lithic fragments and crystal debris from a porphyritic once glassy acidic volcanic source.

<u>Sample No.</u> M113 Evr 6800N/9650E

<u>Rock Type.</u> Sparsely porphyritic rhyolite with very minor selective alteration.

<u>Hand Specimen</u> A massive very fine grained compact pink grey

to mid grey sample with sparse medium grained pale grey to pale pink crystal sites. K-feldspar staining gave very strong positive results for most of the matrix fraction.

Thin Section. This is a sparsely porphyritic fine grained acid volcanic rock containing about 10% of phenocrysts and glomero-porphyritic aggregates mostly within the size range 1 mm up to 3 mm across. Subhedral feldspar phenocrysts predominate, and these commonly have central zones or patches of mottled K-feldspar intergrown with albite dusted with wispy "sericite". Subordinate microphenocrysts of quartz have euhedral to magmatically rounded and embayed shapes. Rare sites of mafic microphenocrysts, however, now are pseudomorphed by assemblages amongst the phases carbonate, chlorite, sphene, "sericite" and small patches of subradiating allanite. The voluminous groundmass fraction shows ubiquitous fine granular devitrification comprising a mosaic of intergrown quartz and K-feldspar domains enclosing very abundant wispy unoriented albite crystallites. Highly irregular shaped patches of secondary products are commonly zoned, with subradiating epidote ± allanite centrally and granular quartz peripherally. These are sites of previous vesicles or miarolitic cavities.

Sparsely porphyritic texture is well preserved in this acid volcanic rock in which minor partial alteration is restricted to sparse phenocryst and vesicle sites. The very large proportion of K-feldspar in the groundmass fraction, together with the presence of significant phenocrysts of alkali feldspar and quartz indicates a rhyolitic composition.

Sample No. M72 Evd (non vesicular) Tullabardine Dam.

Rock Type. Partly altered distinctly porphyritic volcanic flow rock (or very shallow intrusive type) of acidic (rhyolitic or possibly dacitic) primary composition.

<u>Hand Specimen</u> A massive fine grained mid-grey compact sample with more or less evenly distributed medium grained pale grey crystals (phenocrysts) and aggregates. K-feldspar staining gave very strong positive results for the fine grained groundmass fraction.

<u>Thin Section.</u> Porphyritic texture is well developed in this acidic igneous rock, and phenocrysts account for about 25% of the total thin section area. Individual phenocrysts range in size from less than 0.5 mm up to more than 2.5 mm, while glomeroporphyritic aggregates and cognate inclusions reach 3.5 mm across. The phenocrysts include predominant crystals and aggregates of albitised and weakly sericitised plagioclase enclosing abundant dusty epidote granules and traces of carbonate. Very subordinate sites of euhedral mafic microphenocrysts retain shapes suggesting the presence of previous amphibole. These sites now are pseudomorphed by almost monomineralic granular to subradiating epidote with minor chlorite and dusty sphene marking previous cleavage traces. Elsewhere are altered mafic sites with shapes that could have been pyroxene. Accessory subhedral opaque oxide microphenocrysts that are partly degraded to leucoxene ± sphene, almost certainly had titaniferous primary compositions, while minute euhedral acicular apatite crystals also are accessory. Quartz phenocrysts are conspicuously absent. A cognate inclusion consists of decussate albitised plagioclase laths intergrown with mafic crystal sites converted to epidote, chlorite, sphene and carbonate, as well as opaque oxide granules. The very fine grianed felsic groundmass fraction consists of a devitrified mosaic of intergrown K-feldspar and quartz in approximately equal major proportions enclosing abundant evenly distributed elongate prismatic shaped decussate albite microlites, as well as very abundant sphene dust, epidote granules and patches of chlorite.

Partial selective alteration has affected the mafic phenocrysts in this sample obscuring its primary igneous character. Nevertheless it may be tentatively identified as a partly altered distinctly porphyritic volcanic flow rock (or very shallow intrusive type) of acidic (rhyolitic or possibly dacitic) primary composition.

Sample No. M40 Eir 2800N/9325E

Rock Type. Strongly porphyritic fine grained rhyolitic igneous rock that shows only minor patchy selective alteration.

Hand Specimen A pale pink very fine grained massive sample containing evenly distributed abundant coarse grained pale grey to dark grey (quartz) phenocrysts. K-feldspar staining gave very strong positive results for the fine grained groundmass fraction.

Thin Section. Only minor selective alteration and possible fine devitrification has affected this strongly porphyritic acidic igneous rock. Phenocrysts account for about 20% of the total thin section area, and unlike the previous sample M72, quartz phenocrysts greatly predominate with slightly subordinate albitised plagioclase and ragged but degraded biotite phenocrysts. The quartz phenocrysts and aggregates have euhedral and subhedral shapes with fewer crystals that are magmatically well rounded and embayed. Individual quartz phenocrysts range in size up to more than 3 mm across. On the other hand the albite phenocrysts which retain subhedral prismatic shapes are lightly dusted with sericite ± wispy ?montmorillonite. No biotite remains as such, and these sites are pseudomorphed with chlorite, sphene dust and minor intergrown lenses of sericite. Dense patches of decussate "sericite" intergrown with minor chlorite commonly replace central parts of several albitised plagioclase phenocrysts.

The voluminous fine grained groundmass fraction consists of a very fine grained granular to somewhat spherulitic mosaic of quartz and K-feldspar enclosing poorly defined unoriented albite microlites. Accessory patches of secondary phases scattered throughout the groundmass include chlorite, and minor wispy sericite (or montmorillonite). A single narrow vein which cuts across the rock contains abundant secondary albite, quartz and traces of chlorite but no K-feldspar.

This sample is a relatively little altered, strongly porphyritic, fine grained rhyolitic igneous rock containing abundant quartz, albite and degraded biotite phenocrysts set in a K-feldspar rich fine grained groundmass fraction.

Sample No. M124 Esg 7600N/9775E

Rock Type. Weakly foliated silty carbonaceous mudstone (slate) with a narrow band of medium grained sandy siltstone.

Hand Specimen A mid to dark grey fine grained weakly foliated sample for which K-feldspar staining gave weak positive results for extremely fine grains throughout the sample, and for a very narrow band or veinlet.

Thin Section. Clastic sedimentary texture is characteristic of this extremely fine grained sample. It contains about 15% of more or less evenly scattered silt sized (up to 0.06 mm across) angular crystal detritus including K-feldspar grains (see staining) quartz, chlorite-altered mafic crystal debris, and deformed wispy mica flakes (now "sericite"). These are set in an even finer grained matrix of microcrystalline felsic material, minute wispy "sericite" flakes, chlorite, and carbonaceous dust concentrated in discontinuous narrow subparallel to branching trails defining a weak foliation.

This weak foliation cuts across a narrow band (primary bedding) about 1 mm thick, comprising considerably coarser grained material. The detrital grains in this band have extremely angular shapes and mostly lie within the size range 0.06 mm up to 0.2 mm (very fine to fine sand size). The crystal detritus which makes up about 30% of the band includes mostly quartz, mottled and polygonised K-feldspar (see staining), sparse mafic grains converted to chlorite ± sericite together with accessory subhedral zircon crystals and olive green pleochroic tourmaline. Once again, this material is "suspended" in very fine grained secondary products including felsic microcrystalline material intergrown with carbonaceous dust, wispy sericite and chlorite stained by yellow-brown limonitic oxides. Extremely narrow lensed and discontinuous wavy veinlets which cut across the rock are filled with microgranular quartz.

The sample may be described as a weakly foliated silty carbonaceous mudstone (slate) with a narrow band of medium grained sandy siltstone, containing at least some material from an acidic volcanic source. The sample has undergone minor yellow-brown limonitic oxide staining due to near surface weathering.

Sample No. M62 Esl 50m North of Mackintosh Power Station

Rock Type. Foliated deformed and finely recrystallised poorly sorted crystal (lithic) ?tuff, derived from a coarsely porphyritic acidic igneous source.

Hand Specimen A mid grey medium to fine grained sample that is distinctly foliated. No K-feldspar was detected by staining and the rock is not magnetic.

Thin Section. Poorly sorted fragmental texture is well preserved in this sample in spite of strong alteration and foliation. Coarse grained deformed and shattered phenocrystic grains and aggregates of albitised plagioclase and quartz commonly reach 2 mm across. Recognisable broken crystal debris accounts for about 20% of the total thin section area, with stout prismatic shaped albitised plagioclase crystals predominating, that are lightly dusted with sericite, and commonly bent and deformed or even shattered in situ. Certain crystals also show strain shadows and narrow zones of fine polygonisation. Slightly subordinate are phenocrystic quartz grains also showing strain shadows and narrow zones of metamorphic recrystallisation. Deformed and flattened sites of previous ragged biotite flakes now are converted to wispy chlorite with minor intergrown "sericite" enclosing numerous minute zircon inclusions with distinct radioactive haloes. Barely recognisable are lensed and flattened lithic fragments, with polygonised phenocrystic quartz and/or albitised plagioclase, set in a finely recrystallised felsic matrix intergrown with chlorite ± "sericite" ± traces of carbonate.

Relict textural features are not preserved in the voluminous rock matrix which now comprises a dense mat of recrystallised wispy "sericite" (or pyrophyllite, paragonite etc.) intergrown with chlorite in subparallel wavy trails defining a distinct foliation. These bend around the coarse grained crystal debris and deformed phenocrystic aggregates. Elsewhere in the thin section the "sericite" rich material encloses elongate lenses of fine grained polygonised intergrowths of secondary albite and quartz ± chlorite. Small grains of apatite, zircon, and titaniferous oxides converted to clouded sphene dust are accessory.

Identification of the present rock in terms of its parent composition is tenuous due to strong foliation, deformation and partial recrystallisation. The presence of abundant poorly sorted felsic crystal debris and possibly porphyritic lithic fragments suggests a pyroclastic origin, but textural evidence of sedimentary reworking would have been overprinted by tectonic deformation and recrystallisation. The rock may be tentatively identified as a foliated deformed and finely recrystallised poorly sorted crystal (lithic) tuff, that is most likely derived from a coarsely porphyritic acidic igneous source.

Sample No. M123 Epc 7600N/9775E

Rock Type. Partly altered lithic/crystal tuff of acidic primary composition, most likely of mixed origin with a cherty and ?carbonaceous rock matrix.

Hand Specimen A poorly sorted sample containing abundant angular coarse grained pale grey (?feldspar) fragments and fewer dark green-grey mafic ones set in a very fine grianed dark grey matrix. K-feldspar staining gave positive results for sparse coarse grained angular crystal fragments.

Thin Section. Unsorted fragmental texture is characteristic of this pyroclastic rock. Intense patchy and vein-like development of secondary albite has obscured the primary textures and mineralogy of this sample but vague outlines of angular lithic fragments mainly about 1 mm to 3 mm across account for approximately 45% of the total thin section area. A further 15% of the sample consists of angular and broken crystal debris with an grain size ranging from less than 0.3 mm up to about 1 mm across. The lithic clasts almost certainly were once-glassy acidic volcanic types that are now converted to dense aggregates of granular to decussate prismatic crystals of secondary albite, with subparallel discontinuous narrow trails of chlorite marking original flow banding. In other fragments chlorite outlines flattened vesicle sites, while still other lithic fragments retain poorly preserved albitised microlite sites. The crystal debris includes almost equally abundant broken and angular quartz and albitised weakly sericitised plagioclase cleavage fragments as well as subordinate clouded K-feldspar fragments, bent and degraded biotite flakes largely converted to "sericite", mafic grains now converted largely to chlorite, and opaque oxide grains, the sites of which are marked by clouded microgranular sphene.

The poorly defined very fine grained rock matrix is essentially a cherty felsic mosaic (lacking K-feldspar - see staining of offcut) intergrown with sparse wispy sericite flakes, patches of chlorite, sphene and minor ?carbonaceous dust. Traces of disseminated sulphides are largely converted to red-brown limonitic oxides.

The sample has undergone substantial polygonisation and selective development of albite has obscured primary relict textures in sites of acidic volcanic fragments. Nevertheless a poorly sorted fragmental texture is defined by both lithic and broken phenocrystic debris from an acidic volcanic source. The lack of K-feldspar in the rock matrix, and the presence of possible carbonaceous dust suggests partial sedimentary reworking. The rock may be only tentatively identified as a partly altered lithic/crystal tuff of acidic primary composition, that could have a mixed origin, since the volcanic lithic and crystal debris is enclosed within a cherty and partly ?carbonaceous rock matrix.

Sample No. M125 Epp Creek, about 7100N/9250E

Rock Type. Altered and devitrified partly welded vitric tuff enclosing lithic and crystal debris from a porphyritic acidic volcanic source.

Hand Specimen A conspicuously banded sample comprising sub-parallel narrow interlayered dark grey and pale grey fine grained wavy lenses enclosing scattered medium grained pale pink to pale grey phenocryst sites. K-feldspar staining gave weak positive results for several sparse small patches.

Thin Section. The conspicuous wavy lensed layering of the hand specimen is also well defined in thin section since it is enhanced by selective alteration. The layering bends around sparse sites of euhedral prismatic shaped phenocrysts and glomeroporphyritic aggregates ranging in size up to 1.5 mm across. Several of these retain vague outlines of multiple twinning but now are selectively converted to dense carbonate, "sericite" (or illite, pyrophyllite, paragonite etc.) ± accessory secondary quartz and chlorite. Elsewhere are smaller mafic crystal sites, several of which retain subhedral shapes suggesting the presence of an amphibole. These sites are converted to almost monomineralic chlorite ± sphene dust. Still other crystal sites are of partly degraded opaque oxide micropheno-crysts and accessory quartz. Very poorly preserved outlines of sparse deformed lithic fragments include types in which prismatic shaped altered ?feldspar microlite sites are set in a very fine grained matrix rich in clouded ?sphene dust. Other lithic fragments have elongate deformed shapes and possible flow banding but now are finely devitrified to an extremely fine grained felsic mosaic with wispy sericite defining the flow banding. Elsewhere are vague outlines of similar devitrified acidic volcanic lithic fragments in which there are poorly defined outlines of flattened vesicle sites; while rare angular fragments are of fine grained tuffaceous types with sparse small quartz chips. Rare sites of quite well defined cuspate glass shards clearly indicate a tuffaceous parent type for the sample.

The narrow wavy banding of the voluminous rock matrix most likely results from plastic deformation of the volcanic lithic fragments (fiammè) and flattening of glass shard material. Extremely fine grained wispy birefringent layer silicates (sericite or illite, pyrophyllite etc.) are concentrated in lenses adjacent to bands rich in microgranular felsic material (including K-feldspar) ± chlorite. Dusty sphene granules ± yellow-brown oxide dust is accessory.

The presence of rare glass shards, outlines of several types of lithic fragments, as well as phenocryst sites in this finely banded sample attests to its tuffaceous rather than volcanic flow origin. It may be described as an altered and finely devitrified partly welded vitric tuff enclosing sparse lithic fragments and crystal debris from a porphyritic acidic volcanic source. The paucity of quartz phenocrystic material could indicate a dacitic rather than rhyolitic parent type.

Sample No. M68 Evd (vesicular) 4000N/9850E

Rock Type. Partly altered sparsely porphyritic and amygdaloidal fine grained acidic igneous rock of rhyolitic composition.

Hand Specimen A very fine grained compact massive mid-grey sample enclosing sparse small rounded pale grey ?vesicle sites. Several of these react strongly with cold dilute HCl indicating the presence of calcite. K-feldspar staining gave strong positive results for the fine grained groundmass fraction of the rock.

Thin Section. Sparsely porphyritic texture is well preserved in this fine grained acidic volcanic rock, and phenocrysts account for about 10% of the total thin section area. The phenocrysts mostly lie within the size range 0.4 mm up to 1 mm across and include prismatic plagioclase crystals, certain of which show weak primary magmatic zoning, or else are partly albitised with patchy central zones of carbonate, chlorite and minor wispy sericite. Sparse clouded subhedral K-feldspar crystals are subordinate and sparse small quartz phenocrysts, up to 0.5 mm across, have somewhat magmatically rounded to subhedral shapes. The sparse rounded pale grey vesicle sites of the hand specimen commonly enclose aggregates of small euhedral quartz crystals peripherally, while central zones are filled with carbonate (calcite - see positive reaction with cold dilute HCl) and minor chlorite ± sphene. Other vesicle sites have subradiating aggregates of acicular epidote intergrown with chlorite and carbonate peripherally, and central zones of relatively coarse grained granular quartz. Several sites of sparse small mafic microphenocrysts that once may have been amphibole, now are pseudomorphed by aggregates of chlorite, carbonate minor quartz and sphene. Primary accessory phases include opaque oxide microphenocrysts, small apatite grains and zircon.

The abundant fine grained groundmass fraction comprises a very fine grained granular mosaic of intergrown quartz and K-feldspar (see stained offcut) with ubiquitous poorly defined minute decussate somewhat ophitic albite microlites and opaque oxide dust enclosed within the felsic mosaic. Minor narrow branching veinlets or microfractures throughout the groundmass are marked by trails of wispy very fine grained "sericite" or even montmorillonite ± chlorite.

Alteration in this sample is quite selective and affects certain phenocryst and vesicle sites. Otherwise the sample shows little alteration and may be described as a partly altered sparsely porphyritic and amygdaloidal fine grained acidic igneous rock most likely of rhyolitic composition. The sample equally may be of very shallow intrusive or extrusive origin since the abundant groundmass fraction exhibits a somewhat ophitic but extremely fine grained felsic intergrowth texture.

6025
Lake Mackintosh
GEOLOGICAL LEGEND
QUATERNARY — Qg — Superficial fluvioglacial gravels.
JURASSIC ? — Jdl — Dolerite (Post tectonic - intrusives ?)
EARLY ORDOVICIAN "OWEN CONGLOMERATE" — Oc — Siliceous/quartzitic pebbly-conglomerate and sandstone.
CAMBRIAN
"FARRELL SLATES" - "DUNDAS GROUP" EQUIVALENTS
Ess — Grey to black slate. Sometimes wealdy pyritic.
Esg — Micaeous and/or tuffaceous fine to medium grained greywacke and siltstone, massive or laminated/turbiditic.
Esl — Medium to coarse grained feldspathic/tuffaceous lithiwacke.
UNDIFFERENTIATED PYRO-EPI-CLASTICS
Ees — Fine grained tuffaceous/sericitic/siliceous siltstone ?; massive to finely laminated.
Eef — Ultra fine grained, pale grey tuffaceous-cherty silstone ?; usually massive, rarely laminated or brecciated.
"MT. READ VOLCANICS" "CENTRAL VOLCANIC SEQUENCE"
Epa — Fine to medium grained felsic, usually feldspar phyric, tuffs; occasionally well bedded.
Epp — Pumiceous, feldspar phyric, wealdy lithic, ignidioritic tuffs.
Epf — "Rhyodacitic - Rhyolitic" lapilli tuffs, often pumiceous.
Epb — "Rhyodacitic - Rhyolitic" coarse volcanic breccia.
Evr — "Rhyodacitic - Rhyolitic" feldspar (qtz) phyric extrusives. Often partly autobrecciated.
Evd — "Dacitic" feldspar + ferromagnesian phyric, vesicular/amygdoidal extrusives. Possibly partly intrusive.
Eir — "Rhyolitic" Quartz + feldspar ± biotite Porphry. Probably intrusive.
GEOLOGICAL SYMBOLS
Generally according to BMR System (1963)
Banding in igneous rocks.
Bedding
Bedding with younging direction
Cleavage
Joint
Other planar features, contacts, fault planes etc.
Direction and plunge of vesicle/amygdale lineation in Evd.
Outcrop Boundary.
Area of float, scree
E.L. boundary
5 383 000 mN — A.M.G. co-ordinates
500 — Topographic contours in metres
Track
Creek
924112
5 cm
87-2662
PROJECT AREA
LAUNCESTON
Rosebery
QUEENSTOWN
HOBART
LOCATION PLAN
PANCON
PANCONTINENTAL MINING LIMITED
EXPLORATION DIVISION
LAKE MACKINTOSH PROSPECT
E.L. 42/86 - TASMANIA
GEOLOGICAL PLAN
SCALE 1:5000
0 100 200 300 400 500
METRES
Compiled W.H.
Date December 1986
Dwg. Nº 37/D/1
Report Nº 87/7
Map Ref. SK 55-3
PLATE 1
6025


6026
Lake Mackintosh
SWAMP
Water trickling South
SINK
SUBTERRANEAN ?
SPRINGS
HEC WALKING TRACK
QUARRY
INTAKE
LEVEE
LOG BARRIER
L E G E N D
E.L. boundary
5 383 000 mN A.M.G. co-ordinates
Topographic contours in metres
Track
Creek
15831 2/5/13/<1/375/<20/0·030 Analysis of -80 mesh fraction sample Cu/Pb/Zn/Ag/Mn/As/Au ppm
15825 5/23/55/0·2/0·003 Analysis of panned concentrate Cu/Pb/Zn/Ag/Au ppm
15846 <50 Analysis of Bulk Leach Extractible Gold (BLEG) mg/kg Au
924113
5 cm
87-2662
PANCONTINENTAL MINING LIMITED
EXPLORATION DIVISION
PANCON
LAKE MACKINTOSH PROSPECT
E.L. 42/86 - TASMANIA
STREAM SEDIMENT
SAMPLE LOCATIONS
SCALE 1: 5000
METRES
Compiled V.B.
Date NOVEMBER 1986
Dwg. Nº 37/F/1
Report Nº 87/7
Map Ref. SK 55-3
PLATE 2
PROJECT AREA
LAUNCESTON
Rosebery
QUEENSTOWN
HOBART
LOCATION PLAN
6026